VULNERABILITY OF POOR URBAN COASTAL COMMUNITIES TO CLIMATE CHANGE IN LAGOS, NIGERIA

Ibidun O. Adelekan
Dr
Department of Geography
University of Ibadan, Ibadan, Nigeria
ibiadelekan@yahoo.com

Summary: The paper attempts to understand the links between city development in Lagos, with particular reference to growth of slums, and risks from climate change. The impacts and vulnerabilities of residents of selected poor urban communities along the coast of Lagos to the increasing risks of floods arising from climate change are assessed. An impact and vulnerability assessment within an integrated assessment framework that includes both natural and human sub-systems interactions is adopted for the study. Quantitative and qualitative methods including the analysis of acquired data sets, administration of household questionnaires, interviews with key informants and focus group discussions are employed to generate primary data.

Key Words: Climate change, vulnerability, urban poor, coastal communities, Lagos

VULNERABILITY OF POOR URBAN COASTAL COMMUNITIES TO CLIMATE CHANGE IN LAGOS, NIGERIA

I. INTRODUCTION

Coastal towns are by far the most developed of Africa's urban areas and by implication, have a high concentration of residential, industrial, commercial, educational and military facilities (UN-Habitat, 2008). Urban development has however been indicated to be a large creator of risk for much of the urban population, most especially the urban poor who live in more vulnerable physical and human environments. Sea-level rise will have significant impacts on coastal areas of Africa, especially on its coastal megacities, because of the concentration of poor populations in potentially hazardous areas that are more vulnerable to such changes (Klein *et al*., 2002; Nicholls, 2004). The urban poor face a worsening situation as the effects of climate change including floods arising from increasing frequency of storm surges, and heavy rainfall of long duration or high intensity become more severe.

Flooding has been identified as one of the major factors that prevents Africa's growing population of city dwellers from escaping poverty and stands in the way of United Nations 2020 goal of achieving significant improvement in the lives of urban slum dwellers (Action Aid, 2006). This is because many African cities lack the infrastructures to withstand extreme weather conditions. Poor urban planning together with other urban governance challenges contributes to making African urban slum dwellers most at risk. Poor urban planning or lack of planning as urban development increases is evident in not preventing new development on areas at risk of flooding, leaving unprotected areas that should be left undeveloped, for instance wetlands, because of their role as buffers against flooding risks and also not providing safer sites for the urban poor. McGranahan et al. (2007) noted that while economic activity and urban development often increase the environmental pressures that lead to flooding, it is the low income settlements and poor groups within all settlements that tend to be the most vulnerable.

Although the risks faced by urban populations to climate change impacts especially in developing societies has been acknowledged in various regional assessments, their vulnerability cannot be reliably estimated without a detailed knowledge of local contexts since vulnerabilities are so specific to each location and societal context. Also, too little attention has been given to the vulnerability of urban populations to climate change and especially to the vulnerability of their low-income populations (Satterthwaite et al, 2007). In Africa very few attempts in this wise have been undertaken. Douglas et al. (2008) presented the results of a participatory vulnerability analysis to ascertain the dimensions of flood problems in poor communities in five African cities including Accra, Kampala, Lagos, Maputo and Nairobi. The study approach, however, was basically an assessment of local people's perceptions of why floods occur, how they adjust to them, who is responsible for reducing flood risk and what action the community itself can take. This paper attempts to contribute to a better understanding of the vulnerability of poor urban communities in the coastal city of Lagos by exploring the links between city development in Lagos, with particular reference to growth of slums, and risks from climate change. The impacts on, and vulnerabilities of residents of selected poor urban communities along the coast of Lagos to the increasing risks of floods arising from climate change are assessed within an integrated assessment framework.

