Hydrologic and Urban Water Management Modeling Framework under URAdapt

Barnabas A. AMISIGO

CSIR-Water Research Institute (CSIR-WRI), Accra

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Outline

- Introduction
- Objectives of the hydro/UWM modelling
- Expected outputs of the modelling activities

- The hydro/UWM framework
- Stakeholder involvement and participation
- Candidate models in the framework

- Brief on climate change scenarios and climate downscaling

Introduction

Computer modelling will feature prominently in URAdapt.

Models will be used as tools to facilitate:

- **Structuring of available data and information.**
- **Identification of information gaps and needs.**
- **Development and implementation of scenarios.**
- **Simulation of the consequences/impacts of these scenarios on water supply, demand and use.**
- **Design of water management schemes.**

Introduction – use of models - II

- Monitoring and evaluation of implemented management schemes.
- Identification of potential areas of conflict on use of shared resources.

- Stakeholder engagement and participation in sustainable development and management of shared resources.

Main objective of hydrologic/uwm modeling

Using scenarios, generate new knowledge on the U/S and D/S implications of urban Accra's water demand and use.

- **Implications for u/s water use, e.g. rural agriculture and domestic water supply.**
- **Implications for waste water generation and management.**

Expected outputs of the hydrologic/uwm modeling activities

- River basin (the Densu) water availability (runoff) under various climate change scenarios.
- Stormwater generation in Accra, including flooding (flood areas and extent) under various CC scenarios.
- "Balance sheet" of water supply and demand for various uses in Accra – water accounting in the city – under these and other scenarios.

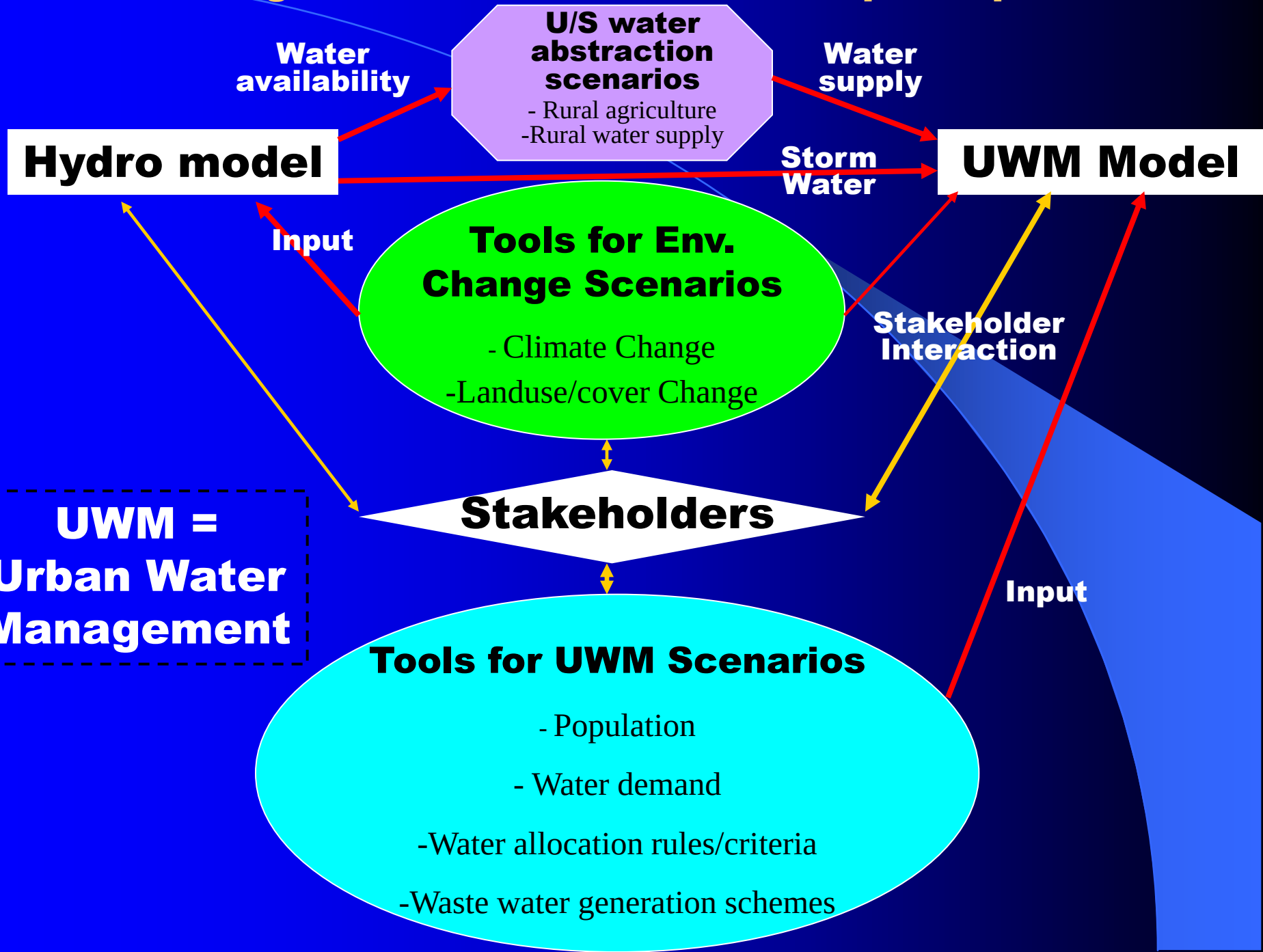
The hydrologic/uwm framework

- A two-tier modeling system envisaged.
- component 1 is a hydrologic model
  - Using metrological, landuse/cover and soil information as input.
  - Also driven by downscaled climate information from GCMs based on CC scenarios.
  - Provides as output:
    - Catchment runoffs.
    - Urban stormwater flows, flood incidences, levels and extent.

