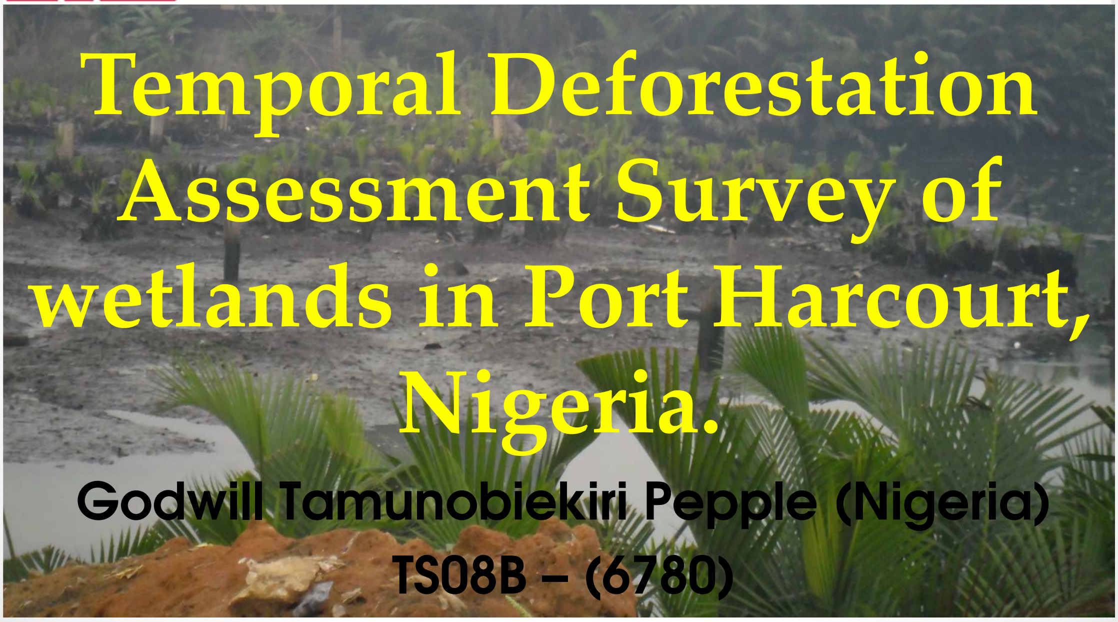
FIG XXV FIG Congress
KUALA LUMPUR 2014
"Engaging the Challenges, Enhancing the Relevance"
16 - 21 JUNE 2014, MALAYSIA



Temporal Deforestation Assessment Survey of wetlands in Port Harcourt, Nigeria.

Godwill Tamunobiekiri Pepple (Nigeria)

TS08B – (6780)

BACKGROUND OF STUDY

Wetlands are a vital ecological component and core element in resource management initiative ranging from local to global ecosystems. Wetlands perform a variety of functions beneficial to society. Wetlands help to control flooding, ameliorate droughts, provide habitat for a myriad of flora and fauna, maintain and improve water quality, provide storage for water, stabilize water supply, mitigate erosion, reduce hurricane-related damage and offer recreation possibilities (Novitzki *et al*, 1996).

Statement of the Problem

City growth is a major indicator of industrialization which has a negative impact on the environmental health of a locality. Port Harcourt city is of economic importance to Nigeria with a concentration of multi-national oil industries in it, now being associated with unplanned and nature threatening activities. This had resulted in high amounts of commercial and industrial activities as well as an ever-increasing multi-cultural population and also the most populous Niger Delta city governed by natural land constraints (Specialist Consult, 1975).

Figures 1: Shows co-habitation of two vegetation species (Nypa palm & mangrove) and permanent structures obstructing a natural drainage at Borikiri sand-field, Port Harcourt.

RESEARCH AIMS/ OBJECTIVES

1. To extract past and recent environmental situation using spatial data processing techniques that will identify vegetation amongst other features.
2. To use the GIS to show local relationships within the study area into the framework in an intuitive and explicit manner producing a synthesize map for all datasets and extract varying land-use trends to accurately identify areas affected using multi sourced datasets.
3. To extract and update wetland locations and propose a planned wetland mapping approach for future inventory mapping utilizing periodic remotely sensed datasets.

STUDY AREA

Port Harcourt thus lies on a peninsula, its urban form being governed by natural land constraints which also have strong bearing and directions of future development and communications. The northern terrace consists of dry land while the southern terrace consists of small isolated islands of firm ground in the vast lower Deltaic area which is continuously being rearranged by strong tidal flood currents (Specialist Consult, 1975).