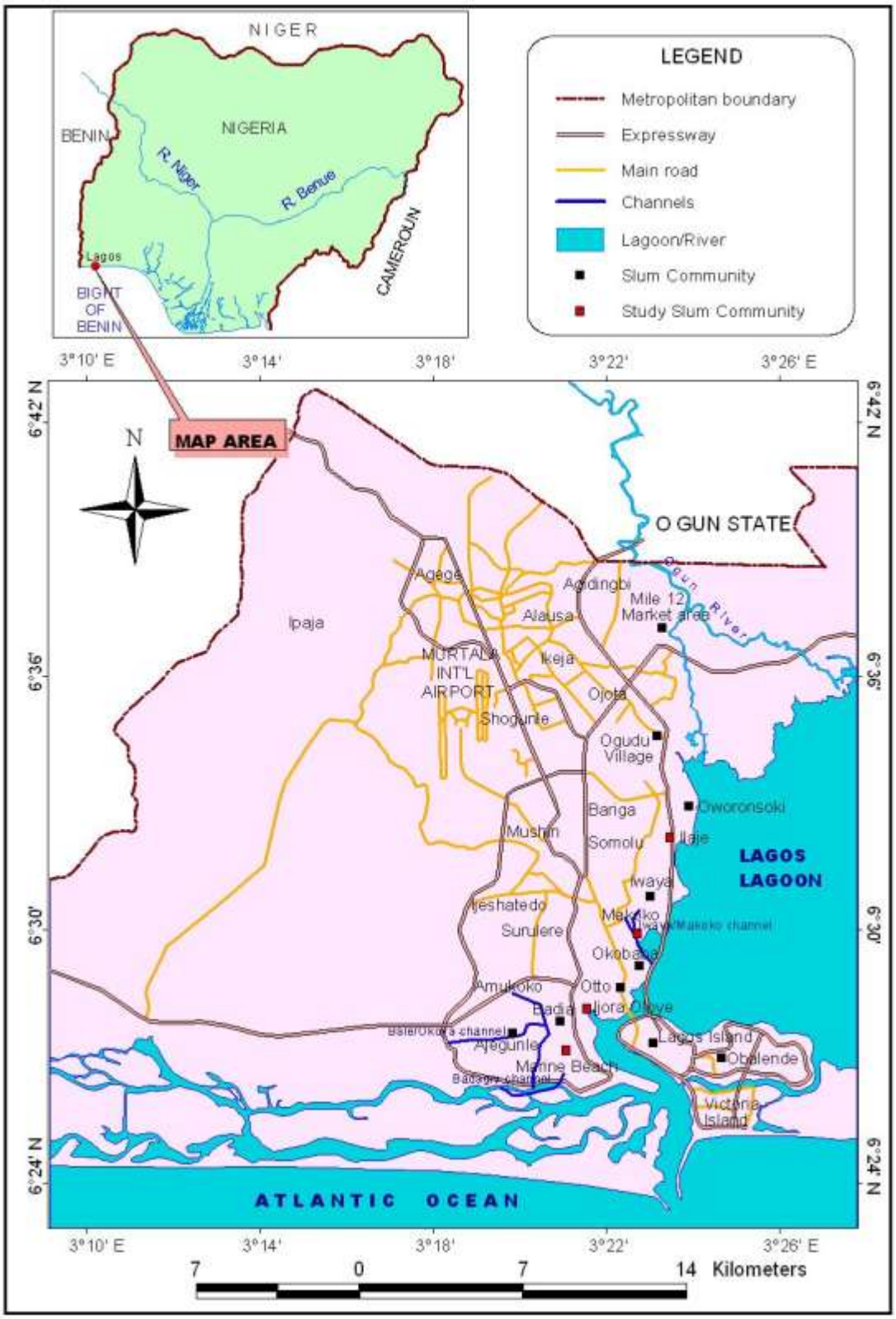


Figure 1: Lagos showing Coastal Slum Communities (Source :

II. CONCEPTUAL FRAMEWORK

The concept of vulnerability is central in the discourse of environmental risks in the context of climate change and offers a valuable framework for this study. The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as the extent to which a natural or social system is susceptible to sustaining damage from climate change. Vulnerability is a function of the sensitivity of a system to changes in climate and the ability to adapt the system to changes in climate. Wilbanks et al. (2007) noted that the two factors that contribute to vulnerability are largely determined by the development context which has such a strong influence on households' income, education and access to information, on people's exposure to environmental hazards in their homes and workplaces and on the quality and extent of provision for infrastructure and services. In urban areas, vulnerability is also so much influenced by the extent and quality of infrastructure and public services, especially for vulnerable populations (Satterthwaite, 2007).

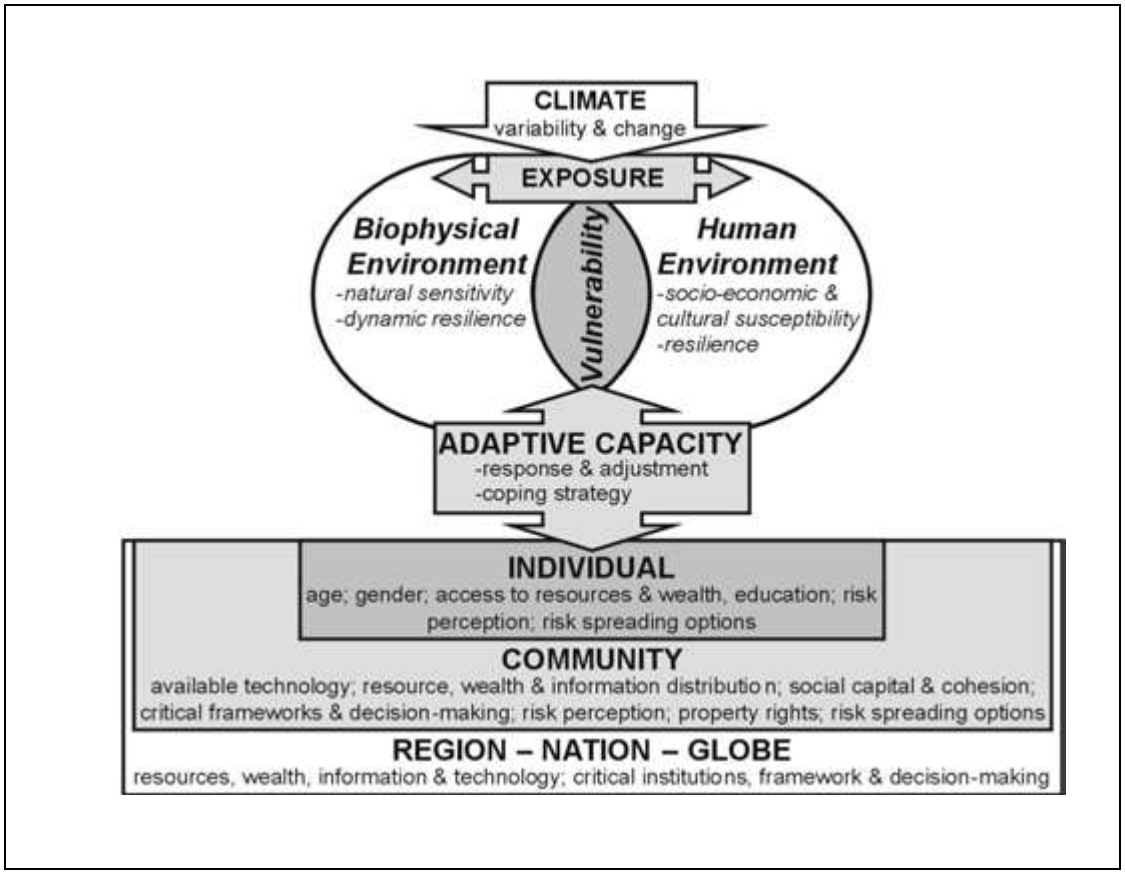


Figure 2: Integrated vulnerability framework (Source: Dolan and Walker, 2004)

Three perspectives of vulnerability from climate change and hazards research are identified which combined address the dynamic and integrated nature of social and environmental vulnerability (Dolan and Walker, 2004). The first perspective characterizes vulnerability in terms of exposure to hazardous events and how this affects people and structures. The second perspective views vulnerability as basically a human relationship and not a physical one, i.e. social vulnerability, while the third integrates both the physical event and the underlying causal characteristics of populations that lead to risk exposure and limited capacity of communities to respond. This paper adopts the integrated approach using the integrated vulnerability framework as described in Figure 2 by Dolan and Walker (2004). This framework is suitable in cities where inherent susceptibilities and resiliencies of both bio-physical and social environments interact to result in observed vulnerability.

