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Uneven Shoreline Degradation and Review Methods of Investigation: From Okpoama to Ezetu in Bayelsa State, Nigeria

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Abstract
Bayelsa state is bounded in the south by the Atlantic Ocean which has been day –to –day impacting the shoreline causing either deposition or erosion depending on how the shoreline has been structured towards the ocean. The study investigated the shoreline from Okpoama to Ezetu communities. The primary occupation in these places is fishing. The fishermen are good environmentalists because they study the environment to cope with their fishing schedules. They carry out fishing activities if the environment is conducive and if not they stay at home pending when the environment becomes suitable for fishing. Some consultations were made with the fishing communities, not only the fishing communities but also with other members who are knowledgeable as regards the environment. Such knowledge is to be scientifically proven. This paper provided the various scientific investigations to be adopted in shoreline irregularities.
Keywords: shoreline, investigation, Atlantic Ocean

1.0 Introduction:

Bayelsa state is bounded on the southern end by the Atlantic Ocean. It is being dissected by rivers, streams and creeks which are, of course, channels of transportation to the riverine communities where there are no motor able roads. It is known, worldwide, that rivers and oceans are constantly impacting on the environment and this activity is not far from what is obtainable in Bayelsa State. The environment is characterized of activities of tides, current and waves which are major contributors to environmental changes. The whole of Bayelsa State is surrounded by water unlike her neighboring state – Rivers state, where there are locations water could be hardly seen, although, it is more also surrounded by water. There is no locality in Bayelsa State where streams, creeks could not be seen.

The interface between land and sea is shoreline (Wiomsa 2010) cited by Fikir Alameyehu (2014). Shorelines are subject to natural forces like wind, water, ice and gravity and consequently eroded away or being impacted by deposition. In the areas of this paper, all those forces are in operation, exception of ice. The climate is tropical in the area. Vegetation has a significant contribution to shoreline degradation when it is removed or becomes unhealthy. Unhealthy vegetation causes the shoreline not to have adequate resistance to erosive forces (Ontario ministry of natural resources et al 2011). Periodic oil spill in the study area has resulted to the destruction of the mangrove forest which in turn led to the erosion of available shoreline especially Sangana to Koluama. Shoreline is known to be made up of four zones namely: toe zone, splash zone, bank zone and terrace zone. The toe zone is the water surrounding the bank but not exactly reaching the bank. Splash zone is the area where the water reaches the bank. It is where wave actions are constantly affecting the land. Bank zone is the land surface close to the water. Terrace zone is the forest zone beyond the bank zone. The first three zones are more prone to erosion. Soil types are also subject to erosion for example, silts and sands can be more eroded than clay soil (Ontario ministry of natural resources et al 2011). The shoreline from Ezetu to Okpoama is made up of sand and erosion could be a day to day activity except where the position of the shoreline plays a part. The influences in the shoreline have been summed up to be two- namely human and natural by some studies (Richmond 1997 et al) cited by Fikir Alemayehu 2014. Sea level rise , in addition to earlier mentioned factors, is classified under natural, produced by variation in storms and climatic conditions Kegizhang (2004) cited by Fikir et al (2014). It is considered to be very significant in terms of shore line degradation which in turn affects waves, current and sediment (Williams et al as cited by Fikir 2014). Sika Orupabo (2008) asserted that continuous economic activities motivated by seaports, oil exploration and exploitation are negatively affecting the Nigerian coastline. The human influence was extended to the construction of harbor protecting structures, dams, dredging and de-vegetation. Also the activities of large scale oceanic and climatic seasonal changes contribute the shoreline dynamics. In the study areas, the natural and human influences are all contributing to the degradation of the environment as we have the waves, tidal current, severe storm, sea level rise on one hand and the activities of the oil companies on the other hand. Rapid changes have been taken place with respect to geomorphology, sediment supply and shoreline position in different times. To bring solution to shelf environment is in great need of convenient set of data on surficial geology, stratigraphy and energy vector. Data must be acquired to see what can be done to proffer solution to the degrading effect of coastal environment (Wilson et al 1996 cited by Lyn Mcdowell et al 2002).Tides are issues which cannot be ignored in shoreline degradation. Tides are affected by

seasonal winds and atmospheric patterns. Tidal currents like waves and river currents help in shaping deltas (Arthur Bloom2003). In the study area, there is a tide which comes as close as possible to the bank zone while there is another tide which over floods the bank zone. The later type of tide lasts for a few days and is no more. But it repeats itself in a seasonal way.

