AN EVALUATION OF THE IMPACT OF FLOODING ON REAL ESTATE VALUE IN LAGOS ISLAND- (2007-2024)

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ABSTRACT

***Purpose**: This study aimed to quantitatively assess the long-term consequences of flooding on real estate values in Oniru and Lekki Phase 1, Lagos, Nigeria, between 2007 and 2024.*

***Methodology**: The population considered for the study was practicing Estate Surveying and Valuation firms within the study area in Lagos State. A systematic random sampling technique was adopted to administer questionnaire to a sample size of 55 for the study; out of which 48 were retrieved, representing 87% response rate. Data was analyzed using descriptive statistics, mean item score, trend analysis and linear regression model.*

***Findings**: The study explored the degree of influence of flood occurrence on land and building value in the study area. Empirical findings showed that similar to Oniru, Lekki Phase I shows a positive trend in rental values, indicating that the area remains attractive despite flooding risks. Oniru further demonstrates resilience to flooding impacts, maintaining an upward trajectory in rental values. However, the impact on land value and traffic are severe.*

***Implications**: The study reveals that, though flooding events have had a negative impact on property values in the short term, the long-term trend suggests resilience in both Oniru and Lekki Phase 1. It therefore emphasizes the need for robust flood management strategies, including improved drainage systems and embankments to prevent property value loss and man-hour loss in traffic. Policymakers, builders and urban planners should prioritize investments in infrastructure and community resilience to mitigate the adverse effects of flooding. Additionally, property owners, investors and the construction industry should consider the long-term implications of climate change, and incorporate flood risk into their decision-making processes.*

***Originality/Value**: This study contributes to the growing body of literature on the impact of natural disasters on real estate markets, particularly in Victoria Island and Lekki Phase 1. The study has further shown the spatial variations of flooding impact on different areas, indicating the level of vulnerability of the different locations and impact on property values. It has also shown the long- and short-term effect of flooding, and the overall resilience of the real estate market in the study location.*

KEYWORDS: *Flood, Lagos, Property Value, Real Estate, Resilience*

INTRODUCTION

Flooding is the resultant effect of actualized hazard. Han (2012); Baruah, Barman, Arjun, Chyne & Aggarwal (2024) defined a hazard as an activated threat to life, health, property or ecosystems. It involves something that could potentially be harmful. It is a phenomenon

that can cause damage to life and property and destroy the economic, social and cultural life of people (Stone, 2009). Therefore, when a dormant hazard comes to fruition, it will cause physical damage or destruction, loss of life or drastic change to the environment and result in an incident, accident emergency event or disaster. Omojola (2009) also defined hazard as the climate-induced stresses on the city where are identified through observed trends and projections derived from global climate models (GCMs) and regional downscaling. He further stated that extreme events affected by climate change include heat waves, droughts, inland floods, accelerated sea level rise, and floods for coastal cities. According to Wright (2021), all real estates are subject to natural disasters which range from tornado, flooding, earthquake, landslide, amongst others; and the effect ranges from minor inconvenience to complete devastation. Furthermore, unlike many other natural disasters, the risk of flooding can be measured, and it varies systematically across locations within a particular area. Floods can devastate a country, and can have a range of short or long term impacts on their victims. The selected areas included Water Corporation Road at Oniru in a part of, Lagos known as Victoria Island annex; and Admiralty Way in Lekki Phase 1. They have a common geographical location. The areas were selected because they form an extension of the Central Business District (CBD) where development in terms of building construction is yet to take place fully. Besides, the choice of the area is because they are preferred location by expatriates, which gives them international outlooks as rents and sales prices are sometimes quoted in US dollars in the areas. In addition, the areas, regarded as an international market, were selected with the aim of assisting international investors choose the location for investment purposes. The areas examined at Oniru are Water Corporation Road, being a low-lying area adjacent to the ocean and beach, and susceptible to seasonal and frequent flooding; and Admiralty Way in Lekki Phase 1, which is adjacent to Oniru and not directly on flood plain area.

The maintenance of property value is a key element in the sustainability of local communities (Bramley, Munro and Pawson, 2004). It is of importance not only to property owners, their agents, financiers and investors, but also to local and national governments. If flooding leads to vacant and derelict property, local blight could ensue. A flood disaster can destroy decades of development gains in a short moment. People and buildings are often the most physically affected, and they need more time to recover economically and psychologically (Lamond, 2008). The World Bank International Development Association (IDA) in its 2009 report affirmed that the impact of natural disasters vis-a-vis fatalities and losses in economic growth is on the rise, and more severe in developing countries. This is worrisome, as natural disasters are likely to increase in frequency and severity due to climate change, increased urbanization and continued environmental degradation. Therefore, a deep understanding of the full impacts of flooding is necessary in order to guide investors, and implement flood management policies in the best interests of all, as disasters pose increasing threats to development efforts. (Green, Vanderveen, Wierstra and Penningrowsell, 1994).

