Administering Marine Spaces: The Problem of Coastal Erosion in Nigeria, a Case Study of Forcados South Point, Delta State.

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Key Words: Coastal Zone, Erosion Survey, Groynes, Surveyors

SUMMARY

Coastal erosion is a global problem facing both developing and developed Countries. In Nigeria, Coastal erosion is experienced in almost all the sections of the country's coastal zone, thus the quest for a lasting solution. The social and economic consequences of coastal erosion can be substantial in many cases. It may cause displacement of a whole community, including the loss of lives as the case with Ogulaha community in Forcados South Point, Delta State, Nigeria. The consequences reflected in the loss of lives and properties could be quite severe, especially in Delta State where the coastal zone contributes to a major part of the nations income.

The loss of port facilities, infrastructures, recreational facilities, industrial and residential land due to coastal erosion are not uncommon. This paper singles out the problem of coastal erosion in Delta State , Nigeria, the Role of the surveyor-(a case study of Forcados South Point), and discusses a number fo factors that influences coastal erosion and their interplay in the study area, it also discusses the survey associated with coastal erosion in Nigeria, and the role of the surveyor in combating it. with also highlights some of the control measures used. solutions based on long monitoring of the area and subsequent construction of revetments and sea-walls are included in the discuss.

The ubiquitous nature of environmental hazards which has persisted over the years has created in man the consciousness to be a watchman over his environment. Earthquakes, land tremors, dessert encroachment, sea surges and coastal erosion are some natural environmental hazards facing mankind. Forcados South point is a case in point, where sea erosion threatened and actually made for the total abandonment of major oil installations. In fact some of the oil wells in that vicinity are currently submerged.

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1. INTRODUCTION

FORCADOS South Point is located to the south of the Forcados River in Delta State Nigeria. No one is sure about the genesis of the erosion problem on Forcados, but settlers of Ogulaha, a town on the estuary front of the barrier island, claim that the problem is as old as anyone living there can remember. According to oral traditions, the settlement was previously built on the beach proper but the continuous rapid retreat of the coastline forced spontaneous movements further inland until the settlers decided to move to the present site a little upstream on the estuary front **.**

The hope of a safe haven away from the hazards of erosion has proved illusive in the face of a continuing retreat of the shoreline that has exposed the village to periodic flooding. In November 1981, a dredging company was in the process of replenishing the beach front, and later set up sheet pile break-waters for about 200m of the ocean front closest to the estuary. In 1983 some other company laid synthetic sand filled mattresses to protect another portion of the beach, but around December 1983, the sheet piles were beginning to fail and high tides were sweeping across the breakwaters and impacting on the beach behind.

The enormity of the erosion problem in Forcados South Point area is best seen against the background of the various attempts by Shell Petroleum Development Company (Nigeria) to protect her oil and gas wells and flow stations around the beach from the menace of erosion.(fig 2 below) Despite the implementation of several remedial measures over the years, the company was forced in early 1983 to abandon its oil wells located on the sector of the beach closest to the estuary. According to available information, eight such wells were abandoned in 1983 alone.
As a result Shell commissioned an expatriate engineering consulting firm to study the problem and recommend control measures. Subsequently, construction of a revetment and groin field was completed in early 1986. Barely a year afterwards, were high water waves overlapping the top of the revetment indicating that the problem of erosion is far from being over. When all had failed, more expatriate companies were commissioned, including Geosite Surveys Nigeria Limited. After long monitoring they arrived at a solution – piling walls (sea-walls) between 2m – 4m depending on the configuration of the coastline were built.

A contract to study coastal erosion in this area by Shell was executed in 1998. the coastline affected in the study was about 8km south from SPDC 48" loading line beach crossing, and 7 km

Northwards along the ocean beach to South point inside Forcados River. Total coastline distance covered by the study was about 20km.

It is also interesting to note that the long – term erosion control measures constructed along the coastline are adequately checking erosion.

But the effect of erosion is still very severe along 1.5km stretch between end of Ogulaha Burial ground shore protection works and Groyne 1. This stretch is where the community resides and lives / property / economic trees are on a daily basis under erosion threat.

