



# ***Climate Change***

## ***Relevance in IWRM***



# Climate Change Relevance to IWRM

- *Actions to manage water are not different*
- *Interventions to improve water management are not (much) different*
- *The difference is that the basic systems are changing*
- *Planning is more difficult – rate of change uncertain, needs a risk based approach*



# Climate Change Relevance to IWRM

*Water availability declining*

➤ *rate of decline uncertain*

*Water demands rising*

➤ *rate of increase uncertain*

*Water quality declining*

➤ *rate of increase uncertain*

*Ecosystem changing*

➤ *rate of change and type of change uncertain*



# Who is Concerned with Climate Change?

## *1. Water and environmental planners*

- *Planning and management increasingly difficult*

## *2. Everybody else*

- *Public awareness, stakeholder participation increasingly important*



# What is the Climate Change Concern?

*Climate Change Mitigation – less relevance for IWRM than Climate Change Adaptation*

*Most mitigation actions are not generated from the water sector.*

*Exception: hydropower – Why?*

- hydro selected because of its lower emissions
- potential for carbon emissions from dead vegetation



# Hydropower Issues for IWRM

Hydropower not considered a water consumer

But changes the natural flow regime of the river:

- ecosystem change
- destruction of habitats
- loss of species
- hydro releases badly timed for other uses
- potential for multi-objective design and operation



# Climate Change Adaptation

*Climate Change Adaptation is a planning issue:*

- *risk is the potential for an action to lead to a loss*
- *also the potential for inaction to lead to loss*
- *vulnerability is the ability to cope with a damaging event*
- *can we cope with climate change without doing anything?*



# Climate Change Adaptation

*Requires a National Climate Change Adaptation Strategy*

*Water must be a key component as:*

- water is most affected, most vulnerable*
- water uses most important to economies*





# Climate Change Adaptation

*National IWRM Plans – Climate change adaptation should be embedded so that budget can be allocated*

- *Planning is a combined national / river basin concern*
- *Benefits to transboundary coordination and cooperation on climate change adaptation in the water sector*



# Climate Change Adaptation

*IWRM Plans incorporate climate change and adaptation:*

- *“no regrets” planning*
- *CC adaptation for sectors but with integration within IWRM*
- *Public awareness a key issue*



# Climate Change Adaptation

- Greater attention to drought and its management – more frequent, more severe
- Greater attention to flood management, flood warning – more frequent, more severe
- Serious consideration of agriculture, especially for irrigation – less water available, greater demands
- Greater consideration of environment because of impacts from CC alone