Flooding, according to Odunuga, Oyebande and Omojola (2012); Wang, Wah Yu, and Cao, (2022); Assaad, Mohammadi & Assaf (2024), is a serious disaster in the world. It not only causes serious damage but also disturbs normal life and working conditions. Several reports have shown that thousands of lives and property worth billions in monetary terms have been lost to flood in various affected areas in Lagos, Nigeria (Emordi, 2012). Also, many empirical studies have found that real estate properties situated in designated flood

plains are valued less than comparable properties situated outside the floodplain; usually by 4–12% in Australia (Lambley and Cordery, 2013); between 2019 and 2024 the trend has moved up to between 8- 33% (Ishak and Rahman, 2019; Pakdel, 2024), 15–35% in the UK (Lamond, 2008); Rehan, Hall, Penning-Rowsell, & Tan, (2024), average of 5.8% in North Carolina (Bin & Polasky, 2003; Bhattacharyya, & Hastak, 2024)and 1.27–4.7% in Japan (Zhai, Fukuzono, & Ikeda, 2013; Koide, Nishizaki & Sudo, 2022).

While anecdotal evidence suggests a negative impact of flooding on land and building values, empirical studies are needed to quantify the relationship in Nigeria. Previous research, primarily conducted outside Nigeria, has consistently shown that properties in floodplains are valued less than those outside. However, the specific impact in Nigeria may vary due to local factors. This study therefore aims to fill this research gap by investigating the extent of flooding's impact on land and building values in the selected areas of Lagos Island. This is to enable real estate managers, financiers, government agencies, residents, communities, insurers and investors to be well informed to so as to enable them determine necessary policy actions and adjustment coping strategy for enhancing investment as well as its rate of return and profitability.

The overall purpose of this paper is to investigate the impact of flood disaster on the market value of land and buildings in selected locations in Victoria Island and Lekki Phase 1; both in Lagos, Nigeria, while the specific objectives are to identify the general and specific effects of flood on land and, particularly, building value, and to compare the magnitude of effects of flood disasters on land and property values in the selected areas.

LITERATURE REVIEW

Flooding may result from increased volume of a body of water, such as a river or lake that over flows or breaks levees resulting in some of the water escaping boundaries. It can also form where there is no stream; for instance, when abnormally heavy rain falls on a flat terrain at a rate such that the soil cannot absorb its water or its water cannot run off as fast as it falls. (Grima, Deguara & Jones, 2011). Oteng-Ababio, Agergaard, Møller-Jensen, & Andreasen (2024) and Lakshmanan (2011) also add that flooding is a state of high water level along a river channel or on the coast that leads to inundation of land which is not usually submerged.

Against the belief that flooding will seemingly have a major adverse effect on real estate value, Kropp (2012); do Céu Almeida and Kropp (2024); Linkha (2024) identify the following as critical values influencing factors of real estate: flooding or flood risk, demographic structure, neighborhood, traffic situation, business situation, social facilities, environment influences urban greening, legal situation, development status, contamination, types and degree of building and land use, protection of historical monuments, form and size of the property, topography, unemployment rate, cost of living, purchasing power, interest on capital and population development. Also, Lamond (2008) concludes that measured impacts of flooding on a property’s price are temporary in nature, as they appear as a reaction to flood events rather than to flood risk designation while the effect of flood status on property value is small relative to location, property size and type.

There are several extant literatures, both local and international, on the impact of flooding on lives and buildings according to Omojola (2009), Emodi (2014), Lamond (2008) amongst others. However, research on the effect of flooding on the market value of real estate seems to be limited. Table 1 gives an overview of some existing related literature on the subject dating back to 2003.

Table 1: Summary of Studies on the Impact of Flooding on Landed Property Values.

Author	Year	Study Area	Method	Result
A. Inoue and Hatori	2021	Japan	Mean, Modelling	Impact value between 7- 37%
B. Zhai, G. Fukuzono T., and Ikeda S.,	2013	Japan	Repeated sales price and Hedonic approach	Impact value negatively by 1.27-4.7 percent as at 2002
C. Bin O., and Polasky S.,	2003	North Carolina	Hedonic approach and repeated sales	Real estate located in a flood plain area has a lower market value than an equivalent house located outside the flood plain. Property values are reduced averagely by 5-8 percent when located in a flood prone area
D. Belanger and Bourdeau-Brien	2018	UK	Mean and Standard Deviation	Impact value: 14% and above
C. Lamond J.,	2008	UK	Regression, repeated Sales and truncated Model	The likely impact on properties which are likely to be flooded is a discount of between 15and 35 percent on value.
D. Pryce et al.,	2011	UK	Repeated sales, Behavioural economics and sociology risk	Merely reveal extent of drift from risk adjusted price. Hence concluded no significant impact on value.
E. Kropp. S.,	2012	Germany	Regression, repeated Sales and hedonic Approach	Real estate in flood plain area result in lower values compared to those outside the flood plain
F. Emodi E.,	2024	Nigeria	General review of literature	Itemized control and preventive measures to flooding; for instance, construction of a flood channel for passage of large water
G. Odunuga et al.,	2012	Nigeria	Mean Average and ANOVA	Concluded that flooding has affected business and other commercial activities in monetary terms ranging between N13, 000-N1, 300,000 (Naira)
H. Adeniji M. and Oyeleye O.,	2013	Nigeria	Mean average and description statistics	Reviewed causes and prevention of flooding and concluded by identifying Preventives and controllable measures like efficient waste management and avoid building on water ways.
I. Lambely, D., and Cordery I.,	2013	Australia	Mean variance of property price and multivariate regression	Affect value negatively by 4-12 percent in areas with intensity of flood risk.
J. Ishak, E., and Rahman, A.	2019	Australia	Mean Variance, Mann Kendal Test	Direction of trend are in the range of 8% to 33%

Flood Risk Perception

According to Meldrum, Champ, Brenkert-Smith, Barth, McConnell, Wagner, and Donovan (2024); Meldrum (2011), there are often no discounts in property price in flood plain areas, as a flood risk is subjective in nature; that is, increasing risk perceptions correspond to decreasing property values. It therefore, goes to reason that the difference in values of properties, in or outside a flood plain area, reflects the subjective flood risk assessments made by investors and occupiers.

