

GROUNDWATER MANAGEMENT IN NON-URBAN AREAS IN SSA UNDER CHANGES IN CLIMATE VARIABILITY

Issues and directions

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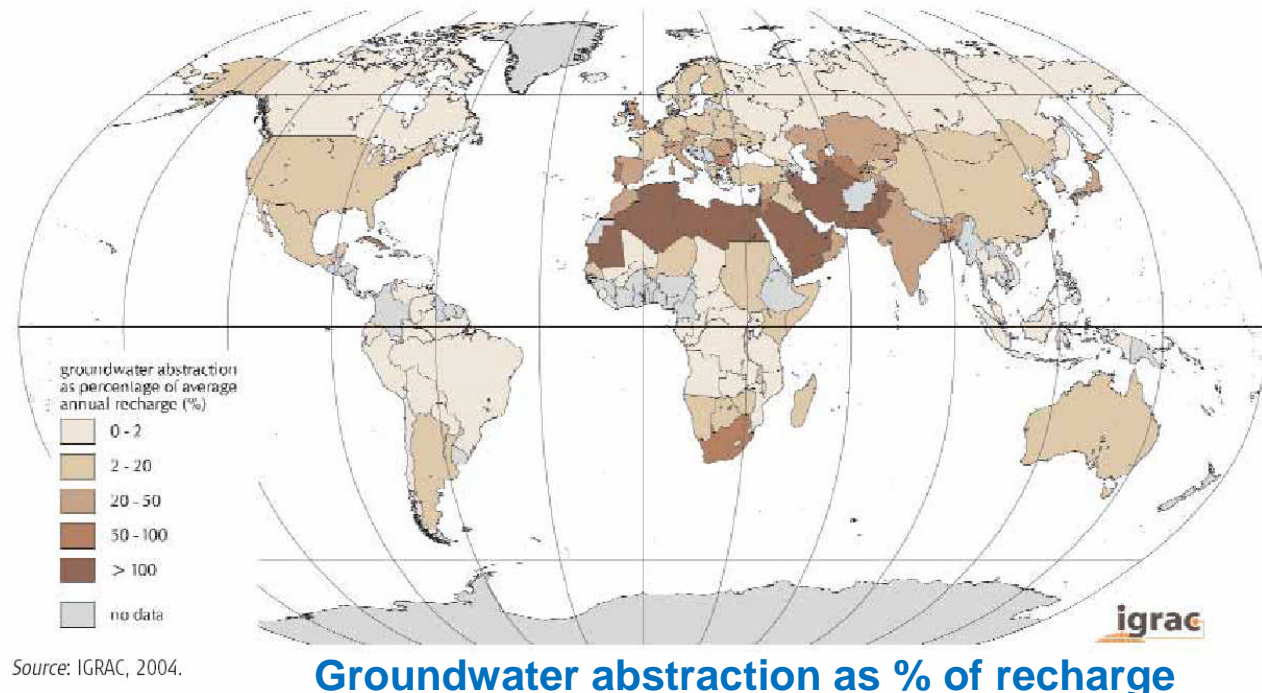
Africa Groundwater & Climate Conference

GROUNDWATER IN AFRICA

- **Groundwater is the critical underlying resource for human survival and economic development in extensive drought-prone areas in large parts of rural Africa**

USE AND AVAILABILITY

Map 4.3: Groundwater abstraction rate as a percentage of mean recharge



Constraints:

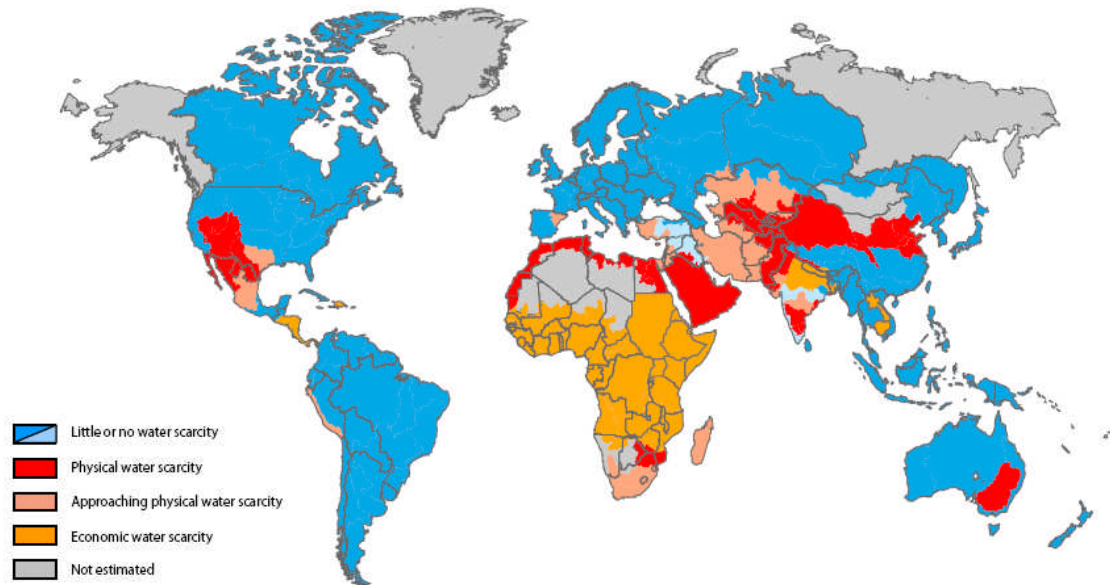
- **Unequal distribution (space and time)**
- **Geology: hard rock (low yields) and great depth (high cost)**