III. DATA AND METHOD

Four poor urban communities (Makoko, Ilaje, Ijora-Oloye and Marine Beach-Apapa) in Lagos were purposively selected for the study (Figure 1). The choice of these communities was informed by three main criteria- i) proximity to the coastline of Lagos, ii) official classification as urban poor communities, iii) annual experience of floods. These four communities are potentially vulnerable to sea level rise and climate change given their location in sensitive landscape. In each community, a random sample of buildings was chosen from several streets/roads to ensure a representative coverage of the community. In each building only one household was interviewed since majority of buildings in the communities are multiple occupancy types sometimes comprising as many as 10 households. A total of 486 households were surveyed using a semi-structured questionnaire designed purposively for the research (Table 1). In each household an adult considered to have good knowledge of the research topic was interviewed. The questionnaire was designed to elicit information on the socio-economic and demographic characteristics of respondents, flood experiences, impacts and coping strategies. Interviews with key informants and group discussions with community members were held to obtain further insights into the impacts of and vulnerability to floods in the different communities. The impacts of floods on the surveyed communities was examined at three levels- individual, households and community.

Table 1: Distribution of respondents

Slum Community	**Male**	**Female**	**Total**
Makoko	53	48	**101**
Ilaje	90	70	**160**
Ijora Oloye	99	40	**139**
Marine Beach-Apapa	45	41	**86**
Total	**287**	**199**	**486**

Source : Author's field data

Other information analyzed related to the physical characteristics of study areas and include percent of wetlands and flood prone areas, sub-standard urban planning and infrastructure. Rainfall data particularly heavy rainstorms is also examined.

IV. THE COASTAL CITY OF LAGOS

Lagos, currently the fifth largest city in the world, is the foremost manufacturing and port city in West Africa, and the hub of business and economic development in Nigeria. This coastal city is situated within latitudes 6^{o} 23′N and 6^{o} 41′N and longitudes 2^{o} 42′E and 3^{o} 42′E (Figure 1). The city has the largest concentration of multinationals and commercial institutions and is home to about 60 per cent of Nigeria's non-oil economy. Lagos grew from 300,000 in 1950 to 7.7 million people in 1990. United Nations estimates indicate that that by 2000 the total population for Lagos had reached 13.4 million, projecting it to reach over 20 million by 2010 (LMDGP Project Appraisal Document, June 2006). The growth of Lagos is primarily the result of its location on the west coat of Africa which has fostered the development of trade within its hinterland as well as with the neighbouring international states. The role of Lagos as the administrative capital of Nigeria until December 1991 also contributed to her growth. The high population growth rate of Lagos has been largely attributed to rural-urban migration which accounts for up to 75% of the population increase (Abumere, 2004). The high population growth rate reaching up to 6% over the last decade has translated to unusual pressure, leading to unprecedented demand for land. It is therefore a common phenomenon to see most `undeveloped land' being taken over by the rural immigrants to satisfy their urban land needs (Agbola and Agunbiade, 2007). Such invasions usually lead to uncontrolled and unorganized developments of slum communities which lack basic infrastructural facilities and characterized by extremely poor environmental conditions**.**

Forty-two slum communities or "blighted areas" were identified in Lagos metropolis in 1981 by a World Bank Urban Renewal Project. The number of slums in the city is estimated to have increased to about 100 due the inadequacy of private and public institutions to provide housing the increasing population. Almost 70 per cent of Lagos' population consequently live in slums. Majority of slum communities are located in the oldest settled areas of mainland Lagos and especially in marshy areas and areas near the lagoons (LMDGP, 2006). The estimated poverty level of 70 per cent (Ministry of Economic Planning and Budget, 2004) makes Lagos one of the poorest of the world's largest cities. The population density in Lagos slum communities ranges between 790 people per hectare to 1240 people per hectare. More than 75 percent of urban poor slum dwellers live in one room households with a density of 4.6 persons per room. Between eight to ten families live in one house structure sharing common cooking and sanitation facilities. The Intergovernmental Panel on Climate Change (IPCC) recognises the Nigerian coast as one of the low-lying coasts in Western Africa which is likely to experience severe effects from flooding as a result of rising sea levels and climate change. The low nature and the topography of the entire Nigerian coastline area render the area very susceptible to flooding especially at high tides and during the rainy season (Table 2).

Table 2: Impact and vulnerability classes for Nigeria's coastal zone.

Impact categories	Vulnerability classes
People affected (no. of people/total population)	Medium (10%)
People at risk S(no. of people ´ flood probability)	Medium (10-100%)
Land loss (area loss/total area)	Medium (3-10%)
Wetland loss (area loss/total area)	High (10-30%)

Source: Nicholls & Mimura, 1998

1. Urban Development and Environmental Change

Metropolitan Lagos situated on the narrow lowland coastal stretch bordering the Atlantic Ocean and originally covered with mangrove swamps has experienced significant land cover changes due to past and present reclamation activities to secure more and more land for urban development. Land reclamation achieved through filling up of swamps and floodplains, and destruction of mangroves and wetlands have generally reduced the flood storage capacity of the urban land. Rapid and largely unplanned urban growth has resulted in land use changes and subsequent changes in the hydrological fluxes in the urban watershed thereby increasing flood hazard and risk in many parts of the metropolis. A study of nine poor urban households in different parts of metropolitan Lagos showed that flooding is a major problem in most of the communities (LMDGP, 2006). The study also revealed that the problem of flooding in poor urban communities appeared to have worsened between 2002 and 2006 with 71.1per cent of respondents reporting flooding of their streets in 2006 compared with 54 per cent in 2002. The problem of flooding is compounded by the inadequacy of the drainage network within the city, which is neither functional nor complete.