Hence in January 2005, an erosion survey was carried out in these areas to ascertain the extent and proffer solution on how best to check the erosion menace along the shoreline of Ogulaha village

From the above discuss, it is evident that the role of the Surveyor could not be over emphasized for he / she in union with other professional disciplines ascertains the factors responsible for coastal erosion. But the surveyor can determine the rate of erosion and therefore provide the engineer with one of the vital information he needs for his designs and constructions.

Below is the erosion control measures listed in chronological order.

1.	1974 – 1976	Ad hoc remedial works commences
2.	1977	Sheet Piling
3.	1979	Sheet Pile extension and Anchorage system.
4.	1980	Extra toe protection and sand replenishment.
5.	1984	Addition of sheet piling to flowline crossing.
6.	1984	Emergency repairs (sheet pile anchor, toe protection scarp `SPDC hoses, permeable groin and beach replenishment).
7.	1986	Revetment plus flexible longard tube drains.
8.	1987	Repair works to tube grains (armour rocks).
9.	1988	Beach nourishment (48” CLL crossing)
10.	1991	Rock Dyke (well 15).
11.	1991	Revetment (Estuary).
12.	1993	48” CLL corridor protection
13.	1994	South Point Protection.
14	1995 – 1996	protection extension, which include burial ground.
15.	1999	Water disposal line Protection.
16	2001	Groynes 1 & 2 Effluent discharge.
17.	2002	Groynes 3 & 4 Barge slots.

2. FACTORS THAT INFLUENCES COASTAL EROSION

In general, the character of any coastline is the product of the interaction of a number of factors. Firstly, there is the work of coastal processes-winds, waves, tides and currents. secondly, there is the geological nature of the coastline being subjected to these marine processes-whether the land margin is elevated or low-lying, straight or indented, stable or mobile, homogenous or varied in character etc. Thirdly, there are the changes of sea level relative to the land. Fourthly, there are special features of some coastal areas, such as the existence of offshore sand ridges, the growth of corals, the impact of glaciers and ice-sheet proximal to the sea. Fifthly there is the intervention of man in the natural environment notably through civil engineering constructions but also through devegetation, mining, pollution etc.
In the following discussion, the significance of the above factors to the coastal erosion problem in Forcados South Point is outlined in the light of observation carried out along the area.
The factors studied are discussed under natural and human impact.

3. NATURAL FACTORS

- Waves / Wind
- Long shore Current
- Tides and Tidal Stream
- Sea Level Changes
- Low Relief
- Rhythmic Topography
- Human Impact
- Oil and Gas Exploration
- Dredging Of Port Channels
- Construction of The Beach

4. SURVEYS ASSOCIATED WITH COASTAL EROSION

The accurate delineation of the coastline and coastal features is an essential feature of the surveyor.
The main method of coast line surveys is enumerated below:
1) Visual Examination.
2) Photogrammetric Method
3) Traverse Method.

Only two of the above methods was used in Forcados South Point.

5. VISUAL EXAMINATION

This entails just going to the site without any instrument. The features are accessed with the eye and a sketch made. After sometime one goes back there and do the same thing. The sketches are compared and rate of erosion could roughly be determined. This was done in Forcados South Point in June 2004 and the sketch of the new shoreline was compared with that of 1996.

6. METHOD OF TRAVERSING

A much used method of fixing the coastline is by means of traverse between adjacent surveying marks.
The method of traversing described below, which is very suitable to control work off a long expanse of beach, gives a very reasonable degree of an accuracy using the minimum of equipment.
The erosion site was divided into clusters, and areas around the ship wreck very close to the sea were made.

7. DETRERMINATION OF RATE OF EROSION

The rate of erosion could be defined as the distance (or depth) eroded over the time. Though only one is discussed here, there are many ways in which erosion could be monitored and the rate determined. The method described is the one applied by Shell Petroleum Development Company (SPDC) Warri. Surveyors were to monitor coastal erosion at the Forcados South Bank.
Using the pillars (A-L), a line of levels was run along each transit far into the sea. The spot heights were taken at a regular interval (10m). The high water mark and vegetation boundary was also noted**.**

8. PRESENTATION AND INTERPRETATION OF RESULTS

On a base map, the control pillars were plotted. The reduced level of each heighted spot was plotted along the transits. The high water marks (HWMS) and the vegetation boundary are also plotted.

