Challenges and opportunities for sustainable groundwater management in Africa

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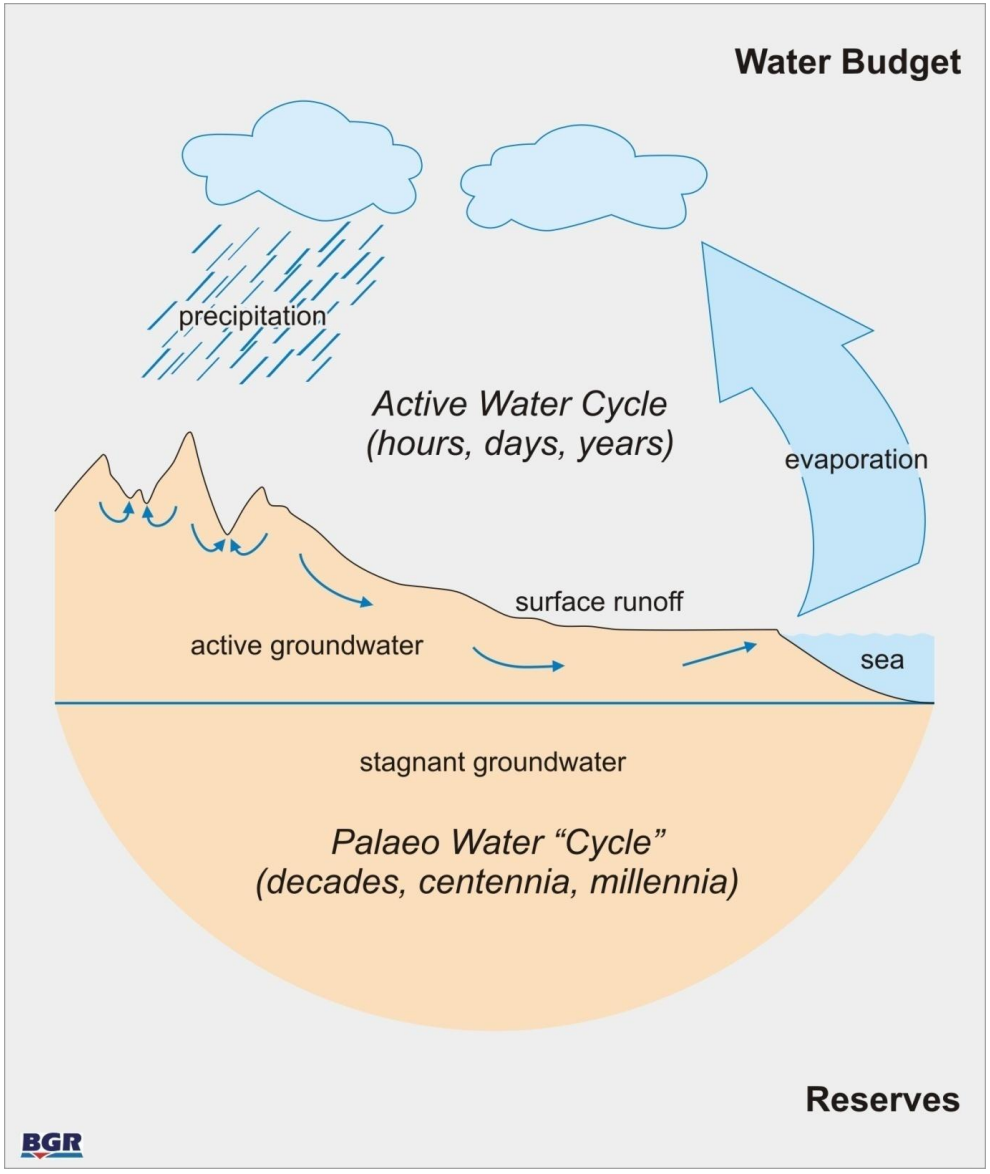
Outline

- Introduction
- Key groundwater management issues
- Groundwater Management Challenges
- Opportunities for improving groundwater management in Africa
- Conclusions and recommendations

