Use of GIS and Remote Sensing Technology as a Decision Support Tool in Land Administration : The Case of Lagos, Nigeria

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Scope of the Presentation

- Background Information and Issues
- Objectives of the Research
- Study Area and the Methodology
- Results and Discussion
- Policy Recommendations
- Conclusion
- Acknowledgement

Background Information/the Issues

- In the last several years, Lagos Metropolis has emerged as one of the fastest urbanizing cities in the West African Sub-region. In the absence of a regular use of information management systems, limited effort has been made to keep track of change in the rapidly growing city for policy making in land administration.
- The rapid urbanization rate in the area has not only created unprecedented consequences by diminishing the quality of the environment but it raises serous implications for land management in the region.
- Socio-economic, ecological and policy elements are the main factors fuelling the land crisis in the Lagos Metropolis area.

Background Information/the Issues

- In places such as Lagos the use of information technologies in land administration is marred due to lack of spatial information tools and infrastructure, inadequate training and lack of coordination between agencies
- To tackle the issues of such a mega city, up-to-date knowledge and skills would be required to capture and analyze land information in order to steer and control city's expansion as well as infrastructure development, make well-motivated choices in planning and (spatial) designs.

Objectives of the Research

- To update the literature
- To design a decision support tool for land administration
- To demonstrate how latest advances in geo-spatial information technology can guide planners and policy makers towards an improved land administration.

Study Area and the Methodology

STUDY AREA

The geographic coordinates: latitude $6^0$2'N to $6^0$4'N Longitude $2^0$45' E to $4^0$20'E

Study Area and the Methodology

- Lagos state is situated in the South Western Nigeria within latitude $6^0$2'N to $6^0$4'N and longitude $2^0$45' E to $4^0$20'E
- The state is bounded from the North and East by Ogun State, in the West by the Republic of Benin and the South by the Atlantic Ocean. The total land mass of the state stretches over 3,345 kilometer with an estimated population of about 15 million.
- 40% of the total land area in the state is covered by water and wetlands. Other notable features are: Lagoon, and creeks, wetlands, barrier islands, beaches and estuaries (Iwugo 2003).

Study Area and the Methodology

- Lagos is currently ranked as the fifth largest city in terms of population.
- Population of Lagos by 2015 is projected at 24.6 million making it the third largest city.
- The rapid expansion of Lagos seem to have surpassed efforts in physical planning as well as the development of infrastructure facilities in meeting the needs of its inhabitants.

Study Area and the Methodology

- Table 1a Lagos State Population (in millions) Monitor

Year	Population	Global Ranking
1997	11.5	12th
1998	12.1	10th
1999	13.4	8th
2015	24.5	3rd

Source: United Nations World Population Monitor 1998/1999

Study Area and the Methodology

- **DATA**

- Primary and secondary data were provided through government sources and data bases from other organizations.

-University of Maryland free Online Data Services provided the raw spatial data and satellite images which was analyzed with ARC View GIS and ERDAS IMAGINE image processing software.

Study Area and the Methodology

- **DATA ACQUISITION AND PROCESSING**

- Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM+) data pair of December 18, 1984 and February 6, 2000 covering Lagos, Nigeria was acquired from the University of Maryland free Online Data Services.
- The images were imported into ERDAS Imagine Image Processing software for further processing.
- A layer stack technique was performed to group the single band images together.
- Further Geometric corrections of the images to remove few scattered clouds in the image was performed.
- Both images were projected to the Universal Traverse Mercator (UTM) coordinates zone 31. The spheroid and datum was also referenced to WSG84.

Study Area and the Methodology

- **DATA PROCESSING (Continued)**

- Histogram Equalization enhancement technique was performed on all the images, and subset to an area of approximately 2,383.994 km^2 to cover Lagos and its vicinity.
- The images were later displayed as false-color composites with band combination of red as band 7, green as band 4, and blue as band 2. All the images were later categorized using unsupervised classification technique.

Results and Discussion

- Table 2: Results of the classified 1984 and 2000 images

Classes	Area (ha) in 1984	Area (ha) in 2000	% change (1990-2000)
Water	29,040	24,708	-14.91
Settlement	24,360	63,317	159.92
Vegetation	180,384	140,568	-22.07
Agriculture	4,615	9,806	112.48

Results and Discussion

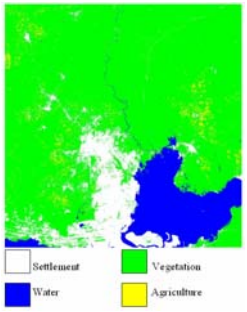

Figure 1: 1984 Classified Landsat Image of Lagos and its Vicinity

Results and Discussion

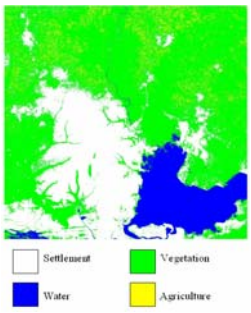

Figure 2: 2000 Classified Landsat ETM+ Image of Lagos and its Vicinity

Results and Discussion

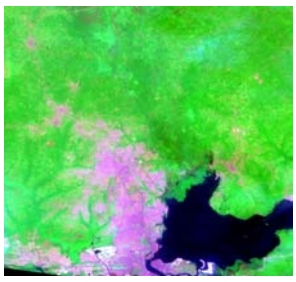

Figure 3: 1984 False-Color Composite (742) Landsat Image of Lagos and its Vicinity

Results and Discussion

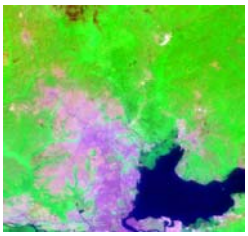

Figure 4: 2000 False-Color Composite (742) ETM+ Image of Lagos and its Vicinity

Results and Discussion

- These results suggest that the state and national administration should adopt policies that would protect the land mass of this vulnerable city by taking advantage of the latest advances in geospatial information technologies given their usefulness as advanced warning information devices for boosting decision support system in land management in the area.
- The results also indicate that geospatial information technologies are the key to planning, management and administration of land in areas such as Lagos.
- This study serves as a road map towards the development of the much needed geospatial information infrastructure for the effective administration of land areas under the pressures of urbanization.

Policy Recommendations

- Encourage Community Involvement in Land Management and Administration
- Provide Support for the Education and Training of Land Administrators
- Allocate Funds For Upgrading Spatial Data Infrastructure
- Strengthen Existing Policy With Emphasis on Periodic Geospatial Inventory of Land
- Design a Regional Land Information System for Monitoring of Change

Conclusion

- Geospatial information technologies are the key to planning, management and administration of land in areas such as Lagos.
- The tools and methods used in the study serves as a road map to the development of the much needed geospatial information infrastructure for the training of land managers and the effective administration of land areas under the pressures of urbanization.

Acknowledgement

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