Lagos had an area of about 200 km^2 in 1960 but by the beginning of the twenty first century the contiguously built-up area of Lagos was estimated to be about 1,140 km^2 (Figure 3). For sections of the metropolis along the coastline large areas have been built-up with high population densities (Table 2). Except for Eti-Osa local government area, the newly developing area of Lagos expansion, which presently has 43.45% of its total area built-up, other local government areas with coastlines have over 50% of their total area built-up. Shomolu local government has the most artificial land cover of about 90%. Much urban development has taken place in Eti-Osa local government area especially since 1983 when the Lagos state government began to allocate the Lekki Peninsula for urban development. Along with the planned development of this peninsular is the emergence of fast growing poor urban neighbourhoods around existing rural settlements. This emerging development pattern has implications as the development of the Lekki Peninsular is with little or no consideration for sea level rise. This makes this rapidly urbanizing area and the growing population vulnerable to sea level rise and climate change.

Table 3: Urban Characteristic of Local Government Areas in Coastal Lagos

LGA	Total Area of LGA	Built-Up Area of LGA	Built-up Area as % of LGA	Population* (2006)	Pop. Density of Built-up Area (per km^2)
Apapa	26.44117	13.90495	52.57	222,986	15,632
Eti-Osa	193.47395	84.07192	43.45	283,791	3,423
Lagos Island	8.59056	5.28071	64.35	212,700	39,661
Lagos Mainland	19.81438	11.28527	60.07	326,700	28,154
Shomolu	11.45639	10.31107	89.97	403569	39,053

*Census 2006

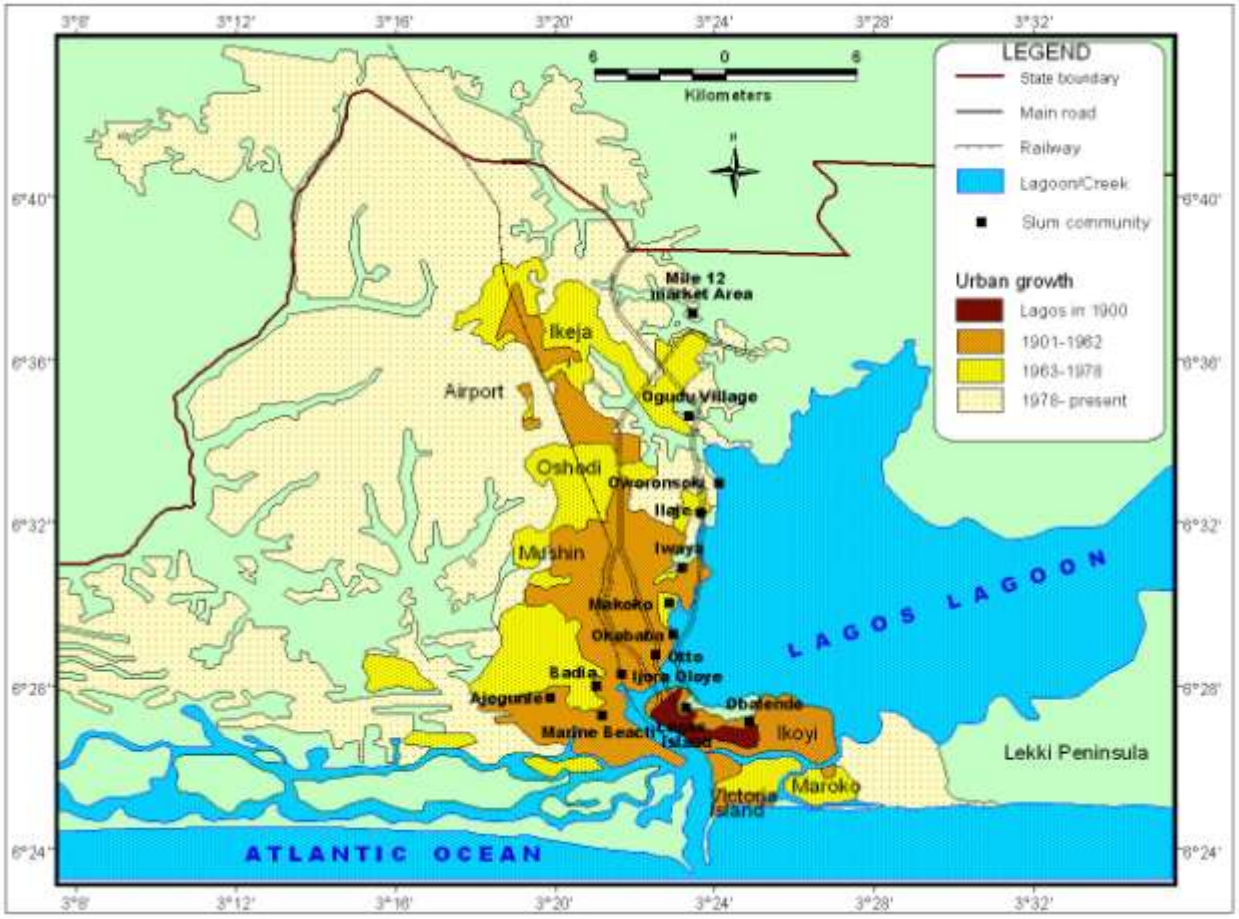


Figure 3: Growth of Metropolitan Lagos (Adapted from Gandy, 2005)