Yeo (2013); Henstra and Thistlethwaite (2018), and Yeo, Thian, Yusof, Johari, Maruthaveeran, Saito and Kasim (2023) further reviewed the spatial and temporal effects of flood disclosure on property values in the United States, Canada, New Zealand and

Australia. They stated that disclosure of flood-liability, whether by flooding or flood plain mapping, should result in differentiation of market value between flood liable properties and those that are not. Furthermore, he stated that in Oregon, USA, in 1964 and 1971 flood had a depressing effect on land values, particularly for waterfront land between 19% and-26%. Also, it affected many that were apparently not flooded by 3%, while the depressed effect lasted for 5-8 years. In Illinois, USA between 1986 and1987, flood had a more pronounced effect on property values by 15% - 21% for both flooded and non-flooded property. Here the depressed effect lasted for more than 2 years.

In 1974, as a result of influence of flooding and flood disclosure at sites in Ontario province in Canada, assessments revealed no significant difference between flooded and non-flooded areas; either before or after major flood. In fact, the price was significantly higher after the flood. In addition, rental value, sales price, assessed value and length of period for house sale in London between 1978 and 1989 found no significant difference between houses situated in and out of designated flood plain. Immediately after flooding in Coromandel, New Zealand, in 1985, selling prices dropped significantly by 9% for all properties in the town including the non-hazard areas for up to 4 years. Also, in 1985 properties in Georges R. catchment in Australia fell by 25%; and in 1991, properties in Parramatta R. catchment situated on highly flood prone land fell by 11%, though recovered within a year. As a result, kellens, Zaalberg, Newtens, Vanneuville and De Maeyer (2013) affirmed that the study of risk perception involves the examination of people awareness, emotions and behavior with regard to hazards.

Flooding in Nigeria

Flooding refers to the inundation of an area by unexpected rise of water caused by either dam failure or extreme rainfall duration and intensity which puts lives and properties in the affected area under risks (Nyarko, 2002). The Most recent occurrence of flooding in Lagos, Nigeria was the torrential rain of about 12 hours on Wednesday, 3rd July, 2024, when the major highways were flooded to about 3metres high, causing heavy traffic and inundation of buildings in several locations in the city of Lagos.

There is no doubt that natural disasters are on the rise globally. Over the past two or three decades, the economic losses, and the number of people affected by natural disasters, have increased more rapidly (UNEP, 2007). About 200 million people were affected by natural disasters in the 1990s, with about USD 63 billion lost in terms of market value of damaged properties globally (World Disaster Report, 2002).

Historical studies indicate that major floods in Nigeria date back to the 1933 incident which occurred in Ibadan, and few others in the same city in 1951, 1960, 1963, 1980, 1985 and 2011. There were other incidents of flooding in Ilorin, 1976; Lagos, 1985 and 1988; Cross river and Akwa Ibom, 1989 (Emordi, 2024). In fact, flooding has become a recurring phenomenon in most cities in Nigeria. In Lagos on the 10th and 11th July, 2011, there was about 12 hours of torrential rainfall which resulted in flooding, and loss of lives, farmlands, household goods and landed properties. Also, on 29th June, 2012, a portion of Murtala Muhammed International Airport Road, by Mobil Filling Station, was submerged, as were some areas in Mafoluku, Oshodi, Victoria Island, Ikoyi, Lagos Island and some other parts of Eti-Osa Local Government Area. Many residents could not get to their offices and business places as most areas in the state were heavily flooded. Many

properties were swept away and some major roads in the state were blocked (Vanguard Newspaper, June 30th, 2012). Flood disaster in Lagos is only an indication of the magnitude of flooding problem in Nigerian cities.

Causes of the Frequent Flood Situation in Lagos, Nigeria

Human settlements may be affected by four types of flooding such as localized flooding due to inadequate drainage; flooding from small streams the catchment areas of which lie almost entirely within built-up areas; flooding from major rivers on whose banks the towns and cities are built; and coastal flooding from the sea or from a combination of high tides and high river flows from inland (Douglas et al., 2008). It is estimated that the required drainage channel to avert flooding is short by about 45%; and the existing ones are only about 30% maintained (Aderogba, 2011). The causes of flooding in Lagos, as affirmed by Aderogba (2011) and Onu (2019) are: torrential rain, base water flow, spring water flow, filled/silted/dirty drainage channels, ocean/lagoon surge, illegal channelization of drains, constructions and reconstructions, blockage of canals, inadequate drainage channel, non-compliance with regulations, illegal structure on drainage channels, encroachment, negligence, collapsed bridges/culverts, farming along flood plains, and nature of terrain.

