

Climate Change Challenges In Nigeria: Planning For Climate Resilient Cities

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Abstract: Climate change is real as its impacts are already widely felt across Nigeria. This study examines the impacts of climate change on Nigerian cities. It describes the relationships between climate change, human settlements, and urban planning. Published and unpublished materials are used to describe the vulnerability of Nigerian cities to climate change challenges. It later argued for the development of appropriate planning strategies for mitigating and adapting to the impacts of climate change on Nigerian urban centers. The strategies suggested include providing adequate infrastructural facilities, strict enforcement of building codes and regulations.

Keywords: Resilient, Urban Planning, Environment and Climate

Introduction

Climate change is a "current reality" worldwide (World Bank, 2008). Earth's climate has been undergoing noticeable changes as a result of anthropogenic activities causing changes in climate in addition to the natural climate variability (Dodman and Satterthwaite, 2009). Frequency of climate related disasters such as floods is now rampant all over the world. For instance, World Bank (2008) reported that Asia has experienced almost 600 floods affecting more than 850 million people within the last century. The Action Aid (2006) confirmed that in Africa (the fastest urbanising region), climate change is already threatening the goal set by world leaders to improve housing for about 100million slum dwellers by 2020. This has put the continent's already strained cities under additional stress. Increasing temperatures, rising sea levels and increasing storm frequencies have great implications particularly for coastal cities.

The World Bank (2009) observed that half of the human population now reside in cities and the figure is expected to

increase to 70% by 2050. About 60% of the world's population is expected to live in the developing world. "Environmental degradation from climate-related droughts and floods is increasingly swelling up the tide of urban migration across Africa. The majority of Africa's population live in urban areas (Action Aid, 2006). Climate change is also bringing chronic flooding to the cities. Urban floods spread disease, interrupt schooling and destroy assets and income (Action Aid, 2006).

Flood hazards are a common phenomenon, but damage and loss from floods are the consequence of inaction. Flooding is being aggravated by rapid urbanization because it restricts the flow of floodwater. Urbanization covers up the ground with roofs, pavements, obstructing sections of channels and building drains that prevent water from moving to rivers faster than in natural conditions (Action Aid, 2006). Habitat (2008) reported that over 50% of the world's populations live within 100km of the sea and that 75% of houses in

developing world are situated in areas liable to natural disasters such as flooding and landslides. Africa has about 25% of its population living within 100km of the coast (Africa Development Bank, et al, 2002). Also, most of the continent's largest cities are coastal cities vulnerable to sea level rise and coastal erosion. It is estimated that about 27% of Nigeria's total population reside within the coastal zone (Intergovernmental Panel on Climate Change (IPCC), 2001). The coastal part of the country like that of other West African countries has low lying lagoon coasts prone to erosion. Coastal cities especially places like Lagos and Port Harcourt located at sea level are highly vulnerable to rising sea levels (IPCC, 2001). Inland cities in Africa are expected to experience more heat island effects and intensified local winds in the near future (Simon and Gueya, 2009).

Climate change mainstreaming is critical in development planning (Yuen and Kong 2009). The United Nations Human Settlements Programme (2009) reported that current urban planning systems are not equipped to deal with the major urban challenges of the 21st century. These include the effects of climate change, resource depletion and economic instability, plus continued rapid urbanization with its negative consequences such as poverty, slums and urban informality. To a large extent, these planning systems have also failed to meaningfully involve and accommodate the ways of life of communities and other stake holders in the planning of urban areas, thus contributing to the problems of spatial marginalization and exclusion.

UN-HABITAT (2007) reiterated that urban planning is important in managing climate change because; well-planned cities provide a better foundation for sustainable development than unplanned cities. It was

further stressed that both adaptation and mitigation actions of environmental change require urban planning. For a sustainable urban future, urban planning needs to be reconsidered. It is against this background that this paper focuses on climate change and urban planning. It goes further to discuss conceptual issues such as climate change and urban planning in Nigeria. It also discusses some empirical issues and concludes by making suggestions on how to reduce the effect of climate change on Nigerian cities.

Climate Change and Human Settlement

Climate change refers to climatic variation at a global or regional level over time. It describes the variability or average state of the atmosphere or average weather over time scales ranging from decades to millions of years (WIKIPEDIA, 2004). These variations may come from processes internal to the earth, be driven by external forces (e.g. variations in sunlight intensity) or most recently be caused by human activities. Human settlement on the other hand can be defined as cities, towns, villages and other concentrations of human population which inhabit a given segment of the environment. Human settlements are associated with numerous and complex environmental pollution and living conditions problems for planning and management (UN-HABITAT, 2008c).

