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Climate Change and Public Service Delivery System in Nigeria

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Abstract

*Climate change has posed a huge challenge to mankind, producing a litany of contradictions such as high temperatures, flooding and shortage in the volume of rainfall, to mention a few. It is widely recognised as the greatest challenge facing society, and this is reflected in a raft of policies and strategies that have emerged in recent years. This paper states that public service plays a critical role in the efficient delivery of quality services to the people of Nigeria. The paper reflects on significant challenges facing the public sector in the 21st century because of climate change. The paper **also notes that public sector** organisations have an essential role to play in helping Nigerians prepare for, and respond to, changes in the climate. It suggests that Nigerian public sectors must identify cost-effective ways of meeting these new statutory responsibilities posed by the effect of climatic change on the citizenry in the delivery of effective and sustainable services. The Nigerian government should adequately equip and empower government agencies to be able to tackle any disaster with dispatch and efficiency arising from climate change. The paper concludes that the drive to develop public services that are sustainable in the context of climate change have become even more imperative in the light of substantial cuts in public sector spending.*

Keywords: *Climate Change, Public Service, Service Delivery, Flood, Global warming*

Introduction

CLIMATE change has an enormous impact on our economies and societies. It is today widely recognised as one of mankind's greatest challenges in the 21st century. Climate change has emerged as a critical development issue since the early 1990s due to its predicted impacts on biodiversity, rural livelihoods and national and global economies. It threatens to reverse the gains of development and puts pressure on already limited human and financial resources in developing countries (Kasali, 2011).

There is no doubt that climate change is now a subject of global concern. This is

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evident from the volume of empirical literature that is currently available on the subject matter. However, most seem to focus on the industrialised countries where the economic impacts are likely to be less harmful because of better adaptation techniques and technology, rather than on developing nations like Nigeria. It is widely recognised in the scientific community that Earth's climate system has evidently changed since the pre-industrial era and will continue to change in the coming centuries at rates projected to be unprecedented in recent human history (Adger *et al.* 2003; Costello *et al.* 2009).

The phenomenon of climate change which has affected virtually every facet of human life in contemporary society has also brought daunting challenges to virtually all facets of life in contemporary society, including, of course, economic development. As climate change results in fundamental transformation of physical and social life, public service has to contend with meeting the challenges of new adaptation to altered climatic conditions and changes in lifestyles resulting from destruction of existing social structure and infrastructures. These challenges become more obvious in a developing economy like Nigeria (Yusuf, 2012).

Numerous studies have focused on different aspects of climate change impacts and adaptation needs in Africa, but few have considered the effects of climate change on the public service delivery system at national and regional levels.

Conceptual Framework

There are two concepts central to our discourse in this paper: climate change and public service delivery.

Climate Change: Climate change is a complex interaction between Earth's atmosphere-stratosphere and troposphere on one hand and land biosphere on the other hand (Allen, 2004; Solomon *et al.*, 2008). Climate change is believed to result from the effects of global warming on the environment. Global warming is regarded by many people to be the most serious environmental challenge of modern times (Giddens, 2006).

The Intergovernmental Panel on Climate Change (2007) defines climate change as a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period – typically decades or longer. Although the length of time it takes the changes to manifest matters, the level of deviation from the normal and its impacts on the ecology are most paramount. The United Nations (2007) defines 'climate change' as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability

observed over comparable time periods. The major characteristics of climate change include rise in average global temperature, ice cap melting, changes in precipitation, and increase in ocean temperature leading to sea level rise.

According to the Nigerian Climate Reports 490 (2010), climate change is any long-term change in weather statistics over durations ranging from decades to millions of years. It can be manifest in changes to averages, extremes or other statistical measures, and may occur in a specific region or the Earth as a whole. Climate change refers to a change in climate that is attributable directly or indirectly to human activities, that alters the atmospheric composition of the Earth which leads to global warming (Allen, 2004). It has the potential of affecting all natural and human systems and may be a threat to human development and survival socially, politically and economically.

Okali (2004) defines climate change first by defining the climate as the “average weather” together with the variability from the average; it is the synthesis of the weather in a given place over a period of at least 30 years. He listed the main elements of the weather to include temperature, rainfall, dew, humidity, wind, sunshine, mist, haze and cloud. It is the collective pattern of expressions of these elements over time that is described as the climate of the place. Climate change is thus a change in these collective patterns of expression, not just in one element of weather. It is the permanent departure of climatic patterns from mean values of observed climatic indices (Obioh, 2002).