USE AND SCARCITY

Physical scarcity

Economic scarcity

Map 2. Areas of physical and economic water scarcity



- Red:** Physical Water Scarcity. More than 75% of the river flows are allocated to agriculture, industries or domestic purposes (accounting for recycling of return flows). This definition of scarcity—relating water availability to water demand—implies that dry areas are not necessarily water-scarce. For example, Mauritania is dry but not physically water-scarce because demand is low.
- Light Red:** More than 60% of river flows are allocated. These basins will experience physical water scarcity in the near future.
- Orange:** Economic Water Scarcity. Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists. These areas could benefit by development of additional blue and green water, but human and financial capacity are limiting.
- Blue:** Abundant water resources relative to use: less than 25% of water from rivers is withdrawn for human purposes.

GROUNDWATER MANAGEMENT ISSUES

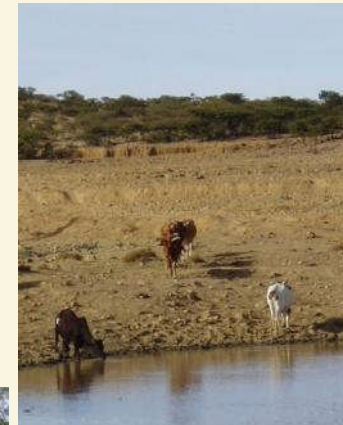
- Achieving improved **rural** livelihoods
- Expanding irrigated **agricultural** cropping
- Improving the security of **urban** water supply
- Coping with **small town** water supply crisis

While recognizing the environmental functions and concerns:

- Groundwater dependent ecosystems
- Land degradation and recharge reduction
- **Climate change and drought propensity**

RURAL WATER SUPPLY /LIFELIHOOD

- **High dependency on groundwater (75%)**
 - **Eliminating dependency on unreliable and polluted surface water**
 - **Reducing walking distances and time spent on water collection**
- **Not only for drinking but also**
 - **Water supply for livestock**
 - **Village subsistence–level cropping**
 - **Community industries**

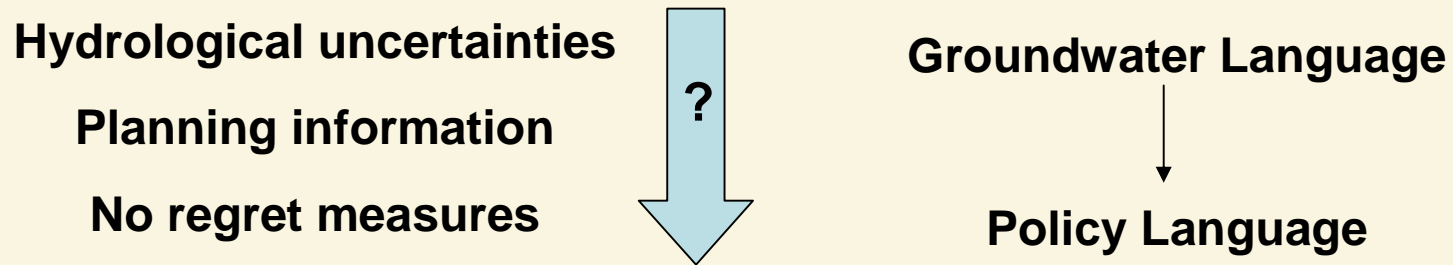


WHAT IS NEEDED FOR RURAL WATER SUPPLY PROVISION?