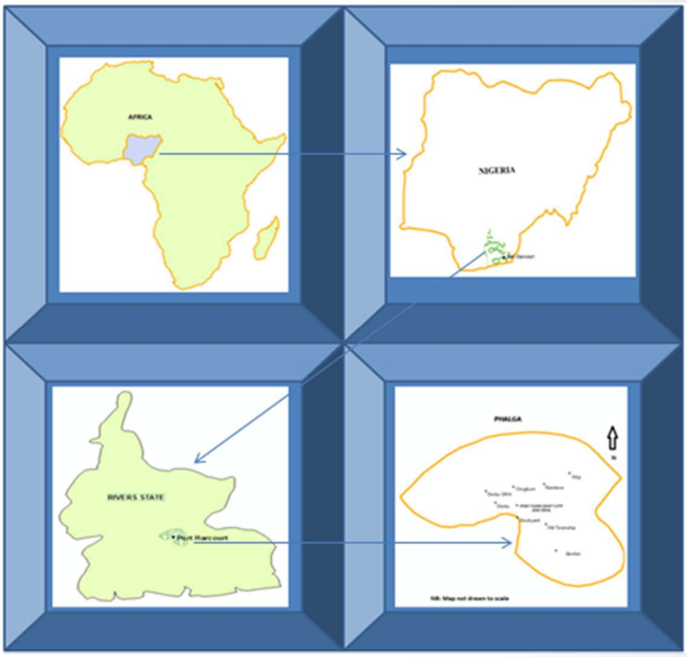
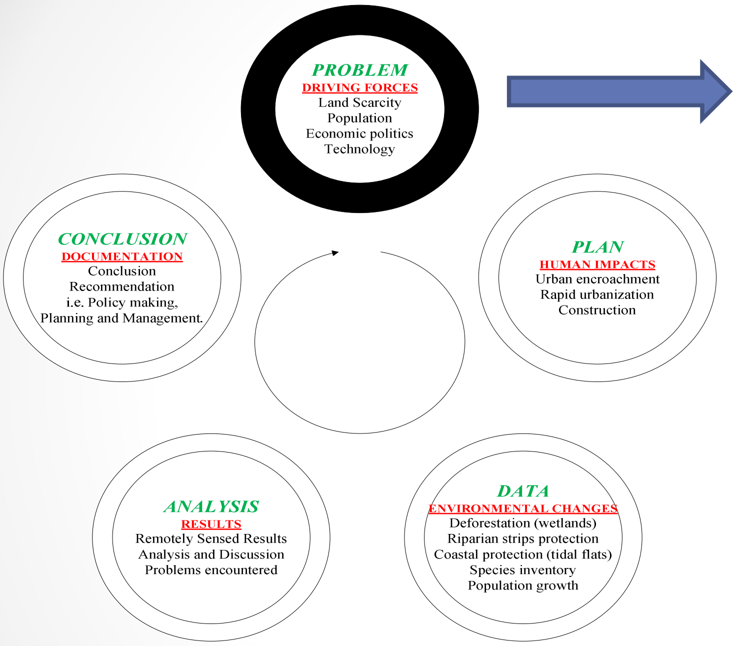


Figure 2: A descriptive array of the study area from continental to local view not drawn to scale.

Conceptual framework



Factors contributing to wetland loss

1. Coastal urbanization
2. Industrialization and
3. Changes in local hydrology (Jon et al., 2005)
4. Occasional dredging and reclamation
5. Sand mining and channelization
6. Oil and gas installation
7. Nypa palm dispersion
8. Wood and tidal flat extraction (Isebor, 1993; World Bank, 1995; NDES, 1997; Ajao et al., 1997; SEDAC, 2001; Godstime et al., 2005)
9. Population (Pepple, 2011 and 2013)

Figure 3: Shows conceptual framework for this study.