Theoretical Framework: Value and Price Theory

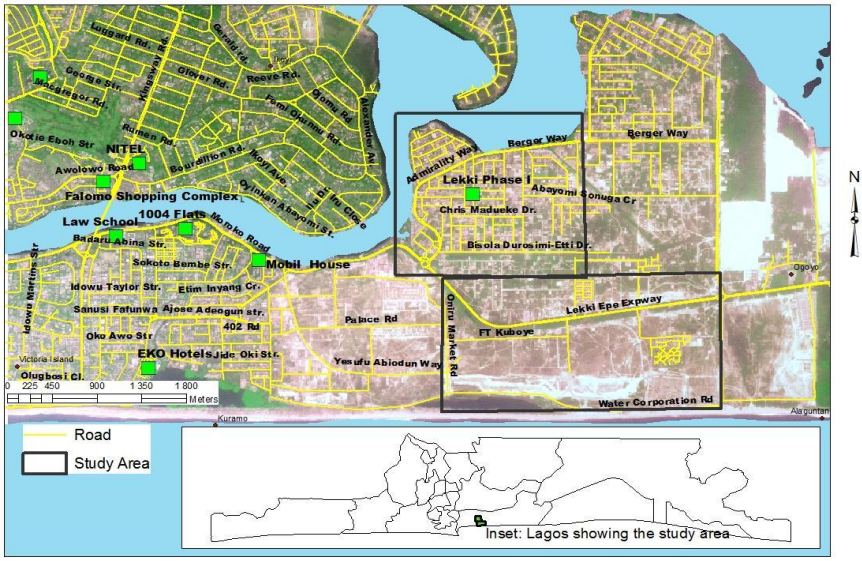
Theory of value encompasses all the theories in economics that attempt to explain the exchange value or price of goods and services. Key questions in economic theory include why goods and services are priced as they are, and how the value of goods and services comes about; and for normative value theories, how to calculate the correct price of goods and services. Theories of value fall into two main categories: Intrinsic (objective) theories, which hold that the price of goods and services is not a function of subjective judgments; and subjective theories, which hold that for an object to have economic value the object must be useful in satisfying human wants, and must be limited in supply. This is the foundation of the marginalist theory of value. In either case, what is being addressed are general prices; that is, prices in the aggregate, not a specific price of a specific good or service in a given circumstance. Theories, in either case, allow for deviations when a particular price is struck in a real-world market transaction, or when a price is set in some price fixing regime. Furthermore, the subjective theory of value is a theory which advances the idea that the value of a good is not determined by any inherent attributes of the good, nor by the amount of labor required to produce the good, but is rather determined by the importance acting individuals place on a good for the achievement of their desired ends. Hence, for the purpose of this study, the subjective theory of value and its application to land and building values were adopted. The study was comparative in nature, as it examined land and property market value only in relation to flood risk, and did not attempt to predict movement of the land market; for land price is driven by investors' decision and their unique assessment of the relative infrastructures of the area (Lamond, 2008). For value to be determined, price theory is an inevitable mechanism which could further be explained through the mechanism of demand and supply and how it affects land value vis-à-vis its general performance. Furthermore, the theory contends that the price of any specific good or service is a function of the relationship between the forces of demand and supply, and that the point at which the benefit gained from those who demand the entity meets the sellers' marginal cost is the most optimal market price for the good (Weber, 2013). In addition, Weber (2013) affirms that value is derived as a result of relative scarcity which determines their real price, and then concludes that strategic and non-strategic

pricing of resources is affected by the presence of externalities, asymmetric information and behavioral anomalies. This generally explains the imperfection of the property market.

RESEARCH METHODS

This study was structured according to a series of questions that serve to demonstrate the spatial effects of flooding on land value. More attention was given to the assessed, rather than the perceived, influences of flooding on land values in the study areas. The approach adopted included document review, administration of a structured questionnaire and direct observation. For most studies, purposive sampling technique is used in which subjects are selected based on their relationship with the research questions (Bryman, 2008). This study was no exception. Purposive sampling technique was used to select sample areas which included Lekki phase 1 and Victoria Island, both in Lagos, Nigeria. Lagos is the smallest State, in landmass, in the Federation but it has a population of about 13.5 million people and is the second city in Africa to have reached the megacity status after Cairo (Omirin, 2013); Victoria Island in Lagos is surrounded entirely by water, bordered by the Atlantic Ocean on the South, the mouth of the Lagos Lagoon on the West, the Five Cowrie Creek to the north North, and Oniru Estate on the East.

A quasi-experimental approach was adopted in the study location for the purpose of assessing the variability of land and building values between areas susceptible to flooding because of their closeness to the ocean and beaches compared to other areas which are not. This was to facilitate the determination of the degree of variability of land and building values in the study area. The magnitude of the effect was to be estimated from repeated sales and rental price, average mean, relative importance index and Pearson product-moment correlation. The population considered for the study was the 318 practicing firms registered with The Nigerian Institution of Estate Surveyors and Valuers, Lagos State Branch. A systematic random sampling technique was adopted for the sample selection in which every 6th firm on the registration list was selected for the study. This gives a total of 55 firms, representing the sample size for the study location.