Human settlements are highly vulnerable to the adverse effects of climate change. For instance, just one meter rise in sea level will put many major coastal settlements under threat (UN-HABITAT 2009). Human activities that contribute to climate change include burning of fossil fuels and alteration of the land surface through deforestation, urbanization, desertification etc. These cause emissions of carbon dioxide (CO₂), the main greenhouse gas.

responsible for climate change as well as of other greenhouse gases (GHG), which contribute significantly to climate change. According to the European Communities (2009), human beings burn fossil fuel such as coal, oil and natural gas to produce electricity and heat. These fuels are also to fuel cars ships and planes. Furthermore, deforestation is taking place across the world with tropical forests disappearing much faster than other ecosystem at a rate of 10 million hectares a year. IPCC (2009) reported that climate change has an impact on infrastructure common to all human settlements such as buildings, transportation networks, water supply, waste water infrastructure and energy facilities. Climate change vulnerability is high in urban areas that are already under distress to problems such as scarcity of water, governance structure, congestion, poverty, political and economic insecurity and aging infrastructure (UN-HABITAT, 2008b).

Urban Planning in Nigeria

Urban planning is the act of controlling the use of land and the character of buildings and communication routes with the aim of achieving economy, convenience, health and beauty (Onokerhoraye and Omuta, 1977). Urban planning is also concerned with governments' official intervention in physical and environmental development through regulation of physical growth, resolving conflicts and improving the environment (Oduwaye, 2006). In the pre-colonial period land use administration was in the hands of traditional rulers, who were responsible for the allocation, re-allocation and supervision of land use (Olomola, 1999).

The foundation of modern urban planning in Nigeria was laid with the Township Ordinance of 1917, followed by the town and country planning Ordinance of

1946. The 1946 ordinance was comprehensive because it made provision for allocation of land for the construction of roads and regulated construction of buildings, slum clearance and land for industrial, educational and other uses. Urban planning in Nigeria benefited from the Public Health Building Adaptive Bye Laws (Onokerhoreye and Omuta, 1977). After independence in 1960, the 1960 Country Ordinance were however replaced by most Regional Government Town and Country planning laws (Oduwaye, 2006). Other policies concerning land management were later enacted to include the Land use Act of 1978, the Development Policy of 1992, the Regional Planning Law Decree of 1992, the Housing and Urban Development Decree of 2002 (Aribigbola, 2008).

The existing laws and regulations have however, not been able to promote most environmental problems in cities. For instance, there is still uncontrolled land use particularly in the suburbs of cities. These unplanned areas have layout with hardly any space for vehicular traffic. This is compounded by the poor waste disposal and short water facilities. Gbadegesin, Olofinjana and Raheem (2010) noted that most cities are among the dirtiest, poorest and poorly governed in the world. Cities in the country are facing a problem of rapidly deteriorating quality of life and living environment (Olujiro, 2008).

Climate Change and Urban Planning in Nigeria

Generally, cities are vulnerable to the effects of natural made disasters due to a combination of factors.

interrelated processes (UN-HABITAT, 2009). Opiyo (2009) noted that despite the advancement in technology and demand to adopt new technology so as to be relevant and competitive globally, climate change has become a headache to urban planners and managers as it is really threatening many cities' survival, especially in the third world countries whose vulnerability is so high and resilience is weak and very basic in containing the effects of climate change. Proper urban planning ensures that building construction meets a minimum standard of disaster resilience. It can also protect critical infrastructure and services such as electricity, water and sanitation, telecommunications, transportation systems and health services.

In Nigeria, rapidly deteriorating urban structure, slum development and increasing water and land pollution seem to prove that city planners and managers are losing control of the situation (Agbola and Olurin, 1998). Local town planning activities in the country are devoted to physical layout of cities, with almost total disregard for environmental issues (Gbadegesin, Olorunfemi and Raheem, 2010). Cities in the country as in other parts of the world are subject to various kinds of physical, economic and social forces. Proper urban planning helps to maintain the balance between these forces and ensure quick recovery from natural disasters whenever they occur. Proper urban planning will reduce vulnerability to natural disasters through disaster resistant planning and developing mitigation processes for disaster risk reduction (Adeleye and Olayiwola, 2006). Carefully planned settlements are better able to cope with environmental challenges. It will create environmentally-friendly cities in areas of transport and sustainable building and conserve environmental assets. Better planning will

also reduce new slum formation by ensuring adequate supply of land for development at safe and accessible locations. It will bring sustainable economic growth for tackling urban poverty and rural-urban migration. Urban planning will ensure conflict resolution and safer cities and lastly, help enhance quality of life in human settlements (World Planning Congress, 2006).