METHODOLOGY

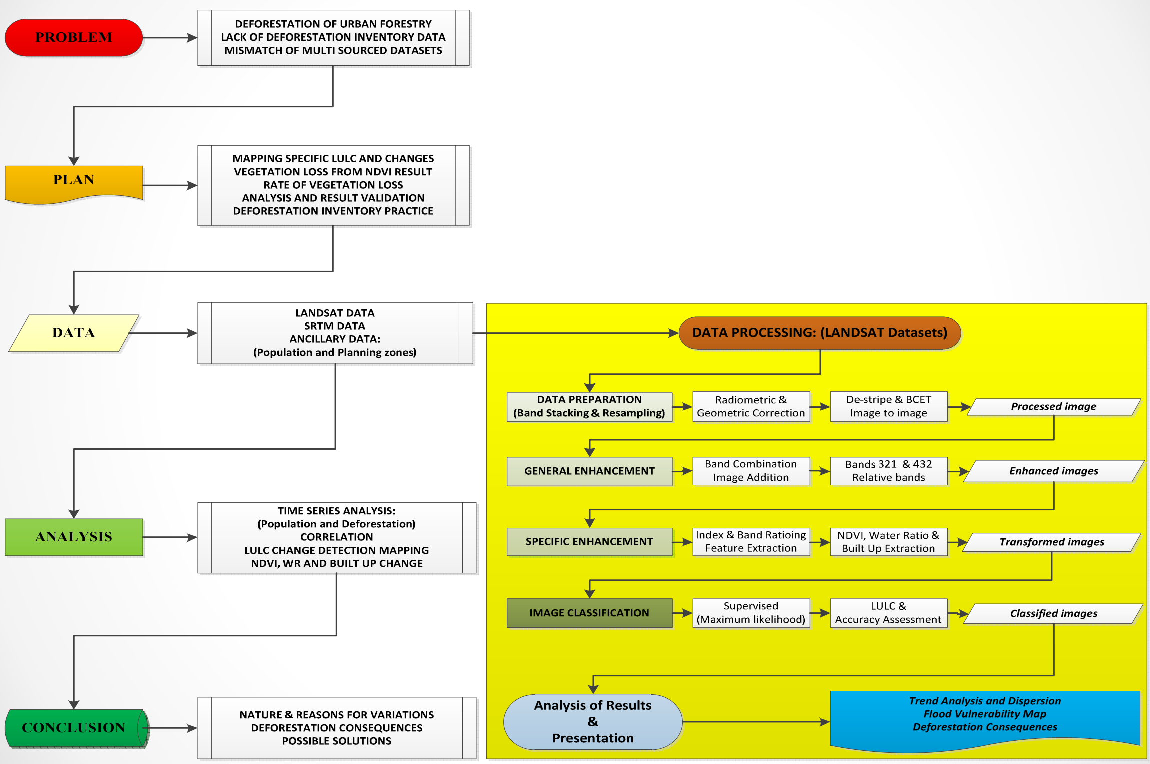


Figure 4: Flowchart of Port Harcourt Wetland Deforestation assessment project.

RESULTS FOR OBJECTIVE ONE

To extract past and recent environmental situation using spatial data processing techniques that will identify vegetation amongst other features.

Table 1: Shows area and change calculation from NDVI statistics for all dates.

Interval	Before Impact	After Impact	Change	Change	Annual change Rate	Inference	Spacing in years
	Area (ha)	Area (ha)	Area (ha)	Area (%)	Area (ha/yr)		
1972 - 1976	5984.02	6229.12	245.100	4.096	61.275	Gain	4
1976 - 1984	6229.12	5060.44	-1168.680	-18.762	-146.085	Loss	8
1984 - 1987	5060.44	7219.52	2159.080	42.666	539.770	Gain	3
1987 - 1999	7219.52	5347.09	-1872.430	-25.936	-156.036	Loss	12
1999 - 2003	5347.09	5791.42	444.330	8.310	111.083	Gain	4
2003 - 2007	5791.42	2920.27	-2871.155	-49.576	-717.789	Loss	4
2007 - 2012	2920.27	1633.91	-1286.355	-44.049	-257.271	Loss	5