Introduction



Groundwater

as an important part of

the Water Cycle

Groundwater stored

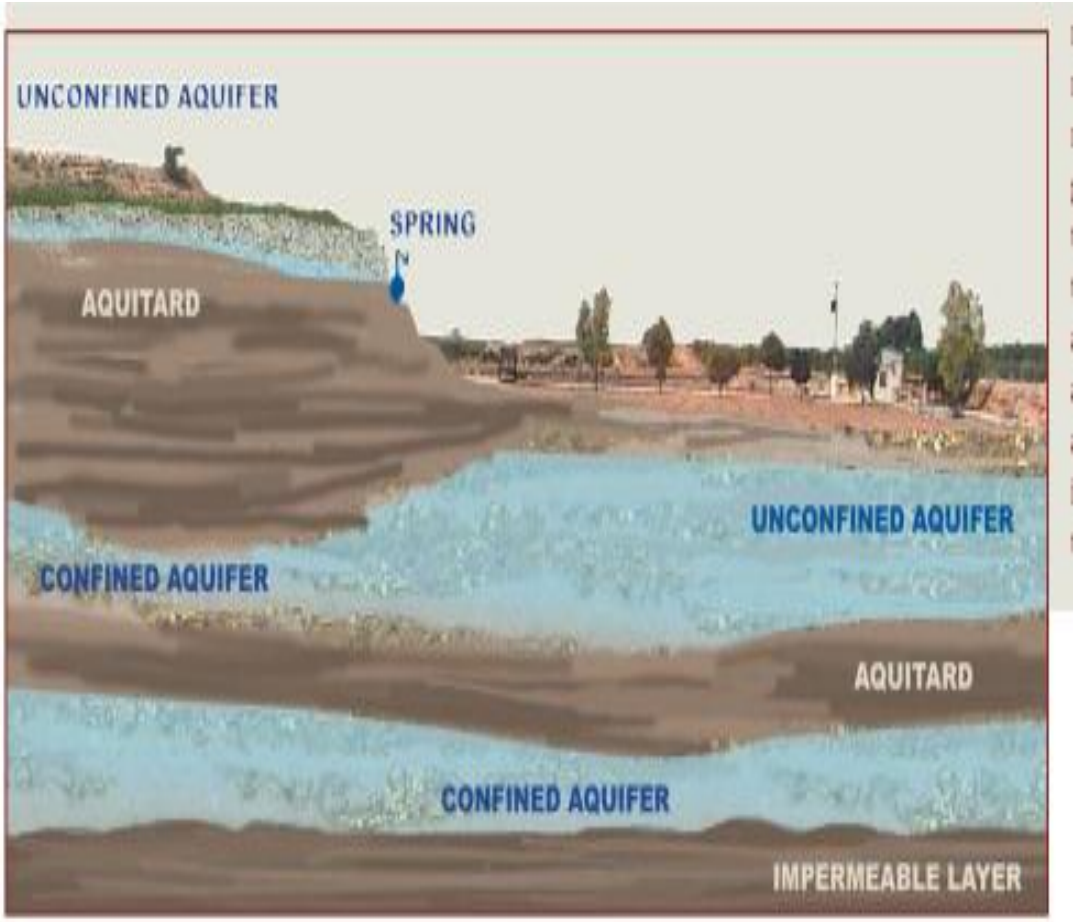
= Water resources inherited from the past millennia

Groundwater…the “hidden” resource

Underground reservoir (rocks) and transmitted through interconnected spaces

Aquifers have differences with respect to their hydrogeological setting.

Aquifers main functions



Storage capacity (storage coefficient or specific yield)

Transfer capacity (transmissivity)

•Physical and chemical interaction capacity (reservoir-rock vs GW)

Facts and figures on Groundwater in Africa

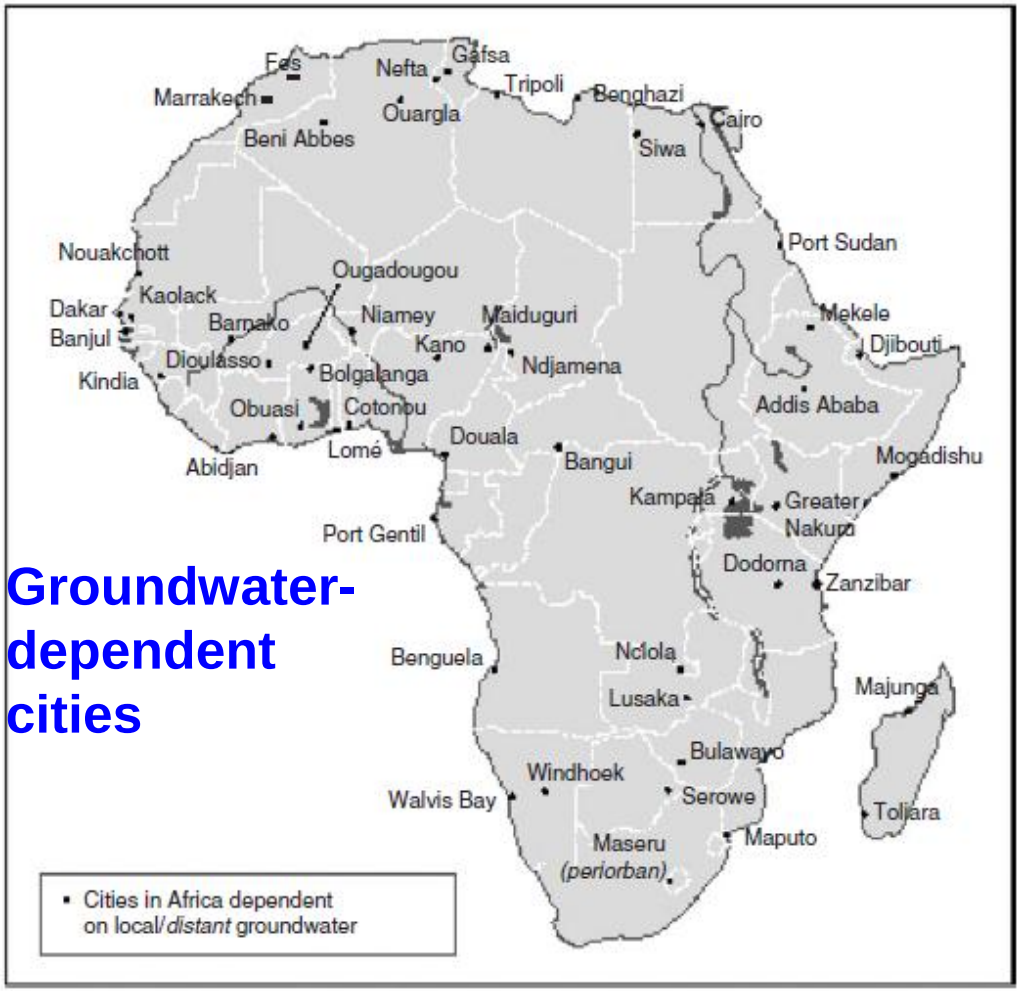
- Key source of water for drinking (urban & rural supplies), livestock, and small scale irrigation
- Approximately half of the nearly one billion people in Africa rely upon groundwater for their daily water supply
- Has enabled communities across Africa to adapt to seasonal or perennial shortages in surface water
- Is indispensable when managing water scarcity, a natural condition in 30 out of 53 African countries.
- Groundwater management is fundamental to effective river basin management e.g 80 % of the Niger River water is from groundwater.

