ECONOMIC BENEFIT OF HYDROGRAPHY: LAND RECLAMATION IN BAYELSA STATE – A CASE STUDY OF SAIPEM CAMP

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Abstract. Bayelsa State is a state in southern Nigeria in the heart of the Niger Delta. It is on the coast and between Delta State and Rivers State. It covers an area of 10,773 sq. Km. and has a population of 1,998, 349 (2005 estimate). Bayelsa has a riverine setting, a lot of her communities are almost (and in some cases) completely surrounded by water, hence making these communities inaccessible by road. It has one of the largest crude oil deposits in Nigeria and petroleum production is extensive in the state. The majority of Bayelsans, who live in poverty, are rural dwellers due to its peculiar terrain, lack of adequate transportation and poor road access. This has posed a large problem to the State since its creation and successive State Governments have not been able to fashion a way out. Apart from the subsistence fishing and canoe making, the state has virtually no stable commercial activity. It heavily depended on royalties (taxes) on crude oil pipeline and Federal Government Allocation. As a result reclamation would necessitate the availability of the required land space that will be needed for agrarian activities, industrialization, commercial activities (establishment of markets) and the development of a transport system, especially roads that will encourage inter-relationship of the people and advancement of the area and the people.

For now, the area is grossly untapped and closed to the open world because of the flooded and swampy nature of the terrain. To this extent, it is only land reclamation that can catapult this rather backward community to its prime of place amongst the community of elegant States of Nigeria.

Saipem Camp is a case study where this problem can be effectively articulated, the extent to which Reclamation can meet this challenge, the attendant costs and the impact the solution(s) will have on the people and the State.

Key words: Access to land, Cost Management, History, Hydrography, Land Management, Dredging, Benefits, Roads. Reclamation

1 HYDROGRAPHY: WHAT IS IT?

According to the *Encyclopaedia Britannica*, hydrography is the science dealing with all of the waters of the earth's surface, including the description of their physical features and conditions; the preparation of charts showing the positions of lakes, rivers, seas, the contours of the sea bottoms, the position of shallows, deeps, reefs, and the direction and volume, configuration, motion, and condition of all waters of the earth.

2 SAIPEM; YENEGOA?

Saipem is a major contractor to Shell Petroleum Development Company Nigeria Limited (SPDC), and specializes in pipeline projects. The company came to Yenagoa, Bayelsa State, due to a pipeline project she had to execute and Yenagoa is closest to the loca-

Figure 1: *Map of Nigeria.*

Figure 2: *Niger Delta map.*

tion and as a result, she decided to situate her base camp there. Her regional headquarter is in Port Harcourt Rivers State.

3 WHY RECLAMATION

As earlier mentioned, Bayelsa has a riverine setting, and Yenagoa which is the State capital is not left out. For Saipem to build its Camp in Yenagoa, the chosen site of course, required reclamation for the site was acutely swampy. The site was dangerously swampy to the extent that one can hardly walk on it without using a swamp buggy. (See Figure 3a and 3b below).

Figure 3a: *Saipem camp site prior to reclamation.*

Figure 3b: *Swamp buggy creating a path into the site for the dredger.*

4 LAND RECLAMATION

Land reclamation is either of two distinct practices. One involves a change from an area's natural state, while the other is restoring an area to a more natural state (Wikipedia, the free encyclopaedia**)** It can also be defined as "the process of improving disturbed land (soil, vegetation, water) to achieve land capability equivalent to the pre-disturbed condition or for a specified end land use."

5 DREDGING AND RECLAMATION:

Dredging is an industry in constant transformation. It has changed tremendously in the last decades. The traditional dredging activity like construction and maintaining ports and harbours, desilting of drainage and irrigation channels, keeping reservoirs at depths and removing sediments from waterways is still of importance. However it is surpassed by other applications of dredging technology (H. van Muijen).

Reclamation is an important example in this respect, where large amounts of sand are dredged, transported over large distances and used to make new land for industrial-, housing-, airport- and other infrastructural purposes. Saipem, in line with the above resolved to dredge its own sand within the premises as this is more cost effective as compared with sand haulage. Due to the fact that the area was a vast one, and the job had a timely deadline, three dredging companies to be precise were engaged.

6 PROJECT PLAN

The following strategies were adopted for this project in other to effectively execute the task at hand.

6.1 Site study

− Determining the actual portion of the landfill area to be reclaimed.
− Carrying out a study of geological features that is check if the quantity of sand needed could be dredged from the area.

− Check for stability of the surrounding area. − Also check for the proximity of ground water.

6.2 Assess project costs

Project costs may also include the following:

a. Capital Costs

- Site preparation
- Rental or purchase of reclamation equipment
- Rental or purchase of safety equipment
- Construction or expansion of materials handling facilities
- Rental or purchase of hauling equipment.

b. Operational Costs

- labour (e.g., equipment operation and materials handling)
- equipment fuel and maintenance
- hauling costs.

Part of the cost analysis involves determining whether the various aspects of the reclamation effort will result in reasonable cost reduction in relation to the anticipated economic benefits.

