

VULNERABILITY AND ADAPTATION ASSESSMENT TRAINING WORKSHOP
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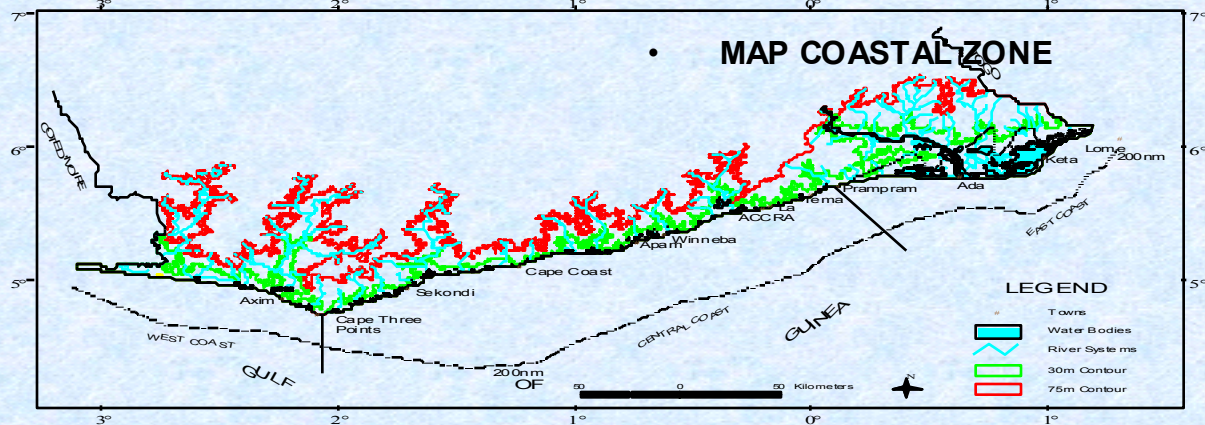
THE COASTAL ZONE OF GHANA: VULNERABILITY AND ADAPTATION ASSESSMENT TO CLIMATE CHANGE

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Map of Coastal Zone

FIGURE 1 : MAP SHOWING THE COASTAL ZONE OF GHANA



The Coastal Zone of Ghana and Sensitivity Mapping (Armah 2004)

Introduction

- The coastal zone may be divided into three geomorphologic zones:
 - West Coast, 95km, fine sand, gentle beaches, coastal lagoons.
 - Central Coast, 321km, embayed coast of rocky headlands, rocky shores, littoral sand barriers, coastal lagoons.
 - East Coast, 149km, sandy beaches, deltaic estuary of Volta River situated halfway in-between.

IMPACT OF CLIMATE CHANGE ON COASTAL ZONE OF GHANA

VULNERABILITY

1. Sea Level Rise

- Loss of land through erosion and inundation
- Increases in salinity of estuaries and aquifers
- Raised coastal water tables
- Exacerbating coastal flooding and storm surges
 - Identified vulnerable entities: Ecosystems, Infrastructure, Agriculture.

2. Translocation of upwelling ???

- Vulnerable entity: Fisheries (80,000 artisanal fishermen)

Problems

- **Risk Zone cannot be accurately delineated due to poor data. (*Risk Zone defined as area within CZ below 3 m contour*).**
- **Limited data on the topography of the coastal zone did not allow other scenarios to be evaluated. Required scale and adequacy were real problems.**
- **Maps are old (1:50,000) produced in 1974. Higher resolution maps (1:2500) restricted to only small sections of the risk zone**
- **Beach profiles are irregular and restricted to only few places**

Sources of Data

- **Data was collected on ecosystems, infrastructure, land, buildings, population that would potentially be vulnerable to sea level rise.**

ADAPTATION

- **Adaptation costs assumed protection for all critical areas i.e. areas with population density of 10 per km² .**
- **Where no adaptation measure was prescribed (do nothing option) area threatened was classified as “at risk”**
 - **Land and infrastructure were considered lost**
 - **People assumed displaced**
 - **Wetlands considered lost**

MITIGATION MEASURES **PROPOSED**

- **Do nothing**
- **Set back**
- **Controlled abandonment (with protection of important areas)**
- **Total protection of all areas with pop. density > 10 per km²**

RANKING COASTAL VULNERABILITY

- **Ranking**

Ranking Coastal Vulnerability

- Several approaches exist for Vulnerability ranking of the CZ to sea level rise.
- Approaches include classification of coastal features and subsequent ranking (prioritization) of their vulnerability
- The ranking can be defined in:
 - Qualitative terms (e.g. high, medium, low vulnerability)
 - Quantitative terms (e.g. numerical values)