Climate change is a pattern of change affecting the global or regional climate as measured by such factors as average temperature and rainfall, or an alteration in frequency of extreme weather conditions. This variation may be caused by both natural processes and human activity. Climate change has been blamed on human activities which result in the increased release of greenhouse gases and widespread deforestation both of which alter the balance of atmospheric gases in favours of the greenhouse gases (GHGs). These greenhouse gases are carbon dioxide and carbon monoxide (CFCs) (Fawehinmi, 2007).

In his own view, Ozor (2009) sees climate change as change in the climate over time, whether due to natural variability or as a result of human activity and is widely recognised as the most serious environmental threat facing our planet today. This definition elicits the seriousness of the threat posed by climate change and the urgency of the need for countries to rise up to this urgent clarion call of combating the negative effects of climate change. The climate we know cannot be said to be static, but variations are so insignificant that it is only climatologists that can identify them. Over the years, the change has become more pronounced and significant. This is as a result of Earth's natural variations and man's activities which cause emissions of greenhouse gases

thereby increasing global warming. This global warming is what actually induces the change in climate.

Public Service Delivery: Public services are key determinants of quality of life that is not measured in per capita income. They are also an important plank of essential service delivery. It is a particular challenge in Nigeria, given the low quality of service provision and the pressing needs of the poor (Besley and Ghatak, 2007). Public service delivery has been one of the key functions of the public sector; indeed, it is a fact of life for government. Citizens and businesses tend to expect convenient access to government services and information through multiple channels, such as telecommunication, agriculture, transportation, education, etc. Many government agencies have traditionally functioned as separate business units, resulting in complex and disjointed communications. This leads to inefficiencies and service ineffectiveness, which serve to drive up costs. Meeting increasing service demands with fewer resources under constrained budgets is a major challenge for most governments (Mitel, 2007).

Public service delivery is a comprehensive concept. In the context of governance, public service delivery is the result of the intentions and decisions of government and government institutions, as well as the actions undertaken and decisions made by people employed in government institutions (Rakate, 2006). It has an impact on human development directly if it is delivered to people in the form of basic services such as education, health, water and sanitation which contribute to promoting human development.

Public service delivery also provides inputs into the growth process. Growth is a necessary condition for human development to be attained. In these two senses, access to the adequate quantity and quality of services contributes to accelerating progress in economic growth and human development. However, service delivery requires resources for it to occur. The quantity and quality of these resources is a major determinant of the influence of these resources on growth and human development. These resources may be from internal or external sources. Effective service delivery will require scaling up of the quantity and quality of all resources – internal and external (Wangwe, 2010). Effective service delivery is the provision of services to a buyer in such a way that the buyer's expectations can be met or exceeded while at the same time the business remains viable (Nash and Nash, 2004).

Effective service delivery, therefore, is rendering services that correspond to the customer's desires, needs and expectations. This concept emanates from the perceived need to treat members of the public that require government services the way a private-sector entrepreneur would treat his/her customers. This is against the backdrop that a major obstacle to efficient and effective delivery of

government services is the attitude of public servants to members of the public, who are their customers (Fagbemi, 2006). Describing the requirements of the access principle for effective public service delivery, Bardhan (2006) explains that all citizens should have equal access to the services to which they are entitled. The openness and transparency principle has it that citizens should be told how national and provincial (states, local governments) departments are run, how much they cost and who is in charge. Public service delivery is commonly understood to mean the provision of public goods or social (education, health), economic (grants) or infrastructural (water, electricity) services to those who need (or demand) them.

Theoretical Framework

Theories help us simplify difficult concepts and explain reality. By simplifying concepts and identifying the core elements, it then becomes easier to explain events and the implications of those events. We utilise Agency Theory as the main framework for explaining the relationship between the government as the principal and the citizen as the agent. We therefore use it to analyse climate change and public service delivery.

