

## THE IMPACT OF DEVELOPMENT CONTROL ON SETTLEMENT VULNERABILITY TO CLIMATE CHANGE IN LAGOS COASTAL AREA

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**Abstract:** Climate change has been singled out as a major challenge currently facing the world. It has a variable effect on the residents with various intensities. This paper examine the impact of development control on the vulnerability of settlements to climate change in Lagos. The study area is the coastal area of metropolitan Lagos. The study is based on three Local Government areas that have coastal location. Three local governments have been selected using purposive approach aimed at ensuring that specific areas that are vital to this study are not left out. Two streets each were selected from each of the settlements. They are Ajegunle, Ebute Metta East and Lagos- Island. For ease of selection, the street guide for each of this settlement was used as the sampling frame. A systematic sampling was used to obtain sample at an interval of 10 buildings in each of the 6 streets involved in this exercise. An Adult person within the building selected was interviewed. At the end of the day out of a total of 400 samples expected only 396 questionnaires were retrieved. The result shows that there is a significant difference in the opinion about the development control made by the government in the settlements. The study also observed that poor monitoring by government officials of development activities contribute greatly to the vulnerability of settlements to climate change. The paper recommends that the development control department of all the local government area should be strengthened to ensure effective monitoring, formation of a coastal planning and climate change monitoring team and planning for land requirement for the poor to avoid encroachment on marginal lands.

### INTRODUCTION

Climate change has been singled out as a major challenge currently facing the world. Suzuki et al (2010) noted that for the first time in history, more than half of human populations or 3.3 billion people resides in urban areas. This underscores the need to pay attention to the effect of climate change on these settlements and more importantly because most human settlements Olujimi (2007) has always been attracted to the coastal areas. The world Urban Forum (2012) opined that out of the top 20 fastest growing cities in the world in 2010 – 2025, African cities account for 16. Of particular interest is the fact that most of these cities are

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concentrated along the coastal area despite the fact that the coastal areas portend great danger to residents. In recognition of the current rate of urbanization the UN – Habitat (2012) opines that the transition to a predominantly urban world is irreversible and brings with it equally irreversible changes in the way we use land, water energy and other resources and more importantly how we manage this rapid urbanisation will be the key to our very survival and prosperity – thus it has become imperative to evolve a new urban planning approaches or strengthen existing ones to address the climate change problems.

Lagos has received its own share of the world population largely through rural–urban migration. Lagos state is particularly vulnerable to the impacts of climate change and unless concerted and urgent action is taken it could result in wide spread ecosystem degradation, thus disrupting socio-economic development and the welfare of the people (BNRCC, 2012). This paper examines the impact of development control on the vulnerability of settlements to climate change.

#### **LITERATURE CONSIDERATION**

Recent studies suggest that the expected climate change in Lagos may include: A temperature increase of 0.04 degrees Celsius per year from now until the 2046 – 2065 period with areas near the coast expected to warm up at a slower rate than elsewhere; A wetter climate, with the annual rainfall increasing by about 15cm and a rainy season that will be longer by up to two weeks by 2046 – 2065; and An increase in the frequency and magnitude of extreme weather events, such as extreme heat days (with the temperature exceeding 38 degree Celsius), and more violent tropical storm (BNRCC, 2012). Carter and Culp (2010) stated that ‘climate change’ and ‘global warming’ are long-term, far reaching changes to the planet’s average temperature, which in turn affect precipitation and wind patterns. DFID (2009) observed that potential sea level rise is likely to cause significant problems to the poor in and around Lagos they also observed that infrastructure such as water, transport and power are also extremely susceptible and will result in knock on effects on other parts of the economy, especially wholesale and retail.