A plot on the same base map of the results of surveys done at the different times will enable the surveyor to determine the height difference over the period and hence calculate the rate of erosion.

1) Eroded portions or siltation are easily noticeable.
2) Rate of erosion or siltation can easily be determined.

3) With depth contour profile, required frequency of observation could be determined thus optimal use could be made available personnel and equipment.
4) The profiles different times could be plotted together thus reducing storage problem.

9. THE SURVEYOR'S ROLE IN EROSION CONTROL

The Surveyor's role in erosion control could not be over emphasized. Various professionals are involved including the Surveyor. The Surveyor's role is vital because he is the only one that can coordinate effectively with other professionals in the team and give accurate information of the area of interest that is the erosion site. The surveyor is also the one that provides the engineer with one of the vital information he needs for his designs and constructions.

10. REQUIRED MEASUREMENT

- Observation/Measurement of Current, Direction and Speed.
- Velocity, Water Temperature, Density and Salinity.

Forcados South Point erosion site is divided into eight clusters, taking the wells into consideration. Since cluster .3 is prone to erosion, it is used for this write up.

11. PLANNING AND LOGISTICS

Planning is necessary for the successful execution of any project. Hence there is need to have the Surveyos from the unset of the project. This will enable the Surveyor plan for all the factors that will enable a successful execution of the project. A major factor in this line is the consideration of the type of instrument that will give the best of results. Though no two surveys are alike, a considerable sequence of event at the planning stage follows a pattern like this.

- Examination of clients requirements and drawing up of a specification for the requirements
- The evaluation of available documents that are connected with the project at hand. For example, client's maps, tide tables, and control points for earlier surveys.
    - Soundings and reduced depth of the area in question if available.
- A recce has to be made of the area to select locations for the measurements and to decide on the number of vessels, type of vessel required, and position fixing method to be used, personnel requirement, and logistical requirements, auxiliary equipment and materials.
- Preparation of sheets required for observations for example the current meter booking form, graph sheets for plotting of the observation.
    - Operation report to include time and resources schedule.

12. CURRENT OBSERVATION

Generally, current may be regarded as the horizontal movement of water. Its magnitude is measured by its velocity in meters per second. This movement may be said to be caused by one or a combination of the following factors.

a. Astronomical factor
b. Topographic influences.
c. Climatic conditions and other meteorological factors.

13. CURRENT METERING

The current meter provides a means of measuring the rate and direction of any depth. Velocity can be accurately determined at nearly all points in the cross-section and over a sufficient period of time.

The DNC-3 current meter was used. It consists of three parts. The recorder, the fish (towed in water) and the cable. It works on the principle that a propeller of certain pitch is turned by the water particles equal to the pitch of the propeller.
The number of revolution in a certain time-lapse gives the velocity of the current according to the calibration formula of the propeller. The information obtained with the current meter would determine baseline information for predicting stresses acting on the erosion site and also as design criteria for construction purposes.

14. METEOROGICAL DATA

On instructions from the topographical department of the Shell Petroleum Development Company of Nigeria limited, a meteorological data collection survey was carried out in Warri and Environs, including Forcados, the area of interest. This is to evaluate environmental condition for future development especially in the coastal zone.

The Mechanical Meteorological Stations (MMS) had been installed at all locations about 13th October 1980. All stations were serviced and repaired prior to commencement of the survey and charts changed monthly. The stations were also run on a trial basis during June 1990 and also 1999

15. MECHANICAL METEOROLOGICAL STATION

A Mechanical Meteorological Station was established at each station and the following parameters were recorded on a chart.

(a) Wind runs (M/S)
(b) Wind directions (in degrees)
(c) Air temperature (OC)
(d) Relative humidity (%)
(e) Rainfall (mm)

16. WIND DIRECTION

Once the orientation of the stationery vessel is known, the direction of wind will be simple to estimate by facing the wind and relating one's stance to the orientation. It is expressed as the direction from which the wind is blowing.