Agency theory, also frequently referred to as the principal-agent model, is a theoretical framework that has been used to explain the behaviour of both the principal and the agent and is the area of economic theory most concerned with accountability while correcting for opportunistic behaviour that results from asymmetric information (Alchian and Demsetz, 1972). As is the case with managerialist theories rooted in economics, agency theory is concerned with designing optimal contracts and achieving efficiency yet it assumes self-interest over the attainment of collective interests. This assumption guides many of the management and governance mechanisms used to ensure that there is goal convergence among the contracting parties. The principal delegates responsibility to the agent for the production or delivery of a good or service. The principal and agent agree on the terms of the contract including the inputs, processes, outcomes, and how the agent is to be compensated for doing the work of the principal. For purposes of this research, government, specifically public managers, will be referred to as the principal and the citizens as agents.

The operational linkages between government organisations and the citizens are now recognised as important contributors to the success of government policy and decision-making. Agency theory is concerned with resolving two problems that can occur in agency relationships. The first is the prospect of conflict between the desires or goals of the principal and the desires or goals of the agent. The second is the principal's difficulty in monitoring and verifying what the agent is actually doing. The problem here is that the principal cannot verify whether the agent has behaved appropriately (Eisenhardt, 1989).

Political scientists have used the principal-agent theory to describe the nature of bureaucracies, public service and other areas, while economists use the principal-agent model as a way of explaining the interactions that take place in the development and execution of contracts. Principal-agent theory spells out the problems that develop between the principal and the agent upon entering the relationship. Principal-agent theory uses several special terms to explain the inherent challenges and problems of the principal-agent relationship.

Essentially, the principal-agent framework aims to model how a policy maker (the principal) can induce a service provider (the agent) to deliver high-quality services. Two assumptions characterise the principal-agent model. First, there is goal conflict between the wealth-maximising behaviour of the principal and utility-maximising behaviour of the agent. Secondly, agents have more information than principals, which results in information asymmetry that agents can exploit for self-gain rather than for the collective interests of the contracting parties. The tenets of agency theory that attempt to explain and structure contracts include information asymmetry (when one party has information the other party does not possess), adverse selection (when one party knows more about attributes of a product or service than another and, as a result, the uninformed party runs the risk of purchasing a product or service of low quality), and moral hazard (when a party to the contract uses information and expertise and acts opportunistically, in its own self-interest, to the exclusion of the agreed-upon contract goals).

Principal-agent theory also argues that the public (as principals), on whose behalf politicians and bureaucrats (as agents) are supposed to govern, is unable to hold the latter accountable because of insufficient information (information asymmetry), the incompleteness of the contracts of employment, and the problems of monitoring behaviour (Walsh, 1995; Lane, 1995). The public sector underperforms because state officials pursue their own narrow self-interests rather than the public interest. It is difficult to extract accountability and good performance from public servants (agents) because of the monopoly characteristics of public services, imperfect information about the services, and about the abilities and interests of public employees, and the huge transaction costs that would be involved in efforts to write and monitor complete contracts. One solution to this public sector problem is to expose the public services to greater competition.

The result of the above drivers for change is that the role and institutional character of the state have been under increasing pressure to be more market-oriented and management-oriented, with emphasis on 'doing more with less.' The traditional model of organisation and delivery of public services – based on the principles of bureaucratic hierarchy, planning, centralisation, direct

control and self-sufficiency – is being replaced by a ‘new public management’ (NPM) model.

In relation to climate change and public service delivery, the principal, which is the government, is bound to protect the interest of the agent in the provision of essential services, and to protect them against natural disaster like climate change which seriously affects the citizen in recent times.

Climate Change and the Challenges of Public Service Delivery

Climate change is a topical issue worldwide because of its attendant problems that are threatening the sustenance of effective public service delivery. In recent times, they have become particularly severe in Nigeria, bringing with them grievous consequences. The impact of climate change includes floods, landslides, drought and famine. As weather becomes fiercer and storms increase in frequency and intensity, serious socioeconomic consequences result. Malnutrition and disease become common occurrences. Despite these multifarious impacts of climate change, the biggest obstacle is lack of awareness about it, as Nigerians still need to be educated and informed about it (Wangwe, 2010).

Climate change has been one of the most engaging environmental subjects of debate in recent times. Indeed, the environmental problems associated with the potential impact of expected climate change may prove to be among the major environmental problems facing many countries. In Nigeria, it has been realised that serious environmental problems arise in association with global warming resulting from emissions of greenhouse gases into the atmosphere. These problems in one way or another affect the location and planning of features and economic activities in Nigeria (Onyenechere, 2010).