In the views of IPCC (2007) the consequences of climate change are likely to be devastating and in similar vein CIFR (2012) observed that with weak institutions and economic conditions, developing countries are home to the most vulnerable populations, who often live and work in impoverished and high-risk areas. They also observed that the greatest challenges of this generation is to shore up the resilience of communities, ecosystems and sensitive sectors such as water, agriculture and energy to anticipate and weather these climate

– change – triggered blows, adapt to the new conditions and thrive. This is why it has become imperative to ensure the capacities of settlement especially cities to cope with the effect of climate change. Vulnerability is the degree to which a system or unit is likely to experience harm due to the exposure to perturbations or stress (Schiller et al, 2011, and Kreimer et al 2003). Similarly, Adebayo (2010) described settlement vulnerability as the habitation of a group of people that are permanently living in a place that is prone to be easily hurt, influenced or attacked physically, emotionally or mentally. The state government of Victoria (2008) in Australia describe settlement vulnerability as the extent to which a settlement system is exposed and sensitive to negative implications of change, and the degree to which the community is able to anticipate, resist, cope with adapt or recover (i.e. the extent of resilience).

Initially climate change was thought to be basically a scientific issue; however evidences have shown that it could be multidisciplinary in nature cutting across different thematic areas especially in dealing with the issue of vulnerability. The concern for cities and climate change is based on the important role cities play in human development. For instance cities account for up to 80 percent of global greenhouse gas emissions and 75 percent of global energy consumption, harbours urban population who are mostly poor and are vulnerable to the consequences of climate change such as droughts and flooding. In Lagos and in most African countries, development have always gone unrestricted even on marginal land which now constitute great worries to urban planner and policy makers. Biogio, (2010) also observed that sea level rise, storm surges, flooding, land subsidence, and the salinization of water tables are the phenomenon that most threaten coastal cities, compounded by decreasing fresh-water availability and rising ambient temperatures, in addition to natural disaster risks. The concentration of most cities along the coastal area in Africa calls for climate change concern.

Rosenzweigh et al. (2010) Observed that cities are critical to global mitigation efforts. The international energy agency estimates in its most recent survey that urban areas are responsible for 71% of global energy – related carbon emissions, although the numbers vary widely depending on how cities or urban areas are defined. This percentage will grow as urbanization trends continue. They noted that climate change will exacerbate urban pressures of rapid population growth and sprawl, poverty and pollution. There will also be other knock-on effects because of cities' concentrated and integrated economic activity, highly complex infrastructure systems and social services and multi layered governance. Bojo et al. (2010)

and UN-Habitat (2011) seem to agree on the opportunities that cities have to offer and the large concentration of people that resides in the cities which underscores the need to take the issue of climate change seriously in the development plans of government especially in developing countries. Resiliency may be used as a potential design criterion for all urban systems, including built infrastructure, culture and governance. Such adaptability involve a number of simple strategies that are familiar to most engineers and designers which are flexibility, or enabling minor shifts in the way systems function or spaces are used; Convertibility or allowing for changes in use for parcels of land or buildings or changes in inputs for infrastructure systems and expandability, or facilitating additions (or deletions) to the quantity of land or space dedicated to particular uses. This work is of relevance as it provides a framework for strengthening critical infrastructure especially along the coastal areas (Suzuki et al 2010).

Schellhuber, (2008) pointed out that urban regions have to tackle three essential future trend – warming of the atmosphere; growing interaction of dryness and intense rain; and rising sea level. Shagun (2009) has advocated a need for city specific efforts to graduate from awareness raising to impact assessments – including costing impacts and identifying co-benefits-and-costs- and adaptation analysis so that responsive adaptation options can be adopted to increase resilience of cities to climate change. Cities are of outstanding importance in combating the accompanying risks of global climate change, because they produce approximately 80% of anthropogenic greenhouse gas emissions and so they are highly vulnerable to environmental threat (Rahmstorf and Schellhuber, 2007).

UN-Habitat (2011) observes that climate change is one of the most dangerous threats ever faced by human kind and admitted that the effects of urbanization and climate change are converging in ways which threatened to have unprecedented negative impacts on urban quality of life and economic and social stability. From these discussions it is clear that the success of any response to climate change must be inclusive where all irrespective of their status in the society is given opportunity in arriving at solutions to this problem. Also Shagun (2009) gave a leeway, his submission for instance stress the issue of awareness which is a very important aspect in achieving an appreciable progress. Residents need to be aware Jabeen (2010) on the other hand suggested a holistic approach that will cover adaptive-before, during and after disaster. This presupposes that adequate preparations must be made and these can be achieved if the view of Shagun is taken seriously.