2.0 Methodology:
Two approaches to data collection were adopted in this article, namely primary and secondary. The primary data collection was such that the various communities were visited during which some few persons, who were known to be versed in coastal features, were interviewed concerning what were happening in the shoreline. Those areas, which were not visited, were investigated by means of phone calls, sms, email and making contacts with them in the city of Yenagoa. Secondary method of data collection was by sourcing out the various principles that could be used in investigating the coastal environment via journals, textbooks, internet, library etc.

3.0 Uneven Shoreline Degradation:
In Nigeria, coastline degradation is a very serious problem for which little or no attention is given. The country is gradually being compressed by environmental factors as we have in the north, desert encroachment while in the south, the little available land is eaten off by wave actions, tidal currents as well as human factors. These issues are as important as any other factors militating against the well being of man. In the south, communities like Sangana, Koluama, Ekeni and Ezetu are having problems of shortage of available land and their lives are seriously threatened. In Sangana community, houses were being eroded away by wave actions, tidal currents and some inhabitants were rendered homeless as a result of such degrading environmental phenomenon.

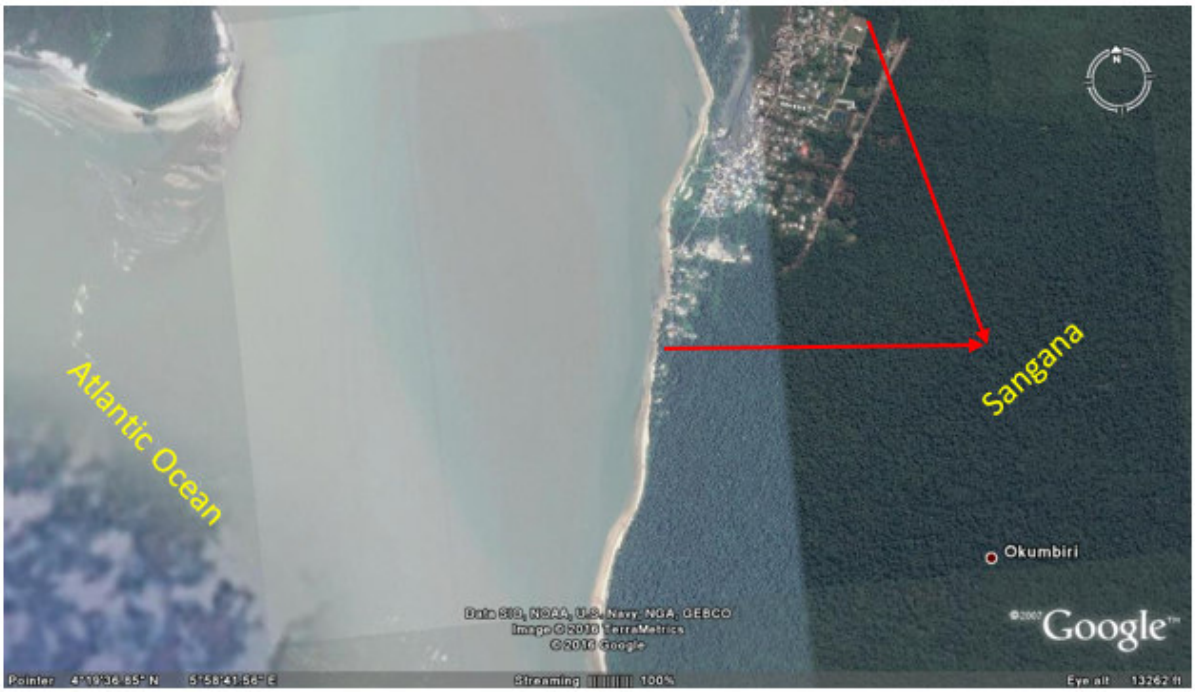

Figure 1: The Sangana Community Situation, Source: google earth

These people are merely living at the mercy of God because the governments are indifferent to these issues especially now that the Nigerian economy is in problem due to the lingering, dwindling crude oil prices. The people of these areas like other coastal communities knew that most of the outlets to the ocean were closed or landmasses but later gradually eroded away to form openings to the ocean. Most of the rivers linking the Atlantic Ocean were not open but such areas of linkages to the ocean were surrounded by landmasses which were gradually eaten off and openings were made to the oceans. For example, the river mouth between koluama 1 and koluama 2 communities, that between koluama 2 and fish town, that between fish town and Sangana and so on. These people are not at ease due to constant coastal dynamics. The ancient Koluama community was eroded off by wave actions following intensive oil exploration activities in the early 1950s. There were severe seismic activities which went on this period and even led to the vibration of the whole settlement after which the community was wiped off by the continuous disturbance of wave actions. The community consequently split due to divergent interests into two communities namely Koluama 1 and koluama 2. These communities are not still left alone, they are completely enmeshed in the activities of the wave actions and tidal currents. The lives of these people are continuously under threat of coastal dynamics. Initially at koluama 2 community, it was about 1