Vulnerability of Nigerian Cities Impacts of Climate Change

According to NEST (2009), Nigeria is one of the countries expected to be most affected by the impacts of climate change through sea level rise along its 800km coastline. Other expected impacts include intensified desertification, erosion, flood disasters and general land degradation. It is predicted Nigeria will lose close to \$9 billion as a result of the catastrophe while at least 80 percent of the inhabitants of the Niger Delta will be displaced due to the low level of the oil rich region (Guardian Monday, September, 17, 2001, p. 80).

Nigerian coastal cities like Lagos and Port Harcourt might presently be at risk of increasing cases of ocean surge. For instance many high density low lying areas around the Lagos Lagoon are highly vulnerable to rising sea level. The barrier promenade at the mouth of the lagoon is ineffective against the expected sea level rise of 30-50cm at the end of the century (Simon and Gueye, 2009). A sea level rise of 2 meters will lead to the displacement of about 6 million people in Lagos alone (Metrotra et al, 2009). On June 17th 2004, 243 millimeters of rain recorded in Lagos caused massive flooding resulting in washing away of bridges and erosion of various roads. Also, the number of waves recorded has increased in recent years. For example average monthly temperatures of over 34 degrees Celsius

have been recorded for some months in Lagos for seven of the last 20 years (Metrotra, 2009).

Re-occurring cases of flooding characterizing recent years are not limited to coastal cities like Lagos. Interior cities in various parts of the country are facing increasing cases and magnitude of flooding. Rapid urbanization, encroachment into marginal areas, poor waste management and non-enforcement of planning regulations are some of the reasons responsible for flooding in Nigerian cities (Jeb and Aggrawal, 2006).

In Ilorin for instance, three major flood episodes were experienced between 1971 and 1980. Nine flood episodes were also recorded in the city between 1991 and 2008 (Olaniran, 1983 and Iroye, 2009). Many areas of Abeokuta, western Nigeria were hit by massive floods in July, 2007 (Daily Champion, 2007 and Daily Trust, 2007). Kaduna, Sokoto, Yola, Makurdi and Abuja among other northern cities and Benin city in the south experienced destructive floods in 2009 (AllAfrica.com, 2009).

The former president of the World Bank, Mr. McNamara commented that there is no state in Nigeria without one environmental problem or the other. For example some parts of northern Nigeria (Sokoto, Zamfara, Kebbi, Katsina, Kano, Jigawa, Borno and Yobe) are being threatened by wind erosion, while some southern parts (Lagos, Delta, Rivers, Ogun, Ondo, Akwa Ibom and Cross Rivers) are under the threat of seasonal flood (United Nations Commission on Sustainable Development 1997).

Population pressure, over grazing and the continuous exploitation of marginal lands have aggravated drought and desertification in Nigeria especially in

places like Borno, Katsina, Sokoto and Jigawa States. Borno State which experienced drought between 1972 and 1977 is presently experiencing desertification. The resultant effect of this is that animals are dying and farm yields are decreasing, also human beings are getting ill. People are now migrating from areas taken over by desert to wetter parts of the state and to the urban centers. This is compounding the problems of the urban centers already groaning under the pressure of inadequate basic infrastructures.

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 the Millennium Development goal of achieving significant improvement in the lives of urban slum dwellers. This is as a result of many African cities lacking the infrastructures to withstand extreme weather (Action Aid 2006).

Planning for Urban Climate Change Challenges in Nigeria

Facing the challenges of climate change require an integrated approach encompassing both mitigation and adaptation strategies (African Development Bank, et. al 2002). Good urban planning is of great significance as we face the challenge of matching our building systems against the forces of nature. There is therefore, the need to adapt urban planning principles to the impacts of climate change (Brakely, 2007). The adaptive capability of the system is however, dependent on some factors. These include financial capability, level of technology, managerial ability, human capital and ability to manage information (UN Habitat, 2008).