Jabeen, Johnson and Allen (2010) opined that coping strategies operate at different levels: individual (e.g. household), community (e.g. neighbourhood) or institutional (e.g. city wide or beyond). Cooperation beyond the household at the community or institutional level – is usually necessary for the neighbourhood level coping strategies. Climate change is inevitable, and its impacts will be felt most severely by the poor. There is a real need to support bottom-up delivery of adaptation measures – in cities and rural areas – that build on local capacity for innovation (Toulmin (2012). IISD (2014) believed that there are enough laws, regulations, guidelines and standards both at the local levels and at international levels to handle environmental problems but the problems, is that of effective implementation. Thus a comprehensive review of national regulations and standards and provision of adequate implementation aid is required to achieve the desired goal.

## **METHODOLOGY**

This section discusses the research methodology for this work. The data used for this study were obtained from the field otherwise referred to as field survey and published documents.

The field sources traditionally referred to as the primary sources of data was accessed through direct and indirect observation, interviews were conducted on the three local government councils involved in this study. This was aimed at obtaining information relating to their activities as regards climate change, their challenges and more importantly their level of preparedness to climate change related disasters and structured questionnaires were also used to elicit information from residents. The questionnaire was addressed to the residents of selected settlements. In addition to this direct observation were also carried out especially at the Bar Beach. Three Local Governments were selected out eight that have coastal location using purposive sampling to ensure that areas that of important to this study are not left out. Two streets each were selected from each of the settlements selected and a systematic sampling method were used to collect samples at an interval of 10. 396 questionnaires were collected and analysed at the end of the exercise.

The published document which is secondary sources involved a review of relevant literature (in published and unpublished, research works, text books, government gazettes and journals and articles mostly journal articles on settlement vulnerability, coastal erosion, rainfall distribution and intensity, urbanization, and mitigation and adaptive, government policy etc. Respondents were residents of the three settlements selected visit was made to NIMET office – Nigeria Metrological Agency both in Victoria Island and Oshodi to obtain relevant information on rainfall distribution and intensity in Lagos over the years. Visits were also

made to the Nigeria Institute of oceanography and Marine research to obtain information on the changes along the coastline. Visits were also made to the planning offices in each of the local government involved in this study. Map procurement was also a major aspect. Some television stations were also visited to obtain information on past flood incidence.