km to the shore but now it is as close as 118m. The coastline degradation is uneven in the sense that one location is the opposite of another location. For example, areas like Okpoama and Egweama there is erosion but not impacting the environment like the other communities like koluama, Sangana, Eken. This might be the reason why some elites of Okpoama community built their houses along the beach which is impossible in places like Sangana, koluama, Ekeni. This is because such houses would be eroded off within the shortest possible time. However, observations have been made concerning the shoreline along Okpoama to Twon which are 1. Noise from the shore as a result of the disturbance from wind and wave actions is becoming quite audible from specific locations in Okpoama Town compared to the past when such noise was not heard. It means that the shore is getting closer. 2. Some specific plants along the shore of Okpoama are no longer there due erosive actions like umbrella trees and others. 3. In Twon Town, a well of water located at a strategic location, which was very useful domestically, was eroded by wave actions in the past 50 years. These and other evidences point to the fact the shore line from Okpoama to Twon is prone to the hazard of erosion. The erosive activities of theses places have made them to embark on various self help projects as the governments have become indifferent. Not only governments, the oil companies which are also degrading the environment do nothing about the situation. The only island protecting koluama 1 shown in the figure below along the shore was cut off twice and the people had to devise means of restoring the land being cut off by way of embankment. The people had to perform such an assignment without waiting for government because their lives are being threatened. Their effort was not enough because the financial resource to perform such a huge task was not at their disposal.

Figure 2: The situation at koluama 1, source: google earth

This is the situation at koluama 1 and it is only a small island protecting the people and if that portion is cut off, they would be thrown into serious trouble. The people have perceived the imminent risk by means of erosion but they have not the will power to do something to avert or reduce the risk impact. Risk according to Association Prograamme on Flood Management (2008) is a function of hazard, vulnerability and exposure. They not only see the exposure of the risks but also how it might impact on the people and their infrastructures