The starting point for city planners and managers in Nigeria is to understand

that they have to address three important issues. These include reducing the risk of climate change, developing risk profiles for potential risks based on each city's geography and geology and finally, designing adequate strategies for adaptation (Adeleye and Olayiwola, 2006 and Blakely, 2007).

The risk reduction strategy must begin with the use of environmental planning and design that saves energy and reduces emission of greenhouse gases. For instance, designing more compact cities will encourage walking and the use of non-motorised transport (NMT). This will reduce walking distance and vehicular emission. The idea of the compact city is part of the green principle to city planning and building design. According to El Sioufi (2009), the other aspects of the green principle include the introduction of zero emission metro buses, creating pedestrian-only zones and use of high rise greenery. Natural ventilation can also be used to reduce dependence on air conditioning. In Nigeria, mitigation efforts at reducing emission should be directed at encouraging the use of non-motorized transport like bicycles as well as trekking. On the other hand, promoting mass transit will help to discourage the use of personal vehicles which will further reduce congestion on urban roads.

All levels of government should be fully involved in planning our cities. At the national level, the government should begin by incorporating climate change into national development plans. In the same vein, urban planning should be well-articulated to develop adaptation actions and strategies that can aid in reducing the impacts of climate change. Urban environmental planning and management should also be closely integrated with the national development plans. Although some Nigerian cities have master plans, most of

these are outdated and need to be reviewed. The principle of sustainable urban development as adopted by the United Nations Development Programme (UNDP) needs to be fully adopted in the country. The Sustainable City Project (SCP) which has been applied in Ibadan, Kano and Enugu and Lagos should be adopted in other Nigerian cities.

There is the need to fully adopt urban planning strategies that effectively enforce policies aimed against building in flood prone and vulnerable areas. There is also the need to fully embrace spatial planning and building technology encompassing the use of modern building materials and structural designs. This will help to reduce the vulnerability of the built environment to natural disasters.

Cities in Nigeria like in other parts of the developing world face greater risk because of poor infrastructure. Emphasis should therefore, be on proper infrastructural development to provide critical access to services. For instance, well developed transport, communication and early warning systems are required for quick evacuation of people during emergencies.

The provision of other necessary infrastructures like well-designed drainage systems and proper solid waste management facilities are imperative. These will reduce the risk of flooding which is high in most Nigerian cities. Urban building regulations and land use development policies must be strictly enforced.

In coastal cities like Lagos and Port Harcourt, emphasis should be on coastal zone management. Construction should be strictly controlled and sand excavations on the beaches should be discouraged. Flooding and ocean surges can be controlled by

improving the canal systems and building more sea walls.

Nigerian Urban planners and administrators can further learn from the experiences of North African cities like Tunis, Casablanca and Alexandria where vulnerable infrastructures like roads, bridges and ports are given special attention through regular maintenance. All necessary institutions and facilities required for quick response to emergencies should be put in place thus ensuring rapid response and quick evacuation of people during disasters. Local emergency management agencies should also be closely integrated into national emergency management strategies. Nigeria can also borrow a leaf from the experience of Cuba which has put in place a very efficient disaster management system.

Conclusion

Climate change is a fact and is one of the greatest challenges facing mankind today. Though the physical processes responsible for global climatic systems are very complex, it is clear that humans are mostly to blame for global warming. Increasing intensity of storms, floods and droughts have catastrophic implications for millions of people especially in developing countries. The high vulnerability of developing world cities to climate change effects was observed to be the result of some factors. These include poor technology, poverty and inadequate urban planning and poor enforcement of planning regulations.

Meeting the challenge of climate change effects in our cities requires both mitigation and adaptation strategies. Thus, city planners and managers have very important roles to play in this regard. They must be prepared to adapt our urban planning to present day realities. Cities as centers of population concentration must be

built to better withstand the effects of climate change. A factor identified as increasing the vulnerability of Nigerian cities is that of inadequate infrastructure; others are inadequate enforcement of planning regulations. Though our city planners should adopt new urban design and emission, greater efforts should be made to adaptation strategies. Urban planning should therefore, be planned to withstand natural disasters like flood storms.

It is therefore important for developing countries to develop drainage system, waste disposal management and emergency management in cities. This paper further suggests that building on highly vulnerable sites should be discouraged. It also suggests include the adoption of coastal management practice in cities so as to reduce coastal erosion.

Proper emergency management systems should be incorporated into urban planning and management. To ensure a quick response and reduce the loss of lives and property during disasters.

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