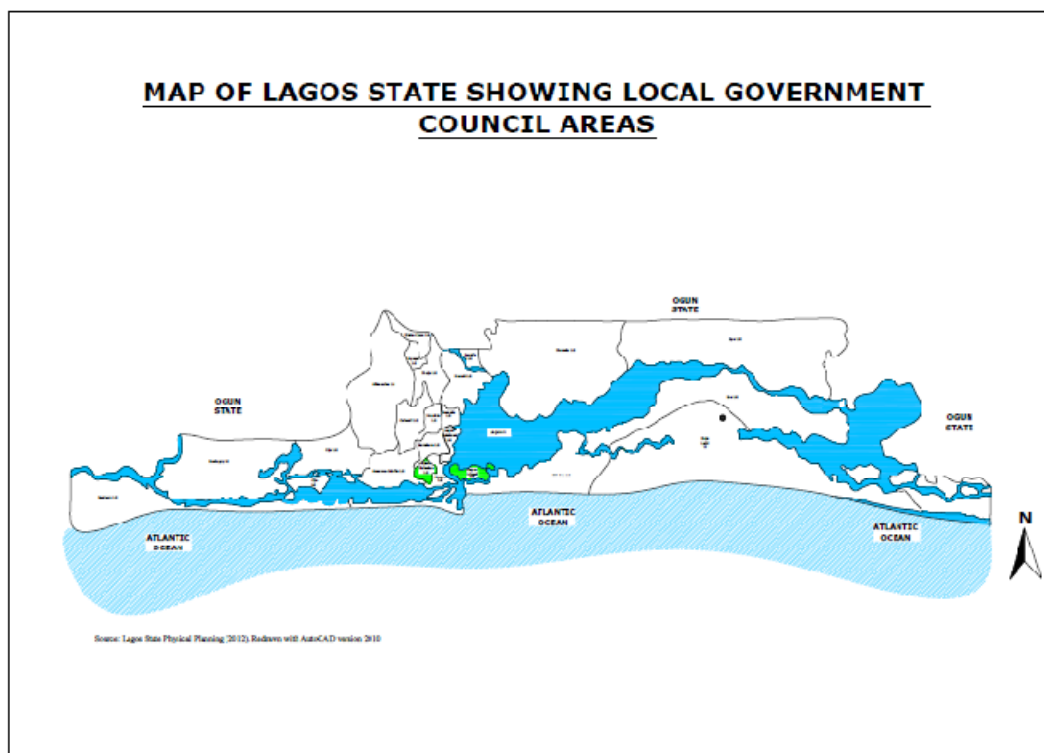
### **STUDY AREA**

The study area is the coastal settlements of metropolitan Lagos. Lagos as a state came into being in 1967 as both the federal capital and state capital. Lagos State is divided into five divisions of Ikeja, Lagos, Badagry, Ikorodu and Epe division. Three of these divisions fall within the metropolis which are Lagos division, Ikeja division and Ikorodu division? Out of these three divisions emerged the 20 local governments. See the map for the 20 Local Government Areas.

Lagos is located in the South western part of Nigeria having boundary with the Atlantic Ocean. The southern boundary is formed by the 180km long Atlantic coastline while its northern boundaries are shared with Ogun State and on the western side by Republic of Benin. The presence of large water bodies also compounds the level of vulnerability of these settlements especially those along the coast.

It is located between longitude  $2^{\circ}42'E$  and  $3^{\circ}42'E$  and Latitude  $6^{\circ}22'N$  and  $6^{\circ}22'N$  and  $6^{\circ}52'N$  (Balogun et al, 1990).

Area of Lagos is 3,577 sqkm out of which about  $787\text{km}^2$  or 22 percent of the total land area is water.



Lagos state is Nigeria's economic capital with over 2,000 industries located in the state. It accounts for 65 percent of the country's formal economic activities. Lagos consists of two major regions; the Island, which is the original city and the mainland, which is made up of rapidly growing settlements.

The climate of Lagos is tropical, hot and wet. The environment is characterized by coastal wetlands, sandy banner islands, beaches, low-lying and estuaries. The average temperature in Lagos is 27<sup>0</sup>C and the annual average rainfall is 1532mm (Aina 1994, Peil 1991).

The state of Lagos is bordered to the South by 180km of Atlantic Ocean coastline, running from the Benin border in the west to the borders with Ogun state in the east. The Atlantic Ocean has brought prosperity to the country of Nigeria; the port city of Lagos has grown into an economic hotspot for trade and commerce of regional and global importance, benefiting from its presence close to the ocean. Nevertheless, the ocean also brings a risk. Repeated flooding of coastal areas occurs overtime, damaging important and valuable infrastructure, housing and commercial assets. Also, erosion is observed at several locations (NEDECO, 2010). The general description of the climate is humid tropical climate. This is reflected in the climatic characteristics.

Rainfall throughout the year with varying intensities. There are double maxima (peak) period of rainfall From April to July and in October to November. There is brief relatively dry spell from December – March. Relative humidity is high throughout the year round, about 80 percent.

The metropolis is influenced by two principal winds otherwise called Trade winds They are North East (NE) trade wind and the South West (SW) trade wind.

The rainfall regime in recent years has been unpredictable both in intensity and duration. This phenomenon is associated with climate change. A proper understanding of the climatic characteristics becomes a vital aspect of this discourse.

### **The Population of Lagos**

According to the 2006 census, there are 9,000,000 people in metropolitan Lagos. This figure is seen as a gross underestimation by both the Lagos State Government and the World Bank. The Lagos State social Security Exercise (2006) puts the population at 17,552,942.