Groundwater use in Africa

Groundwater strongly relied upon for drinking supplies

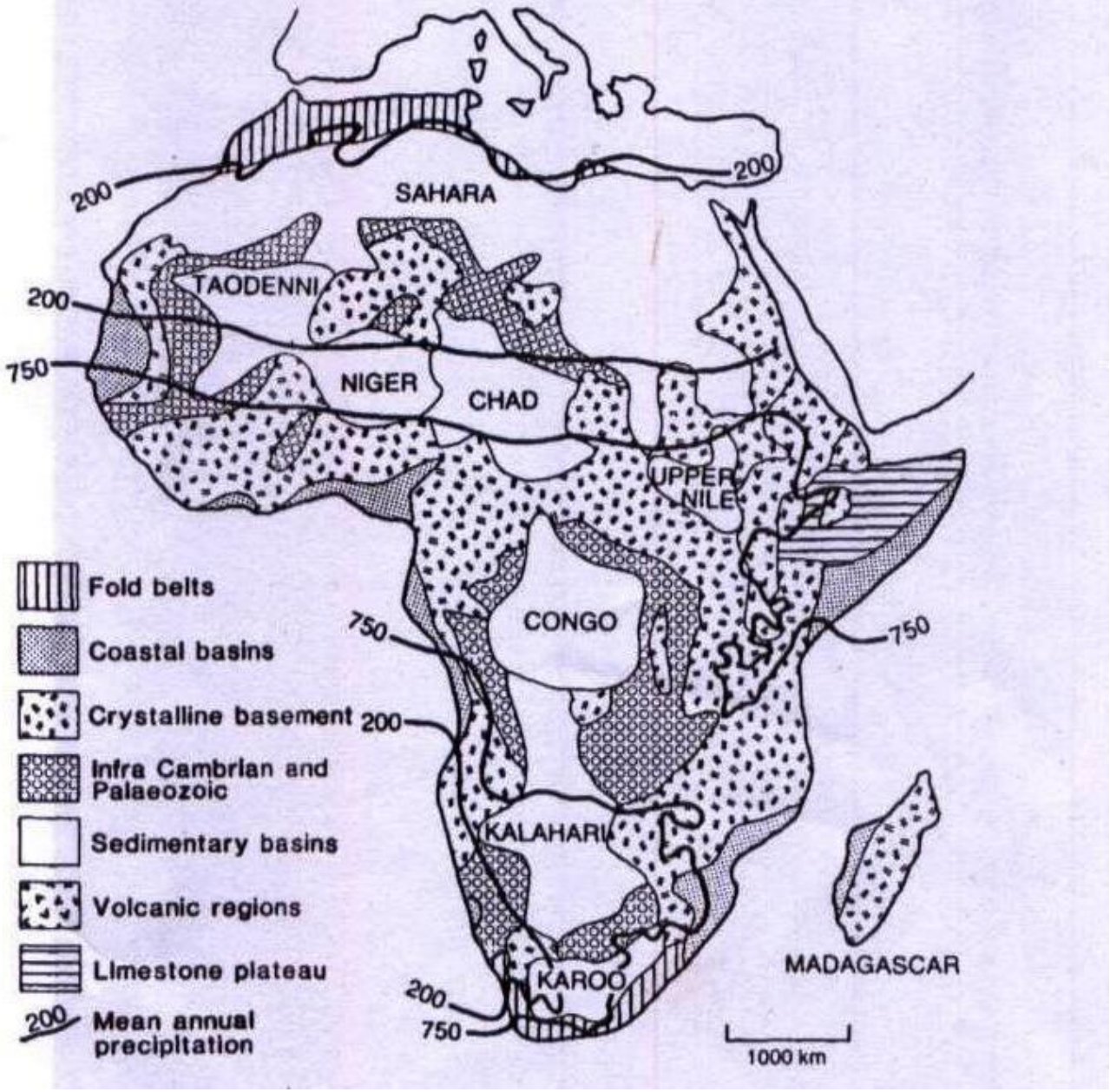
Borehole numbers steadily increasing in many countries

Many small towns are also served by groundwater in most of Africa (105 in South Africa, over 100 in Uganda, over 48 in Bukina Faso etc)