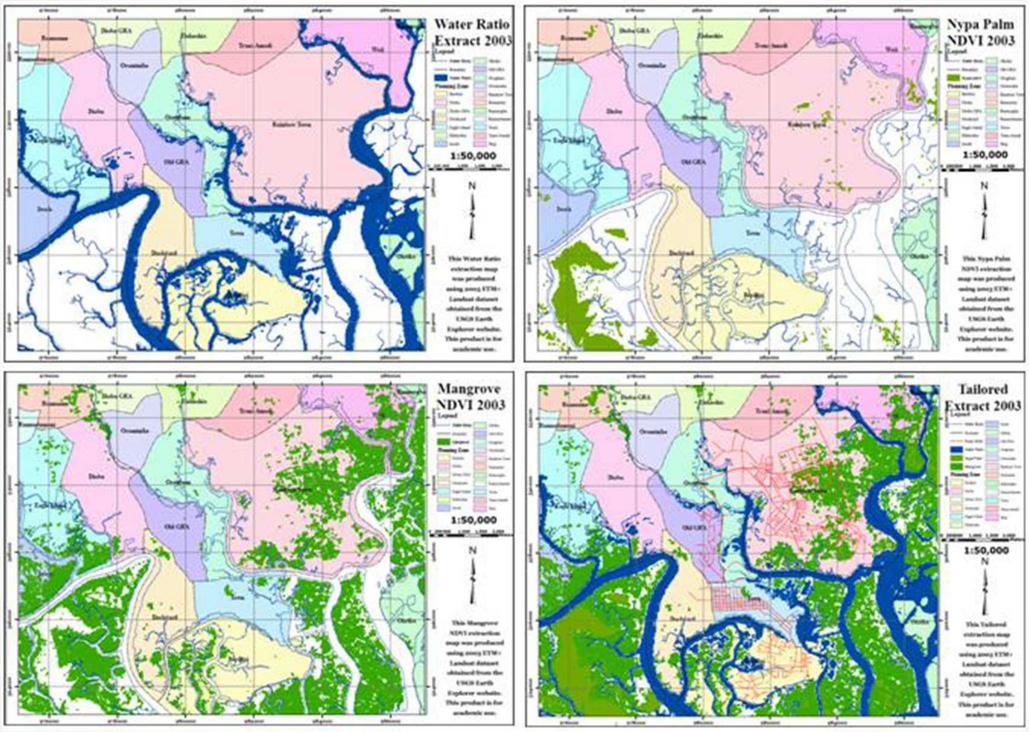
Source: Geo-database (Author, 2013).

Table 2: Shows area and change calculation from NDVI statistics for first and last dates.

Interval	Before Impact	After Impact	Change	Change	Annual change Rate	Inference	Spacing in years
	Area (ha)	Area (ha)	Area (ha)	Area (%)	Area (ha)		
1972 - 2012	5984.02	1633.91	-4350.109	-72.695	-108.753	Loss	40

Source: Geo-database (Author, 2013).

RESULTS FOR OBJECTIVE TWO



Figures 5: Shows individual and combined feature extraction maps.

RESULTS FOR OBJECTIVE THREE

Using Table 3 below as an interpretation key figure 5 the composite index map could be effective analysed using the tri-stimulalus theory for addition (or in the reverse form subtraction of colours.

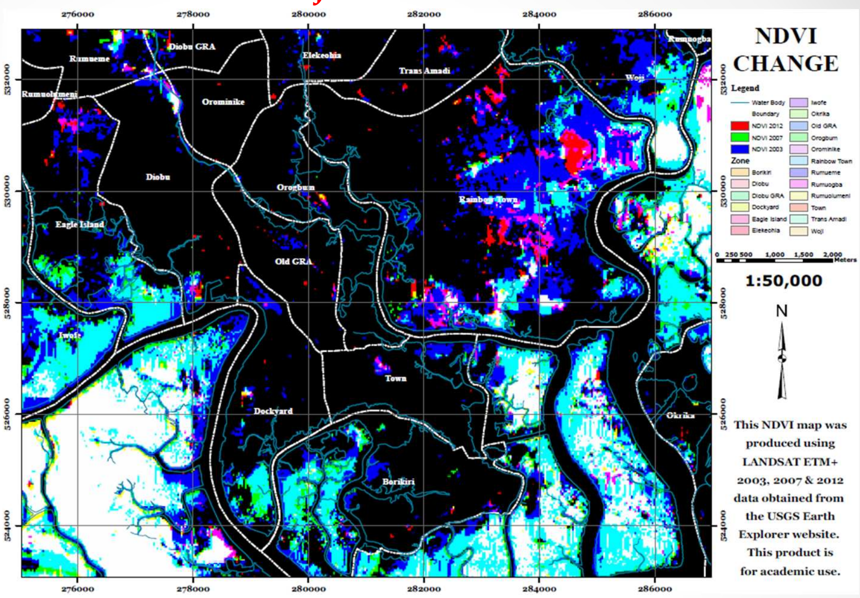


Figure 6: NDVI map for LANDSAT ETM for 2003 in blue, 2007 in green and 2012 in red.

Table 3: Binary image interpretation for the last three epochs in RGB composite (2003, 2007 and 2012).

S/No	Colour	Combination	Interpretation
1	Black	R - G - B	No vegetation in all images (does not exist 2003, 2007 & 2012 images).
2	White	R + G + B	Vegetation before 2003 (exist in all images).
3	Magenta	B + R	Vegetation before 2003 and after 2007 (exist in 2003 & 2012 images).
4	Green (G)	Green only	Vegetation after 2003 and before 2012 (only in 2007 image).
5	Yellow	R + G	Vegetation after 2003 (exist in 2007 and 2012 images).
6	Blue (B)	Blue only	Vegetation before 2007 (only in 2003 image).
7	Red (R)	Red only	Vegetation after 2007 (only in 2012).
8	Cyan	G + B	Vegetation before 2012 (exist in 2003 and 2007 images).

