

Sustaining Coastal Mangement / Adaptation of Climatic Change and Sea Level Rise in the Niger Delta.

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Keywords: Coastal Zone Management, Informal Settlements, Sea Level Rise, Climatic Change.

SUMMARY

The coastal zone, with their vast resources of food, energy, and minerals, not only are composed of various fragile ecosystems, but are scenes of a variety of often conflicting uses. At present, the uncontrolled development of the coastal zone and the almost haphazard exploitation of their natural resources threaten to turn the promise of economic prosperity into an environmental nightmare that portends great dangers for present and future generations.

The Niger Delta environment as a result of several decades of oil production, and industrial and infrastructural developments had witnessed tremendous environmental degradation. Profound changes have often had adverse effects on local livelihoods and social well-being. For years, local people hoped for protection that never came from successive Federal and State Governments. Attempts to fight back have at times compounded their environmental challenges—the sabotage of oil pipelines, for example, has only exacerbated oil pollution.

Sustainable development demands an integrated and interactive approach that allows for the understanding of the complex relationship between society and nature, simultaneously respecting human rights and assuming that environment is a vital dimension of the future of the human kind.

The level of infrastructure and industrial development demanded can hardly be sustained by the fragile ecosystems in the core Niger Delta, particularly in the unique mangrove swamp zone.

The need of Integrated Coastal Management in the Niger Delta is well known due to the fact that the fragile coastal ecosystems are simultaneously attacked by organic and chemical pollution and the degradation of natural resources is sometimes irreversible. In fact, coastal zones are vulnerable areas in different parts of the world, but in developing countries like Nigeria, the impacts of degradation can be worse than in other countries.

The complex and conflicting interactions of social equity, human security and environmental sustainability within the social process of shaping and building development for present and future generations are important issues to address.

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INTRODUCTION

The Niger Delta

The Niger Delta is located in Atlantic Coast of southern Nigeria where River Niger divides into numerous tributaries. It is the second largest delta in the world with a coastline spanning about 450 kilometers terminating at the Imo River entrance (Awosika, 1995). The region spans over 20,000 square kilometers and it has been described as the largest wetland in Africa and among the three largest in the world (CLO, 2002). About 2,370 square kilometers of the Niger Delta area consist of rivers, creeks and estuaries and while stagnant swamp covers about 8600 square kilometers. The delta, with mangrove swamps spanning about 1900 square kilometers has the largest mangrove swamps in Africa, (Awosika, 1995).

The region consists of nine states in southern Nigeria and includes Abia, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and River States (as shown in figure 1 below).

