ASSESSMENT OF NEXUS BETWEEN BUILDING CHARACTERISTICSAND CLIMATE CHANGE EXPERIENCES ON HOUSING QUALITY OF RESIDENTS IN AYETORO, ONDO STATE.

Abstract

Climate change is one of the most pressing challenges facing the world today, with far-reaching impacts on various sectors, including housing. Ayetoro, a coastal community in Nigeria, is particularly vulnerable to the impacts of climate change due to its location and socio-economic factors. The study assessed the relationship between building characteristics and climate change experiences of the residents of Ayetoro community on their housing qualities. The following null hypotheses were tested: 1.) there is no positive relationship between building materials and increase in the room temperature in Ayetoro community from 2000 to 2022. 2.) There is no positive relationship between Age of building and Erosion of supporting soils in Ayetoro community from 2000 to 2022. 3.) There is no positive relationship between locations of building and permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022. The study was a mixed method cross sectional inferential study. A total of 379 questionnaires were distributed with 92.9% completion rate. Gathered data were presented by means of frequencies & percentage on tables and analyzed using inferential statistical tools such as linear correlation and pair sampled correction at 95% confidence level. The study found that; increase in room temperature has no positive effect on building roofing materials covering and building floor materials while increase in room temperature has positive effect on building materials used for wall foundation footing and Building materials used for the construction wall. Permanent flooding in the low-lying areas has no positive impact on location of building. Also, there is no positive relationship between age of building and erosion of supporting soils in Ayetoro community from 2000 to 2022. The study underscores the urgent need for proactive measures to address the climate change impact on housing quality.

Keyword: Building Characteristics, Housing Qualities and Climate Change Experiences.

Introduction

Climate change has posed significant obstacles in the last few decades from the perspectives of the physical, social, economic, and psychological spheres. The intensity of heavy rains, the frequency of cold days and frosts, the frequency of hot days and the length of heat waves, and an increase in the global average temperature are some of these challenges (Intergovernmental Panel on Climate Change, 2014). These days, we have to deal with retreating glaciers, shifting river flows, and changing ecosystems on a daily basis (Adger, Paavola, and Hug 2006). The quality of life for households in both urban and rural regions is significantly impacted by these extreme weather events, particularly for those who "live in poor quality housing, exposed areas, and the built environment" (IPCC, 2019). Nwakunor's (2023)- synthesis report, which is based on years of study by hundreds of scientists during the Intergovernmental Panel on Climate Change (IPPC) sixth assessment loop, has confirmed extreme weather occurrences as a threat to the wellbeing of humans and planters. The report went on to claim that humans were solely to blame for the 1.1% increase in global temperatures over the previous 200 years. This increase in temperature has resulted in more frequent and dangerous weather events that have wreaked havoc on people's lives, property, ecosystems, and the planet itself. In 2018, the IPCC emphasized the magnitude of the difficulties needed to maintain warming at 1.5°C. Because coastal towns are more exposed to erosion, stronger storms, and rising sea levels, they are especially vulnerable to the consequences of climate change. The severe issues with climate change adaptation in