Source: GIS Laboratory, Geography Dept. UNILAG (2024)

Figure 1: Map of the Study Location: Oniru in Victoria Island and Admiralty way, Lekki phase I, Lagos, Nigeria

The research findings

This section presents the findings of the study in the selected locations to examine the impact of flooding on real estate values.

Characteristics of the Respondents

This study consisted of 48 Estate Surveyors and Valuers with age distribution and distribution of the position in the organization. There were 24 respondents (that is, 50%) within the age bracket 41-50 years, and only 4 respondents (8.3%) and 5 respondents (10.4%) in the 21-30 and 51-60 years age brackets respectively. This implies that most of the respondents were above 40 years in age. On the position in the organization, there were three categories involved, namely; principal partner, partner and staff. While principal partners were 14, representing 29.2 percent; partners and staff were 16 each, representing 33.3 percent respectively. Thus, the respondents mostly consisted of partners and staff members of their respective firms.

The Degree of Seriousness of Flood Occurrence

Table 2: Degree of Seriousness of Flood Occurrence

	Frequency	%
Extremely serious	13	27.1
Serious	23	47.9
Uncertain	7	14.6
Fairly unserious	5	10.4

The finding (Table 2) shows a high level of occurrence of flood incidence in the study area. In 13 cases was the flooding categorized as being extremely serious in degree of occurrence while in 23 cases was it considered as serious. These evaluations together represent the opinion of 75% of the total respondents to the study. This implies that the occurrence of flood is an issue of concern in the study areas.

Average Depth of Flooding

Table 3: Average Depth of Flooding

	Frequency	%
Basement only	18	40.0
Between ground level and up to 2 meter deep	27	60.0

Examining the depth of flooding on the average from Table 3, the study obtained response from 60% of the respondents who indicated a depth between ground level and up to 2 meter while the remaining 40% indicated a depth at basement level. Thus, the water level was 2 meter deep, at maximum.

Number of Hours Water remains on the Land before Receding

Table 4: Number of Hours Water remains on the Land before Receding Finally

	Frequency	%
Less than 1 hour	5	10.6
Between 1&24 hours	34	72.3
Between 2&4days	8	17.0

As shown in Table 4, most respondents (72.3%) indicated that during flooding incidents the water remains on land for 1 to 24 hours before receding, which means that, in most cases, the water remains for a day at maximum. Only in a few cases (17%) has the water lasted beyond a day or up to 2-4 days.

Physical Effect of Flooding

Table 5: Physical Effect of Flooding

	Std. Deviation	Mean
Effect of flood on traffic	0.771	4.54
Effect of flood on buildings	0.841	4.13
Effect of flood on on-going construction	0.729	3.77
Effect of flood on open land	0.911	3.32
Effect of flood on household items	1.073	3.26

Based on the rating provided by the respondents in table 5, the flood has a higher impact on traffic than on other areas observed in the study. The impact of flooding on traffic was found within the band of 4.5 and 5.0, and categorized as being very high. Following the impact of flooding on traffic is the impact on buildings, found with 4.13, and categorized as high. Also in this same categorization is the impact on on-going construction, 3.77. The least effect was on open land, 3.32; and household item, 3.26. This implies that the physical effect of flood on traffic is high, as it increases the number of waiting time spent at designated bus-stops, and in high traffic jam or in slow movement of vehicles caused by flooding of the roads. The impact on buildings was also rated high as it imposes cost of maintenance due to physical damage especially on façade of the building. This is followed by the effect on on-going construction work on site as flooding increases labour and material costs as well as total construction time. Effect on open land was rated low with mean of 3.32 as well as effect on household items with the lowest mean of 3.26. This could be because of flood measures put in place during construction; for instance, raising the foundation high to prevent it from being flooded.

Degree of Relevance in determining Market Value

Table 6: Degree of Relevance in Determining Market Value

	Std. Deviation	Mean
Damage to buildings	0.798	4.40
Market's perception of risk	0.673	4.06
Cost of remediation(repairs)	0.419	4.04
Damage to open land	1.150	3.64
Increase in cost of insurance	0.622	3.46

As shown on Table 6, Estate Surveyors and Valuers considered damage to buildings (with 4.40 out of 5) most relevant important in determining sales and rental value of landed property. Market perception of the risk and cost of repairs are second and third, rated on 4.06 and 4.04. This implies that damage to building will, oftentimes, have a more rapid effect on the sales and rental value of buildings than perception of risk, cost of repairs and cost of insurance will do.

Frequency of Flood Occurrence

Table 7: Frequency of Flood occurrence

	Very often	Often	Uncertain	Fairly often	Not often
Oniru	7 (14.6)	30 (62.5)	1 (2.1)	6 (12.5)	4 (8.3)
Lekki phase I	5 (10.4)	28 (58.3)	1 (2.1)	7 (14.6)	7 (14.6)

Note: figures in parenthesis are in percentage

The rating evaluation of the frequency of flood occurrence in the two study locations is as provided in Table 7. The occurrence is frequent in the two locations. Only little differences are noted between the locations. For instance, while 14.6% of the respondents indicated that flooding occurred very often in Oniru, 10.4% posted similar rating for Lekki phase I. The response on the rarely occurrence of flooding indicated 8.3% for Oniru and 14.6% for Lekki phase I respectively by respondents. The distribution is considered comparably low.

