



Remote Sensing and GIS Application in Coastal Zone Management: A Case Study of Ghana

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13:30 – 15:00, Ruby Auditorium

Remote Sensing and GIS Application in Coastal Zone Management: A Case Study of Ghana

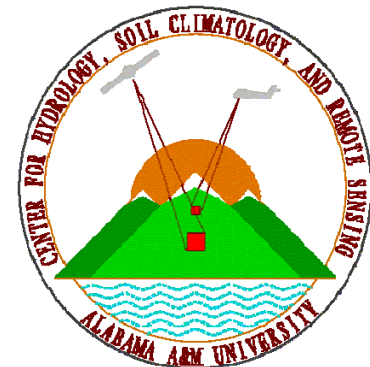
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Historical Significance of Coastal Ecosystems

Coastal ecosystems are highly important to most nations around the globe and serve a number of productive functions

- In the tropical areas, coastal mangrove vegetation is important in stabilizing coastal ecosystems.
- Medicinal source among both urban and rural dwellers, and plant medicines are widely traded in the rural and urban markets.



Historical Significance of Coastal Ecosystems

- Coastal ecosystems are home to biological diversity providing water and primary productivity upon which countless species of plants and animals depend for survival.
- It also serves as resource which provides economic benefit: water supply, fisheries, agriculture, timber production, energy resources, wildlife resources, transport, recreation and tourism opportunities (IUCN, 1999).



Historical Significance of Coastal Ecosystems

Despite these benefits, coastal vegetation in Ghana is threatened by human and natural caused factors. These includes:

- Urbanization – Rural-to-urban migration
- High population growth resulting from economic opportunities along the coastal cities
- High economic activities such as salt and sand mining along the coast
- Agriculture



Anthropogenical pressure

Population migration

City	Population (yr)			Increase	
	1970	1984	2000	1970-1984	1984-2000
<u>Sekondi</u>	64,000	70,000	114,000	9.4	62.6
<u>Takoradi</u>	80,000	118,000	175,000	47.5	48.3
Cape Coast	57,000	66,000	82,000	15.8	24.2
<u>Winneba</u>	31,000	27,000	40,000	-12.9	48.1
Accra	624,000	969,000	1,660,000	55.3	71.3
<u>Tema</u>	61,000	100,000	141,000	63.9	41.0

Environmental Impact of Sand Mining along the Coast Areas



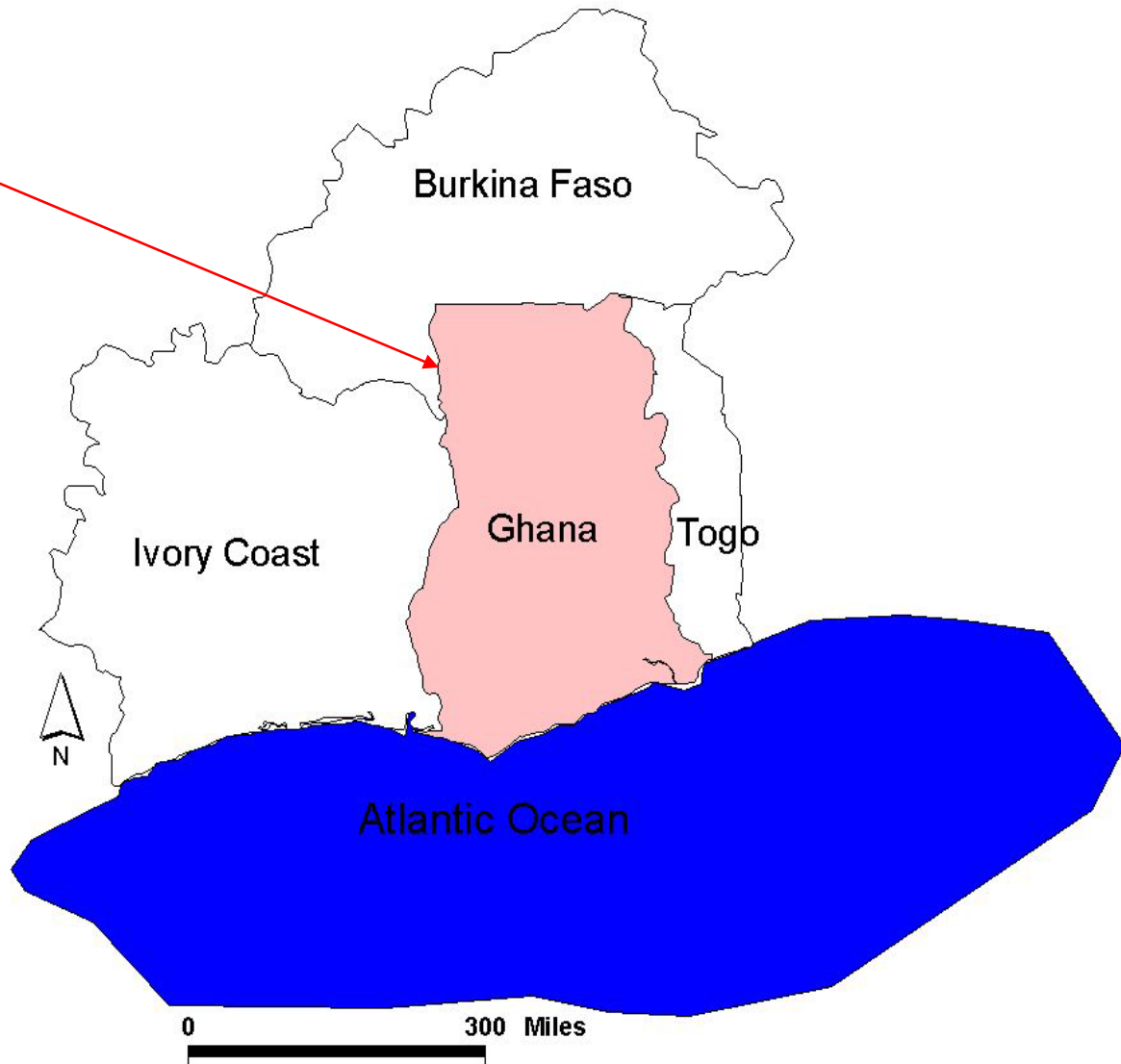
Destruction of primary Forest in the coastal areas