17. TEMPERATURE

Short period fluctuations in temperature could be caved by tides and other internal waves having periods of up to two hours. Such waves are characteristics of the layering and result in vertical oscillation of the themocline (region of rapidly changing temperature).
The temperature of sea water may be determined by thermometer or other similar means. Knowledge of the temperature alone at a station is inadequate at least the depth at which it was gathered is required in addition since sea water may not have uniform temperature in a given vertical column. This an active factor of erosion and results in saturation of soil favoring mass movement of soil and high rate of runoff which provokes large generalized erosion Kirk, R M (1938)

The mean of six hourly meteorological values recorded on the charts were tabulated and this data was processed at Geosite survey office in Warri Delta State, to produce the various listings and graphics.
The monthly histograms have been produced taking the mean of all the samples for each parameter at six hourly intervals. Due to space constrains, all the data and diagram would not be included in this report.

18. SEABED SAMPLING

Seabed sampling is carried out to determine the stability and strength of the materials that form the seabed. The hydrographer is very useful here. He coordinates the position of samples for the geologist and geophysicists.

There are a number of sampling equipment which include the grab dregger, gravity covers, drills and drivers. The election to be used in a survey operation is determined by the following factors: geology of the area, purpose of the sampling, cost and penetration capability.

The van veen was used at Forcados South Point. The instrument was used manually from an anchored survey vessel. To collect a sample, the grab is lowered over the stern rail of the vessel and allowed to freely fall to the seafloor. On contact with the sea flour, the pair's closes and the grab is recovered. After a visual and tactical appraisal of the sample on board, it is bagged, labeled, sealed and sent to the laboratory for test.

19. BATHYMETRIC SURVEY OPERATION

The bathymetric survey is an essential part of coastal / shore erosion study as it gives information about the bottom configuration; the cross sectional profiles in the coast, an insight into sedimentation and gives therefore the basic information to the engineer of the area under study.

It is therefore important to carry out this survey as accurate as possible and special attention should be given to the calibration of the echo sounder, the position fixing, the water-level measurements to establish an accurate reference of echo sounder attuned to the purpose of the study.

For this study, the Raytheon DE-719c fathometer was used. Depths of water were determined using the time required for sound waves to travel from a point near the surface of the water to the bottom and back echo. High frequency super-sonic sound waves are produced in the boat and transmitted to the bed of the water body. The waves are then reflected back to the sounding instrument. The transmitted pulses are regularly repeated at the interval of a fraction of a second.
Prior to carrying out the sounding operation, the echo sounder is calibrated. The bar check is the most common method, and is carried out at the area of interest (i.e. area to be surveyed). The system has to be calibrated at the starting of sounding (SOS), end of sounding (EOS) and in between soundings by means of a bar-check lowered to a set depth .The calibration is necessary due to the fact that the speed of sound in water and thus depth measured is affected by the temperature and salinity of the water. Hence the echo-sounder is calibrated to arrive at the correct factor for the speed of sound.

20. TIDE OBSERVATION

Tidal levels were observed relative to a fixed mark ashore in order to obtain the necessary information. The information was used to adjust soundings to correct for the effect of tides.
To achieve this, a tide pole was read regularly by an observer at regular intervals while marking soundings

Tidal observations were carried out during the period of the survey in order to interpret the soundings and reduce the results to a standard datum. In Forcados South Point, the tidal record was obtained with the Raytheon echo-sounder, which was carefully calibrated before use. The

transducer is set to a certain depth below the water surface and records obtained for the desired length of time.

The tidal curve obtained is compared with the prediction for the nearest standard post (Forcados bar) and arrange ratio and time difference arrived at to establish the sounding datum. The tidal curves constructed were then used to reduce the sounding.

21. EROSION CONTROL MEASURES

There are three general classes of structural and engineering methods of shore-erosion control: those that harden the shore line to make it more resistant to erosion, those that stabilize the shore line by altering the prevailing coastal maintenance of beaches and sand dunes.