Effect of Flooding on Demand for Land and Building

Table 8: Effect of flooding on demand for land and building

	None	Below 1&10%	Between 11&20%	Between 21&30 %	Above 30%
Oniru	4 (8.3)	16 (33.3)	22 (45.8)	1 (2.1)	5 (10.4)
Lekki phase 1	8 (16.7)	22 (45.8)	11 (22.9)	4 (8.3)	3 (6.3)

Note: figures in parenthesis are in percentage

From Table 8, the effect of flooding on the rate of demand for land and building is rated averagely between 1-20%. This implies that the effect of flooding will reduce demand averagely by 1-20%. In Oniru, 33.3% of the respondents rated the effect flooding will have on demand below 1 to 10% and 45.8% provided similar rating in Lekki Phase I. About 45.8% rated the effect on demand between 11 and 20% in Oniru and 22.9% considered a similar view for Lekki Phase I. On this rating, the effect between the two

locations stood at ratio 2 to 1 with Oniru having ratio 2 over Lekki Phase I. A similar ratio is shared on effect that is above 30%. This implies that the occurrence of flooding has a more negative implication on demand for land and buildings in Oniru than Lekki Phase 1.

Table 9: Effect of Flooding on Market Value of Land and Building

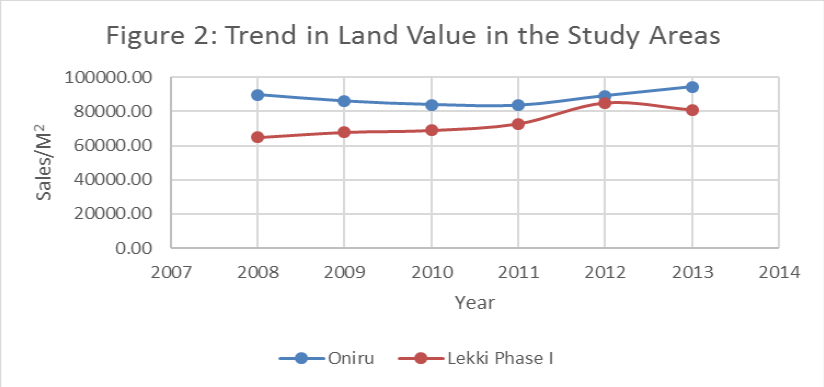
	None	Below 1&10%	Between 11&20%	Between 21&30%	Above 30%
Oniru	-	17 (35.4)	7 (14.6)	12 (25)	11 (22.9)
Lekki phase 1	7 (14.6)	22 (45.8)	3 (6.3)	11 (22.9)	5 (10.4)

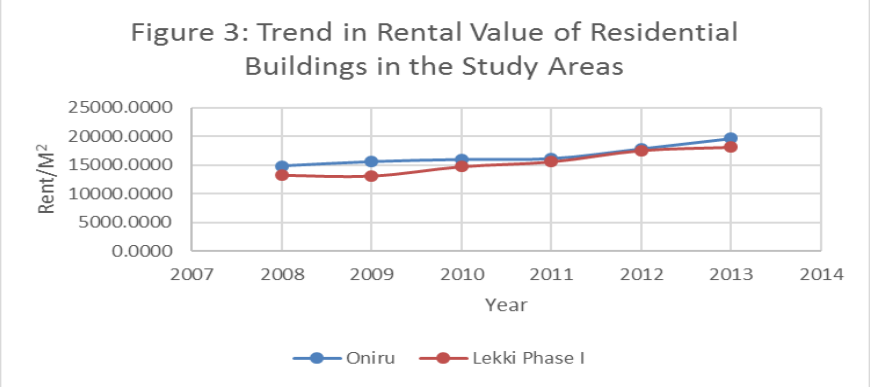
Note: figures in parenthesis are in percentage

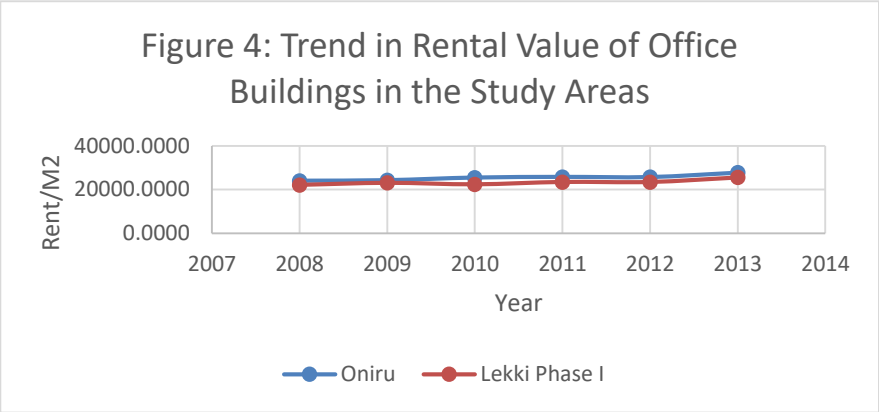
Effect of Flooding on Market Value of Land and Building

According to Table 9, Oniru recorded a high effect of flooding on reduction of market value for land and buildings. Approximately, 30% of the total respondents indicated that the impact of flood is above 30% reduction in both sales and rental value at Oniru, while only 10.4% held a similar view on Lekki phase I . For degree of impact between 11 and20%, and between 21 and 30%, Oniru equally recorded high number and percentage of respondents compared to Lekki phase I, emphasizing higher impact of flooding on sales and rental value reduction at Oniru.