Groundwater Management Challenges

Geological setting



40 %: basement rocks

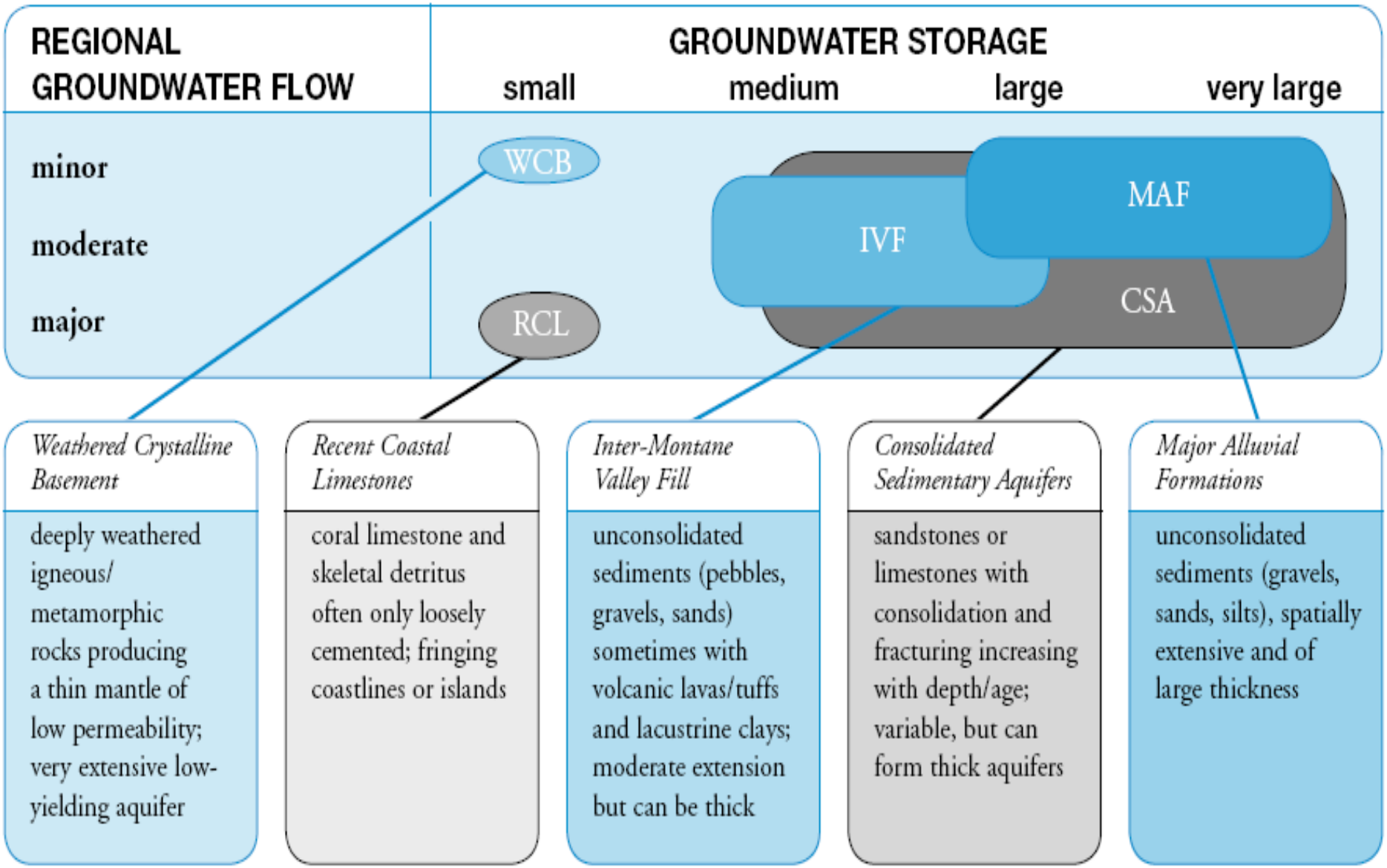
32%: consolidated sedimentary rocks

22%: unconsolidated sediments

6%: volcanic rocks

***Source:*MacDonald and Davies, 2000**

Hydrogeological diversity and complexity



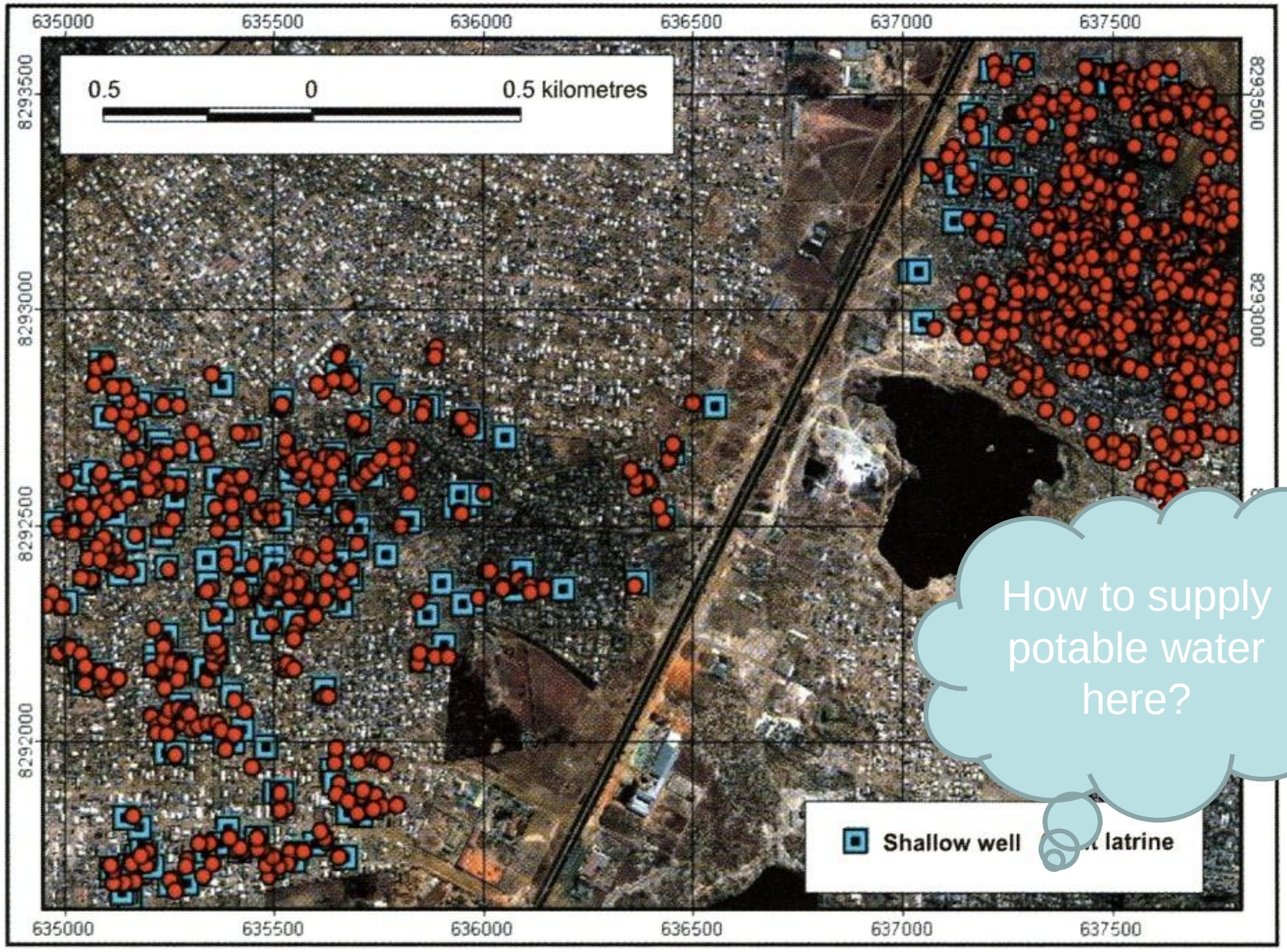
Summary groundwater Characteristics in Africa