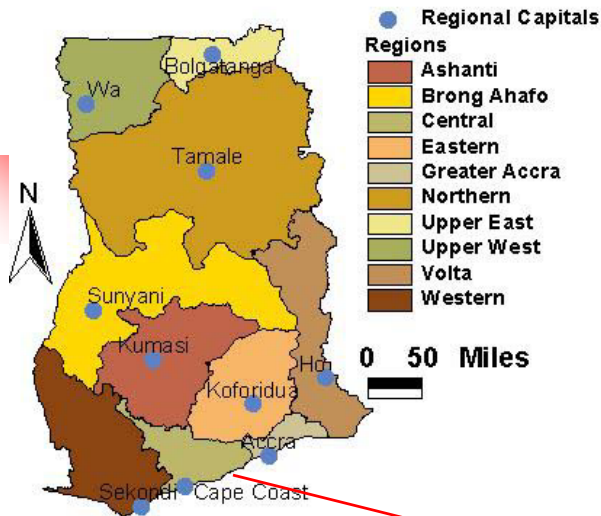
Accelerated erosion
Soil compaction
Soil Crusting

Location of Ghana

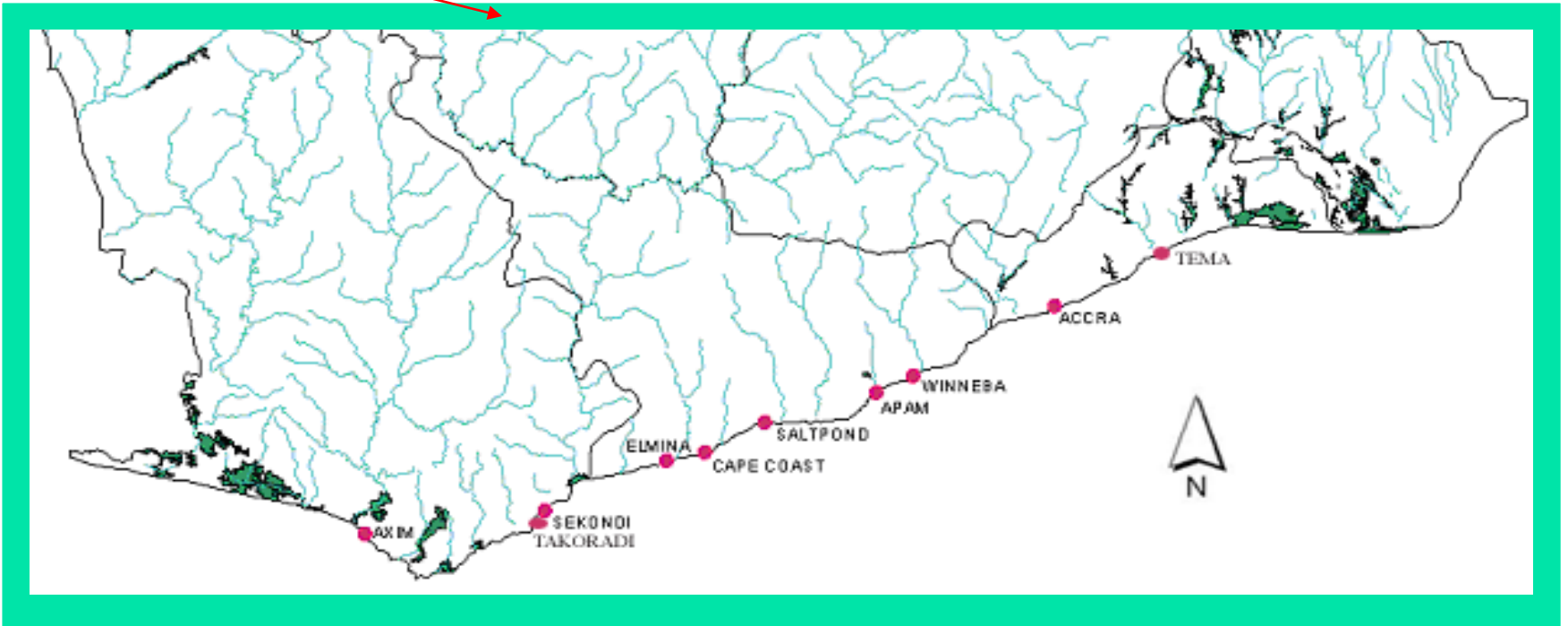
Ghana, former British Colony. It gained its independence in 1957 and shares borders with Togo in the east, Ivory Coast in the west, Burkina Faso in the north, and Atlantic Ocean in the south.



Study Area



For the purpose of this study, the investigation will focus on the east coast of Ghana.





Investigation of Degradation



Use of multi-spectral and multi-temporal remote sensing:

- Spectral range,
- Affordable cost, and
- Rapid coverage of large areas

Purpose of Study

- ❖ To use Landsat TM and ETM+ images to detect land degradation along the east coastal of Ghana.
- ❖ create an information database to assist in the effective planning and management of resources along the coast of Ghana .