Analysis of changing land cover in the Lagos coastal area by Okude (2006) showed that between 1986 and 2002 the developed land cover comprising residential, industrial, commercial, transportation and other man-made use increased from 85.44km^2(43.36%) to 111.89km^2 (56.78%). Similarly natural vegetation cover including mangrove and swamp thicket reduced from 59.24km^2(30.06%) to 38.31km^2(19.44%) while naturally occurring water bodies comprising the ocean, lagoons and streams reduced from 52.39km^2(26.58%) to 46.87km^2(23.78%) during the same period. Furthermore, between the period 1986 and 2006, wetlands, an important buffer against coastal floods had reduced significantly in coastal Lagos (Table 4). In four coastal local government areas of Lagos wetland loss of 38% to 100% occurred during the same period (Taiwo, unpublished manuscript, 2009)

Table 4: Temporal variation in wetland coverage (%) in Coastal Lagos

Coastal LGA	Wetland (%) within LGA		Wetland Loss (%) (1986-2006)
	1986	2006	
Apapa	14.0	8.6	38.6
Eti-Osa	41.8	25.2	37.8
Lagos Island	0	0	0
Lagos Mainland	17.0	6.7	60.6
Shomolu	4.4	0	100

Source: Taiwo, 2009

2. Climate Change and Floods

The humid tropical climate of Lagos is influenced by her coastal location and nearness to the equator and is characterised by two distinct seasons. The wet season occurs mainly between April and October while the dry season is experienced during the remaining months of the year. During the rainy season many parts of Lagos are susceptible to flooding. Major causes of floods in built-up areas are uncontrolled expansion of impermeable surfaces due to increasing urbanization resulting in increase runoff volume, runoff responses under high intensity rainfall, building on floodplains, lack of storm water drainage, failure to maintain existing drainage systems and weak institutional capacity of the urban administration. Changes in the intensity and pattern of storms have also been listed as factors that may influence the risk of flooding. Ayoade and Akintola (1980) in a study of rainstorms for Lagos for the period 1960-1980 observed that most rainstorms for this period were rather small in size as the yielded less than 12.7mm of rainfall. Analyses of rainstorms in Lagos Island for the period 1971-2005 show that in more recent years (1996-2005) rainstorms have been heavier even though the number of rain days per annum has reduced (Figure 4).

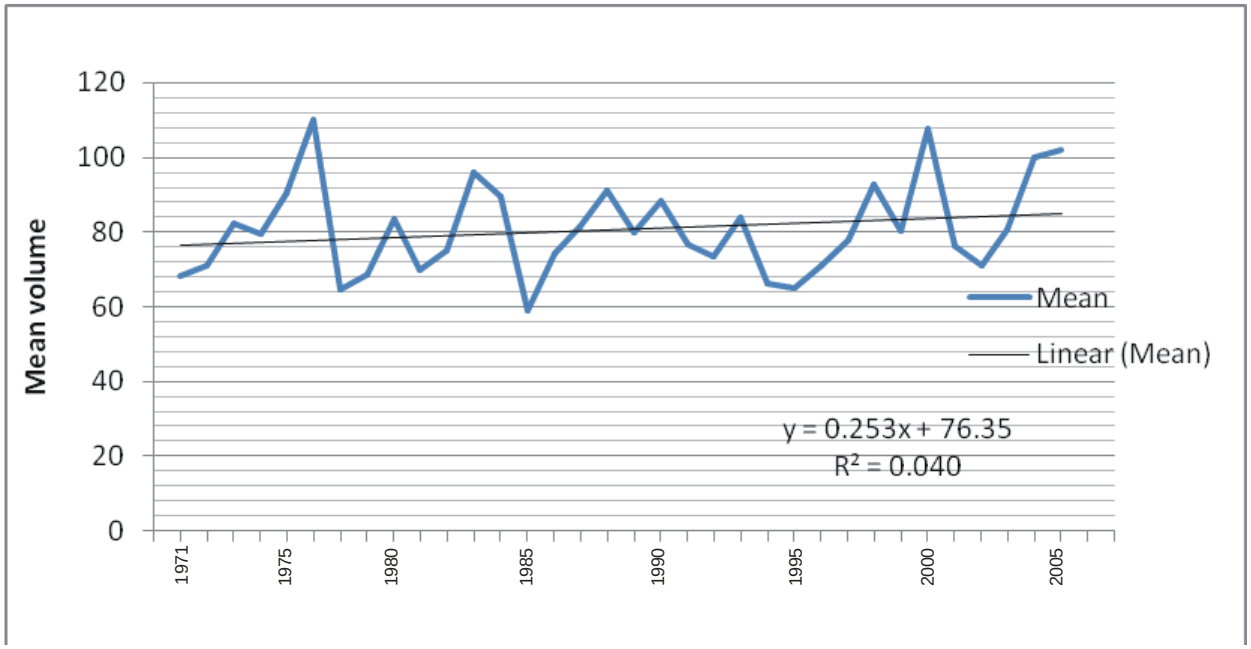


Figure 4: Mean rainstorm amount(mm) for Lagos Island(1971-2005)
(Source: Author's analysis of meteorological data)

Table 5: Rainfall characteristics for Lagos Island

Rainfall Characteristics	1971-1995	1996-2005
Mean no of raindays	112	82
Max no of raindays	163	105
Min no of raindays	76	69
Mean rainfall(mm)	1697.79	1647.26