- Mainly low yielding aquifers
- Limited storage & little recharge
- Depth of occurrence

Aquifers in Africa are poorly mapped, characterized and understood

Pollution of groundwater esp. in large cities

Groundwater pollution in Lusaka City, Zambia



Groundwater aquifers that supply many African mega cities are often heavily polluted (e.g. Dakar, Abidjan, Lagos, Accra, Lomé, Lusaka, Adis Ababa)

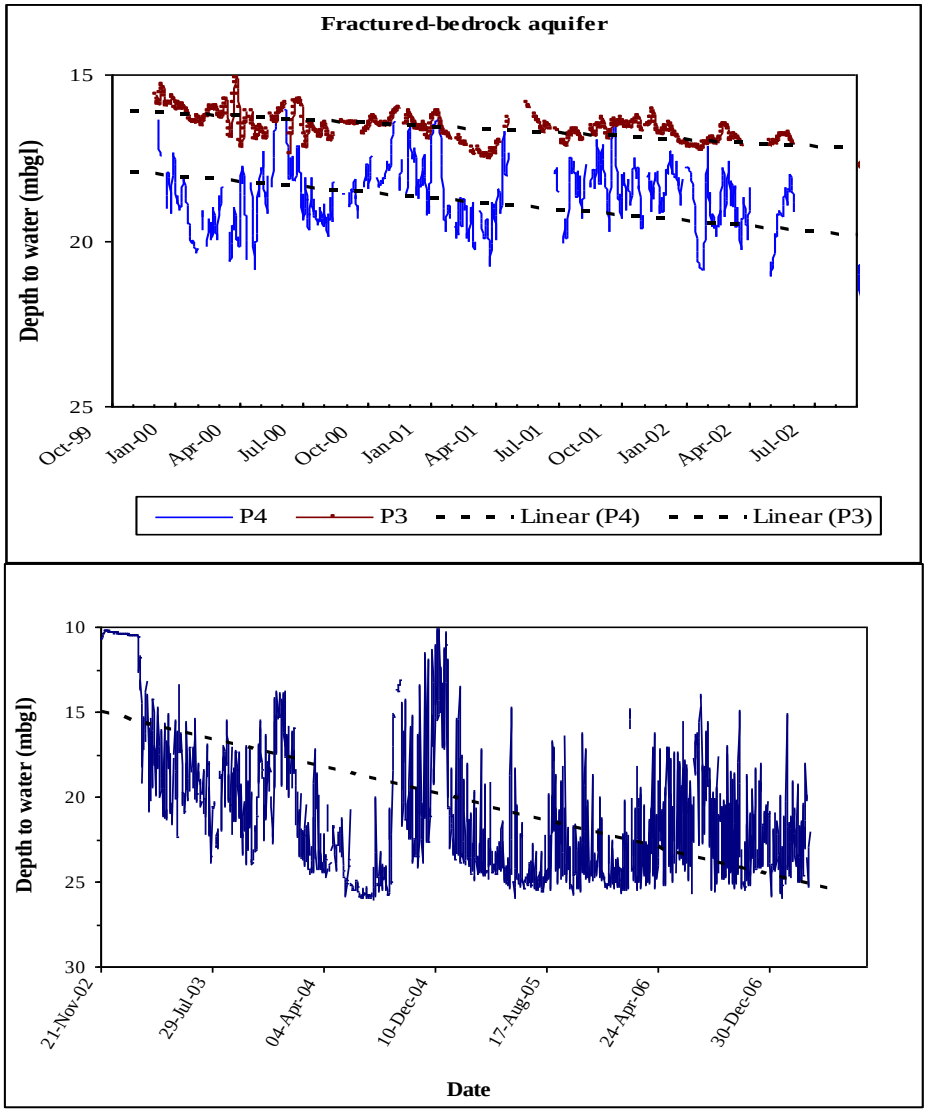
Impacts of intensive abstraction on groundwater levels and storage

- Information based on groundwater monitoring networks

- Depletion of discrete aquifers within weathered crystalline rock

  - *aquifer system underlies 40% of sub-Saharan Africa*

Groundwater that is subject to unplanned and excessive abstraction in coastal cities is inducing salt water intrusion resulting in permanent damage to coastal aquifers.