Methods

Images

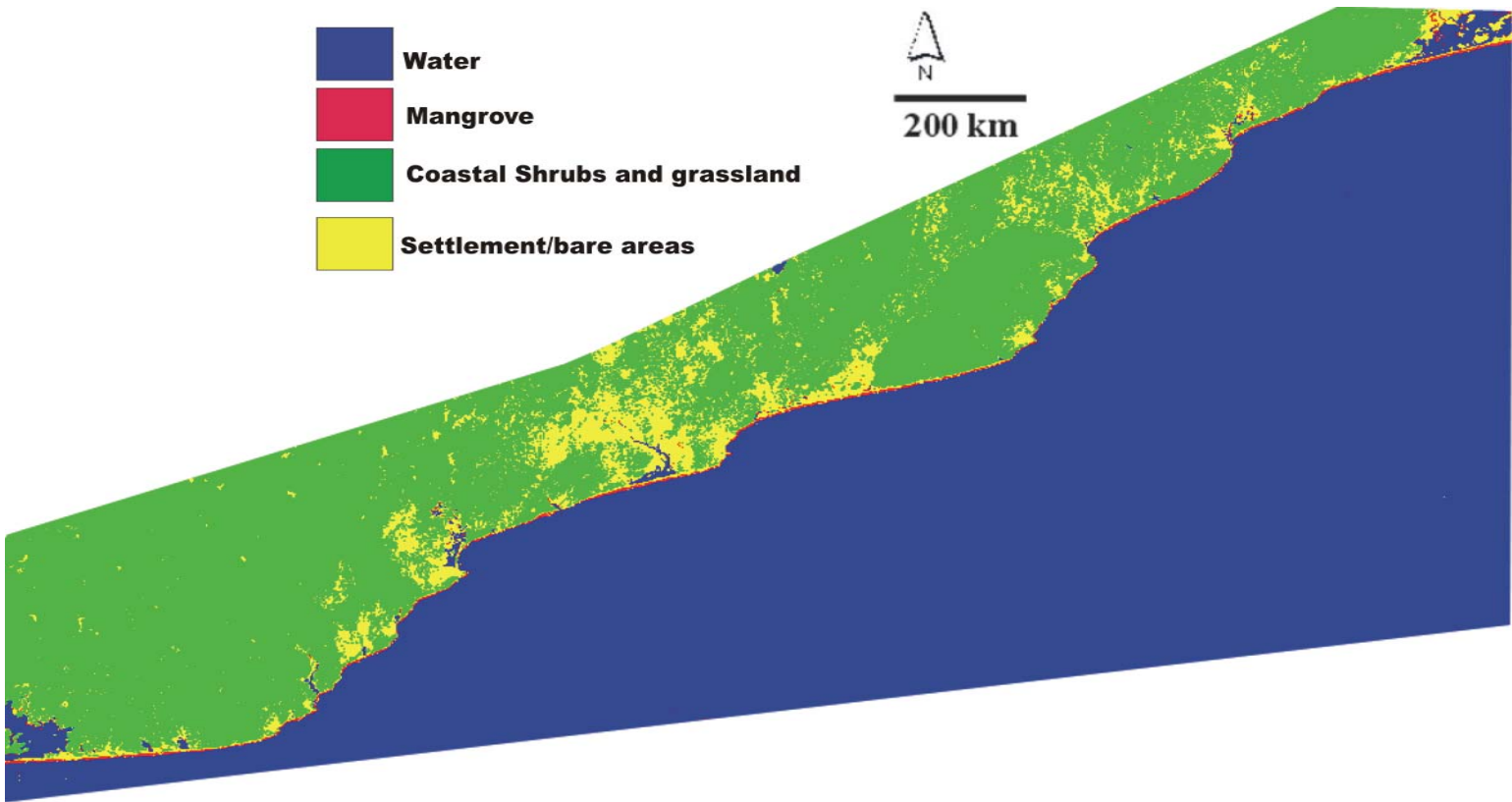
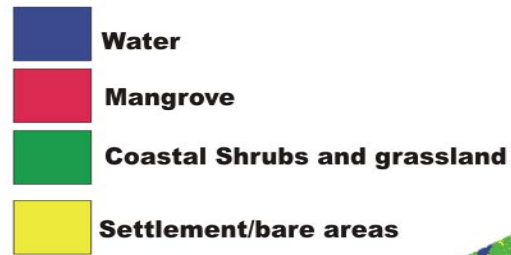
Imagery Type	Date
Landsat TM	25 May 1985
Landsat ETM+	16 June 2000

Image Processing

- Radiometrically corrected
- Georeferenced and co-registered to UTM coordinates
- Subset to emphasize the study area was displayed as 4-3-2 false color composite.
- Enhancement with histogram equalization
- Unsupervised classification