There has been growing concern over climate change and its impacts on many aspects of human society, particularly on public service delivery system. The quest of every government includes: maintenance of law and order, provision of basic infrastructures and ensuring accelerated socioeconomic development, among others. Each of these requires an enabling social, political and physical environments (Yusuf, 2012). The current spate of environmentally induced havoc ravaging many parts of the globe has therefore become a source of major concern to governments, organisations, scholars and stakeholders in environmental issues. The devastation caused by super storm Sandy in some parts of the United States in October 2012 is a wake-up call on developing countries like Nigeria. Hurricane Sandy came in the heat of the campaigns for the U.S presidential elections. There had been adequate warnings about the advancing storm that had wreaked havoc in the Bahamas, Cuba, Dominican Republic, Haiti and Jamaica. Yet when it hit the US, it was a devastating blow.

The incident affected fuel and electricity supplies in some areas. Houses were submerged and Sandy knocked out power from more than 8.5 million customers in 21 states. At least, 121 people were reportedly killed, with an estimated \$50bn in property damage and economic losses. In August 2005, Hurricane Katrina killed over 1,800 people in the US' states of Louisiana and Mississippi. Again, in August 2011, Hurricane Isaac swept through New Orleans and killed at least 23 people. In other parts of the world like Japan, the tsunami is the main problem (*The Punch*, 2012). Nigeria, though relatively lucky with nature, experienced a flood disaster in October 2012 which led to great devastation of lives and properties. The Federal Government, through the ministries of environment and internal affairs, as well as the National Emergency Management Authority (NEMA), have taken some measures in addressing the flooding problem that has ravaged some parts of Nigeria in which many houses have yearly been submerged by floods, rendering hundreds of residents homeless and valuable properties destroyed.

Although the Federal Government has taken some measures to manage the 2012 flood disaster in Nigeria, it has admitted that the disaster was beyond what it could solely handle due to substantial cuts in public spending and budgetary constraints. The FG has therefore called for aid from both the private sector as well as the international community. This development led to the setting up of the Dangote-led Presidential Committee on Flood Relief and Rehabilitation, which realised more than N11.35 billion in cash and promissory donation for flood victims across the country. Notwithstanding this invention, flood disasters are going on unabated in Nigerian cities and the government's drainage option has not provided solutions to this menace (Odufuwa *et al.*, 2012).

Climate change has effects on virtually all aspects of human endeavour (politics, health, education, religion and the economy). Climate change is one of the most pressing environmental challenges facing humanity with strong relevance to food security, health, natural ecosystems, freshwater supply, secure shelter and social relations. It is instructive to note that the public service delivery system has hindered implementation of the United Nations Environment Programme (UNEP) report on the cleanup of the Ogoni environment in the Niger Delta. This is evident in the fact that the UNEP assessment report found that there is overlapping authorities and responsibilities between ministries, in addition to lack of resources within the key agencies that has resulted in serious implications for environmental management in the area.

Nigeria, as a developing nation, is particularly sensitive to the effects of climate change. A large part of the economy of the country depends on natural resources, which are particularly vulnerable to climate change. Disease, loss of livelihoods

and settlements can force entire communities into relocation or complete extinction and even refugee status. As critical as the effect of climate change is, it is not clear whether Nigerians are aware of what climate change is or its effects. Perhaps the biggest obstacle is the lack of awareness and knowledge, as Olorunfemi (2010) has put it. Nigerians need to be educated and informed about climate change and how it can change our lives drastically. For instance, the state government has warned about the likely effects of Hurricane Sandy on the state, most especially on its coastlines. The Nigerian Meteorological Agency has also warned of more natural disasters ahead caused by unfavourable weather conditions. Experts warn that preparedness is vital in the event of man-made and natural disasters.

Climate change is an environmental, social and economic challenge on a global scale (Scholze Annel and Prentice, 2006; Mendelsohn Dinnar and Williams, 2006). It can be exacerbated by human-induced actions such as: the widespread use of land, the broad scale deforestation, the major technological and socioeconomic shifts with reduced reliance on organic fuel, and the accelerated uptake of fossil fuels (Millennium Ecosystem Assessment, 2005). It is instructive to note that the frequent price increase and scarcity of basic domestic fuels like kerosene is likely to have a significant effect on government's afforestation programmes in Nigeria. Nigerian environmental groups have noted that massive deforestation of the nation's severely depleted forest may follow if frequent fuel price increase is not addressed (Raufu, 2003).