Nigeria's coastal regions, which particularly affect low-income caregivers' homes, have been the subject of numerous studies, government initiatives, and established development agencies. These efforts have attempted to address the catastrophic effects of extreme weather events on infrastructure, buildings, the environment, and ecosystems, but have not yet produced remarkably positive outcomes. These difficulties are not exclusive to the Nigerian coastal town of Ayetoro. Understanding how Ayetoro's housing quality is affected by climate change is essential for creating practical adaptation plans and guaranteeing the community's resilience as the phenomenon worsens. These impacts can lead to the degradation of housing infrastructure, displacement of residents, and increased economic and social burdens. Recent studies indicate that housing quality in these regions are directly affected by climate change, highlighting the need for localized assessments (Adeola & Abubakar, 2022). Specifically, Ayetoro coastal community exemplifies the intersection of these challenges, where housing resilience is critical to ensuring the well-being of its inhabitants. (Akanbi & Oyeleke, 2024).The standard of housing is essential to people's livelihoods and general well-being, both individually and collectively. It includes a number of elements, including as affordability, accessibility, structural soundness, and suitability for human occupancy. However, because of heightened susceptibility to natural disasters like flooding, strong storms, and coastal erosion, climate change may compromise the quality of homes. These effects may result in resident displacement, deterioration of the housing infrastructure, and heavier social and economic responsibilities. According to records, the Ayetoro community's ecology, biodiversity, structures, and ecosystems have all suffered significantly from changes in rainfall patterns, sea level rise (SLR), windstorms, and temperature (Enete, 2012; NDDC, 2014; Odjugo, 2019). Marine and coastal habitats may be significantly impacted by the increasing acidity. 2017 saw the United States Environmental Protection Agency (EPA) release. The issues that coastal areas presently confront are projected to get worse due to the effects of climate change. In many places, there is already concern about addressing issues including shoreline erosion, coastal flooding, and water pollution that have an impact on man-made infrastructure and coastal ecosystems (EPA United States Environmental Protection Agency, 2017). But housing is more than just a structure. It comprises public services and utilities including garbage disposal facilities, recreation centers, well-maintained roads, and the provision of water and power. According to Agbola (1998), "housing has become a political football and has thus suffered from poorly articulated problems, short-lived policy formulation process, ill-conceived legislative and unsustainable programme objectives". Understanding the housing strategies used is necessary if policies and initiatives in the riverine Ilaje area are to be implemented. In order to improve the housing situation in the riverine area, the study will help both public and private housing cooperation (oil firms). Additionally, it will aid in the reconstruction of the catastrophe zone—communities swept away by sea erosion—and aid in the resettlement of the war-torn Ilaje Ward for both public and private oil businesses. According to the IPCC (2014), a shift in climate refers to a sustained alteration of an area's usual meteorological conditions, including average temperature, precipitation, and frequency of windstorms. Global warming is mostly brought on by an increase in greenhouse gas emissions, which include nitrous oxide, carbon dioxide, and methane. These gases trap heat in the Earth's atmosphere. This indicates that during the next few decades, the range of conditions anticipated in many areas will vary. In a similar vein, the United States Environmental Protection Agency (EPA) (2017) claims that any significant changes to the climate will be held back by climate change for a longer amount of time. In other words, climate change refers to significant, long-term changes in temperature, precipitation, and wind patterns, among other effects. According to the United States Global Research Program (USGCRP) (2014), the average global temperature has increased by 1.5°F during the previous century and is expected to increase by an additional 0.5°F to 8.6°F over the following centuries. In the end, this will result in significant and maybe catastrophic modifications to the climate and variability of the weather. According to National Geographic NG (2019) on GHGs, the oceans have tempered the effects of human-caused greenhouse gas emissions into the atmosphere by absorbing more than 90% of the heat. In addition, the oceans are being overheated as a result of this exercise. Global warming or climate change has caused sea level rise (SLR) of nearly 23 cm since 1880, with an average of 7.5 cm gained in the last 25 years. The paper also stressed that while big glaciers melt every summer by nature, the persistently rising temperatures brought on by global warming have recently led to both an increase in average summer ice melting and a decrease in snowfall because of late winters and early springs. This results in an imbalance between ocean evaporation and runoff, raising sea levels and causing damaging erosion, flooding of wetlands, aquifer contamination, and alkaline soil degradation in agricultural areas. As a result, the habitat of fish, birds, and plants is lost, and the coastal area's infrastructure, homes, and means of subsistence are all devastated. Over 500 homes were impacted by another intrusion of Ayetoro property by the Atlantic Ocean on April 16, 2023. The World Health Organization (WHO) claims that the largest threat to humanity is climate change, which has an impact on people's health both directly and indirectly. Extreme weather events like heat waves and floods have direct effects on health. Additionally disturbed food supply networks that resulted in food insecurity. Malnutrition, the spread of water-borne illnesses, and vector-borne infections, which raise the prevalence of illnesses and diseases including diarrhea and malaria, are examples of indirect health effects. The effects of global warming on the 36 million fishermen worldwide and the almost 1.5 billion consumers who rely on fish for more than 20% of their dietary animal protein are causing growing concerns about food security and livelihoods. As a result of variations in sea surface temperatures, mackerel landings by Taiwan and Chile decreased by approximately 50% and 70%, respectively, after the 1997–1998 El Nin¸o. Fisheries in Peru for various pelagic species, such as sardine and anchovies, were also severely impacted, with landings down around 55% from the prior year, resulting in over $26 million in lost income. Prices for replacement goods, such Baltic sprat, usually peak around these occasions. Conversely, these fisheries thrive from La Nin'a events, which are linked to lowering sea surface temperatures around Peru and Chile. (Halls, Allison, Dulvy, Badjeck, 2009). Coastal areas can be impacted by climate change in many ways. Sea level rise, variations in storm frequency and intensity, increases in precipitation, and greater ocean temperatures can all have an impact on coastal areas. Moreover, the oceans are absorbing more carbon dioxide (CO2) and becoming more acidic as a result of growing CO_2 concentrations in the atmosphere. Marine and coastal habitats may be significantly impacted by this increasing acidity (EPA) Environmental Protection Agency of the United States, 2017). The issues that coastal areas presently confront are projected to get worse due to the effects of climate change. It is already a concern in many places to address issues like coastline erosion, coastal flooding, and water pollution that have an impact on man-made infrastructure and coastal ecosystems (Environmental Protection Agency (EPA) of the United States, 2017). Sea level variations that have been observed in the US between 190 and 2014 in relation to land elevation (EPA, 2015). The relative sea level rise rate is higher in areas where the land is sinking than it is globally. Certain regions of the United States, such as portions of the Gulf Coast, are experiencing some of the highest rates of relative sea level rise. For instance, in the previous 50 years, coastal Louisiana has experienced a relative sea level rise of eight inches or more, which is roughly twice the global pace. In the Chesapeake Bay region, subsiding land exacerbates the consequences of relative sea level rise, raising the possibility of flooding in tidal wetlands, cities, and inhabited islands. 2017 saw the United States Environmental Protection Agency (EPA) release.

Figure 1: Ayetoro impact on climate change in 2023[Source: Work of the researcher].