A comparative Study of the Trends in Land and Buildings Values in the Study Area: 2007-2013 and 2014- 2024







Figures 2-4 gives and compares values of residential and office buildings in the two locations over a period of 2007-2013 while Figures 5-6 evidence a comparative value impact between the years 2014 and 2024

In examining the perceived effect of the July 2011 flood in Lagos, Nigeria, the study considered land price and rental value of properties. Result showed that between year 2010 and 2012, the study location experienced increase of about 1-25% in sales value of land and building, except at Oniru where land value was negatively affected by 5.1% in year 2011; and this was just for 12 months as an increase of 7% occurred in the subsequent year.

Furthermore, the trends do not show specific effect of flooding on rental value of residential and office buildings in the study area as rent remained constant over the period. This could be ascribed to the custom of yearly rent advance payment, in the study area as well as cravings for the study location by investors for building development.

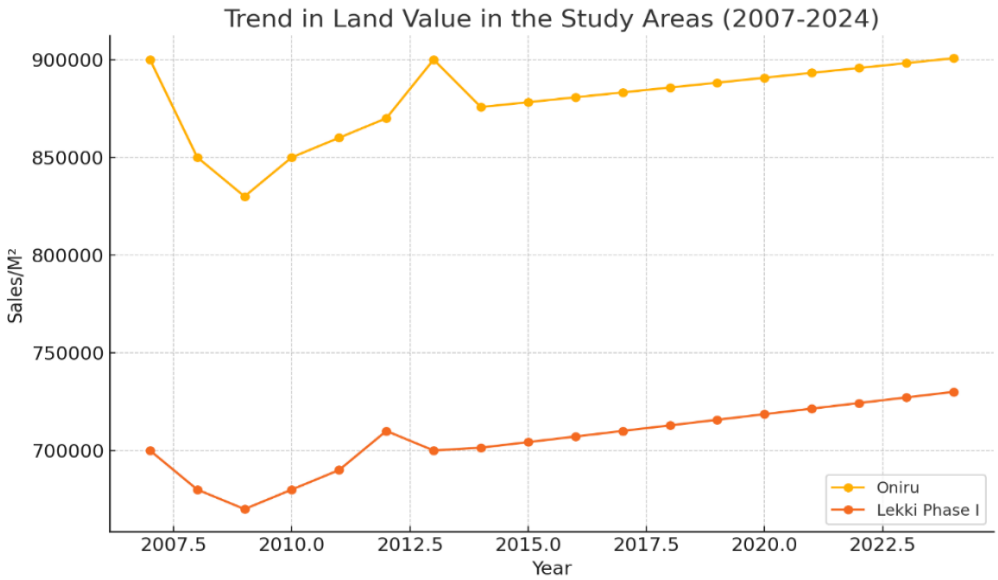


Figure 5: Trend in Land Values in the Study Areas

Based on the linear regression model, the projected land values for Oniru and Lekki Phase I from 2014 to 2024 indicates that land values in Oniru show a consistent upward trend from ₦875,714.29/m² in 2014 to ₦900,714.29/m² in 2024. The land values in Lekki Phase I also show a steady increase from 01,428.57/m² in 2014 to ₦730,000.00/m² in 2024.