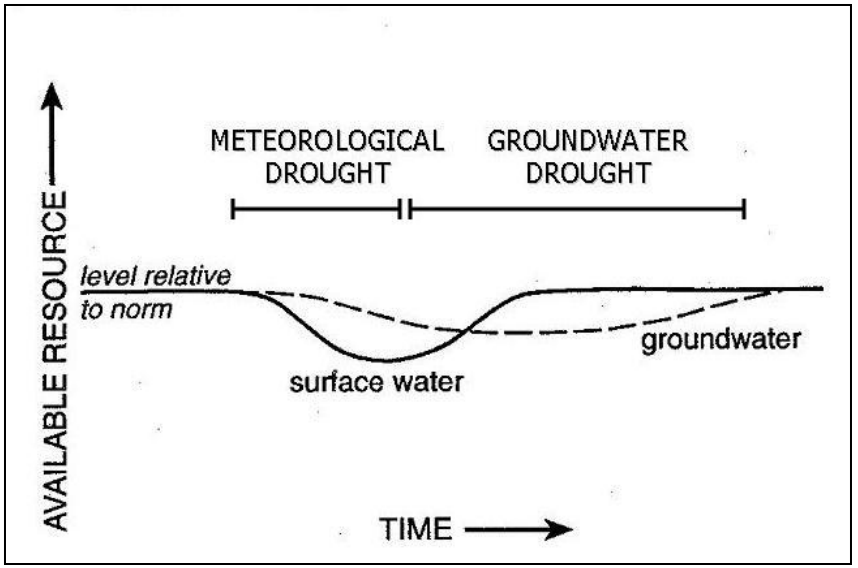
Transboundary groundwater aquifers

- Around 41 transboundary aquifers exist in Africa

- Great lack of scientific knowledge on characteristics of TBA

Impact of climate change on groundwater resources

- Changing climate means changing groundwater resources
- Extent and time-scales of change are still very much less understood due to limited knowledge on timing of recharge and aquifer characteristics
- Surface water resources respond sharply to climate variability, while groundwater response is often delayed at different time scales.



Source: Calow et al, 1997

Strategic approaches for improving groundwater management in Africa

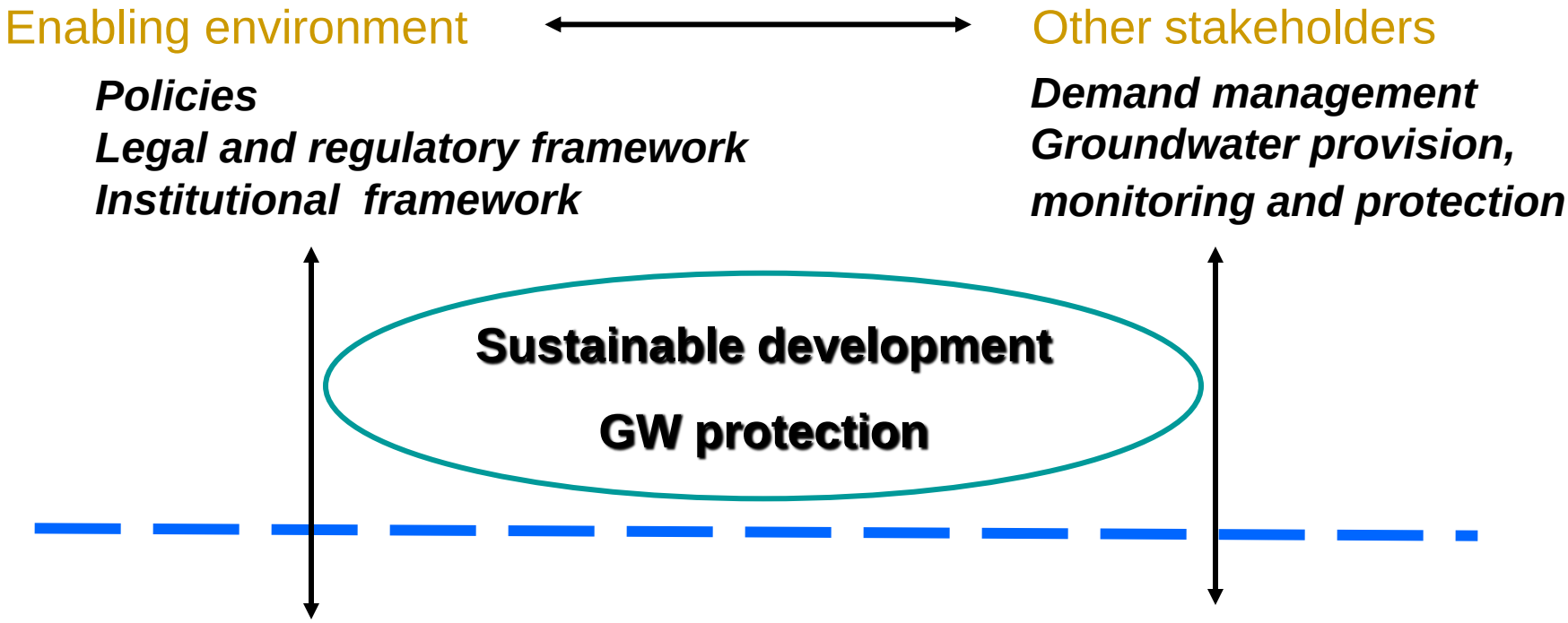
African Groundwater Commission

- Groundwater high on political agenda in Africa through AMCOW
- African Groundwater Commission (AGWC) formed under AMCOW
- AGWC will support AMCOW to promote groundwater on political agendas in Africa as a whole and at national and local levels
- African groundwater professionals and networks will be expected to supply capacity building and other services to AGWC in its mission to promote sustainable management and development of groundwater in the African context