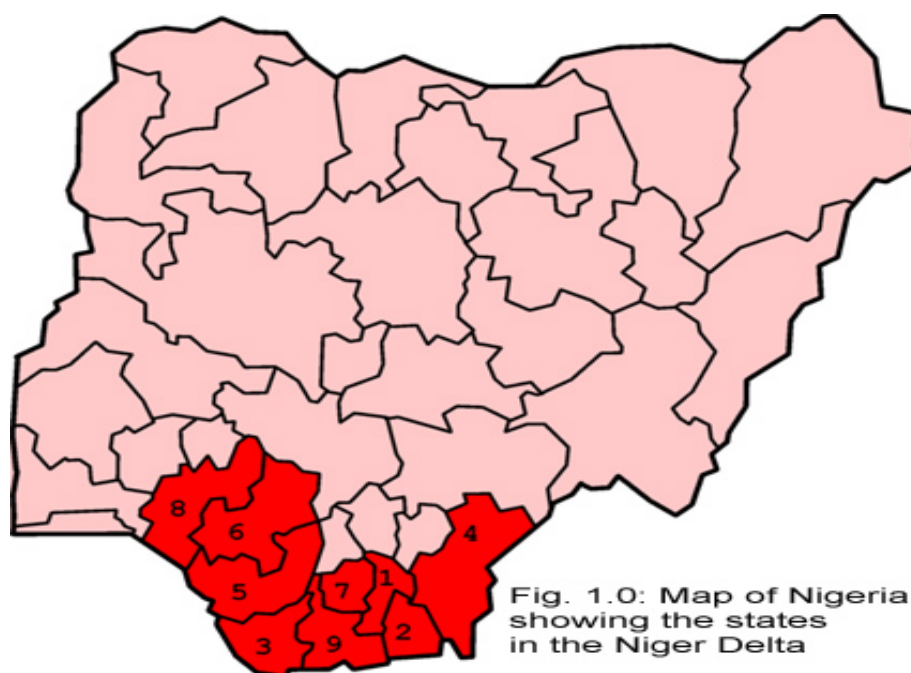


Fig. 1.0: Map of Nigeria showing the states in the Niger Delta



Figure 2. The Niger Delta Map.

Coastal Problems of the Niger Delta Region

The Niger Delta region is the bedrock of Nigeria's oil production, which accounts for 97% of the government total revenue. Since the discovery of oil in the region, oil exploration and exploitation have caused severe climate and environmental changes which have impacted the lives of the inhabitant adversely.

The natural terrain and hydrology of the Niger Delta have always caused certain environmental problems, especially flooding, siltation, occlusion, erosion and the shortage of land for development. Communities, roads and farmlands are partially or totally submerged from channels or by water flowing over the levees. In the mangrove swamp forest areas, diurnal tidal movements result in floods exacerbated by rising sea levels, coastal erosion and land subsidence. The floods also cause continual modification of river courses in the area, rendering the rivers useless as modes of transportation. This also has significant impacts on the pattern of human life and economic (Ibe, 1988b). Communities have been displaced and forced to relocate as a result of it. Public facilities, houses and other economic assets have been lost. The local people have lived with these problems for many years, as with the case of the people of Awoye in Ondo State (Etuonovbe, 2007).

Around the world, the reality of dangerous climate change is being felt and its full force is striking the people least equipped to cope, The Niger delta has been caught in man-made environmental disasters, and in many cases relief is reaching them last.

CLIMATIC CHANGE, WHAT IS IT?

Climate change refers to the variation in the Earth's global climate or in regional climates over time. It describes changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the Earth, external forces (e.g. variations in sunlight intensity) or, more recently, human activities (Wikipedia, the free encyclopedia)

Global climate change is caused by the accumulation of greenhouse gases in the lower atmosphere. The global concentration of these gases is increasing, mainly due to human activities, such as the combustion of fossil fuels (which release carbon dioxide) and deforestation (because forests remove carbon from the atmosphere). The atmospheric concentration of carbon dioxide, the main greenhouse gas, has increased by 30 percent since pre-industrial times.

What is Sea Level Rise

Sea level rise is an increase in sea level. Multiple complex factors may influence such changes. It can be a product of global warming through two main processes: expansion of sea water as the oceans warm, and melting of ice over land. Global warming is predicted to cause significant rises in sea level over the course of the twenty-first century.

Effects of Sea Level Rise

The Intergovernmental Panel on Climate Change Third Assessment Report (IPCC TAR) WG II report notes that the current and future climate change would be expected to have a number of impacts, particularly on coastal system. Such impacts may include increased coastal erosion, higher storm-surge flooding, inhibition of primary production processes, more extensive coastal inundation, changes in surface water quality and groundwater characteristics, increased loss of property and coastal habitats, increased flood risk and potential loss of life, loss of nonmonetary cultural resources and values, impacts on agriculture and aquaculture through decline in soil and water quality, and loss of tourism, recreation, and transportation functions.

There is an implication that many of these impacts will be detrimental. The report does, however, note that owing to the great diversity of coastal environments; regional and local differences in projected relative sea level and climate changes; and differences in the resilience and adaptive capacity of ecosystems, sectors, and countries, the impacts will be highly variable in time and space and will not necessarily be negative in all situations.

EVIDENCE OF CLIMATIC CHANGE IN THE REGION

- Erosion
- Flooding
- Migration
- Infrastructure
- Agriculture
- Changes in rainfall pattern
- Poor health.