There is ample proof that rising gas concentrations in nurseries are mostly to blame for the recent global warming (IPCC 2012). According to Peterson and Baringer (2008), the 1970s saw the start of much of this warming, with the last 12 years seeing 10 of the hottest years and the last 20 hottest years occurring since 1981. Regardless, surface temperatures increased even after the 2000s solar production declined as a result of very deep solar radiation, at least from 2007 to 2009 (Allison et al., 2009). Citing Nicholls and Collins (2006), the measured variations in global temperature over a 100-year period are approximately 0.6± 0.2°C. additionally concur with the instruments, given that CO_2 GHG concentrations increased by 282 ppm between 1800 and 2000. However, data from today indicates that CO_2 concentrations are already above 400 parts per million (ppm) (Roségrant, et al., 2002). According to Akinleye (2010) and Akinleye et al. (2012), the climatic model of Ayetoro, a community in the Ilaje Local Government Area in Ondo State, has two peak rainy seasons along with a brief and uniform dry season. From late August to mid-November and from March to mid-July is considered the rainy season. While the long dry season lasts from late November to March, the short dry season spans from mid-July to early August. The year-round temperature is between 21 and 33°C, with a comparatively high humidity level. The southern regions receive 2,000 mm of rainfall annually, while the northern regions receive 1,150 mm. Akure uses the TAMSAT Platform, which displays a descriptive analysis of precipitation, temperature, and relative humidity. Average annual meteorological data for Ondo State, Nigeria for 20 years (2001 to 2000) based on monthly data from the Nigeria Meteorological Agency (NIMET) and WASCAL under the Bureau of Meteorology and Climate science and Technology (FUTA). TAMSAT provides and supports the use of satellite-based rainfall, flooding, and other meteorological data to improve the ability of African meteorological agencies and other organizations. relative humidity, SLR approximations, and further relevant data products. At a resolution of 4 km, it generates daily estimates for weather variation connected to all African countries. Additionally, they forecast weather conditions for every nation on Earth, providing early notice of potential threats to infrastructure, the environment, and means of subsistence (Maidment et al., 2017). Jean characterized Ayetoro rainy season as gloomy and its dry season as nearly cloudy, hot, and cruel all year round in his study of the "D Astronomical Algorithms 2nd Edition Report." The average annual temperature ranges from 28.55°C to 32.78°C, with the wet season typically seeing lows of 20°C (Jean, 2019). The study evaluated the association between architectural attributes and the experiences of Ayetoro community members with regard to housing conditions and climate change.

The following hypothesis was tested in order to achieve the aim of the study:

Null Hypothesis 1: There is no positive relationship between building materials and increase in the room temperature in Ayetoro community from 2000 to 2022.
Null Hypothesis 2: There is no positive relationship between Age of building and Erosion of supporting soils in Ayetoro community from 2000 to 2022.
Hypothesis 3: There is no positive relationship between location of building and permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022.

Materials and Method

Study Area: In the Ondo State town of Ayetoro, the study was carried out. The research area is located around 160 km east of Lagos, at latitude 6°13.785 N and longitude 4°38.975' E. The Ilaje people live in the swampy area that separates the study area from the mainland by about 40 km. The Yoruba ethnic groups of Nigerians, known as the Ilaje, are located in the coastal area of Ondo State's Southern Senatorial District. A local government known as the Ilaje Local Government Area (ILGA), with its headquarters located in Igbokoda in Ondo State, Nigeria, has been formed out of Ayetoro and adjacent communities near the Atlantic Ocean (Figure 2). Barbero &Savvidu (1986) state that Holy Apostle Ogeleyinbo (the community's head) started the community in 1947. from the sect of Cherubim and Seraphim, who claimed they were divinely sent. This movement sprang from a revolt against the customs of idol worship. Hence, on January 11, 1947, at midnight, he guided the refugees to the utterly inhospitable Laje Estuary on the Atlantic Ocean's edge, where the 'Ayetoro Community' was established and flourished as a theocratic community that distinguished itself from other theocratic communities that the same movement gave rise to (Barbero, and Savvidu, 1986). The majority of the state's oil-prospecting businesses and their wells are located there. This hamlet is part of the Ugbo kingdom, but because it is theocratic, it has maintained its independence. The Ayetoro community was selected because of its high degree of decadence from the damaging effects of extreme weather events like SLR/flooding and windstorms on the environment and buildings, which could be appropriately contained. Additionally, the community was chosen because of the immediate sea incursion that has encroached into it by more than 900 meters, severely damaging the infrastructure and buildings, and requiring corrective intervention strategies without displacing the locals. The communities of Ayetoro, Mahin, Etikan, Aheri, and Ugbo share common boundaries. The growth of clustered buildings/settlements, primarily residential with a few commercial businesses tucked away along the main broad street, defines the entire town. Up until recently, the only ways to go from Ayetoro to other settlements was via river or ocean; there was no road connection. Due to the low elevation, close proximity to the Atlantic Ocean, and swampy terrain, the majority of the village is vulnerable to seasonal flooding. The Ayetoro village has no fenced-in buildings.