Shore-line hardening structures are parallel or nearly parallel to the shore-line and work by hardening the shore-line or by separating the land from the water. Their purpose is to make the land more resistant to erosion and to protect upland facilities and improvements from damaging wave action. They protect only the land directly behind them and have no beneficial effects on adjacent shore-lines, or on the land, or on beaches seaward of them.

Shore-line-hardening structures are commonly classified according to their intended function or use. In terms of the functional classification, nearly all of these structure fall into one of three groups, sea-walls, revetments and bulkheads.

22. SEA - WALLS

Sea –walls are structures whose function is to protect the land and property behind them from damages by heavy wave action, they usually rely on their own weight to hold them in position and can thus serve the secondary purpose of retaining land-fill behind them.

Depending upon the construction material, sea-walls may be permeable or impermeable, smooth or rough, and may use any face shape or combination of. Sea-walls are, in general, the most costly form of hardening structures. Since they rely on their own weight for support, more materials are required.

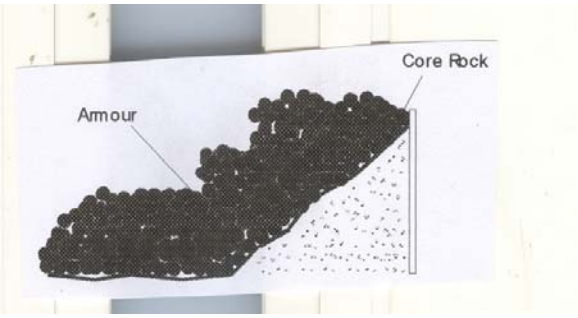
Sea-walls may be constructed of a water variety of materials than any other shore-line-hardening structures. Concrete in many forms, rocks, rock-filled timber cribbing, rock-filled gabions and cellular steel sheet pile. In Forcados South Point, concrete sea-walls were used in areas very close to the ship wreck, while rock sea-walls was used about 1.3km away from the ship wreck.

23. CONCRETE SEA-WALLS

The ability of concrete to assume shapes and designs of any size is limited only by the design of the form one is willing and able to construct.
Massive cast-in-place concrete sea-walls can provide very reliable and long lasting protection from heavy wave attack. They are usually used where a high degree of protection is required for high value facilities and improvement.

The basic steps involved in the construction of cast-in-place structures are site preparation, form construction, concrete preparation, and placement and toe protection. Labour and equipment requirements will depend upon the size and design of the structure, as well as on the foundation and other site conditions.

All sea-walls require protection of the toe against wave scour to prevent undercutting of the foundation. The two most common forms of toe protection are rock blankets laid on the ground seaward of the toe and sheet pile cut off walls in front of the toe. See diagram below.



24. ROCK SEA-WALLS

Rock sea-walls have sloping faces with rough surface textures, and they are permeable and structurally flexible. They are built with an inner core of small stone covered with layers of progressively larger stone. The outer most layer is of the largest rock, the capstone, sizes for each layer cannot pass through the interstice of the layer above. The rock is placed on timber cribs which stand as a foundation for them and gabions are placed in between layers.

Timber cribs are relatively simple in their simplest form, they are overlapping, squared timbers pinned together at the corners to form a four sided box to be filled with rock or rubble. The cribs can be filled by machine or by hand. Important in the construction of rock-filled cribbing are three factors, the rock must be large enough not to pass through the spaces between the timbers, toe scour must be kept in place. To prevent the loss of fine sediment from behind the structure, filter cloth are use. Filter cloth is a synthetic woven or non-woven fabric designed to allow

passage of water while retaining sediment. Gabions are rectangular baskets of pre-fabricated six-sided, galvanized steel-wine mesh that are filled with rock to form a sea-wall. The wire must be obtained with a PVC coating for addition protection from corrosion. PVC coating is recommended for use in salt water.

A typical gabion basket for sea-wall construction might measure one meter square by two meters (1m x 2m x 2m).