Most of these communities are of the opinion that the problem could be spiritual and have resorted to a spiritual means of helping themselves. The world's activities all seem to be mysterious but there are always underling principles behind them. For example, tides are as a result of the interactive forces between the moon and the sun. The moon has more tide generating force than the sun. Along the shoreline, at Foropa community, which is about 900m from the shoreline, the erosion is not like communities such as Ekeni, Koluama, and Sangana. This difference might also make some of them to be suspicious of spirits disturbing their land. The beach along Okpoama community is a straight reach without so conspicuous curve along the coast line. It might, therefore, not be impacted by helical flow which has been noted to be very significant in bank erosion. The shore line along the koluama 2 can be subject to such flow which is noted to have a bend. Apart from this, the shore line is sloping towards the sea unlike Okpoama where the shore line is spreading outwards to the sea with little or no gradient. The people of Okpoama trek a longer distance to get to the shore while at Koluama2 it takes a

shorter distance to get to the shore, the shore is almost seen from the community which was not so in the past. The continuous disturbance of wave actions, currents and the structure of the shore towards the sea have contributed to the incessant erosion in the area. The distance from the shoreline to koluama 2 is about 118m which was far more than this in the past.

Figure 3: The situation at koluama 2, source: google earth

According to this image, the koluama 2 community is bounded by u shaped creek and the Atlantic Ocean. From the image, it is quite clear that the community is about to be eaten off by the Atlantic Ocean and other environmental activities.

4.0 Review methods

Topographical Survey:

The expression topographical survey is self explanatory in the sense that it deals with topography including the perimeter survey of the area in question. The shoreline normally consists of narrow strip of land usually about 10 to 60m or more in width. It is necessary to perform perimeter survey in the area after which heights of points taken along the beaches perhaps 25 meters or more interval for a given stretch. For a width of 10meters or more, another stretch of 25 meters or more interval is taken until the whole area required is covered. This is a very strenuous and tedious assignment but on the long run would be highly beneficial as the results of the observations would apparently exhibit what would be going on in the place with respect to deposition or erosion. However, the selection of dimensions is discretionary it is not restricted to any observer. The topographical survey would involve the use of total station equipment, levelling staves, GPS and a computer.

Surfer: surfer is a soft ware which has the capability to plot the results of topographical survey into three dimensions. The computer would produce the digital terrain model of the area via the results of the field observations. The observations would be carried out periodically usually six months or more than six months interval would be quite appreciable. The surfer would help produce the results in three dimensions using wire frame. The differences in observation would be depicted by the plotting. If the area is stable, the two sets of observations would not be differentiated. The difference would enable us know the amount or volume of deposition or erosion which has taken place in the area and the rate at which these activities are taken place. This would, in turn, enable us carry out some predictions as to what would happen in the future with the trend of observations in the area.

Hydrography:

The word hydrography is made up of hydro and graphy. Hydro is related to water while graphy is related to measurement in metric forms or unit measures. Ojinnaka (2007) defined hydrography as “Hydrography is the acquisition, analysis, visualization and management of spatial information concerning all marine features, processes and properties in four dimensions (space and time)”. Hydrography enables us know what is happening on the floor of a seabed in three dimensions. The information obtained from hydrography could equip us with the

knowledge of the trend of deposition and erosion taking place in the area in consideration. Hydrography is highly expensive and equally highly necessary concerning environmental issues in the coastal communities. International association of hydrography has split core hydrography into the following areas seismic, oceanography, soft ware specialists, position fixing, geodesy, research and development, coastal engineering, deep sea specialist.

Aerial photogrammetry

Aerial photogrammetry is the science and technology in which spatial information about land surface is obtained without getting to the site or the location, measurement and interpretation being conducted. It involves the use of special cameras usually mounted on air craft. It has also several areas of consideration such as aerial triangulation, analogue photogrammetry, analytical photogrammetry, and geometric photogrammetry. There is also close range photogrammetry where cameras are mounted on theodolites and this does not cover a large distance. Photogrammetry can help reveal what is happening in our shoreline if such assignment is carried out periodically and the rate of shoreline degradation can be estimated. Predication can be in turn made as regards the rate of erosion. On the contrary, aerial photogrammetry is expensive as it involves the use of air craft and so it is not easily affordable unless by government. Ground truthing is also conducted for photogrammetric assignment which entails going to the site and carrying out the required observations.