Erosion

The most important environmental problem facing the Niger Delta is coastal erosion. Although the World Bank has rated coastal erosion as needing moderate attention in the region, it is the most important impact of sea level rise in the region and should be given high priority attention. As with the case of the people of Awoye in Ondo State (Etuonovbe, 2007). Flooding of low-lying areas in the region has been observed. Settlements in the coastal region have been uprooted by coastal erosion. In some places, especially in Ogula in Forcados South Point, some oil wells have been lost to the ocean due to erosion (Etuonovbe, (2006).

Flooding

Apart from coastal erosion, flood in general has impacted negatively the livelihood of many communities in the region. Flood and erosion remove top soil, destroy roads, affect fresh water resources and threaten lives and properties. Many people have been rendered homeless by floods and several roads have been made impassable. The usefulness of several roads has become seasonal, only passable during the dry months of the year.

Floods paralyze economic activities in many towns and cities in the region. Major roads, some linking states are flooded causing hardship to motorists. When these roads were constructed, the flooding problems were not there, and the companies that constructed the roads probably did not anticipate the problem.

At extreme cases of flood, many abandon their houses and completely relocate to other areas that are not affected by flood. Some others live in their houses for few months of the year during the dry season, after which they relocate and come back when another dry season begins. The money that would have been spent to improve the standard of living in the home is spent by families to relocate, helping to further impoverish the people. Shelter is one of the basic needs of man. In some other instances where the affected people can not relocate, they are forced to live with the flood. This makes them vulnerable to various water-borne diseases such as malaria, diarrhea, cholera and typhoid fever. Trauma resulting from the circumstance can also cause non-pathogenic diseases such as high blood pressure and diabetes (Etiosa, and Ogbeibu, (2006).

Migrattion

A latest report on climate change has stated that though it is defined as a growing crisis, the consequences of climate change for human beings are unclear and unpredictable. Arguing that in 1990, the Intergovernmental Panel on Climate Change (IPCC) noted that the greatest single impact of climate change could be on human migration-with millions of persons displaced by shoreline erosion, coastal flooding and agricultural disruption.

In the Niger Delta, forced migration has hindered development in various ways,. An example is increased pressure on urban infrastructure and services as in Warri in Delta State, and Port-Harcourt in Rivers State, and recently Yenagoa in Bayelsa State. This has increased the risk of conflict in the area as a result, undermining economic growth, has led to worse health, educational and social indicators among migrants themselves.

Infrastructures

Roads

The road network is most vulnerable to increased intensity of precipitation and the consequent increased risk of flooding.

Flooded roads and subways, railroad tracks and weakened bridges may be the wave of the future with continuing global warming, a new study says. Climate change will affect every type of transportation through rising sea levels, increased rainfall and surges from more intense storms (The Trucker.com).

"The time has come for transportation professionals to acknowledge and confront the challenges posed by climate change and to incorporate the most current scientific knowledge into the planning of transportation systems," said Henry Schwartz Jr., past president and chairman of the engineering firm Sverdrup/Jacobs Civil Inc., and chairman of the committee that wrote the report. The report cites five major areas of growing threat:

- More heat waves, requiring load limits at hot-weather or high-altitude airports and causing
- thermal expansion of bridge joints and rail track deformities.
- Rising sea levels and storm surges flooding coastal roadways, forcing evacuations,
- inundating airports and rail lines, flooding tunnels and eroding bridge bases.
- More rainstorms, delaying air and ground traffic, flooding tunnels and railways, and
- eroding road, and bridge.
- More frequent strong hurricanes, disrupting air and shipping service, blowing debris onto
- roads and damaging buildings.
- Rising arctic temperatures thawing permafrost, resulting in road, railway and airport
- runway subsidence and potential pipeline failures.(the Trucker.com)

Structures

Just recently a manager of the region's 88-year old Port Harcourt Port complex alerted the Federal Government that the multi-billion naira structure may sink if it does not take urgent remedial measures. According to the worried Port manager Anya Kalu, related engineering survey had shown massive structural weakening of the premier seaport east of the Niger.

Expressing concern that Nigeria had no programme to monitor mid-sea level had also urged the government to tackle the environmental problems of the Niger Delta urgently to avert natural disaster (Achi, 2001).