RANKING CONT'D

- Still on Ranking

STILL ON RANKING

- Ranking is only a tool assessing magnitude of consequences, and ranking is a balance between many interests
- The guiding principles of the ranking proposed are:
 - Transparency
 - Easy to accept and explain to decision makers
 - The rankings shall include ecological features and human use features, but these features preferably should be ranked separately

RANKING CONT'D

- **BASIS**

Scope

- The vulnerability rankings shall be based on the consequences of sea level rise in the coastal areas of Ghana

RANKING CONT'D

- **ECOLOGICAL FEATURES**

Ranking of Ecological Features

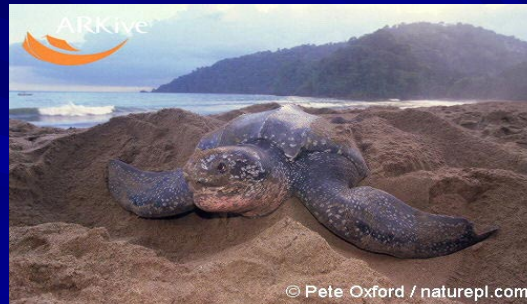
- Ranking of vulnerability of ecological features in terms of sea level rise could be carried out in two steps:
 - **Step I:** Identification and classification of the coast in terms of different types of ecosystems
 - **Step II:** Ranking the vulnerabilities of the different ecosystems in terms of scenarios of sea level rise
- Categories (Qualitative):
 - Very high vulnerability
 - High vulnerability
 - Medium vulnerability and
 - Low vulnerability

RANKING CONT'D

- **SANDY BEACHES CAN BE RANKED AS HIGHLY VULNERABLE DUE TO BIODIVERSITY REASONS**

Sandy beaches with turtle nesting sites

- Characteristics
 - Erosion takes away sand and exposes bedrocks and turtles may not nest in preferred areas
- Vulnerability
 - **High vulnerability**



*Leatherback turtle covering eggs after laying.
Photo: Pete Oxford*

RANKING SOCIO-ECONOMIC CONCERNS

STEPS

Socio-economic Ranking

- The ranking of the vulnerability of socio-economic features may involve two steps:
 - **Step I:** Identification and classification of coast in terms of socio economic importance
 - **Step II:** Ranking of human use features in terms of vulnerability to sea level rise

RANKING SOCIO-ECONOMICS

- GHANA

Example of Rankings from Ghanaian perspective

Socio-economic features in the coastal area	Vulnerability to sea level rise
Fishery and Fishery Activities Fishery in open water Fishing villages having vessels and canoes in number > 50 Fishing villages having vessels and canoes in number ≤ 50 Coast used for intensive beach seine fishery (villages having >5 nets) Coasts used for beach seine fishery (villages having ≤ 5 nets) Coasts with lagoon fishing and/or aquaculture	High High Medium Very high High Low to High
Industrial and Agriculture Activities Coast with salt production utilizing marine water Coast with major port Coast with industrial plant relying on marine water intake Coastal Farming (e.g. shallot cropping)	Low to high High Low to high High
Tourism and recreational issues Coast with tourist hotels at the water front having > 20 rooms Coast with tourist hotels at the water front having ≤ 20 rooms Coasts used for recreational purposes	High Medium Medium
Historical Monuments and Amenities Coasts with historical monuments (forts/castles) near waterfront	high

SOCIO-ECONOMICS IMPACTS (CONT'D)

- FISHING

Coast with lagoon fishing and/or aquaculture plants

- Characteristics

- Coastal lagoons with artisanal fishery
- Few small-scale aquaculture ponds exist

- Impacts on lagoon fishing and/or aquaculture

- Only artisanal fishery in open lagoons has a potential of being impacted

- Vulnerability

high vulnerability



Aquaculture facility at Ada

SOCIO-ECONOMICS IMPACTS (CONT'D)

- SALT PRODUCTION

Coast with salt production utilising marine waters

- Characteristics

- Salt production takes place within or near coastal lagoons
- Production may involve pumping water from adjacent sea
- Extensive salt production occurs in about 14 lagoons

- Impacts on salt production

- Land for salt production may be lost

- Vulnerability

- Very high vulnerability



Salt production, Keta lagoon

INFRASTRUCTURE AT RISK
(Coastal road and rail to main Port in Ghana)



SOCIO-ECONOMICS IMPACTS (CONT'D)

- TOURISM

Coast with tourist hotels at the waterfront

■ Characteristics

- Hotels located next to shoreline that depends on natural amenities of the coast
- About 28 of such hotels along coastline with similar number of minor resorts and campsites

■ Impact

- Infrastructure could be washed away

■ Vulnerability

- High vulnerability if the hotel has more than 20 rooms
- Medium vulnerability if the hotel has 20 or less rooms

SOCIO-ECONOMICS IMPACTS (CONT'D)