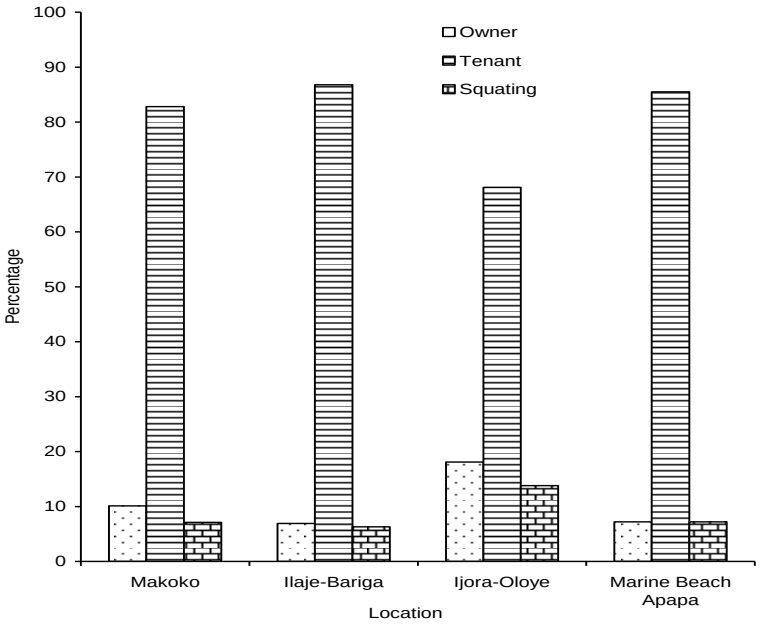
Source: Author's analysis of meteorological data

A comparison of rainfall characteristics for the two periods 1971-1995 and 1996-2005 show marked differences (Table 5). While the mean annual rainfall for the 25-year period,1971-1995 is 1697.79mm that for the 10year period 1996-2005 is 1647.26mm. Although the difference in mean annual rainfall in the two periods is not much, fewer raindays are recorded during the more recent ten-year period relative to the 1971-1995period. This translates to the fact that the fewer rainstorms recorded in the latter period are much heavier than those of the earlier period with a tendency to producing more floods.

V. SLUM COMMUNITIES IN CONTEXT OF STUDY

The four slum communities selected for the study are situated in environmentally degraded conditions and lack basic infrastructural and social services including water supply, electricity, roads, sanitation and quality housing. In all four communities surveyed, over 50 per cent of respondents live less than 500 metres from the coastline. A larger number of respondents live much closer to the ocean/lagoon in Ijora Oloye and Marine Beach-Apapa communities with 79% and 71% living less than 500 meters from the coastline. Large sections of these communities have been built on land reclaimed by sand filling and are therefore not able to sustain solid structures. The type of housing structure in the four communities generally differs. In Makoko the dominant housing type is wooden houses/shacks (35%) followed by one-storey concrete bungalows (22%) while Ilaje-Bariga is characterized by one-storey concrete bungalows (39%) followed by wooden shacks (26%). In Ijora-Oloye and Marine Beach-Apapa, 62% and 65.4% of houses are built with zinc sheets.

A large number of respondents in the sampled slum communities are tenants. With the exception of Ijora Oloye which has 68% of respondents as tenants, the three other communities have over 80% as tenants. Similarly not more than 10% of respondents in Makoko, Ilaje and Marine Beach-Apapa owned their houses. In Ijora-Oloye relatively higher numbers (18%) of respondents own their houses. Other respondents in the communities are either squatters or 'floaters'.



Fifty percent of households in all four communities comprise between 4 and 6 persons. Ijora Oloye and Marine Beach communities, however, have up to 24% of households with 6 – 9 persons indicating high population pressure in many households. In all communities, an average of 6% of households has 10 persons or more living therein. Respondents provided varied reasons for living in the slum communities. About 42% of total respondents live in the slum communities because of existing family ties.

Figure 5: Status of respondent (Source: Author's field data)

For 23% of total respondents' economic activities undertaken was an important factor contributing to their living in these communities. In Ijora Oloye this factor was important to 35.3% of respondents. The low-cost of housing was also a factor in the choice of respondents. In

Makoko 35% of respondents listed the low cost of housing as contributing to their residing in the neighbourhood.

1. Socio-economic characteristics of respondents

Differences are observed in the residency pattern of respondents living in the four communities. While 60% and 66% of respondents in Makoko and Ilaje respectively have been living in the communities between two and ten years, over 65% of respondents in Ijora Oloye and Marine Beach-Apapa have lived in the communities for upward of eleven years.

Majority of the respondents (73%), in the four slum communities had not more than secondary school education while 8% had no formal education at all. About 19% had some form of tertiary education. Trading is a major occupation of many of the respondents in the communities (33.3%). Other respondents are engaged in government employment (15%) and as artisans (13.6%).

The proportion of unemployed among respondents is however relatively high in the four communities (19%). In Makoko and Marine Beach-Apapa, about 26% of are unemployed while 13.1% and 15.8% are unemployed in Ilaje-Bariga and Ijora-Oloye respectively. Monthly income of respondents indicates that majority of respondents are in the low-income class. In Ilaje and Makoko, about 27% and 25% of respondents respectively earn less than ₦5,000 a month.

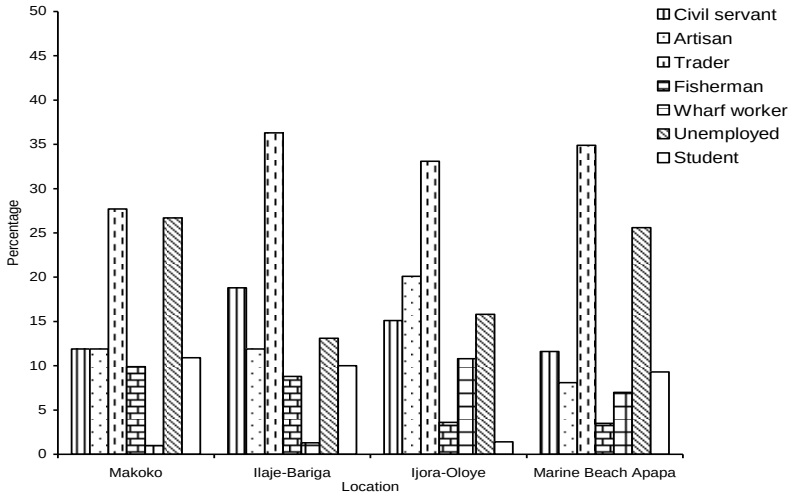


Figure 6: Occupation of Respondents
(Source: Author's field data)

Also, less than 10% earn between ₦20,001 – ₦50,000 in these communities. Income levels are relatively higher in Ijora-Oloye and Marine Beach with no respondent earning less than ₦5,000. About half of respondents in Ijora Oloye earn between ₦20,001 and ₦50,000 while in Marine Beach, 40% of respondents earn between ₦10,001 and ₦20,000. Unemployment and income levels in these communities contribute to increasing the vulnerability of the people to environmental hazards including floods.