Also, in the past three years there have been cases of collapsed buildings in the region. Several cases occurred in Warri and Port-Harcourt and other places in the region. This has made the Ministry of Lands, Surveys and Urban Development in Delta State to review the building approval laws. The laws are good quite all right but the real issues causing the problems has not been addressed.

Agriculture

Other adverse effect of sea level rise in the Niger Delta is increased salinity of both surface and underground water due to the intrusion of sea water. This will lead to the death of aquatic plants and animals that cannot tolerate high salinity.

The brackish water is the home of several species of fishes and it is the breeding sites for several others. The ecology of the brackish waters will greatly be affected by this phenomenon and this may lead to lose of species.

Some terrestrial plants that have low tolerance for high salinity will also be affected. Sea water intrusion will have serious impact on food security in the region; because of it impacts on coastal agriculture. The salinity of underground water will lead to shortage of fresh water. Inhabitants of the region depend on underground water as their main source of water for drinking and for other domestic use (CREDC)

Changes in Rainfall Pattern

The Niger Delta depends on climate-sensitive sectors such as agriculture and fishery. The changing climate has created uncertainty in the timing and amount of rainfall in every part of Nigeria. The problem is more severe in the rain forest zone of the region where rain-fed agriculture is mainly practiced. Because of the uncertainties in predicting the rain, farmers now delay their time of planting. After the first or second rain, they watch the rains for sometime to ensure that the rains fall regularly enough before planting. These they do to keep their crops from being killed because of insufficient rain (Etiosa, and Ogbeibu, (2006).

Health Related Hazards

Other impact of sea level rise on the region is the emergence of health-related hazards. Poor health arising from damp, cold housing is likely to worsen.

ADAPTING TO CLIMATIC CHANGE

Most natural systems and many human activities are sensitive to the changing climate. The extent to which these systems will be harmed by climate change depends both on the magnitude of the change and on the capacity of the natural or human system to adapt. Society's capacity to adapt is dependent on the prevailing socio-economic situation through time. Consequently, understanding the evolving socio-economic situation is as important as knowledge of the likely future climate for identifying vulnerable elements of society.

When planning an effective response to the threat of climate change, society must consider the likely impacts of climate change on their evolving social, economic and environmental systems and explore possible means of adapting to future changes. The Intergovernmental Panel on Climate Change (IPCC), which provided a synthesis of global climate change impacts and adaptation responses in its periodic Assessment Reports in 1990 and 1995 (IPCC, 1995), has led the international effort. While much international research has focused on climate impacts, relatively little work to date has been conducted on the practical application of strategies for adapting to climate change. The Third IPCC Assessment was published this year and provides a more general synthesis of our current understanding of adaptation to climate change (IPCC, 2001). While the IPCC provides a global overview of climate impacts, it is apparent that regional and national climate strategies require a focus on local socio-economic and environmental factors.

Unfortunately, information is not available on the area of land in the region that are at risk from river flooding and coastal erosion. Maps used for coastal protection are equally lacking in topographic and hydrographic detail. It is therefore impossible at present to assess properly the sensitivity of increased flood risk in areas.

On the basis of the existing climate scenarios, as regards increases in rainfall. Dampness is already a major problem and, for buildings in disrepair, is likely to worsen in the future. The climate scenarios are ambivalent about any increase in the intensity of storms, which might lead to infrastructure damage. Sea level rise will have an adverse impact on the relatively small number of exposed dwellings in coastal towns and villages.

ADAPTATION STRATEGY

Community-based adaptation has become an important term in the climate change debate. It recognizes the fact that environmental knowledge and resilience to climate change lie within societies and cultures (Mitchell and Tanner, 2006). Thus an understanding of how communities cope with climate change is importance of community-based adaptation project

is to increase the climate resilience of communities by enhancing their capacity to cope with less predictable rainfall patterns, more frequent droughts, stronger heatwaves, different diseases and weather hazards of unprecedented intensity (Mitchell and Tanner, 2006).