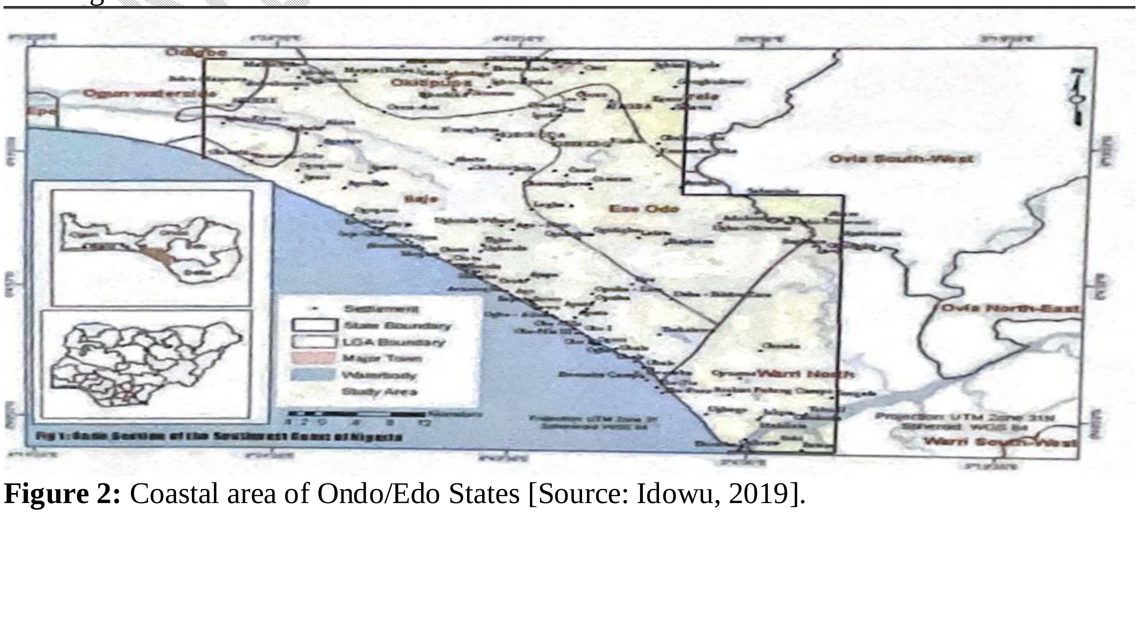

Figure 2: Coastal area of Ondo/Edo States [Source: Idowu, 2019].

Research Design: Mixed-methods approach comprising of quantitative (questionnaire survey) and qualitative (interview and direct observations) was adopted for the study. Mixed method allows for an investigation that addresses more complicated research questions, to collect complementary data that enables researcher to gain more contextual understandings of the phenomenon being researched. The study is also a cross-sectional study, conducted in partial fulfillment of a PhD program. Cross-sectional studies are conducted over short-medium stipulated time.

Research Population: This is universally a large collection of individuals or objects that are the main focus of a scientific query (Explorable.com, 2009). According to the Digest of Demographic Statistics of Ondo State, (DDS), (2006), Ayetoro community has a provisional census figure of about 20,070 according to the 2006 census and a projection of 33,173 in 2023 using a 3% yearly increase as recommended by the National Population Commission (NPC). The research population includes all categories of buildings (residential, religious, civic, and commercial), streets and the environment in Ayetoro community.

Sampling Techniques and sample size

Sampling Techniques

The sample and the sampling techniques involved the choice of sampling techniques and the derivation of sample size used. since it is technically wasteful to attempt to collect data from the entire residents of Ayetoro community, it is therefore desirable to adopt a sampling process that will be suitable for the target population. This study adopted a random sampling procedure of the selection of the most affected streets in the study area from the existing 56 streets, where twenty-five (25) streets were selected alternately along the main Broad Street, representing about 45% of the entire streets in the community. Secondly, a random sampling with a simple interval of 5 also used to select buildings to be assessed in each street. About 10-12 owners were chosen from the selected 24 streets - (310 buildings) depending on the extent of the streets. The main Broad Street that runs the full length of the community had 65 buildings selected. Simple random sampling according to Lauren Thomas (2022) is the randomly selected subset of a populace where every member is eligible to be selected. The method is most straightforward with high internal and external validity and lower risk for research sampling and selection biases.

Sample Size: This is the process of selecting the number of observations or prototypes to include in a statistical sample. It is an important make-up of any empirical study in which the goal is to make inferences about population from a sample (Kibuacha Frankline, 2021). With regards to the purpose of this study, consideration was given to the method of Krejcie and Morgan (1970) in determining sampling size for a finite population, because of its simplicity and clarity. Thus the total population which consists of a fixed number of elements and the updated cartographic maps form the basis for an estimated population upon which quantitative information were obtained from the respondents in the study area was utilized. Therefore, with a projected population of 33,173 and using the sample size calculator, with a confidence degree of 95% and error of 5%. an overall number of 379 respondents were chosen for this research. Responses were retrieved from 352 respondents giving an equal completion rate of 92.9%, these respondents were used to generalize the assessment of the effects of climate change effects on buildings and the environment in Ayetoro community.

Sample Frame: The sample frame for this study was the entire Ayetoro community as represented by the randomly selected representatives. The sample frame has been limited to owners or occupants of sampled 379 buildings in the study areas, either completed or uncompleted (but excluding unoccupied or uninhabited buildings) upon which information was taken from the owners' occupants above the age of twenty-four (24) years and domiciled in the community. The same parameters applied to the 15 members of the FGD groups whose answers were used to generalize the assessment of the extreme weather event impacts on buildings/environment in Ayetoro community.