According to Ishaya and Abaje (2008), the most devastating adverse impacts of climate change in Nigeria and other subtropical countries include the following: frequent drought, increased environmental damage, increased infestation of crop by pests and diseases, depletion of household assets, increased rural urban migration, increased biodiversity loss, depletion of wildlife and other natural resource bases, changes in the vegetation type, decline in forest resources, decline in soil conditions (soil moisture and nutrients), increased health risks and the spread of infectious diseases and changing livelihood systems, (Reilly, 1999; Abaje and Giwa, 2007).

Climate change has been an age-long phenomenon but it is only recently attracting serious interest among the world's population due to its impact on the weather and natural resources as well as agriculture. From decade to decade, change in the climate has continued to be evident. Since the start of the 21st century, the world has been witnessing the warmest in the instrumental weather record. Normally, climate change can be described as part of the Earth's natural variability. It is a subject of the connections among the atmosphere, ocean and land, as well as changes in the amount of solar radiation reaching the Earth. From country to country, community to

community, the challenges mounted by change in climate cannot be underestimated (Kasali, 2011).

Climate change – evidenced by extreme temperature, frequent flooding and drought and increased salinity of water supply – has become a recurrent subject of debate globally, and Nigeria is one of the countries contributing to global warming. Like other developing countries, the challenge of climate change and global warming is enormous in Nigeria due to widespread poverty, the prevailing system of slash-and-burn agriculture, erosion and burning of firewood and farm residues. Though climate change is a threat to agricultural and socioeconomic development, agricultural production activities are generally more vulnerable to climate change than other sectors (Derresa *et al.*, 2005).

Climate change is already having significant impacts in Nigeria, and these impacts are expected to increase in the future. Recent estimates suggest that, in the absence of adaptation, climate change could result in a loss of between 2% and 11% of Nigeria's GDP by 2020, rising to between 6% and 30% by the year 2050. This loss is equivalent to between N15 trillion (US\$100 billion) and N69 trillion (US\$460 billion), according to Yusuf (2012). Another critical challenge of climate change in Nigeria is the need for the government and other non-governmental agencies to prepare against possible occurrence of environmentally induced natural disasters in the future. The recent outbreak of similar disasters in countries like Haiti, Australia and Japan is a warning to other countries to get prepared at all times. The disaster management capacity in our country must be enhanced, in terms of manpower training, equipment and public awareness and sensitisation (Yusuf, 2012).

The Lagos State Commissioner for Waterfront Development and Infrastructure, Adesegun Oniru, has noted that the state government is planning to protect Majidun, Kuramo, Oniru and Alpha beaches and other areas prone to ocean surge in Lagos. Although Nigeria has not had any serious natural disaster in the magnitude of a hurricane or tsunami, the worst we have had being flooding, past experiences indicate that beyond the government's alert and promises, the country is not really prepared for serious natural disasters. A recent example is the Kuramo ocean surge in Lagos. When this incident occurred, rescue efforts were late in coming while some Kuramo victims failed to heed the warnings concerning the looming danger (*The Punch*, 2012). Also, beyond the warning about the recent flood which claimed many lives and property across the country, the best the Federal Government has done has been to set up a committee to source relief funds for the victims.

Climate change adaptation and mitigation bring substantial opportunities for the creation of secure, quality jobs in public services such as water

management, energy supply, health care, coastal and natural resource management, disaster preparedness, urban planning. But the content of many of these jobs is likely to be different from today, requiring innovative capacities and skills development programmes to ensure opportunities are seized. For instance, while the current approach to adaptation is principally through investment in physical infrastructure (sometimes referred to as 'rubber cutting'), green infrastructure and soft, regulatory approaches to adaptation has increasingly been preferred (European Commission, 2009). Public servants, who are involved in the immediate response to climate related disasters, are the most exposed to higher temperature, strong winds and water floods and epidemics, and face higher risks of physical injury, diseases and skin cancers. It is also extremely difficult to control their working conditions. This concerns such public service workers as police, fire-fighters, emergency medical staff, park rangers and life guards. Also, if they remain on duty, health care workers will be more exposed to pandemics or disaster occurring because of climate change. In energy companies, outdoor workers and engineers required to fix problems across the network could be placed at higher risk during extreme weather events.