The core challenge is to prepare an adaptation road map for the government and demonstrate possible strategic interventions in and across sectors, so that a comprehensive action plan of adaptation to address the vulnerability to the impacts of climate change, including variability can be developed which is under active consideration of the government.

....The IPCC, as well as the recently concluded NAPA process, highlights a number of issues that must be overcome in order to successfully implement policies and programmes that promote climate change adaptation. They include:

- National capacity at policy and programme levels for climate change adaptation yet not build up;
- Lack of climate risk assessment at different levels as well as comprehensive implementation plans.
- Inadequate preparation for climate-resilient agriculture and sustainable livelihood options in vulnerable areas.
- Lack of climate resilient water resource management technologies.
- Need for developing community-based adaptation capacity.
- Incomplete and un-coordinated (institutional) management systems with overlapping roles and responsibilities.
- limited capacity of staff in key local agencies, particularly the analytical, planning, monitoring and evaluation skills.
- weak knowledge management infrastructure as well as usage in planning processes.
- Limited awareness of stakeholders and population on long-term planning frameworks to address climate change concerns .
- Limited development of economic instruments including insurance and other emergency preparedness measures as tools to facilitate improved preparedness for enhanced climate induced events....

Infrastructure

In the road sector, the development of route management plans will enable the prioritization of road network maintenance. Alternative approaches for reducing flood risk include land use zoning adjacent to roads and the development of Sustainable Urban Drainage Systems, which do not exist in the region. What exist are gutters called drainages.

Alternative options for reducing flood risk associated with road developments include the development of upstream attenuation systems to reduce the likelihood of flooding. Such approaches raise the issue of land purchase associated with road development and the need to zone land use on either side of the roads. This requires robust infrastructure design with a capacity to adapt to the changing flood risk.

In the buildings/structures, the majority of people own properties not built under recent building regulations and must continue to invest in maintaining the condition of the property, in view of possible increased exposure to driving rain, storminess and coastal/riverine flooding. To many this is a serious problem as the fund to do so is not readily available as some of the property owners who built long ago cannot afford it due to inflation.

The onus is on private property owners to take steps to protect their buildings from adverse climate impacts. The use of insurance policies is the most pervasive adaptation technique, but tends to transfer responsibility of property protection away from the owner and on to the insurance company. It is in the public interest to educate property owners about possible climate impacts and opportunities for protecting their property.

Developing Flood Defenses

This requires better data on flood risk in key catchments and coastal areas across the Niger Delta Region and coordination between catchment landowners/communities and make more demands on stakeholder involvement

Health

Detrimental health impacts from the changing climate could be reduced through the effective implementation of current social policies to reduce fuel poverty and improve housing;

CONCLUSION / RECOMMENDATION

We can see so far that the people of the Niger Delta are faced with myriads of environmental problems caused by climate change and the activities of multinational oil companies operating in the region. An integrated approach in solving the problem in the Niger Delta will be proposed. By an integrated approach, I mean a combination of several development strategies packaged into one piece in a way that it will be more effective. The integrated approach must have this key element. It must be participatory.

There is a need to conduct a comprehensive and up-to-date study to assess the likely impact of climate change on the Niger Delta . The study will review and update the inventories of greenhouse gas (GHG) emissions in the Niger Delta; project local GHG emission trends under different scenarios; characterize the impacts of climate change on the Niger Delta; recommend additional policies and measures to reduce GHG emissions and facilitate adaptation to climate change; and assess the cost-effectiveness of the proposed measures.

Coastal education has a great role to play as regards managing coastal environmental problems. It should take roots in the minds of all Nigerians. In order to accomplish effective education of the citizenry on coastal zone management, all the stakeholders must be identified and involved. The various professionals involve in climatic changes plays a key role through education in raising awareness and facilitating an understanding of the opportunities and risks associated with climate change.

The government authorities in charge of climate data need detailed record of rainfall data from year to year and pre- inform farmers on the time to start planting working with the rainfall data from previous year. This will help to strengthen this strategy for adapting to variation in rainfall pattern.