Instrumentation for Data collection

Quantitative Method: Data collected with the use of well-structured, self-administered multiple-choice questionnaire, administered on randomly selected 379 respondents in Ayetoro community. A set of questionnaire was employed to extract quantitative data from residents (sample size= 379), who are over 20 years old, living in completed or uncompleted houses in Ayetoro community. The sample size was calculated with reference to Krejcie and Morgan (1970) at a sure and interval level of 95% and 5% respectively.

Qualitative Method: The second sets of data were obtained with the help of direct field observation and focused group discussion through visitation to the most affected sites in Ayetoro from where qualitative information was extracted. Questions related to extreme weather events and its various impacts on building and the social amenities and infrastructure in Ayetoro community were discussed.

Table 1 Result of reliability Test of the Instrument of the questionnaire

Reliability Statistics

Cronbach's Alpha	N of Items
.846	34

Table 1 shows the SPSS result of the reliability test. It demonstrated that the Cronbach's Alpha coefficient was 0.846, which is considered Excellent. This connotes internal consistency.

Method of Data Analysis

The collected data from the field survey, a total of 352(92.9%) of the distributedwere presented on tables by means frequencies &percentage and then subjected to inferential statistical methods using the instrumentations of both linear correlation and paired sampled correlation at 95% confidence level and 0.05 margin of error.

Results and Discussion

Socio-demographic Characteristics of Respondents

Table 2 Respondents 'sociodemographic information.

Factor	Variables	Frequency(F)	Percentage (%)
[**Number of Respondents (%)** = 352(100)]			
Sex	Male	208	59.1
	Female	144	40.9
Age group	18 – 27years	40	11.4
	28 – 37years	64	18.2
	38 -47years	16	4.5
	48 – 57years	160	45.5
	Above 57years.	72	20.5
Marital status	Single	64	18.2
	Married	240	68.2
	Widow	48	13.6
Religion practicing	Christianity	256	72.7
	Islam	48	13.6
	Traditional	24	6.8

	Preferred not to say	24	6.8
Education level	No formal Education	80	22.7
	Secondary	72	20.5
	Tertiary Education.	200	56.8
Stay in the Community	Less than 5years	40	11.4
	5years – 10years	40	11.4
	Above 10years	272	77.3

Table 2 presents the result of the sociodemographic characteristics of the Respondents. It demonstrated that majority of the respondents 208 (59.1) were male. The highest age group distribution 160(45.5) was between the ages 48 and 57years. Largest number of the respondents 240(68.2) were married, with greater distribution 256(72.7) practicing Christianity. It demonstrated that most of the respondents 200(56.8) had Tertiary Education. Majority of the respondents 272(77.3) had stayed in the Community for more than 10years.

Building Conditions and Characteristics

Table 3 Showing the responses on the building conditions and characteristics [Number of Respondents = 352(100)]

Factor	Variables	Frequency (F)	Percentage (%)
Type of building	Storey building	32	9.1
	Bungalow	320	90.9
Location of Building	On swamp	312	88.6
	On dry land	40	11.4
Foundation	Concrete block	24	6.8
	Wooden pile (Omeghen)	328	93.2
Tenure status	Owner occupied	88	25.0
	Privately rented	88	25.0
	Family house	176	50.0
Stage of participation in house development	Inception stage	216	61.4
	House design stage	24	6.8
	Modification stage	48	13.6
	Preferred not to say	64	18.2
Source of finance for house	Housing loan	32	9.1
	Personal savings	144	40.9
	Mortgage borrowing	24	6.8
	Local borrowing	64	18.2

	Preferred not to say	88	25.0
Indicate the Source of Water supplies in the building	River & Ocean	152	43.2
	Pipe borne water	32	9.1
	Tanker	168	47.7
Indicate the availability of Electricity facilities in the building	Electric Generator	280	79.5
	Solar and Inverter.	40	11.4
	None	32	9.1
Building materials used for the construction wall	Planks/Timber	328	93.2
	Sand Crete block	24	6.8
Building material used for wall foundation footing	Strip	24	6.8
	Wood	304	86.4
	Concrete	24	6.8
Roofing Materials covering	Corrugated Iron sheet	8	2.3
	Corrugated Aluminium sheet	344	97.7
Floor Materials	Laterite/Sand	24	6.8
	Concrete	32	9.1
	Wood/Plank	296	84.1
Overall assessment of the building condition	Needs major repairs	288	81.8
	Needs minor repairs	64	18.2
Use of building	Residential	240	68.2
	Public e.g. Church, school	56	15.9
	Commercial	56	15.9

Table 3 presents the result of the Building condition and characteristics. It demonstrated that majority of the respondents 320(90.9) and 312(88.6) leaving in Bungalow and located in swampy area. It also shows that majority of the respondents 328(93.2) used Wooden pile (Omeghen) for foundation, with majority of the respondents 176(50.0) tenure status being family house. Highest distribution of the respondents 216(61.4) stage of participation in house development was inception stage. It shows that majority of the participants 144(40.9) finance their house by means of Personal savings. 168(47.7) and 280(79.5) which represents the major distribution of the respondents relied on Tanker for the source of water supplies and Electric Generator as Electricity facilities in the building. A great number of the respondents 328(93.2) and 304(86.4) used Planks/Timber as materials for the construction wall of the building and wood for material of wall foundation's footing. The result also shows that majority 344(97.7) of the participants uses Corrugated Aluminium sheet as materials for