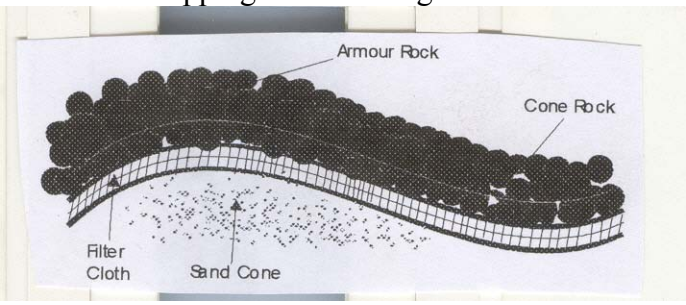
Individual baskets are wired together for greater width, height and length. Construction consists of assembling the baskets, filling them with rock, and wiring the lid down. Filling can be done by machine or by hand but in either case care must be taken to prevent cutting of the PVC coating.

25. REVETMENTS

Revetments are structures designed to prevent erosion hand from wave and current action. They rest upon, and are supported by the land behind them, which is usually at or near its natural angle of repose. Revetments are intended to retain fill but they are not used for other purposes such as berthing. They are usually lighter in construction than sea walls and they are not commonly used on coastlines subject to heavy wave attack, thus the interlocking block revetments were used farther away from the erosion site, for protective measure, at Forcados South Point.

26. INTERLOCKING BLOCK REVTMENTS

Interlocking block revetments requires bedding layer of small stone underlain by plastic filter cloth. Should filter cloth not be used, a graded filter bed consisting of layers of progressively coarser stone can be substituted. Filter cloth is less expensive far easier to install and more reliable than a graded filter bed. A Stone splash apron behind the revetment will prevent erosion should over topping occur See fig below.



28. BULKHEADS / SHEET PILING

Bulkheads are structures designed to fill and to prevent the land from sliding into the water. They are made of relatively thin, sheet-like materials called sheet-pile and generally depend upon

some system of bracing or support to hold them up right. Although principally designed to retain fill, bulk-head can be, and extensively used to protect shore line from wave and current action. They are a vertical or nearly vertical structure which makes them very suitable for berthing.

Concrete sheet-pile can be pre-cost to the required length, width, and thickness as dictated by the structural design. Concrete sheet-pile, when properly formulated, is a durable, strong, long-lasting material that is often preferable to wood, steel and aluminum where wood-boring organisms and corrosion are known to be formidable

Since bulkheads are vertical heavy or regular wave action will result in severe scour. Thus, it is constructed to withstand high wave forces, but must be protected from undercutting. This can be done by placing revetments at the toe or by adequate toe penetration.

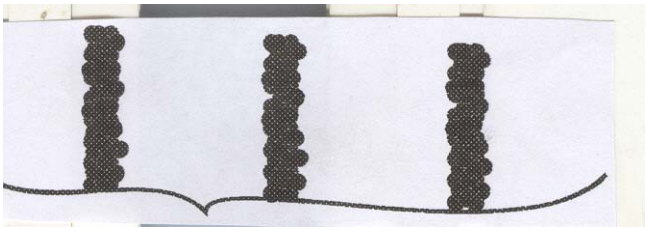
29. MATERIALS AND CONSTRUCTION

Sheet-pile materials bulkheads are wood, steel, aluminum and abestors cement. Selection of materials will depend on such factors as material availability and costs, site, and soil conditions, wave forces, available construction equipment. Concrete bulkheads(Sheet Piling) were also used in Forcados South Point in areas close to the shore.

30. GROYNES

A groins is a partial or total barrier to the littoral drift between the seaward end of the groin and the limit of wave up rush.

They are protective structures designed to alter long-shore drift in such way as to build or maintain a beach, and are usually narrow in comparison with their length which may be varying from less than 100meters or many hundreds of meters. Groynes may be constructed of timber, sheet or cellular steel, rock, concrete asphalt, gabions or grout-filled synthetic bags. These materials may be used individually or in combination.
Groynes are most advantageously applied on beaches immediately up drift of complete natural or artificial barriers to the littoral drift, harbor entrances, inlets, down drift ends of barrier islands, spits and other coastal land-forms act as barrier to drift. Groynes will do no harm to these structures. In some cases, they may act to prevent excess siltation of shipping channels.