# Case Study: Climate Change Adaptation Strategy for Lagos, Nigeria





# Case Study: Climate Change Adaptation for Lagos, Nigeria

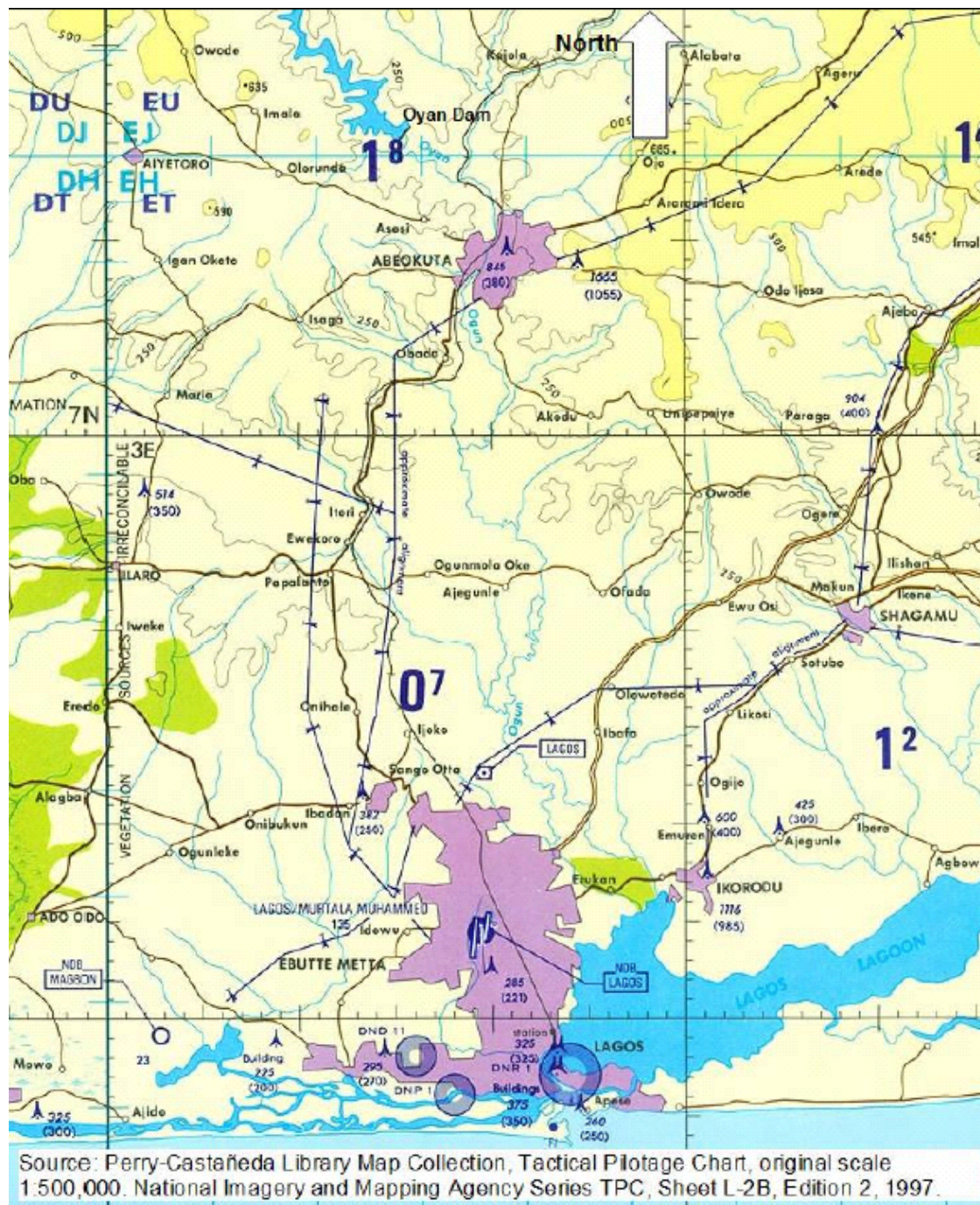




# Case Study: Climate Change Adaptation for Lagos, Nigeria







Empowered lives.  
Resilient nations.







# Case Study: Climate Change Adaptation for Lagos, Nigeria







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# Climate Change Adaptation Strategy - Lagos

Now: 20,000,000 people

Planning horizon: 2050 – 66,000,000 people!

## Climate Change Issues:

- Water supply
- Food (agriculture, irrigation)
- Waste water collection and treatment
- River flooding
- Coastal erosion and flooding



# Climate Change

## Coastal erosion and flooding

- 40 km of coastline















# Climate Change Adaptation Strategy - Lagos

Coastal erosion and flooding:

- major lagoon (connected to the sea)
- large slum area on lagoon (poor most vulnerable)



Empowered lives.  
Resilient nations.