Roof covering, with highest distribution 296(84.1) using Wood or Plank as materials for flooring the building. The result of the survey also depicted that greater number of respondents' buildings 288(81.8) need major repairs. While majority of the respondents 240(68.2) use their building for use their building for Residential purpo

The Climate Change experiences of the Residents of Ayetoro Communities on their housing qualities from 2000 to 2022

Table 4 Showing the main resultant effect of impacts of climate change

Factor	Variables	Frequency (F)	Percentage (%)
[**Number of Respondents (%)** = 352(100)]			
Main resultant effect of impacts of climate change	Economic problems	64	18.2
	Displacement from dwelling	240	68.2
	Restriction of movement	16	4.5
	Discouragement and depression	8	2.3
	Security and safety problem to properties	24	6.8

Table 4 shows the result of the main resultant effect of impacts of climate change. It demonstrates that the majority of the respondents 240(68.2) opines that displacement of people from their dwellings is the main resultant effect of the impact of climate change. Although, lowest number of the respondents 8(2.3) believe discouragement and depression.

Table 5 Showing the experiences of the residents on the quality of their building due to climatic change from 2000 to 2022

Factor	Variables	Frequency (F)	Percentage (%)
[**Number of Respondents (%)** = 352(100)]			
Collapse of building	Agree	112	31.8
	Strongly Agree	240	68.2
Erosion of supporting soils	Agree	128	36.4
	Strongly Agree	224	63.6
Surges of saltwater into waterways and roadways near the coasts	Agree	40	11.4
	Strongly Agree	312	88.6
Permanent flooding in the low-lying areas	Agree	96	27.3
	Strongly Agree	256	72.7
Increase in the extent and depth of tidal permanent flooding	Agree	136	38.6
	Strongly Agree	216	61.4
Increases room temperatures	Disagree	24	6.8
	Neutral	8	2.3
	Agree	296	84.1
	Strongly Agree	24	6.8

Wet concrete due to flood breeds bacteria and mold causing microbial effect like skin inflammation	Strongly Disagree	24	6.8
	Agree	72	20.5
	Strongly Agree	256	72.7
Disruption of movement of human and vehicles dues to permanent flooding	Agree	72	20.5
	Strongly Agree	280	79.5
Increased the attraction of filthiness and dirt in the surroundings	Agree	24	6.8
	Strongly Agree	328	93.2
Destruction of residents' belongings	Strongly Agree	352	100.0
Prevented access to the residents' building due to flooding	Neutral	48	13.6
	Agree	152	43.2
	Strongly Agree	152	43.2
Prevented access to the residents' building due to flooding	Neutral	48	13.6
	Agree	152	43.2
	Strongly Agree	152	43.2
Damaged important infrastructure in my community	Strongly Agree	352	100.0
Events that brought about threaten to the lives of residents of the community	Strongly Agree	352	100.0

Table 5 show the result of the experiences of the residents on the quality of their building due to climate change from 2000 to 2022. The result demonstrated that highest distributions of the participants 240(68.2), 224(63.6) and 312(88.6) strongly agree that collapse of building, Erosion of supporting soil and Surges of saltwater into waterways and roadways near the coasts respectively, are experiences of the residents on quality of their building as a result of climate change. Also, 256(72.7) and 216(61.4) of the respondents strongly agree that permanent flooding in the low-lying areas and increase in the extent and depth of tidal permanent flooding respectively, are experiences of the residents on quality of their building as a result of climate change. Meanwhile, majority of the respondents 296(84.1) agree that increases room temperatures is an experiences of the residents on quality of their building as a result of climate change. A great number of the respondents 256(72.7), 280(79.5), 328(93.2) and 352(100.0) strongly agree that the experiences of the residents on quality of their building as a result of climate change were wet concrete due to flood breeds bacteria and mold causing microbial effect like skin inflammation, disruption of movement of human and vehicles dues to permanent flooding, increased the attraction of filthiness and dirt in the surroundings and destruction of residents' belongings respectively. Largest distributions of the respondents 152 (43.2) each strongly agree and agree that prevented access to the residents' building due to flooding. Although, all the respondents 352(100.0) strongly agree that the experiences of the residents on quality of their building as a result of climate change were damaged to important infrastructure in my community and Events that brought about threaten to the lives of residents of the community respectively.

Assessing the relationship between building characteristics and climate change experiences of the residents of Ayetoro community on their housing qualities.

Null Hypothesis 1: There is no positive relationship between building materials and increase in the room temperature in Ayetoro community from 2000 to 2022.

Table6 Statistical result of building materials and increase in the room temperature in Ayetoro community from 2000 to 2022

Variables	Correlation coefficient (α)	p-value	Remarks
Building materials used for wall foundation footing and Increase in room temperature	0.310	0.000	*There is positive relationship (p-value < 0.05, α = 0.310). Null hypothesis is rejected.*
Roofing materials covering and Increase room temperature	-0.023	0.664	*There is no positive relationship (p-value > 0.05, α = -0.023). Null hypothesis is retained.*
Floor materials and Increase room temperature	-0.472	0.000	*There is negative relationship (p-value < 0.05, α = -0.472). Null hypothesis is not rejected or retained.*
Building materials used for the construction wall and Increase room temperature	0.495	0.000	*There is positive relationship (p-value < 0.05, α = 0.495). Null hypothesis is rejected.*

Confidence level is 95%, Significant level is 0.05.