The hydrologic/uwm framework - II

- Component 2 is an uwm model
  - Using the output of the hydrologic model as input.
  - Also requires scenarios of water demand, allocation/distribution rules/criteria and waste water generation schemes.
  - Provides as output:
    - Levels of water demand and use.
    - Water supply deficits.
    - Volumes of waste water generated.

Modelling framework and stakeholder participation



Candidate models in the framework

- Hydrological component
  - Hydrologic Engineering Centre Hydrologic Modelling System (HEC-HMS).
  - Soil Water Assessment Tool (SWAT)
  - Geospatial streamflow model (GEOSFM).
  - .....
- Urban water management component
  - VENSIM
  - .....

Climate change and CC scenarios

Climate Change:

A significant change in the state of the climate through natural or anthropogenic causes (IPCC).

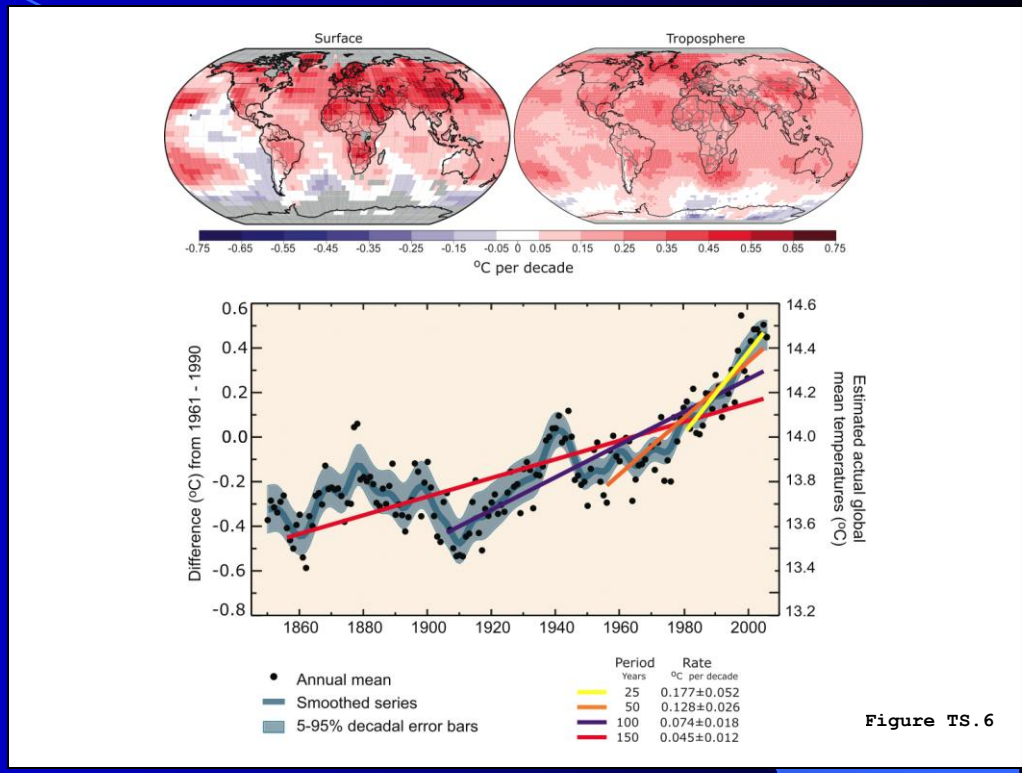


Figure TS.6

- High levels of Green House Gases (GHGs)
- Land use change

Climate change and CC scenarios - II

Special Report on Emission Scenarios (SRES) scenarios

- emission scenarios published by the IPCC in 2001 and used in climate change scenario modelling.
- 4 scenario families – A1, A2, B1, B2 – equally plausible.
- 6 scenario groups A1B, A1F1, A1T, A2, B1, B2

Climate change and CC scenarios - III

Climate downscaling

Downscaling is a method that derives local- to regional-scale (10 to 100 km) information from larger-scale models or data analyses.

- **Dynamical downscaling**
  - **Regional climate models (RCM)**
  - **High resolution Global climate models (GCMs)**
- **Empirical/statistical downscaling**
  - **Relate large-scale atmospheric predictors (e.g., humidity, sea level pressure) to local variables (eg. precipitation) statistically (eg. multiple regression)**

Climate change and CC scenarios - III

Mitigation and adaptation

Mitigation

- Reducing CC intensity by adoption of appropriate technology
  - Decreasing frequency of shocks

Adaptation

- Strengthening capacity of people and systems to better cope with the impacts of CC – preparing towards the unforseen.
  - Responding effectively to shocks

THANK YOU, for your attention