(U.S. EPA. 1997. Report)

7 THE EQUIPMENT USED FOR SAND MINING OPERATION AT THE SITE

See figures 4a–c.

Other equipment used are:

- Excavator
- Work boat (almarine work boat with 45 HP O?B engine.

8 THE ROLE OF THE SURVEYOR IN RECLAMATION

The Surveyors role in land reclamation is simply inevitable. It is the Surveyor that determines the quantum of sand to be dredged, and to achieve this, he/she needs to carry out a pre and a post dredge survey of the area in quo.

It is also the surveyor's duty to carry a bathymetric survey of the river from where dredging is to be done.

The surveyor also carries out the geological survey of the area.

Figure 4a: *Heavy-duty cranes capable of lifting up to 80 tonnes*

Figure 4b: *A 12" x 10" ellicott truckable cutterhead suction dredge powered by a 370 hp caterpillar diesel engine, with a 10m ladder and maximum digging depth of 6.1m. Included are 500 metres of 12 inch hdpe pipe with 300 metres of 8 inch hdpe floats.*

Figure 4c: *Caterpillar d6 v-track bulldozer.*

9 OPERATION AT SITE

9.1 Geological Survey

A recce was conducted round the area to be dredged. After the recce, boring was done at random. Five points were dug and gotten. The result is as shown on pages 3, 4, 5, 6, and 7 respectively.

The average width of 25.0 m x 25m away from the area where the previous dredger was situated was covered. Samples were taken at five different points to a depth of 15m.

From the samples taken, the following results were obtained.

On this project, the geological survey was done prior to the dredge mobilizing to site. (See results of geological survey below.)

9.2 Field operation results

Bore-Hole 1: 0.0–3.0 m contains clay, from 3.0–6.0 m has reddish sharp sand, from 6.0– 8.0m contains white sharp sand while from 8.0–15.0 m has very smooth white sand.

Bore-Hole 2: 0.0–2.5m contains clay, from 2.5–6.0 m has reddish sharp sand, 6.0–8.0 m is made up of white sharp sand, while from 8.0–15.0 m contains smooth white sand.

Bore-Hole 3: 0.0–3.0 m contains clay, from 3.0–6.0 m has silt mixed with clay, from 6.0m – 8.0m contains clay and from 8.0–15.0 m has clay.

Bore-Hole 4: 0.0–3.0 m contains clay, from 3.0– 4.0 m, has reddish sharp sand, from 4.0m – 8.0m contains sharp sand mixed with clay and from 8.0– 15.0 m has clay

Bore-Hole 5: 0.0–3.0 m contains clay, from 3.0–6.0 m has reddish sharp sand, from 6.0–8.0 m contains white sharp sand, while 8.0–15.0 m is made up of smooth white sand.

9.3 Sub-soil investigation site sketch

As stated earlier, as soon as the result of the geological information were on hand, the dredge mobilized to site, and the dredge was positioned by the surveyor on the spe-

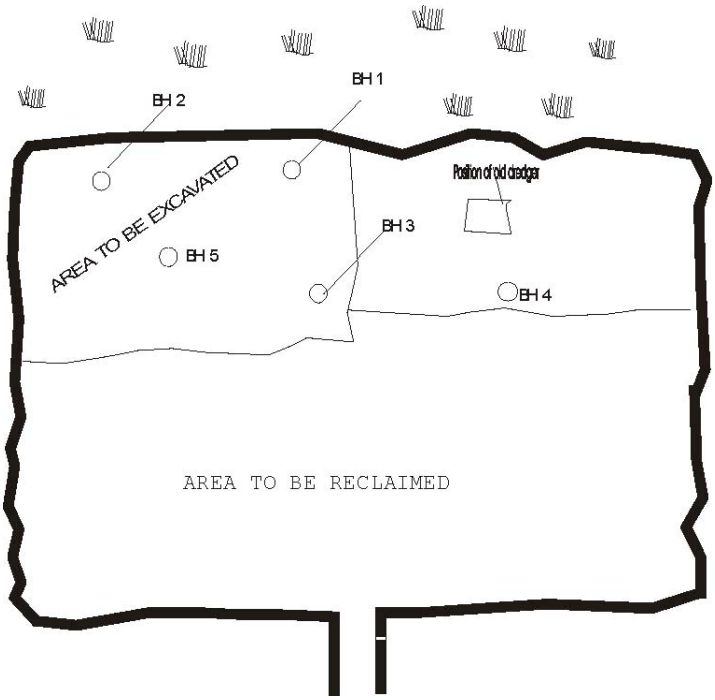

Figure 5: *Sub-soil investigation.*

cific spot from where commercial quantity of materials (sand) could be produced. After the dredge has been positioned, sand mining had begun.

However it should be borne in mind that after that much material has been deposited, a post dredge survey was carried to determine the actual quantum of materials that was actually produced on site.

Prior to the sub-soil investigation, a pre-dredged survey of the site had earlier been carried out (See figure 6 below.)