SWOT ANALYSIS

1 **Strengths**

- The researchers in depth knowledge of the study area
- Ability to utilize the PPDAC approach in solving real life problems.

2 **Weaknesses**

- Limited previous academic studies on this area
- Availability of required datasets

3 **Opportunities**

- It will encourage wetland conservation in this area and creates opening for further studies by other researchers.
- Could be utilized as a reference material to guide legislation in the future.

4 **Threats**

- Time constraint in image pre-processing and processing.
- Demands high techniques in handling multi sourced datasets.

Contribution to Knowledge

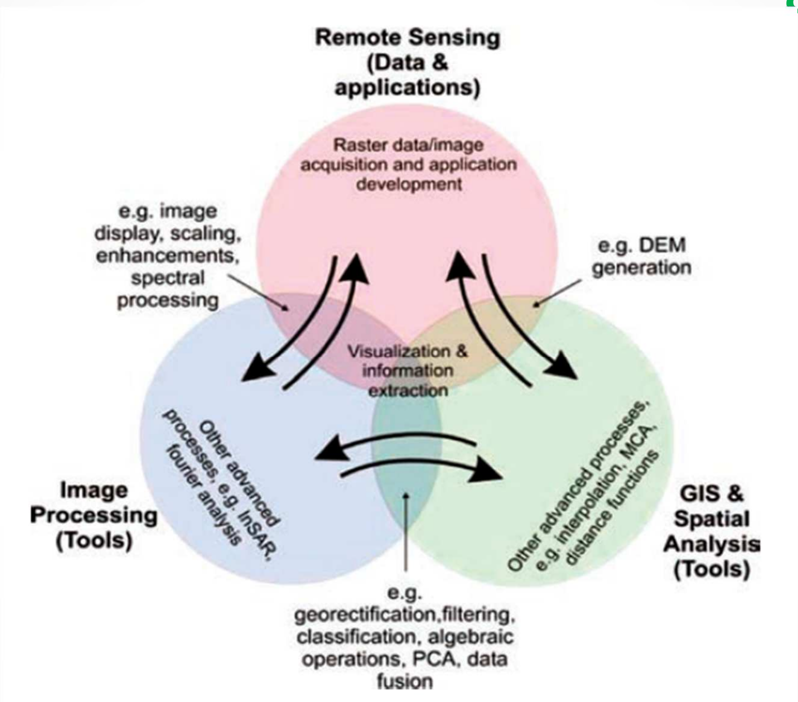


Figure 7: Showing synegy of three branches of Geomatics adapted from Lui and Mason (2009).

XXV International Federation of Surveyors Congress, Kuala Lumpur, Malaysia, 16 – 21 June 2014

CONCLUSION

The completion of this study has demonstrated the relevance of spatial planning employing image processing analysis and geo-information in revealing urban wetland loss within the coastal suburbs. In monitoring estuarine ecosystem such as the Port Harcourt wetlands for its preservation management high-quality vegetation maps produced from temporal vegetation indices can be employed to monitor changes.

Remotely sensed data offers an alternative measurement of vegetative characteristics that provides a more synoptic view to remote terrain. Hence in monitoring estuarine ecosystem such as the Port Harcourt wetlands for its preservation management medium scale vegetation maps were produced using the temporal vegetation index extract.

Finally, the acquired LANDSAT datasets were effectively utilized to obtain measurements and map the aforesaid temporal vegetation loss. Therefore, for the forty (40) years under review a loss of 4350.109 hectares was recorded as a result of deforestation of urban forestry at annual change rate of 108.753 hectares.

RECOMMENDATIONS

Further study on this area is recommended to validate the results obtained from this study. Hence the data processing techniques to be used should be done taken account of the problems encountered in this study.

The Geographic Information System, Remote Sensing approach and image processing approach should be employed for yearly map updating as a means of monitoring construction activities on or along low-lying elevated land forms.

Higher resolution datasets are therefore recommended for effective discrimination amongst the two wetland vegetation of interest.

Special thanks to reviewers, senior colleagues and contributors to this presentation

and the audience for your apt attention!!!

Terima kasih

Jumpa anda di Sofia 2015!

Ще се видим в София! 2015

See you in Sofia 2015!