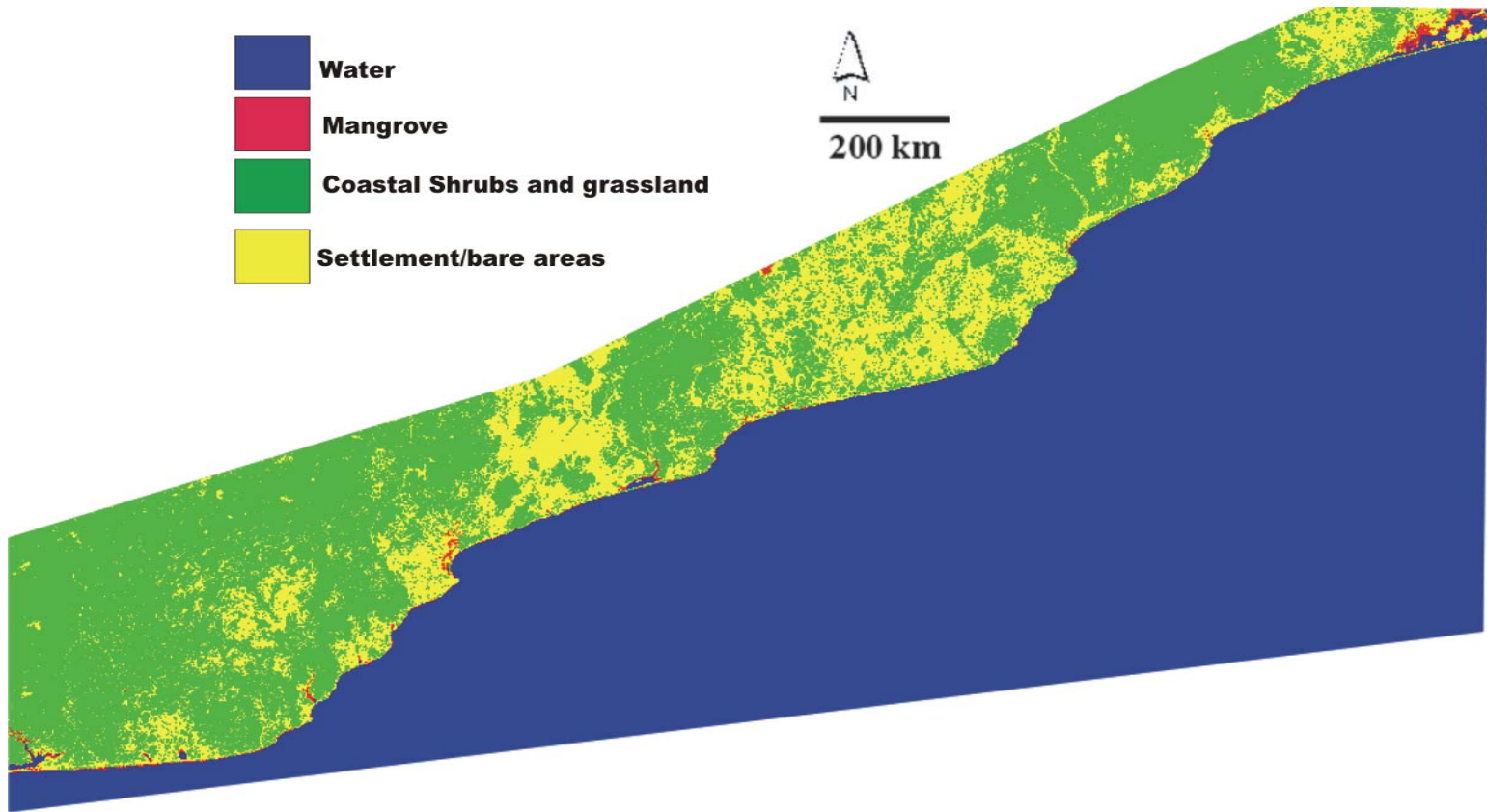
Results

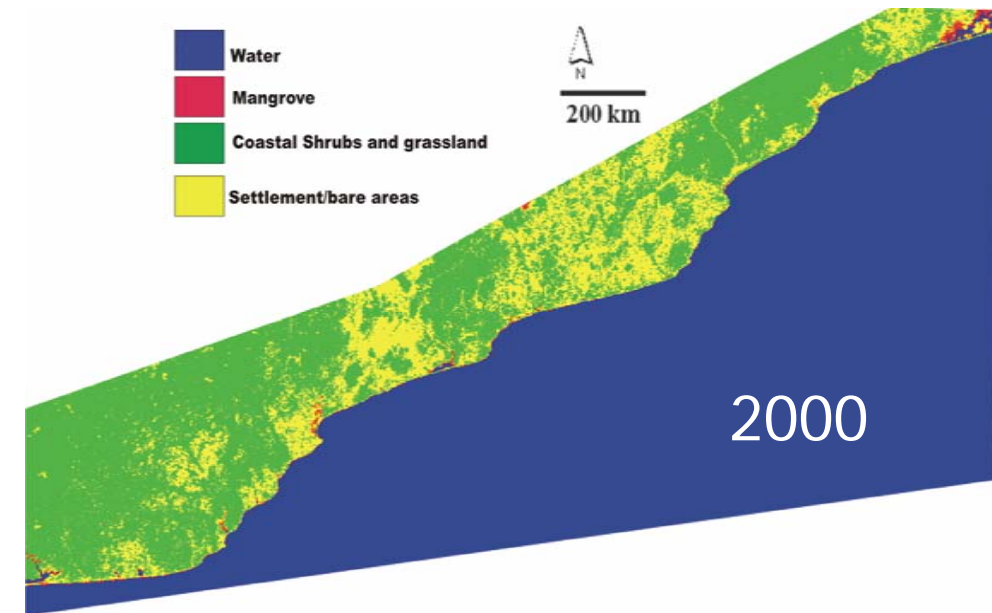
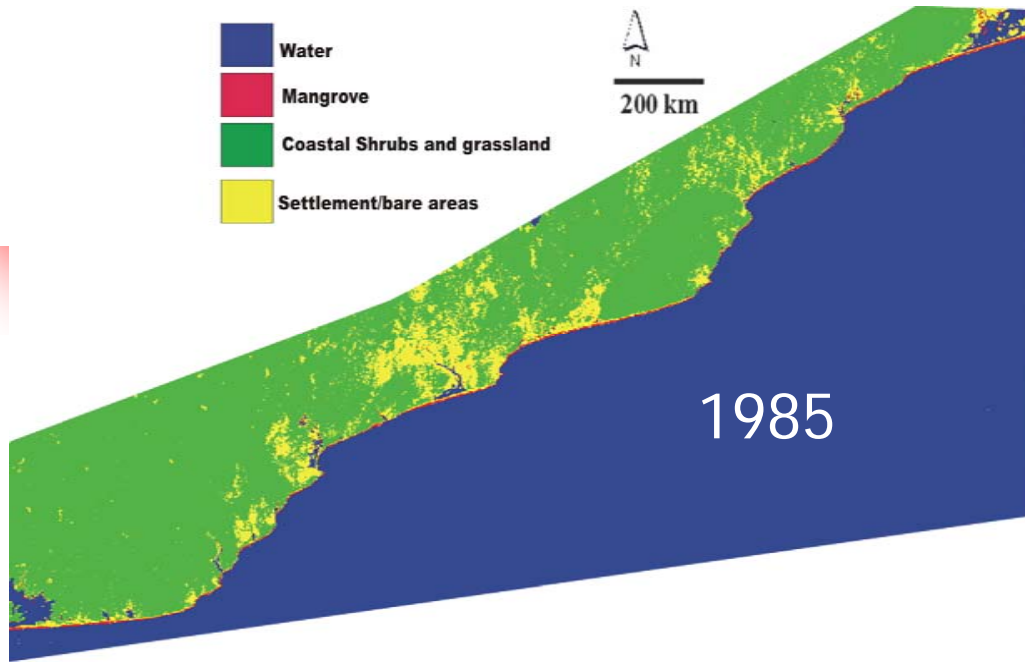
1985



Results

2000





Results

Classes	Area (ha) in 1985	Area (ha) in 2000	% change (1985-2000)
Water	98,631	98,119	-0.51
Mangrove	842	626	-25.65
Settlement/bare areas	8,632	18,912	119.09
Coastal Shrubs/grassland	42,296	37,744	-10.76

From these figures and table, three coastal environmental features – water, mangrove and coastal grassland posted a decline from 1985 to 2000, whereas settlement increased. For example in 1985, mangrove declined from 842 to 626 hectares in 2000 representing an overall decrease of 25.65 percent. There was also a decline of 10.76 and 0.51 percent for coastal grassland and water respectively during the same study period. Settlement on the other hand increased from 8,632 in 1985 to 18,912 hectares in 2000 representing a percentage change of 119.09.

Evidence of Degradation Along the Coast



Quarrying along the coast of Accra

Evidence of Degradation



Dumping of refuse and sand mining along the coast of Accra

Evidence of Degradation



Erosion along the coast of Accra



Evidence of Degradation

Removal of soil material from sensitive areas along the coast



Evidence of Degradation



Land converted into salt pans



Recommendations and Conclusion

- Government policies that address the welfare of the people would help to mitigate some of the encroachment along the coast.
- There is also the need for effective monitoring along the coast. Penalty in the form of fines for offenders will also go a long way to reduce the degradation.
- There is need for strict Government regulations to prevent environmental degradation at present



Recommendations and Conclusion

- Finally public education and awareness of the population on the importance of coastal resources would as well help combat environmental degradation.
- In conclusion, this study shows that the use of remote sensing and GIS data in conjunction with other ancillary information could play an important role in the formulation of policies along the coastal areas of Ghana.



Thank You For Your Attention