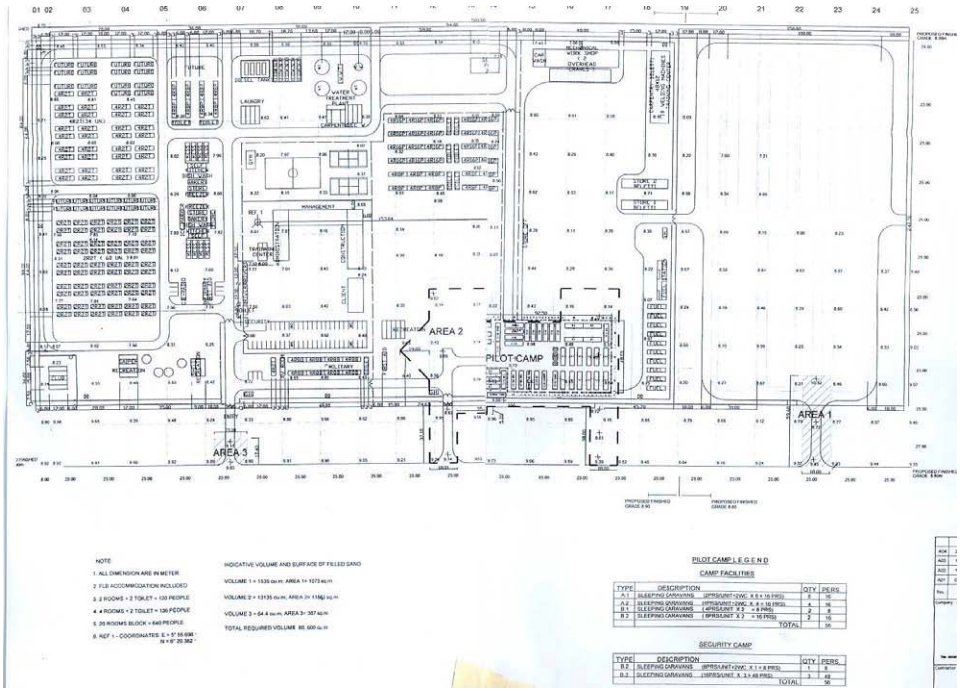

Figure 6: *Pre dredge survey and details of the proposed camp site.*

10 BENEFITS OF RECLAMATION

- Providing needed land for use
- Extending land capacity at the site
- Lowering operational cost.

Costs for reclaiming the site were relatively low for the following reasons:

- The distance for transporting the produced materials was only a few metres away.
- The management authority avoided commercial hauling prices by using its own trucks and employees to transport the reclaimed for eventually this was resulted

to when the pace of work by the dredgers were dismally slow for the materials were not so easy to come by from the designated chosen spots…

– The landfill equipment was operated by the same management authority, thus no tipping fees were required.

11 PROBLEMS ENCOUNTERED

11.1 Collapse of bond walls

There were series of this at the site due to the thickness of the mud. The mud was 3m thick, and as such while dredging was going on, the areas around where materials were being produced from, were always collapsing. The excavator had to be used to remove the mud before dredging could continue. If this is not done, the mud sticks to the dredge's cutter and affects the production of the dredge. And this caused some down time while dredging.

Due to the above, surrounding farm owners were always at site complaining of such incessant pollution to their farm and as a result, the dredge had to relocate. This again means down time.

11.2 Increasing wear and tear of equipment

Reclamation activities shorten the life span of the equipment. For excavators and bull-dozers are continuously on the use due to the high density of produce being handled. In fact there were series of breakdown of such equipment. It was always the case of overheating and as such the equipment had to stop work for some hours. Hence down time. The toll on the machine cannot be overemphasised

12 CONCLUSION

However , as had been mentioned earlier on in the course of this project, the company due to the slow pace of work by the contracted dredgers, that were small; (for only small dredgers that could enter the almost land - lock canal for they were virtually carried – in by excavators) and as such their capacity cannot produce the pace required. And again, due to the materials that could not be found in commercial quantity and the attendant muddy hiccups that were experienced, which resulted onto expensive downtime loss, the company had no choice but to resort to haulage of materials from nearby sand beach. In fact, so many tippers were engaged instantly, that within a few days, about five thousand cubic metres were hauled and spread on site. (See figure 7 below.)

At the moment, 75% of the area has been filled to capacity and work is going on at top speed. In fact the residential area has been completed with all its facilities and the workers are already resident.

This project has afforded the people currently with gainful employment, improved quality of life as cash is readily available, reduced incidence of crime, increase in government revenue due from tax on company facilities, and from income tax, afforded

Figure 7: *Reclaimed land of the camp.*

time and space for relaxation. Thus the joy and human satisfaction this has occasioned had in no small way made for the relative peace the State and thus Nigeria by extension now enjoys currently.

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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 fourteen years of experience in the practice of Surveying, Engineering and Mapping. She also 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, Women – In - Surveying for Edo and Delta States.

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 presented two papers "Under Represented Group – Projecting the Image of the Nigeria Female Surveyor" and "Administering Marine Spaces: The Problem of Coastal Erosion In Nigeria – A case study of Forcados South Point, Delta State" at the XXIII International FIG Congress at Holiday Inn, Munich, Germany.

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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