Improving management of transboundary aquifers

- Around 41 transboundary aquifers exist in Africa
- Need to establish transboundary aquifer management organisations or integrate GW in RB management
- Promote transboundary aquifer monitoring and assessment to improve scientific knowledge on TBA

Ensuring sustainable groundwater development and protection



Characterizing groundwater systems

- Recharge rate quantification
- Recharge area vs land-use (GW protection)
- Interactions (quantity/ quality) with surface water bodies
- Impacts of GW pumping

Aquifer system water balance:

- **to check our understanding**

Modelling approach:

- **to predict implication of impacts**

Groundwater Information management

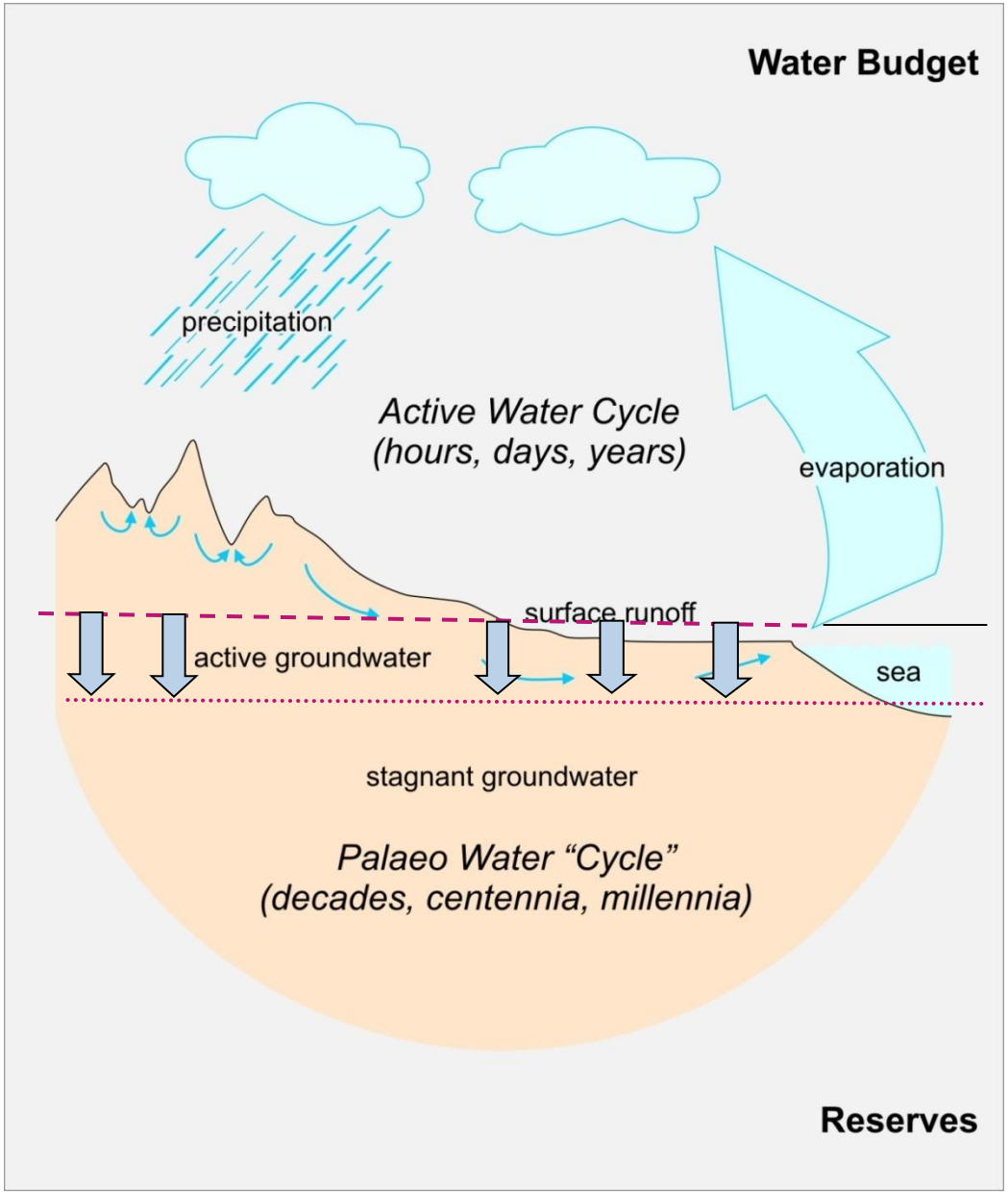
- Need for establishment of groundwater databases

- Information management outputs required by different user groups should be availed in appropriate formats.

- Possibilities of producing graphic charts / leaflets / audiovisual materials etc

- Preparation of groundwater maps showing different groundwater parameters

Managing groundwater in semi-arid regions



Groundwater-Systems are mainly supplied by groundwater storage (groundwater reserves)

(depending on rock formations)

Groundwater-Storage can be managed dynamically (Drawdown in dry years, replenishment in wet years)

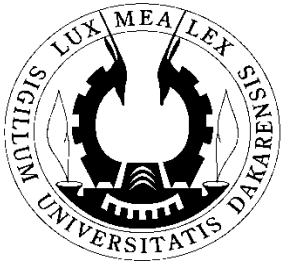
Attention:
Overexploitation possible!

=> GW-Management and Monitoring indispensible !