Table 6 present the statistical result of relationship between building materials and increase in the room temperature in Ayetoro community from 2000 to 2022. The result is used to provide answer to research question two of the study, i.e. 'what is the relationship between the building materials and increase in the room temperature in Ayetoro community from 2000 to 2022?'. The result demonstrates that Null hypothesis is rejected (at p-value = 0.000 i.e. p-value < 0.05, α = 0.310) for the hypothesis on building materials used for wall foundation footing and Increase in room temperature. This infer that there is positive relationship between building materials used for wall foundation footing and Increase in room temperature. The result demonstrates that Null hypothesis is retained (at p-value = 0.664 i.e. p-value > 0.05, α = -0.023) for the hypothesis on roofing materials covering and increase room temperature. This infer that there is no positive relationship between building roofing materials covering and increase room temperature.The result demonstrates that Null hypothesis is not rejected or retained (at p-value = 0.000 i.e. p-value < 0.05, α = -0.472) for the hypothesis on floor materials and increase room temperature. This infer that there is negative relationship between building floor materials and increase room temperature.The result demonstrates that Null hypothesis is rejected (at p-value = 0.000 i.e. p-value < 0.05, α

= 0.495) for the hypothesis on building materials used for the construction wall and increase room temperature. This infer that there is positive relationship between building materials used for the construction wall and increase room temperature.

Null Hypothesis 2: There is no positive relationship between Age of building and Erosion of supporting soils in Ayetoro community from 2000 to 2022.

Table 7 Statistical result of Age of building and Erosion of supporting soils in Ayetoro community from 2000 to 2022

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Age of building & Erosion of supporting soils	352	-0.035	0.519

Table 7 present the statistical result of relationship between Age of building and Erosion of supporting soils. The result demonstrates that Null hypothesis is retained (at p-value = 0.519 i.e. p-value > 0.05, α = -0.035). This inferred that there is no positive relationship between age of building and erosion of supporting soils in Ayetoro community from 2000 to 2022.

Hypothesis 3: There is no positive relationship between location of building and Permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022.

Table 8 Statistical result of location of building and Permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Location of Building & Permanent flooding in the low-lying areas	352	-0.263	0.000

Table 8 present the statistical result of relationship between location of building and permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022. The result demonstrates that Null hypothesis is rejected (at p-value = 0.000 i.e. p-value < 0.05, α = -0.263). It can therefore be inferred that there is no positive relationship between location of building and permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022.