Climate impacts hinder the ability of public sector workers to get to work, thereby affecting the capacity to deliver their services to the public. Possible responses by organisations to ensure service continuity include the development of home working and alternative travel plans. It will be important to increase the adaptive capacity of those vulnerable workers in order to ensure both more social equity in the face of the changing climate and service continuity. Considering the strong nexus between climate change and development, Nigerian public service is highly at risk in the area of food security, poverty reduction, energy and, most importantly, infrastructure and general economic development. Consequently, Nigeria's efforts and actions must be informed by these realities. For example, it is estimated that in the Sudan-Sahel area of Nigeria, between 89,297 and 133,944 square kilometres of arable land would be at risk. It is estimated that the capital value at risk stands at about US\$6.4 billion for the current level of development (NCCC, 2003).

In several ways, climate change affects social services such as elderly and child care, care for the homeless and youth services. A key task of the social services will be to help identify the populations and individuals most vulnerable to both climate change impacts and carbon mitigation measures. Social services will coordinate with the appropriate services (health, housing, environmental agencies) to develop and implement prevention and response plans. Also, it is essential that social services be involved in the design and implementation of programmes aimed at reducing dependency of poor income households on expensive fossil energies, such as energy refurbishment of social housing. Such

programmes can simultaneously help lift the poorest customers out of fuel poverty and reduce carbon emissions.

Change in climate has resulted in changes in most human and natural activities. Climate change and its effect lead to a shift in the boundaries of major ecological zones as well as the wildlife they support (Eke and Onafalujo, 2011). In many parts of Nigeria, tropical forest and rangelands are already under threat from population pressure and land use systems. This can affect the planning of the space in the region. Also, as a consequence of climate change, some areas start receiving heavier and steadier rainfall and such areas will inevitably begin to experience increased rainfall-induced erosion. Conversely, in the arid northern part of Nigeria, higher temperatures will contribute to dry conditions which underlie accelerated wind erosion. These are very serious situations given that soil erosion is already of catastrophic proportions in Nigeria, whether it is viewed as gully or sheet erosion (Elasha *et al.* 2006). Available individual and collective researches at different levels show that Nigeria, like most parts of the world, is experiencing the basic features of climate change. Some localities are experiencing extreme weather conditions due to increasing temperatures and an associated changing climate (Olaniran, 2002; Ayoade, 2003; Odjugo, 2005).

Climate change is thus worsening the working conditions for public office holders through several ways. According to HBS (2010), climate change result in increased variability in rainfall in Nigeria, resulting in floods in some humid areas in the south of the country, while a decrease in precipitation would result in droughts in the northern parts. In the context of climate change, there is a set of social, political, ideological, economic, technological, scientific and cultural elements that define its complexity and must therefore be considered for its understanding (Biermann *et al.*, 2009). These dimensions are particularly evident in the search for solutions to climate change problems, once they involve high economic costs that are justified by research and investments to redirect the current non-renewable energy model; to preserve existing forests and natural resources; to create carbon markets; to adapt populations in risky areas in developing countries and to mitigate the effect of difficult or irreversible problems.

The health sector has been found to be highly vulnerable to climate change. Health consequences stem from extreme climatic events, changes in the patterns of infectious diseases, increased food insecurity, displacement of populations and water scarcity, among several factors. Both malaria and schistosomiasis will extend to areas where the diseases currently do not occur. HIV/AIDS further increases the health-related impacts of climate change on affected communities and households, thus reducing their ability

to cope with and adapt to the impacts of climate change. Climate change will thus be one of the most important and urgent health issues in Nigeria over the next few decades.

Climate change has adverse consequences on human health as well as exacerbates health risks. It could heighten health risks that increase the morbidity rate. However, the mitigation process could be dynamically inclusive if the society develops adequate perceptions of health risks and climate changes, thus removing the illusions thereof (Eke and Onafalujo, 2011).

Climate change seriously affects agricultural production. Climate change brings about changes in weather patterns, which in turn give rise to imbalances in seasonal cycles, harms ecosystems and water supply while affecting agriculture and food production and causing sea levels to rise (Ejiogu and Ejiogu, 2011). Extreme weather events such as floods, landslides, drought and famine are caused by climate change. The vulnerability of the Nigerian agricultural sector to climate change is of particular interest to policy makers because agriculture is a key sector in the economy, accounting for between 60-70% of the labour force and contributing between 30-40% of the nation's GDP. The sector is also the source of the raw materials used in several processing industries as well as a source of foreign exchange earnings for the country. How much one can blame the climate for changes in agricultural productivity in Nigeria will, for a long time, remain a subject of research as long as other factors are at interplay in determining agricultural productivity. The production of major export crops in the country such as groundnut, rubber, coffee, cocoa and palm produce in the country have declined in magnitude since the drought of 1972/73, which was the first real evidence of climate change in Nigeria (Ajetomobi, Abiodun & Hassan, 2010).