2. Perception of floods

Flooding was listed as the most important problem encountered in surveyed communities. From a list of problems encountered in the communities, flooding was ranked as the foremost problem. Other problems mentioned are bad roads, pollution, infestation by mosquitoes, neighbourhood insecurity, poor power supply, unemployment and prevalence of diseases

In all four coastal communities, over 80% of respondents indicated that the communities in which they live, as well as houses were flooded three to four times in the last year, 2008. Each flood event usually left communities flooded for up to four days. The incidence of floods in the communities was attributed to diverse causes. A key factor mentioned by over 50% of respondents in all the communities is overpopulation of the communities.

Other major factors mentioned by respondents in all surveyed communities are:

- inadequate drainage system
- presence of and increase in water level of lagoon
- overflowing of rivers
- blockage of canals due to improper waste disposal
- sand filling activities in communities
- neglect by government
- supernatural factors

Only few respondents (0.8%) mentioned changing climatic conditions to be a contributing factor to the occurrence of floods. To the question "has the frequency of flood events increased or decreased in the last five years?" More than 75% of respondents in all communities observed that there was no change in the frequency of flood events. About 97% of respondents in all the communities informed that during flood events, the level of water in their communities was knee deep. Makoko (100%), Ijora Oloye (91%), Ilaje (100%) and Marine Beach-Apapa (98%).

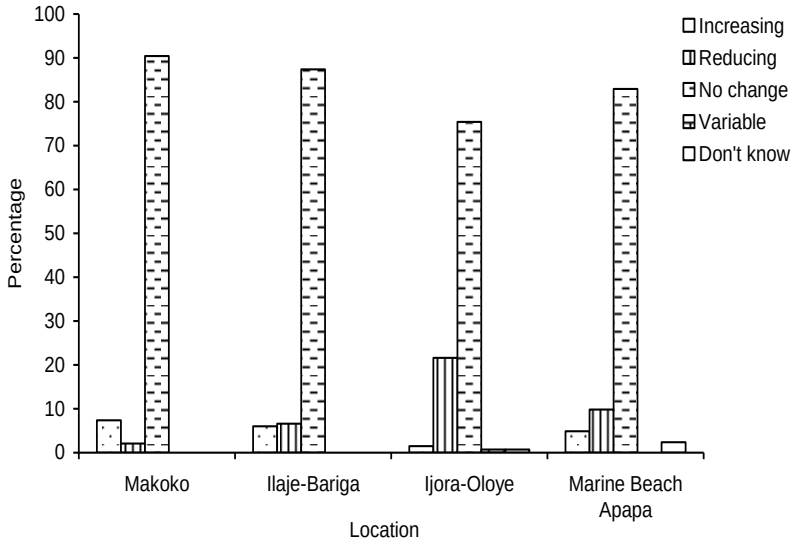


Figure 7: *Perception of flood occurrence*
(Source: Author's field data)

3. Impacts

For the four study communities the impacts of floods appeared to be similar at the different levels and are described below. Respondents nevertheless noted that within communities the impacts of flooding vary. Locations close to drainage canals/channels are more exposed to the risks of floods. Within Makoko, for example, community members noted that sections of the community that have benefitted from improved drainage system experienced less flooding than areas where the drainage system is poor.

3.1 Community level impacts

S/No	Impact	Coping Strategy
1.	Damage to roads	Sand fill roads or deposit wood shavings on roads
2.	Disruption of movement	Use of rainboots; taking unaffected routes if available. Many times residents are helpless
3.	Dirty environment	Surroundings cleared after flood events
4.	Flooding of community	Stay indoors; community members clear blocked drainage channels
5.	School children prevented from going to school	Children stay home until flood water subsides.

3.2. Household level impacts

S/No	Impact	Coping Strategy
1.	Damage to and deterioration of building infrastructure	Dig gutters in front of houses; renovation of buildings
2.	Flooded houses and rooms	Sand filling of rooms; drainage channels are constructed around houses; move to neighbours'/relatives' house; raise the level of household property; evacuate water with buckets; build high walls to block flood waters from entering houses
3.	Prevalence of malaria	Use of mosquito nets, insecticides and taking anti-malaria drugs
4.	Lack of portable water	Drinking packaged water
5.	Homelessness	
6.	Destruction/damage of household property	Relocation of property outside community; keeping property above flood level
7.	Diseases	Use of local herbs and drugs

3.3 Individual level impacts

S/No	Impact
1.	Poor health status resulting from unnecessary sickness, including different skin diseases
2.	Affects social relationships as friends cannot be invited to the house
3.	Disruption of economic and livelihood activities
4.	Scarcity of food

An important coping strategy for households is the sand filling of rooms on an annual basis. This activity costs between ₦6000 and ₦15,000 per wet season, depending on the level of flooding experienced. For many households on the lower income level and the unemployed they are not able to avail themselves of this coping measure and are therefore highly vulnerable to the flood impacts. Furthermore, because majority of population in these communities are artisans and traders who are dependant on work done on a daily basis, the restriction of economic activities due to floods makes them more vulnerable as their livelihood is jeopardized as a result of flood events. Since flooding of communities is highly linked to infrastructures and poor management of the environment, the vulnerability of poor urban population is highly linked to poor urban management and government inability to deal adequately with the issues. An additional vulnerability faced by large sections of the urban poor in metropolitan Lagos is the fear that the state government may clear them off land sites deemed to be vulnerable to floods, with very inadequate or no provision for finding alternative accommodation that meets their needs. This has been aptly exemplified by the demolition of Maroko, a major slum located on the Victoria Island in 1991 upon forceful eviction of the over 300,000 residents by the Lagos state government. Amongst a list of reasons given for the demolition of Maroko was the low-lying nature of the land which was 1.5metres above sea level and was, therefore liable to flooding and complete submergence. However, this same land area has been developed into one of the high-brow residential districts in Lagos.