### **DEVELOPMENT CONTROL ACTIVITIES**

In examining the development control activities one hypothesis was tested on the opinion of the development control made by government in the settlements. The result is as presented below

### **DATA ANALYSIS AND PRESENTATION**

#### **Hypothesis 1**

*H<sub>0</sub>: There is no significant difference in the opinion about the development control made by government in the settlements.*

It was tested at 0.05 level of significance. The table 1.0 below shows the response to “Opinion on the development control efforts of government in the settlements, the expected response (theoretical), as well as the residual (difference). The expected response for all levels of opinion is expected to be 99; however, the observed responses were different from the expected, hence the need to check if the differences observed across all levels of the opinions were truly significant or due to chance.

The table also shows the chi-square goodness of fit test values, the degrees of freedom (df) and the p-values. The p-value associated with the chi-square test statistic ( $\chi^2 = 268.020$ ,  $df = 3$ ,  $p < 0.001$ ) was found to be less than the specified level of significance (0.05). Therefore, we reject the null hypothesis and conclude in favour of the alternative that there is significant difference in the opinion about the development control made by the government in the



settlement. This opinion cuts across highly effective (4.5%), effective (40.9%), not effective (49.7%), and not available (4.8%).

**Table 1.0:** Test of hypothesis of the Opinion on the development control efforts of government in the settlements

	Observed N	Expected N	Residual	Test Statistic	
Highly effective	18	99.0	-81.0	<b>Chi-Square</b>	268.020
Effective	162	99.0	63.0	<b>df</b>	3
Not effective	197	99.0	98.0	<b>P-value</b>	<0.001
Not available	19	99.0	-80.0		

**Source:** Author's fieldwork, 2014.

**Table 2.0: In what way can activities of the development control department be improved upon?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Sensitization of the residents	97	24.5	24.5	24.5
Regular monitoring/enforcements	146	36.9	36.9	61.4
Development control offices should be more accessible	58	14.6	14.6	76.0
Adequate funding of activities	35	8.8	8.8	84.8
Staff development	20	5.1	5.1	89.9
Increase in manpower development	40	10.1	10.1	100.0
Total	396	100.0	100.0	

**Source:** Author's fieldwork, 2014.

The respondents were also asked to indicate in what ways can activities of the development control department be improved, the response is presented in table 2 below. It shows that regular monitoring and enforcements ranked highest, followed by sensitization of the residents and making development control offices accessible among others. Relocation of settlements especially in highly vulnerable areas may be a sure way to reduce vulnerability to

change effects, the result in table 3 show that about 55.8% are willing to relocate if need be while about 33.3% are not willing to relocate for some reasons which include long period of stay in the area, fear of starting life all over again and attachment to family house all of which can be described as cultural attachment.

**Table 3.0:** Are you willing to relocate from this area if need be?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	221	55.8	56.1	56.1
	No	132	33.3	33.5	89.6
	Indifferent	41	10.4	10.4	100.0
	Total	394	99.5	100.0	
Missing System		2	.5		
Total		396	100.0		

**Source:** Author's fieldwork, 2014.

**Table 4.0:** Why wouldn't you want to relocate from this area?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	It is a family house	35	8.8	22.0	22.0
	Long period of stay at the present residence	41	10.4	25.8	47.8
	Means of livelihood will be affected	28	7.1	17.6	65.4
	Community ties will be destroyed	16	4.0	10.1	75.5
	Problem of starting life all over again	39	9.8	24.5	100.0
	Total	159	40.2	100.0	
Missing System		237	59.8		
Total		396	100.0		

**Source:** Author's fieldwork, 2014.

## VULNERABILITY REDUCTION

The impacts of climate vulnerability and change pose great threats to the city dwellers' lives and livelihoods as well as to the country's socio-economic development (Awour, 2008). Viewed from this angle the respondents were asked to rate the ways through which settlement vulnerability can be reduced in Lagos using the following variables; relocation of settlements to safer place, extension of the setbacks to the coastline, regular monitoring/enforcement of the established setbacks, regular dissemination of weather information and reinforcement of critical infrastructures such as water supply, electricity, telecommunication transportation and others. The result is as present in table 5.0. Regular monitoring/enforcement of established setbacks ranked highest with 49% while regular dissemination of weather information ranked 2<sup>nd</sup>, with 16%, reinforcement of critical infrastructures ranked 3<sup>rd</sup>, extension of the setbacks to the coastline coming 4<sup>th</sup> with 10% and relocation of settlements to safer place ranking coming 5<sup>th</sup> with 7.8%. Monitoring/enforcement of establish setbacks place on the lap of the spatial planner who has the requisite knowledge and training to effectively carry out this assignment.