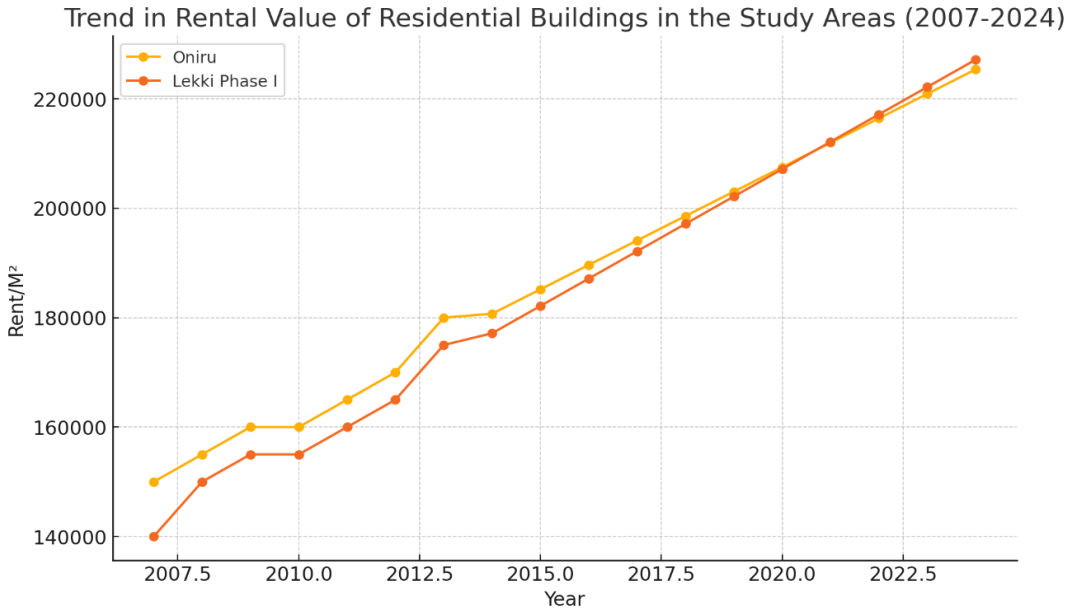


Figure 6: Trend in Rental Values of Residential Buildings in the Study Areas

Similar to Oniru, Lekki Phase I shows a positive trend in rental values, indicating that the area remains attractive despite flooding risks. Oniru demonstrates resilience to flooding impacts, maintaining an upward trajectory in rental values.

DISCUSSION OF THE RESEARCH FINDINGS

Findings of this study have shown that the impact of flooding on land price and rental value of properties is temporary in nature. They appear to be a reaction to flood events rather than the perceived risk of flooding, damage to buildings and cost of remediation (repairs). Although about 75% of the respondents attested to the seriousness of flood occurrence in the study location, the depth has not exceeded between ground level and up to 2 meter deep. This could be because of the government's concerted efforts at developing and reconstructing the drainages for easy passage of excess water, though during incidence of flooding, water remain on land for 1 to 24 hours before receding as evident during the 3rd July,2024 torrential rain with heavy flooding.

The study further shows the effect of flooding on traffic, buildings, on-going construction open land and household items with means of 4.54, 4.13, 3.77, 3.32 and 3.26 respectively. The occurrence of flooding shows a reduced demand for land and building averagely between 1and 20%: Lekki phase 1, between 1 and 10%; and Oniru, between 11 and 20%. Oniru further recorded a high impact of flooding on market value than Lekki phase 1. At Oniru, the degree of effect on the market value of land varies averagely between 5 and 25% discounts while in Lekki phase 1, below 1-10% discount. In fact, some respondents ascribed no effect on the market value of land in Lekki. This emphasizes a higher degree of flood impact in Oniru than Lekki Phase 1.

This further corroborates studies that flood risk results in discount in land value. For instance, Fukozono and Ikeda (2003) ascribe a discount of between 1.27 and 4.7% to land values in Japan, Bin and Polasky (2003) between 5 and 8% discount in North Carolina; Lambley and Cordery between 4 and 12% in Australia while Lamond (2008) ascribe a discount of between 15 and 35% to land values in the UK.

In testing the relationship between occurrence of flooding and landed property values, the study establishes that Oniru, being a prime location, seems to maintain its attractiveness despite flooding issues. This could be attributed to significant investments in flood mitigation infrastructure, such as drainage systems and embankments, which help in maintaining property values. Lekki Phase I, another high-demand area, shows resilience in property values. The increase in values suggests that the measures taken to control flooding might be effective, or that the demand for property in the area outweighs the flood risks. This could also be attributed to the other factors that affect property performance other than occurrence of flooding or flood risk, as extant literature have shown that location is the major determinant of land and property values. The area is also in high demand; therefore, the interplay of economic indices has been noted to be a factor for the increase in real estate values despite the risk of flooding. This further affirms Meldrum (2011) and Lamond (2008) statement that flood risk is subjective in nature; hence, often, there are no discounts in property values in flood plain areas. Nevertheless, there is a need to improve the drainage systems to aid quick flow of excess water in less than an hour to reduce the physical impact on traffic. Besides, there is a need to improve the embankments on shorelines to reduce water waves and over flooding of land and buildings in the study location.

CONCLUSION

The study explored how the impact of flooding varies across different areas on Lagos Island, and the extent of property value decline in the areas. Accounts of incidents of flooding in other cities that experienced similar flooding provided valuable insights into property value rates and trends, and the long term and short-term influences of flooding on property values. Despite the challenges posed by flooding, Oniru and Lekki Phase I remain attractive to real estate markets in Lagos. Rental values in both areas have shown a positive upward trend from 2014 to 2024, indicating resilience to flood risks. The land values at Oniru and Lekki Phase I further support this trend, suggesting continued growth in property values. These findings highlight the importance of effective flood management strategies and infrastructure development in maintaining the value of real estate in flood-prone areas. While flooding can pose significant risks, it is evident that with proper planning and investment, these areas can still be desirable and profitable for property owners and investors. The study further demonstrates that while flooding can have a temporary negative impact on land and building values on Lagos Island, its effects may not be as severe as initially perceived. Areas like Oniru and Lekki Phase I have shown resilience, maintaining their attractiveness despite flood risks. Effective flood mitigation strategies, such as improved drainage systems and embankments, are crucial for mitigating the impact of flooding on property values. Additionally, factors beyond flooding, such as location, economic conditions and demand, also influence land and building values. Future research should focus on the long-term effectiveness of flood mitigation measures and their impacts on sustainable urban development in Lagos. By understanding the complex

interplay of factors affecting property values, policymakers and investors can make informed decisions to mitigate the risks associated with flooding.

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