# Climate Change Adaptation Strategy - Lagos

River flooding from Ogun River







# Climate Change Adaptation Strategy - Lagos

## Water supply and sanitation

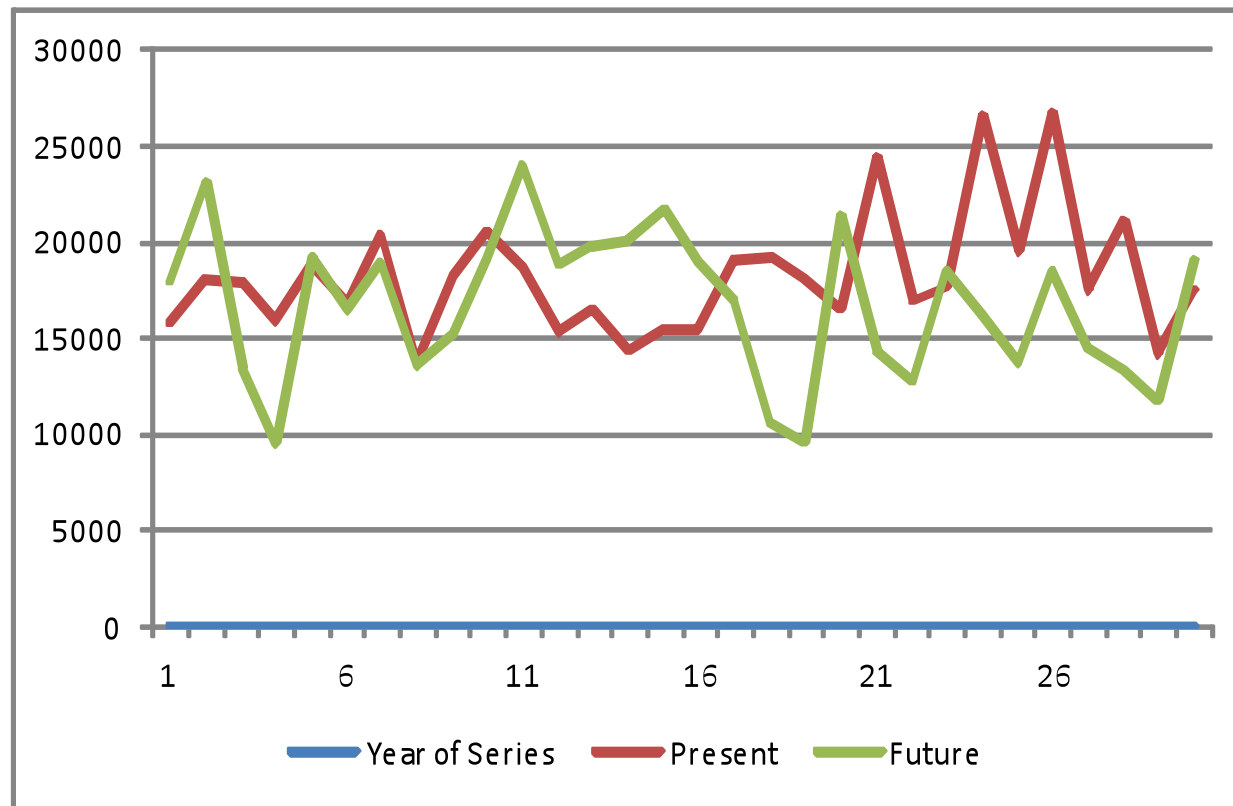






# Climate Change Adaptation Strategy - Lagos

## Evaluation of River Flow Volumes with CC

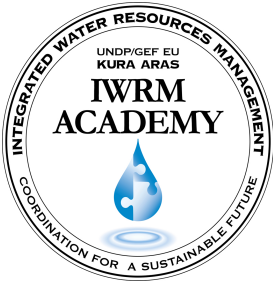




# Climate Change Adaptation Strategy - Lagos

## Agriculture and irrigation





# Climate Change Adaptation Strategy - Lagos

## Adaptation Strategy - Water Supply:

- not enough water in the river for all the people
- relies on water from the lagoon- saline and polluted!
- desalination technology linked with renewable energy technology
- must be coupled with waste water treatment
- increase in demands due to CC: 14%
- conflict with food security



# Climate Change Adaptation Strategy - Lagos

## Adaptation Strategy – Food Security:

- Agriculture will need more irrigation water from upstream reaches of Ogun River
- Ogun River is mostly in Ogun State (different state, requires transboundary considerations)
- Waste water collection and treatment
- River flooding
- Coastal erosion and flooding



# Climate Change Adaptation Strategy - Lagos

## Adaptation Strategy – River Flooding

- Very little impact from CC because of upstream storage of water.



# Climate Change Adaptation Strategy - Lagos

## Adaptation Strategy – Coastal protection

- Biggest CC issue
- Sea level rise already about 20 cm since 1880.
- Another 30 to 59 cm by 2050
- Without protection, loss of 1500 km<sup>2</sup> of high value land
- Will require major investments in sea defenses