Discussion of the findings

The study examined the nexus between building characteristics and climate change experiences of the residents of Ayetoro community on their housing qualities. Hypothesis one stated thatthere is no positive relationship between building materials and increase in the room temperature in Ayetoro community from 2000 to 2022. However, it was discovered that there is a positive correlation between the building supplies used for the footing of a wall foundation and the rise in room temperature; There is no correlation between raising the temperature of a room and the materials used to cover the roof. Contrary to the finding that there is negative relationship between building floor materials and increase room temperature. According to Sokołowski, Nawalany, and Michalik (2022), the heating system, materials, and construction methods all have a big influence on how the exchange of heat with the ground forms. Galabada et al. (2021) found that the soil floor exhibits a lower temperature at an important degree than the other flooring types when compared with ceramic tile floors and cement rendered floors. Thus, it is evident that the materials used in building construction are crucial, and earth is the most sustainable material in terms of end-user indoor thermal comfort.According to Haruna, Muhammad, and Oraegbune (2018), the American Society of Heat, Refrigeration, and Air-conditioning Engineers (ASHRAE) defines thermal comfort as "that condition of mind which conveys fulfilment with the thermal environment." The combination or adaptation of environmental and physiological factors leads to thermal comfort. Building ventilation and indoor temperature are impacted by the local climate. As a result of solar heat gain by means of the building envelope and solar penetration using windows and other openings, buildings in tropical climates get overheated during the day (Haruna et al., 2018). Where there is a mental and physical balance within the building, heat and ventilation are achieved. Ayetoro Community, which frequently experiences heavy rainfall and flooding, is likely to see a drop in building temperature. The interior thermal comfort of building occupants is an important consideration in building design. When residents are able to select building materials that are best suited for their living environment, indoor thermal comfort is accomplished. In contrast to the results of this study, Ponni and Baskar (2015) discovered that the type of building roofing material used decides if there will be an increase in the room's temperature in their comparable study of various kinds of roof and interior temperatures in tropical climates. The insulated double roof with hybrid technology, known as the DOD, offers the best thermal comfort and performance among the chosen roofs. Houses with white roofs remain cooler and more pleasant than those with bare metal roofs, according to research by Carrasco-Tenezaca et al. (2021). The roof rusts as a result of metal oxidising over time as a result of exposure to water, salt, dust, and soot (Alchapar and Correa, 2016). Roofs' properties are essential to keeping a house cool in hot climates because they transfer the heat they soak up from solar radiation to the interior space they cover (Knudsen and von Seidlein, 2014). A white or light-colored roof can help lower interior temperatures. According to Tiara (2019), using palm fibre material in roof fittings reduced room temperature more effectively.In contrast to the finding of this study that there is positive relationship between building materials used for the construction of wall and increased room temperature Koranteng, Essel, and Amos-abanyie (2015) reach the conclusion that the building's orientation rather than material differences has a significant impact on indoor comfort. Buildings could be made more comfortable for their occupants with the correct materials and strict adherence to passive design principles. In a similar vein, research conducted in 2013 by Aldawia, Alama, Khana, and Alghamdi showed that new house wall systems can reduce greenhouse gas emissions and increase energy efficiency for major Australian locations. Conversely, Vincelas, Ghislain, and Robert (2017) looked into how the kind of building material affects temperature as well as the decrement factor. Based on the findings, it was concluded that a building's thermal behaviour is greatly influenced by the kind of building materials used. According to the study, in hot, dry climates, earth block walls are a better way to ensure thermal comfort and energy efficiency in non-air conditioned buildings. Additionally, the outcomes of the thermal resistance for sand brick walls and clay brick walls with and without polystyrene applied to the exterior of the wall are reported by Vikneswaran, Mohamad Nor, and Yean (2015). The findings indicate that the heat flow rate through a clay brick wall was less than that of a sand brick wall.Amos- Abanyie (2012) noted that the capacity of a building material to absorb, hold, and then release heat—indoors or outdoorsis measured by its thermal mass. Whenever the outside temperature becomes higher during the day, thermal mass can help keep a building's interior cool by delaying the transfer of heat through the envelope (Amos- Abanyie, 2012). Thus, thermal mass needs to be taken into account when developing a structure for construction in order to prevent the increase of heat.In the Ayetoro community, between 2000 and 2022, the relationship between the age of buildings and the erosion of supporting soils was investigated by Hypothesis two. According to the analysis's findings, the Ayetoro community's supporting soil erosion from 2000 to 2022 has no positive correlation with the age of buildings. According to Agyarko, Adu, Gyasi, Kumi, and Mensah's (2012) analysis, there was a positive correlation between the age of the building and the land's slope and the amount of the foundation displayed by soil erosion. The majority of respondents managed soil erosion by obstructing waterways with objects like stones, sand mounds, and soil-filled sacks. In addition to being a significant social and economic issue, soil erosion is crucial for determining the health and functionality of ecosystems. One of the issues with soils that arises naturally is soil erosion. It has an impact on every landform. Erosion risk increases with slope length and steepness in a field because more runoff accumulates at longer slopes, there is an increase in soil erosion by water Sheet erosion according to Balasubramanian (2017), is the movement of soil caused by runoff and splashing raindrops. Usually, it happens uniformly over a slope and is not noticed until the majority of the useful topsoil has been lost. Sheet erosion is probably going to happen frequently in the area because flooding occurs frequently in Ayetoro. The majority of Ayetoro's historic structures were not designed with climate change in mind. The development of architectural knowledge and building designs has led to the consideration of a number of factors when determining the best type of foundation to use in a building, particularly in areas that are prone to flooding or waterlogging. German floors, for instance, are a relatively new type of foundation that aids in assisting structures in overcoming environmental issues like erosion and flooding. The lack of use of foundation types like German flooring in older buildings in Ayetoro communities leaves them vulnerable to erosion. Fabiyi and Oloukoi (2013) observed, however, that the Ayetoro communities have modified their construction supplies and architectural style to withstand the catastrophic flooding disasters that frequently occur in the communities. It was observed that the communities construct their buildings by drawing inspiration from the local natural features. The residents of the communities receive advice for building on pile and raft foundations from the mangroves and river birds.Hypothesis three of the study examined the relationship between location of building and Permanent flooding in the low-lying areasin Ayetoro community from 2000 to 2022. The result showed there is no positive relationship between location of building and permanent flooding in the low-lying areas in Ayetoro community from 2000 to 2022. In line with the results of this investigation, Pujari and Wayal (2023) observed that alterations in land-use patterns, low landscape, and unplanned urbanisation are contributing factors to the rising frequency of flood events in urban regions. According to Nicholls et al. (2007), there is a high degree of confidence that in the upcoming decades, buildings situated in low-lying coastal areas will be subjected to escalating risks, such as coastal erosion, as a result of climate change and sea level rise. Low-lying cities with road and outfall elevations are susceptible to flooding and waterlogging that lasts for two to four hours. Depending on the quality of the materials used to build the building's foundation, this can cause water to seep into the building and negatively impact its quality (Pujari and Wayal, 2023). Olakunle, Salami, and Osinowo (2021) state that Ayetoro is located on the Mahin mud coast, where the soil is composed of 54% clayey mud, 34% silty mud, and 12% sandy mud. Because of its low slopes, low landscape, high mean wave heights, receding vegetation cover, and proximity to certain coastal installations, the community is susceptible to rising sea levels. Because of the shifting hydrological conditions of today, drainage system design must be built (Zope, Eldho, and Jothiprakash, 2016).

Conclusion and Recommendations

The study assessed the nexus between building characteristics and climate change experiences of the residents of Ayetoro community on their housing qualities. The research findings underscore the urgent need for proactive measures to address the climate change impact on housing quality in Ayetoro.Overall, the assessment of climate change impact on housing quality in Ayetoro coastal community provides valuable insights that can inform targeted interventions and policy actions aimed at enhancing the resilience and livability of coastal communities in the face of ongoing climate change challenges.

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