- **Knowledge of groundwater system and availability under current and future changes in climate variability**
- **Plans for recharge enhancement and increasing storage or other solutions**
- **Government plans for rural development**
- **Institutional /regulatory capacity at the local level (RBO's, local government)**
- **Rural communities empowered to play their role in rws provision**
- **Financing arrangements: investments /cost recovery**

THE CHALLENGE

- *Knowledge of the resource and assessment of current impacts of climate variability its changes (observed trends - climate models) on the groundwater systems*



- **Integrate this in groundwater management and protection policies and strategies.**
- **Groundwater management plans and implementation**

DROUGHT

- Groundwater resources are much less drought prone than surface water due to large natural storage of aquifers
- The impact of drought on groundwater levels lags considerable behind the actual failure of rains/surface water run-off (conjunctive use)
- Groundwater availability depends on topography, drainage pattern, rainfall pattern, soil type, geology etc.



- *Assessment and classification needed of drought–proofing and drought-vulnerability of aquifer systems + solutions for recharge and storage enhancement*

MANAGED AQUIFER RECHARGE

- Important role for groundwater storage in mitigating more frequent and extended drought episodes
- Multiple small-scale enhancement of aquifer recharge & storage

	Technology	Sub type		
Techniques referring primarily to getting water infiltrated	Spreading methods	infiltration ponds & basins		
		flooding		
		ditch, furrow, drains		
		irrigation		
	Induced bank infiltration			
	Well, shaft and borehole recharge	deep well injection	AS(TR)	
			ASR	
		shallow well/ shaft/ pit infiltration		
Techniques referring primarily to intercepting the water	In-channel modifications	recharge dams		
		sub surface dams		
		sand dams		
		channel spreading		
	Runoff harvesting	barriers and bunds		
		trenches		

Artificial recharge of groundwater in the World



www.igrac.nl

Artificial Recharge Strategy for South Africa, June 2007

SAND STORAGE DAMS

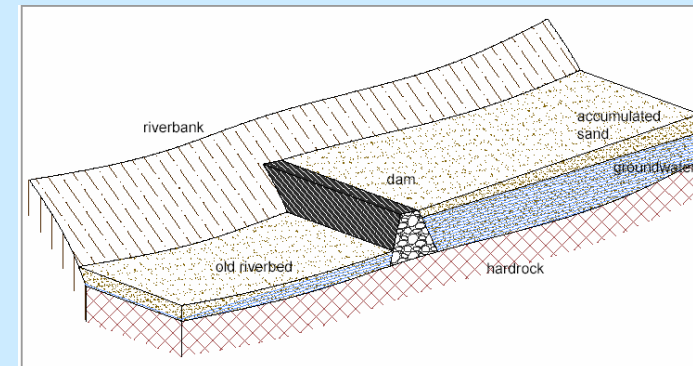
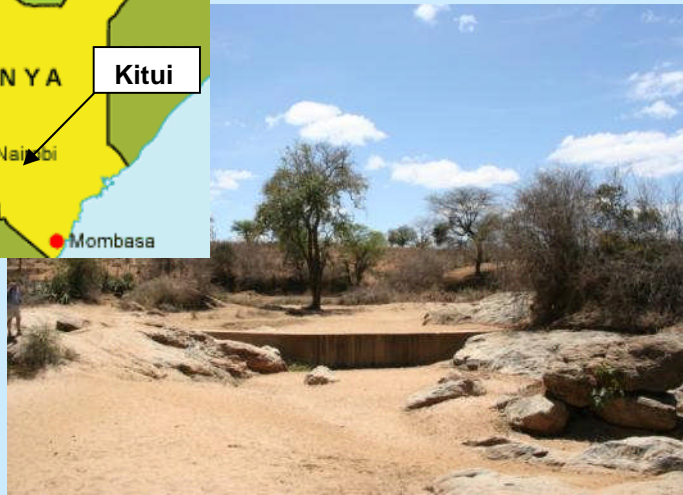


Table 1: Socio-economic performance

<i>Vulnerability Categories</i>	<i>Vulnerability indicators</i>	<i>Before dam construction</i>	<i>After dam construction</i>
<i>Agriculture</i>	# of cash crops	1.5	2.8
	% irrigated crops	37	68
<i>Special aspects</i>	Water collection Domestic (minutes)	140	90
	Water collection Life Stock (minutes)	110	50
<i>Gender</i>	Average walking distance women to water (km)	3	1
<i>Economic</i>	Income (US\$./year)	230	350
<i>Health</i>	% households suffering from malnutrition	31.6	0

FLOODS

- **Locally increase natural recharge,**
- **Groundwater pollution (recharge)**
- **Pollution/destruction of wells and boreholes**



SEALEVEL RISE AND SALINIZATION

- Low lying areas in vulnerable delta's :increased seepage of brackish groundwater
- Often combined with land subsidence due to pumping <> also increased flood risk



- Risk assessment based policies
- Integrate land use and water planning
- Bio-saline horticulture

Vulnerable delta's in the world (IPCC)