4. Source of Assistance

For all communities the main assistance received during flood occurrences was from family and social networks including community members. Except for Ijora Oloye where all respondents informed that they had received some form of assistance from government (10.8%) and religious organizations (6.5%), respondents from the three other coastal communities had not benefitted at all from these sources. The main form of assistance received is in the joint clearing of water ways and drainages in Makoko and Ilaje-Bariga (98%) and Marine Beach (58.3%). Five per cent of respondents in Marine Beach-Apapa benefited from additional aid in form of material donations.

VI. CONCLUSION

The population of metropolitan Lagos is growing rapidly and so also is the urban poor population in coastal areas at risk to climate change and sea level rise. Despite the environmental challenge posed by flooding due to storm surges and heavy rainstorms exacerbated by urban development, the vulnerability of the urban poor has not been taken into consideration in urban planning and development. Results of the study provide knowledge for urban planners and government structures for supporting informed adaptation to present and future climate change in this highly populated and expanding coastal city. There is the opportunity to integrate climate change in Lagos urban development, learning from present vulnerability of urban poor population, as more coastal settlements emerge. A range of measures to increase the adaptive capacity of the urban poor which governments at different levels should pursue include the restriction of land reclamation activities in newly developing areas, construction of more drainage systems taking into consideration storm runoff responses under high intensity rainfall, monitoring of urban development, proper solid waste management and environmental education for the citizenry. Enforcement of building guidelines in coastal locations is also particularly important. Good urban governance in the context of local peculiarities is therefore key to meeting the challenges of climate change in a megacity as Lagos.

BIBLIOGRAPHY

Abumere, S.I. 2004. The State of Lagos Mega City and other Nigerian Cities. Ministry of Economic Planning and Budget, Lagos

ActionAid 2006. *Climate change, urban flooding and the rights of the urban poor in Africa*. A report by ActionAid International

Agbola, T. and Agunbiade, E. M., (2007). Urbanization, slum development and security of tenure: the challenges of meeting Millennium Development Goal (MDG) 7 in metropolitan Lagos, Nigeria. Paper presented to the PRIPODE workshop on Urban Population, Development and Environment Dynamics in Developing Countries. Nairobi, 11-13 June 2007.

Ayoade, J.O. and Akintola, F.O., (1980). "Public perception of flood hazard in two Nigerian cities". *Environment International* 4, 277-280.

Dolan A. H. and I. J. Walker (2004). "Understanding vulnerability of coastal communities to climate change related risks". *Journal of Coastal Research* 39,

Douglas, I., Alam, K., Maghenda, M., Mcdonnell, Y., Mclean, L., and Campbell, J. (2008). "Climate change, flooding and the urban poor in Africa". *Environment and Urbanization* 20,187-205.

Few, R., Ahern, M., Matthies, F., and Kovats, S. (2004). *Floods, health and climate change: A strategic review*. Tyndall Centre Working Paper No. 63.

Gandy, M. (2005) "Learning from Lagos" *New Left Review* 33, 36-52.

Huq, S., Kovats, S., Reid, H., and Satterthwaite, D. (2007). "Reducing risks from disasters and climate change". *Environment and Urbanization* 19, 3-16

Lagos Metropolitan Development and Governance Project 2006

McGranahan, G. Balk, D., and Anderson, B. (2007). "The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones". *Environment and Urbanization* 19, 17- 37.

Ministry of Economic Planning and Budget (2004). State of Lagos Megacity and other Nigerian Cities.

Nicholls, R. J. & Mimura, N. (1998). "Regional issues raised by sea-level rise and their policy implications". *Climate Research* 11, 5–18.

Nicholls, R. J. (2004). "Coastal flooding and wetland loss in the 21st Century: Changes under the SRES climate and socio-economic scenarios". *Global Env. Change* 14(1), 69-86.

Nicholls, R.J et al. (2007). *Coastal systems and low-lying areas. Climate Change 2007: Impacts, Adaptation and Vulnerabilit*y. Contribution of Working Group II to the Fourth Assessment Report of the IPCC, M.L. Parry et al. (Eds.) Cambridge university Press, Cambridge, UK, pp.315-356.

Okude, A.S. and Ademiluyi, I.A., (2006). "Implications of the changing pattern of land cover of the Lagos coastal area of Nigeria". *American-Eurasian Journal of Scientific Research* 1(1), 31-37.

Satterthwaite, D., Huq, S., Pelling, M., Reid, H. and Lankao, P. R. 2007. *Adapting to Climate Change in Urban Areas: The possibilities and constraints in low- and middle-income nations.* IIED Human Settlements Discussion Paper Series.
< www.iied.org/pubs/display.php?o=10549IIED > (Sept. 15, 2008).

LMDGP 2006. Main Report Lagos State Urban Upgrading Project Confirmation Survey. Lagos Metropolitan Development and Governance Project (LMDGP). Report written by O. Soyombo.

Wilbanks, T. and Lankao, P.R., Bao, M., Berkhout, F., Cairncross, S., et al. (2007), *Industry, Settlement and Society*, in Parry, M., et al.(editors) *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge and New York, pages 357-390.