In the agricultural sector, the threat that climate changes pose to agricultural production does not only cover the area of crop husbandry but also includes livestock and, in fact, the total agricultural sector. Nigerian farmers also depend on livestock for income, food and animal products (Nin, Ehui & Benin, 2007). Climate change affects livestock both directly and indirectly (Adams *et al.*, 1999; Manning & Nobrew, 2001). Direct effects of climate variables such as air, temperature, humidity, wind speed and other climatic factors influence animal performance such as growth, milk production, wool production and reproduction. The climate can also affect the quantity and quality of feed stuff such as pasture, forage and grain, as well as affect the severity and distribution of livestock diseases and parasites (Niggol and Mendelsohn, 2008). It affects food and water resources that are critical for livelihood in Nigeria where much of the population, especially the poor, rely on local supply systems that are sensitive to climatic variation. Disruptions of existing food and water systems

have devastating implications for development and livelihood. These are expected to add to the challenges climate change already poses for poverty eradication (De-Wit & Stankiewicz, 2006). According to Obioha (2009), the sustainability of the environment to provide all life support systems and the materials for fulfilling all developmental aspirations of man and animal is dependent on the suitability of the climate, which is undergoing constant changes. The effect of these changes poses a threat to food security in Nigeria.

Conclusion and Recommendations

We have argued that the existing structures and the alternatives that have been proposed up to the present time in Nigeria are far from sufficient to respond effectively to the magnitude and complexity of the problem. If we consider that we are debating and deciding on the future – even though the future has been made present – and that the quality of life on the planet not only for humans but also for diverse ecosystems depends on actions and measures taken now, then the socio-environmental (in)justice that devastates millions raises ethical dilemmas. Emerging from this debate, there are reasonable arguments to defend the engagement in collective and political dialogues, negotiation and proposals that could enhance the response capacity to the challenges posed so that these responses would not be palliative responses that go towards the social and economic maintenance of the status quo, the political interests and unsustainable patterns of human development.

The country has a myriad of environmental problems that are a challenge to governments and scientific communities; therefore, measures must be urgently put in place to confront them. The nation's environment and natural resources are currently not being exploited and managed in a sustainable manner. Environmental data collection is not coordinated and hence cannot be used to create an environmental information database, which is a prerequisite for a meaningful and sustainable environmental management (Atitola, 2010).

Climate change is real. Its impacts on socioeconomic activities and human life are palpable. But Nigeria, like many developing nations, has not put in place any sustainable policy measure to respond to this phenomenon. In Lagos State, it has been observed that degradation of gardens/forests and bush burning have collectively robbed the state of natural resources and environment. To address this problem, the state government resolved to preserve nature in the state by planting trees. As at 2013, it is reported that over 4.6 million trees had been planted across the state in the last six years (Oseghale, 2013). The effort is very commendable and the Federal Government should take its cue from the Lagos State government in charting the course for combating the effects of global warming and climate change in the country (Atitola, 2010).

Climate change is one of the several environmental challenges facing mankind in today's world. There is therefore the need to take effective precautions to prevent further catastrophic consequences to nations across the globe. This is in realisation of the fact that most disasters caused by global warming are consequences of natural reactions to human activities. Challenges of climate change vary across regions of the globe. For instance, while industrialised countries of Western Europe and North America can afford the financial and technological requirements of anti-pollution measures (which are really costly), developing countries like Nigeria simply cannot afford them (Yusuf, 2012).

Climate change is a reality. Therefore, the nation should be proactive in her response to the phenomenon and its challenges and should not wait until much damage is done that will be very costly to correct. Developing nations like Nigeria should not fold their arms and wait for international donor agencies and Research Institutes to provide wholesale solutions to their global warming issues. They must take up the challenge and seek cooperation and collaboration with International Agencies in order to create opportunities for technology transfer.