**Table 5.0: In what way can vulnerability of this settlement to climate change be reduced?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Relocation of settlements to safer place	31	7.8	7.9	7.9
	Extend the setbacks to the coastline	40	10.1	10.2	18.2
	Regular monitoring/enforcement of the setbacks	194	49.0	49.6	67.8
	Regular dissemination of weather information	67	16.9	17.1	84.9
	Reinforcement of critical infrastructure	59	14.9	15.1	100.0
	Total	391	98.7	100.0	
Missing System		5	1.3		
<b>Total</b>		<b>396</b>	<b>100.0</b>		

**Source:** Author's fieldwork, 2014.

**Highlights of Findings** The result of hypothesis tested shows that the alternative hypothesis is accepted that there is indeed a significant difference in the opinion about the development control made by the government in the settlements.

The study note that the development control department in each of the local government areas have significant roles to play in addressing the issue of climate change effects. It also observed that development control department has contributed negatively to settlement vulnerability through poor monitoring of development activities, sharp practices by development control officers and non-inclusionary policies.

The study observed that poor monitoring by government officials of development control activities contributes greatly to the vulnerability of settlements to climate change. This is highly visible in the non-compliance of most developers to development control and the inability of the development control department to apply sanctions. The inability to apply sanctions have also been traced to frequent interference by the government. The government has an undue influence on the development control activities thus making it possible to change laid down rules at will and more importantly for political gains. The local governments along these coastal areas do not have the capacity to handle the enormity of the problems associated with climate change in the area. For instance, the monthly allocation to the local governments is barely enough to attend to recurrent expenditures let alone having surplus to handle emergencies on a large scale. It is therefore important to strengthen the link between climate change adaptation and development, which in the views of Awuor (2008) can increase public awareness and understanding of the issues, and pragmatically tackle the challenges posed by the phenomenon (Awuor 2008).

### **Conclusion and Recommendation**

The study on settlement vulnerability is a vital issue that need to be addressed to ensure not only environmental sustainability but to ensure the protection of life and property. Climate change is a global issue but the fact remains that it is likely going to have variable effects in different environment. It now beholds each government to identify the peculiarity of each region to be able to come up with adaptation strategies that will be responsive to the local needs. Some recommendations have been put forward in this paper. It is hoped that when the issues raised in this paper are addressed the issue of settlement vulnerability will be reduced drastically.

1. The development control department of all the local government area should be strengthened to ensure that their respective jurisdictions are properly monitored.
2. Formation of coastal planning and climate change monitoring team also in collaboration with the state government ministry of environment and other Federal Agencies connected with the issue of climate change and or coastal planning and management. Such

Agencies in Lagos include The Nigeria Institute of Oceanography and Marine Research, Nigeria Metrological Agency and (NIMET) Nigeria Maritime and Safety Agency (NIMASA). The monitoring team is very essential in view of the fact that a lot of laudable programmes put in place have become Mori-bond soon after take up because of poor monitoring.

3. Authorities need to start planning for the land requirement for the poor in the society. This is necessary to avert the re-occurrence of slum development which has become a major feature of most cities in less developed parts of the world. This is in line with the views of Angel (2008) who provided a detailed suggestions on how city administrations could plan ahead effectively for the land requirement of the poor.

4. The vulnerability of settlement to climate change can be reduced through relocation of settlements to safer sites. This may be difficult to implement because the result of willingness to relocate shows that relocation to other site ranked lowest. This suggests that despite the risks associated with continued stay in highly vulnerable areas people are not willing to move to other safe sites.

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