- MONUMENTS/TOURISM

Coast with historical monument near the waterfront

- Characteristics
 - Around 26 forts and castles along the coastline
 - They have a unique place in world history
- Impacts on historical monuments
 - Direct impact on buildings or sites
- Vulnerability
 - **High vulnerability**



Battlement of Fort, Axim

VULNERABILITY RANKING RESULTS

- **BIOPHYSICAL AND SOCIO-ECONOMIC**

Results of Vulnerability Ranking

Ranking	Ecological Features	Human Use Features
Number and value of features of very high vulnerability	x	y
Number and value of features of high vulnerability	xx	yy
Number and value of features of medium vulnerability	xxx	yyy
Number and value of features of low vulnerability	xxxx	yyyy

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- **BIG QUESTION**
- **NOW DO WE COMBINE ECOLOGICAL AND SOCIO-ECONOMIC SCORES TO DETERMINE OVERALL RANK OF VULNERABLE SITES (COASTAL STRIPS) ETC ????**

KETA

- **Most erosion prone area, now protected in 2004 (for economic and socio-political reasons! Not sea level).**
- **Cost US Dollars 90 million**

Physical structures eg. groynes,
breakwaters (Keta, Tema, Takoradi)



VOLTA DELTA ESTUARY UNDER THREE DIFFERENT SCENARIOS

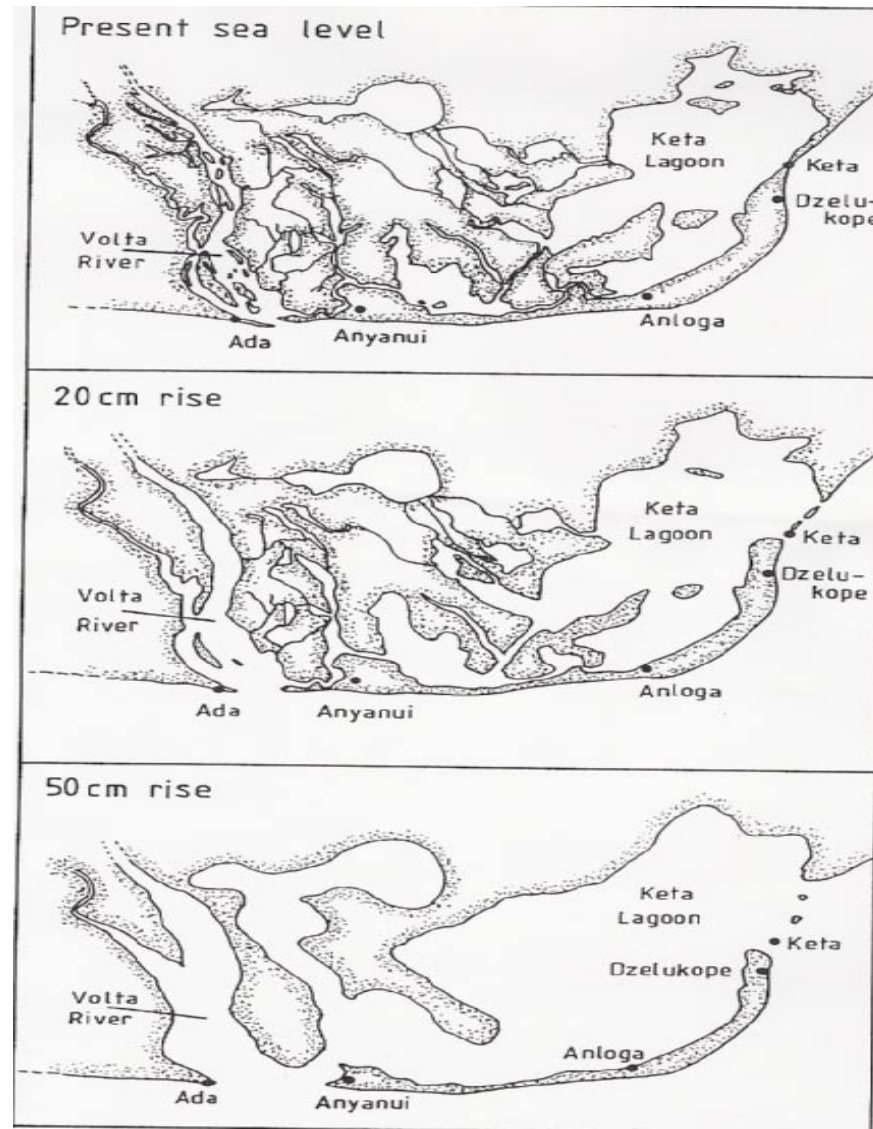


Figure 6: Possible changes in the coastline at the Volta Delta under the three different sea level rise scenarios.

- YOUR ANSWER?
- JUST AS BAD AS MINE !!!

THANK YOU