It is our submission that issues concerning climate change should not be taken with levity as the phenomenon affects all sectors of the society. Consequently, government, non-governmental organisations and the public at large are implored to take preventive measures against the effects of climate change thereby paving the way for accelerated economic development (Yussuf, 2012). Non-governmental organisations such as the Red Cross should begin to prepare for natural disaster emergencies that may arise from time to time. Relevant agencies should do more to curb risky habits that may aggravate these disasters. According to Beck (1992, 1995), climate change is part of a new set of risks. The use of public agencies and departments to address environmental issues and formulate environmental policies is a recent development in Nigeria. It is also recommended that it is not enough to create awareness on climate change, but people's attitude towards the environment should be changed.

Climate change is a complex crosscutting issue that cannot be the sole prerogative of one government department. Effective integration of adaptation and mitigation measures require the buy-in and prioritisation of climate change within many government departments at the three spheres of government and across the administration as a whole. Challenges regarding mainstreaming climate change into the policy space relate to: a perception that climate change mainstreaming is a constraint to development priorities; the range of definitions that exist regarding what successful mainstreaming is; and the highly fragmented environmental policy space into which climate change needs to be integrated.

Singer and Avery (2007) show that it is impossible for man to stop the natural causes of climate change but that much can be achieved to either stop or drastically reduce the human causes of climate change. If human activities that deplete the ozone layer are largely reduced and the carbon sinks are well managed and protected, then the ongoing global warming will significantly decline. To reduce the emission of greenhouse gases, clean and environment-friendly technologies are needed. Industrial productions should convert to machines that emit limited or no greenhouse gases. Automobiles and industrial machines should be improved upon to use only ethanol, solar engines, electric engines or hybrid electric engines. Gas flaring, especially in the Niger Delta region of Nigeria, should be reduced to the barest minimum. Sufficient and appropriate finances are to be provided to provinces and municipalities to address climate change. Political accountability in terms of climate change at provincial and municipal levels must be linked to a robust framework and system for monitoring climate change governance; as well as to facilitate improved vertical coordination through horizontal coordination.

For developing nations like Nigeria to survive the effects of climate change, serious adaptation measures are needed. There is the need to establish better-equipped weather stations as against the scanty and ill-equipped ones we currently have in Nigeria. With these, accurate weather forecast and predictions will be possible and this will help to prevent weather-related disasters through early warning and an effective response system. Nigeria needs to focus on adaptation. If such suggestions as made here are effectively pursued, the country's vulnerability to change in climate will reduce appreciably.

Of course, appropriate policy instruments are needed to make all of these happen. Government needs to ensure that her current effort at producing a Climate Policy is quickly brought to conclusion and that the policy is implemented. The good thing is that ability to adapt is an excellent index of the socioeconomic development that the country needs at this time. The Federal Government should take the lead in integrating the States into efforts to combat the challenges of climate change. Good synergies between policymakers, scientists, the citizens and other stakeholders should be promoted at all levels of governance in the country. A comprehensive response approach that will include a climate change information system, flood risk analysis and operational adaptation strategy, with emphasis on increasing people's resilience, should be put in place. The State should invest in research and development innovation to enable it to capitalise on a number of new opportunities that climate change offers, particularly for innovative approaches to the diversification of the State's energy mix, development of alternative energy sources, energy efficiency, and cleaner technologies and industries.

Effective service delivery must be tailored to the circumstances of Nigeria. This requires a good evidence base and sound economic reasoning. The best way to make a policy effective is to make sure that it is evidence-based and learns from experience elsewhere as well as working to expand the evidence base for Nigeria. Equally, it is important to connect this to our wider understanding of the principles of good policymaking in this area.

Nigeria should focus more on economic activities that are tertiary in nature and which generate few greenhouse gases; development should be limited in areas likely to be flooded; the siting of new facilities and the location of infrastructure should not be very close to the sea so as for them to be free from sea level rise; already threatened infrastructure/facilities should be relocated very quickly; Nigeria should develop a technology that can capture at least 80% of carbon emitted by industries which are discharged into the atmosphere; the spaces in rural areas and urban centres should be earmarked or apportioned for rigorous and extensive tree planting; there should be heightened public awareness on the danger associated with climate change; resettlements should be encouraged in certain areas of the country; Nigeria should develop a cleaner source of energy instead of its overdependence on fossil fuel energy that generates greenhouse gases.

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