Capacity building in groundwater management in Africa


UNIVERSITY OF THE WITWATERSRAND
JOHANNESBURG


WATERnet


SIGILLUM UNIVERSITATIS DAKARENSIS
LUX MEA LEX


GROUNDWATER MANAGEMENT INSTITUTE


Global Water
Partnership
West Africa


Federal Ministry
for Economic Cooperation
and Development

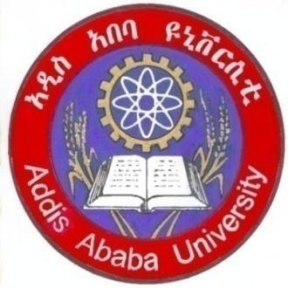

BGS
British
Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL


Africa Groundwater Network
AGW - Net


SPLASH


iah aih


WRC
Water Resources Commission


Addis Ababa University

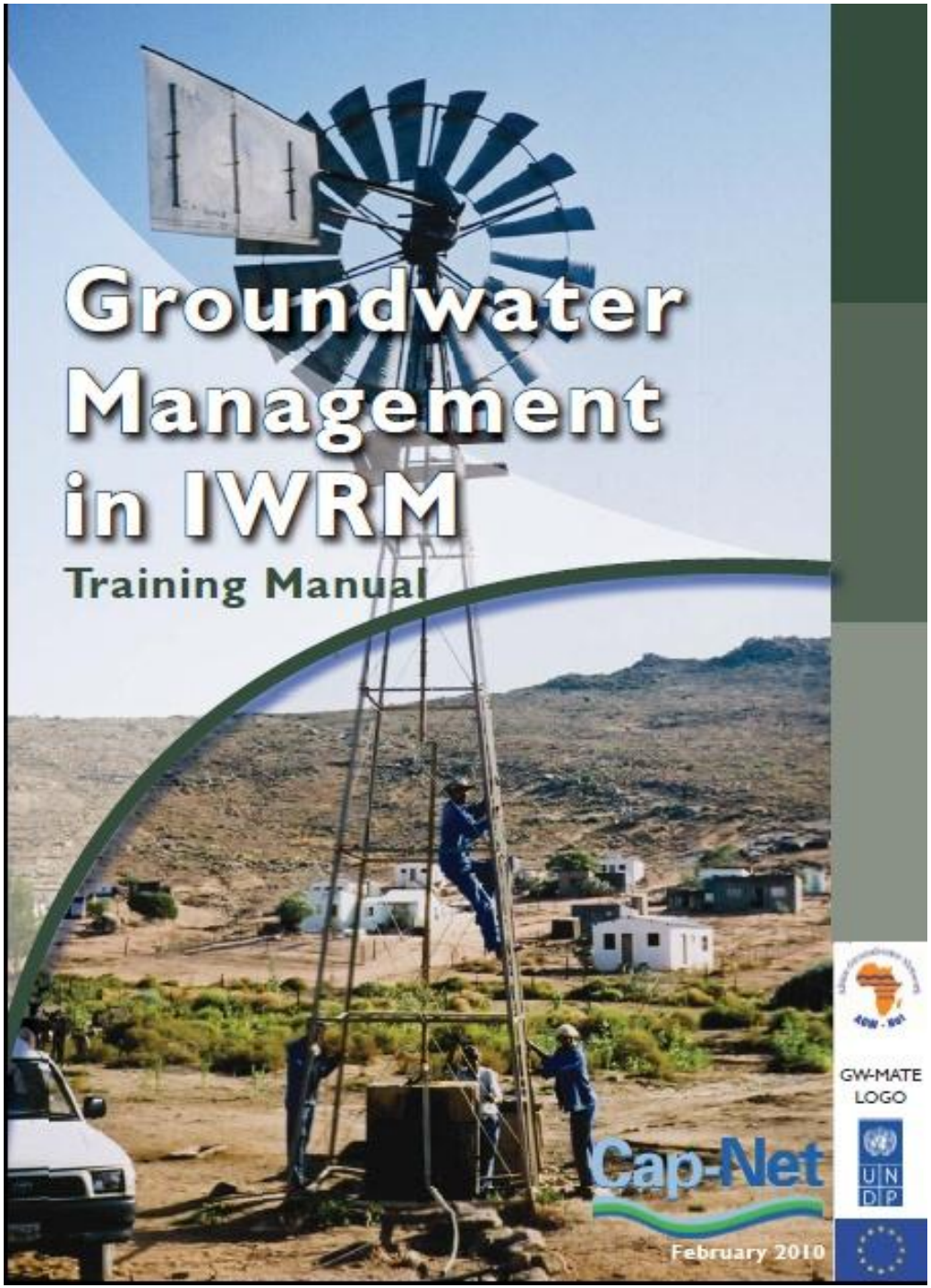

BGR


IRD
Institut de recherche
pour le développement


GEUS


Cap-Net


GW·MATE



1. IWRM & groundwater management framework
2. Aquifer system characterization for management
3. Integrated groundwater management in practice
4. Groundwater legislation and regulation
5. Groundwater allocation and licensing
6. Economic and financial instruments in groundwater management
7. Stakeholder participation in groundwater management
8. Groundwater quality protection and management
9. Groundwater monitoring
10. Groundwater and climate change
11. Information management and communication.

SUMMING IT UP

- Sustainable groundwater management requires a good understanding of the groundwater system based on data collected through monitoring programs and groundwater assessments/studies/research.

- The groundwater data needs to be stored, analyzed and presented using appropriate information management systems to facilitate decision making by various stakeholders.

- The above need to be supported by relevant policies, laws, institutions and capacity building programs


Thank you