Planning plays a major role in the protection of natural resources, of habitats and biodiversity. Closer attention should be focused on detailed research, proactive environmental planning, impact assessment and management. For instance preparing master plans for the control of land, coastal and marine based activities to minimize pollution and protect coastal and marine resources. The value of the coast should be emphasized, ways of facilitating sustainable coastal development, promotion of coordinated and integrated coastal management as well as the style of management should all be adequately considered. In order to achieve this, extensive use of external consultants (Surveyors, Environmentalist, Engineers, Builders etc.) who have a good knowledge of practical options should be used.

Finally, the world must respond to climate change and other environmental challenges now while the cost is low or else pay a stiffer price later for its indecision.

In other to achieve sustainability in the Niger Delta, the following is recommended.

There is a need for research on how societal driving forces such as social and demographic, political and institutional, economic and commercial, cultural and technological, affect the nature and distribution of human activities on coastal zones of the Niger Delta and its impacts on coastal ecosystems associated with the prevailing and possible alternative patterns of human activity.

—Development agencies such as the World Bank, UN and others should works more closely with grassroots organization in the region that are privileged to have good knowledge of the communities.

—An integrated coastal resource management approach with the objective of promoting sustainable utilization of coastal resources as well as restoring and maintaining the integrity of coastal ecosystems, needs to be adopted to address a wide range of social and environmental issues and move coastal zone towards sustainable development.

—Sound policies and decision making with information systems especially the geographic information system (GIS) needs to be adopted for information collection, analysis, management, and dissemination of technical data relevant to the coast.

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BIOGRAPHICAL NOTES

Mrs. **Angela Kesiena Etunovbe** has a B.Sc.(Hons) degree in Surveying, Geodesy & Photogrammetry from the University of Nigeria, Enugu Campus. She is a Registered Surveyor and the first female Surveyor in Private Practice in Delta State. With over fourteen years of experience in the practice of Surveying, Engineering and Mapping. She also has a Master in Business Administration (MBA), at the moment she's is undergoing a master degree program on project management (M.Sc. Management).

She is a Federal surveyor, a consultant of no mean repute, a prolific writer, a Lady of the Knights of Saint Mulumba Nigeria, Member of the Nigerian Institution of Surveyors, the indefatigable Public Relations Officer of the Nigerian Institution of Surveyors (NIS) - Delta State Branch, the Secretary, Association of Private Practicing Surveyors in Nigeria (APPSN) - Delta State Branch and the Coordinator, Women – In - Surveying for Edo and Delta States of Nigeria. She is also one of the Editors in the Newsletter for under re-presented groups at the International Federation of Surveyors (FIG).

Over the period, she had successfully executed a research work on

- Road Construction In Nigeria – Defects And Solutions”,
- Solutions to Erosion Problems in Delta State Nigeria.

—And she is currently on a research On Lasting Solutions to Power Outage in Nigeria Using Delta State as a Case Study.

From her school days, she has always been an icon to female Surveying Students and has been championing the course of Gender inequality in the Survey Profession in Nigeria.

She has presented various papers at the International Federation of Surveyors (FIG) events. They are as follows:

—Under Represented Group – Projecting the Image of the Nigeria Female Surveyor. A paper presented at the XXIII International FIG Congress at Holiday Inn, Munich, Germany.

—Administering Marine Spaces: The Problem of Coastal Erosion In Nigeria – A case study of Forcados South Point, Delta State. A paper presented at the XXIII International FIG Congress at Holiday Inn, Munich, Germany.

—Economic Benefit of Hydrography: Land Reclamation in Bayelsa State Nigeria, A case study of Saipem Camp in Yenagoa. Presented at the FIG Working Week 2007 in SAR, Hong Kong.

—Coastal Settlement and Climate changes- the Effects of Climate Change / Sea Level Rise on the People of Awoye in Ondo state Nigeria. Presented at the FIG Working Week 2007 in SAR, Hong Kong. May 2007.

She had authored eight informative, educative exciting and highly spiritual books currently on the Bookshelves. Over 5000 copies of **God the Father Loves You Personally** have been printed in the past two years and distributed freely to prisons, hospitals, communities, youths, schools and the needy.

She is excited at challenges the Survey challenges not an exception.

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