31. PROBLEMS ASSOCIATED WITH EROSION SURVEY SOLUTION

The major problems associated with erosion survey are:

- Time Limitations
- Waves
- Inaccurate Positioning

Time Limitations: Very good results are easily obtainable during low water. It is therefore important that the Surveyor going for the field work knows when he is going to have low waters. This can be done by using the tide tables. The Surveyor therefore needs to plan for the work so as to get his / timing right.

Waves: At low tide, the sea occasionally gets very rough even near the shore. It is therefore important that only experienced assistants who can swim are used for the job. The Surveyor should ensure that his/.her crew wear their life jackets.

Inaccurate Positioning: It is very necessary that the same spots are heighted during each succeeding survey. However, because of wave action, it becomes difficult to go along the transit and still keep to the 10m interval. A solution to this problem is to use experienced men who apprecriates the need for accurate positioning.

32. MULTI – DISCIPLINE APPROACH

Working independently, Engineers, Geographers, Geologist and others have failed to supply a solution to the problem of the Forcados South Point sites. There are some cases however where a degree of success has been achieved, but these notably involve individuals from more than one discipline working together.

This should not be surprising if one asks an Engineer to solve a problem, one would expect an Engineer to solve the problem using an engineering solution, if Geographer were asked, a geographers solution would be expected.

The key then may be to use multi-discilpine teams to examine specific cases. A central factor, as identified by Healy (1980) is to understand the geology, or more specifically the geomorphology of the coast. Then Engineers, Geologists, Oceanographers, Meteorologists etc must also be expected to play a significant role.

In the words of Nikos and Mclaughin (1984) 'as the problem of locating former water lines demonstrates, the delineation of tidal boundaries comprises many areas of expertise. We believe that the key figure is the surveyor, who relies on the principles of definitions of the boundary and on information and techniques provided by science, he / she is the expert in boundary delineation".

Already, oil installations have been abandoned in Forcados area as a result of fierce coastal erosion. But the action of the sea cannot be allowed to continue unchecked. To find the solution, the 'first – man' (the Surveyor) is called upon to provide the necessary data and information about the strength and severity of the phenomenon. He does this by regularly taking level and other measurements in the affected area. With these the rate of erosion could be determined and the suitable control measure recommended.

There remains a need to have some forum or mechanism by which relevant disciplines can come together to examine the common aim – finding lasting solution to the erosion problem of Forcados South Point.

33. CONCLUSION / RECOMMENDATION

This paper has traversed a number of problems which arise in the assessment of erosion on the Forcados South Point. It should be clear that coastal erosion is a complex phenomenon which results from the interaction of a large number of variables which act as a variety of scales in time and space.

For this reason, assessment of erosion harzard on Forcados South Point Coast is a specialist task and one which should be approached with more caution than has perhaps been the case in the past.

It is probably to state the obvious that there is a wealth of information available which can assist with the problem that has been identified. It is certainly true that there are a growing number of individuals with range of expertise that shares a common concern about the causes and results in the coastal environment. What is lacking is the means by which all these specialists can come together to share their concern, pool their expertise, and then adapt this vast knowledge unto positive and practical action.

There is a significant place for Surveyors in the definition of boundaries within the coastal zone. Surveyors have the knowledge, the expertise and the experience to take the initiative in advising the government and engineers. If new directions are needed, if new control measure is to be taken, it is the Surveyor who will provide this information.

THANK YOU

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INTERVIEW

Interview with Mr. UGORJI Eke, Chief Surveyor, Nigerian Wsetminster Dredging Nigeria ltd. June 2006.

BIOGRAPHICAL NOTES

Mrs. Angela Kesiena Etuonovbe 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 thirteen years of experience in the practice of Surveying, Engineering and Mapping. She has a Master in Business Administration (MBA).

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 - Delta State Branch and the Coordinator for Delta and Edo States, Women – In - Surveying.

Over the period, she had successfully executed a research work on "**ROAD CONSTRUCTION IN NIGERIA – DEFECTS AND SOLUTIONS.**" And she is currently on a research on lasting "**SOLUTIONS TO EROSION PROBLEMS IN DELTA STATE NIGERIA**.

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 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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