5.0 Conclusion

This study, if the field observations are performed, would help reveal the rate and volume of sediment that has been eroded. Although, the rate of erosion along the shoreline is unstable because erosion would be followed by deposition in some areas but predictions would be made as to what erosion or deposition which has taken place for a given period, if the rate is uniform. The investigation would give us a picture of what the underwater topography looks like. It would further assist in the process of navigation because vessels have been known to get grounded in near shore. This is due to lack of information about the nature of underwater topography. The study of this type should be given high premium because the lives of the people are in serious threat. The study would further help in the activities of planning and development. All the review methods require huge amount of financial resources which pose a limitation on the process of investigation. These jobs cannot be undertaken by the communities unless financial assistance is got from the government and oil companies operating in the areas. Coastal dynamics is continuous and cannot be stopped but one can only devise ways of reducing such impacts-embankment, relocation to a new site where the impacts of the coast would not be felt. There are few areas or no area in Bayelsa State where rivers, creeks, streams and sea could not have effect upon the environment. The federal and state governments should come to the aid of these people to salvage them from the threatening, surging Atlantic Ocean. If the argument for not helping them is based on the economic contribution this area is giving to the government, the area is known to be hosting major oil companies such as Chevron, Agip, and Con oil. The people are also Nigerians, they should not be left alone to the frightening coastal degrading activities. Establishment of maritime academies is a welcome development in Cross Rivers State, Delta State and Rivers State but their curricula should include the review methods in this paper, if they are not there especially hydrography. It is advisable to establish institutions for hydrography in the Niger Delta region of Nigeria and it is only Nigerian navy that has a similar institution but its functionality does not have wide publicity. The region cannot do away with water and such institution will go a long way in helping avoid some hazards, providing a better living condition for the people, it would be of help to the various oil companies in the area, recommend solutions to the degrading shoreline and attract further areas of environmental investigations. The methods of investigation are not limited to the areas in this paper but can be conducted in all other areas of similar environmental features.

Reference:

Arthur L. Bloom (2003) Geomorphology: A systematic Analysis of Late Cenozoic Landforms, Third Edition, And ISBN: 81-203-2067-38

Association programme on flood management et al (2008), Urban Flood Risk Management: A tool for Integrated Flood Management.

Fikir Alemayehu (2014) Assessment of Shoreline Changes in the Period 1969-2010 in Watamuarea, Kenyam , Global Journal of Science Frontier Research, volume 14 issue 6 version 1.0, 20145

Keqizhang, Bruce C. Douglas, and Stephen P. Leatherman. (2004). Global warming and Coastal Erosion. Climatic Change 64: 41–58. Kluwer Academic Publishers. The Netherland

Lyn Mcdowell (2002), High – resolution geophysical investigations of Estuarine and nearshore sediment dynamics, River Bann Estuary, Northern Ireland Coast, Journal of Coastal Research, Special Issue 36, 2002, pages 483-486, ISSN : 0794-0208.

Ojinnaka O.C.(2007) Principle of Hydrographic surveying from Sextant to Satellite, ISBN: 978-8143-10-5

Ontario Ministry of Natural Resources et al (2011), Solutions for Shoreline Erosion (A Basic Guides to Bioenginneering)

Richmond Matthew D et al (1997). A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands. Published by Sida/Department for Research Cooperation, SAREC ISBN 91-630-4594X.

Sika Orupabo (2008) , Coastal Migration in Nigeria, Hydro International

Williams, S.J. and Gutierrez, B.T. (2009). Sea-level rise and coastal change: Causes and implications for the future of coasts and low-lying regions. U. S. Geological Survey Woods Hole Science Center. Shore & Beach Vol. 77, No. 4. 2

WIOMSA (2010). Shoreline Change in Tanzania and Kenya: Assessment Procedures and Mitigation Strategies for Management. WIOMSA Manuals No. 00. Zanzibar