MANAGEMENT APPROACHES

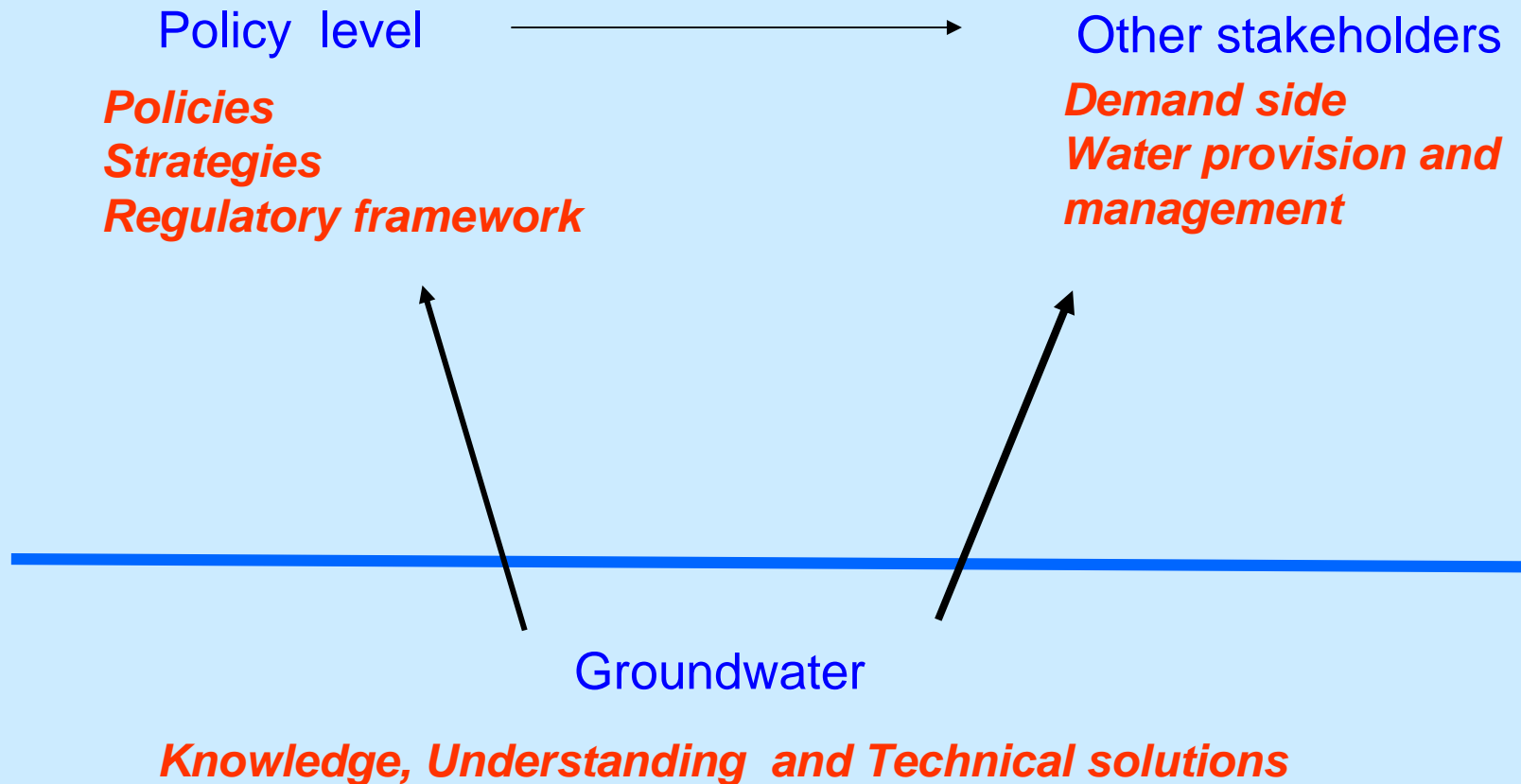
Supply side

- *Resource enhancement : deep aquifers*
- *Recharge enhancement: managed aquifer recharge*
- *Use of marginal water (brackish water, reuse waste water)*
- *Storage and long distance conveyance*

Demand side

- *Policies and strategies*
- *Water allocation / water saving*
- *Regulation /water rights*
- *Institutional /organizational capacity*
- *Financing /economics*
- *User participation*

MAKING OUR KNOWLEDGE VISIBLE



THANK YOU

**BORENA ZONE WATER
RESOURCES OFFICE
Wa/Qab/Bishaan G/Boorana**

VISION

The Office Aspires to See 80%
Of the Population Of Borena Zone
Get access to Potable & Adequate
Water Supply and improved Sani-
tation Services On Sustainable ba-
sis by the year 2015 and the Zone's
Water res. Properly Controlled & Managed

