



adaptive management of groundwater in Africa

CHALLENGES OF WATER GOVERNANCE: DEVELOPING SHALLOW GROUNDWATER RESOURCES FOR SMALL-SCALE IRRIGATION IN SUB-SAHARAN AFRICA

John Gowing

School of Agriculture, Food & Rural Development
Newcastle University

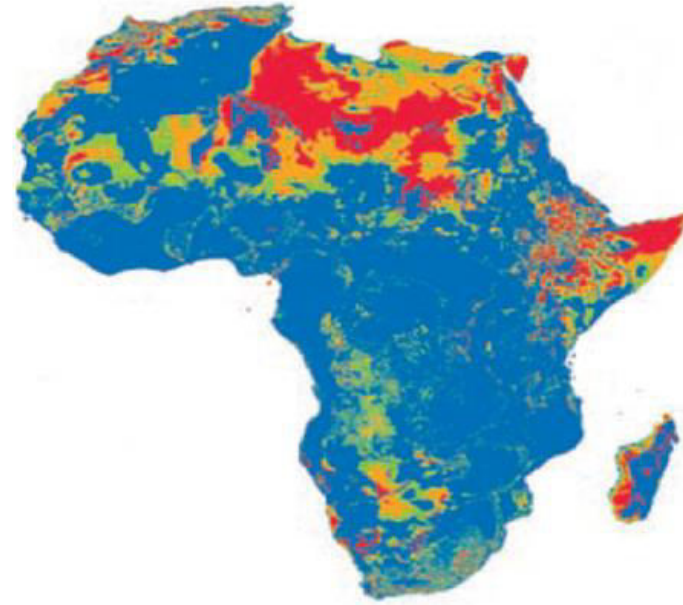
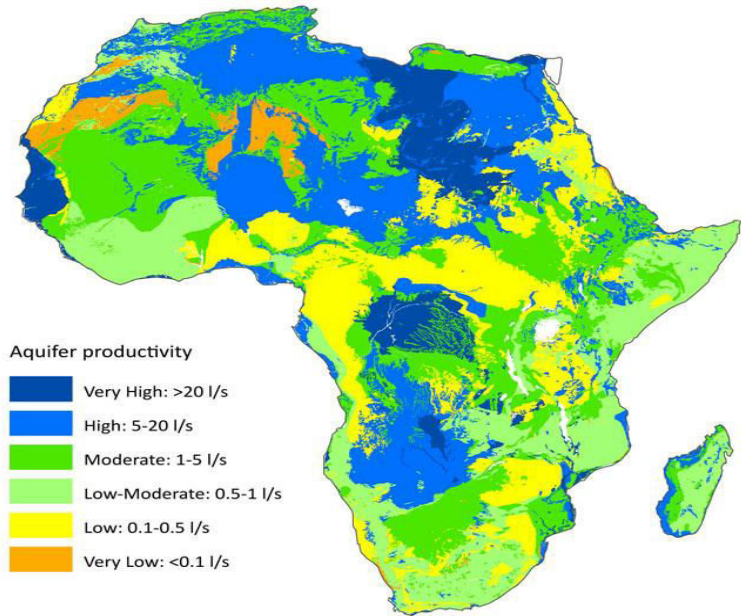
World Water Congress XV (IWRA) Edinburgh 25-29 May, 2015



adaptive management of groundwater in Africa



Information on groundwater availability and use in SSA is inadequate



(From MacDonald et al, 2011)



adaptive management of groundwater in Africa

Millennium Development Goals

Halve the proportion of the population without sustainable access to safe drinking water and basic sanitation.

BUT nothing on resource management/sustainability





AMGRAF focus: productive use (irrigation)
- can be developed quickly at low capital cost by private investment and allows farmers control of supply provided that technology for water lifting is available





Global survey of groundwater irrigation

Region	Groundwater irrigation		Groundwater volume used	
	Mha	% total area	km ³ /year	% total
South Asia	48.3	57	262	57
East Asia	19.3	29	57	34
South-East Asia	1.0	5	3	6
MENA	12.9	43	87	44
Latin America	2.5	18	8	19
SSA	0.4	6	2	7

Source: Siebert et al, 2010



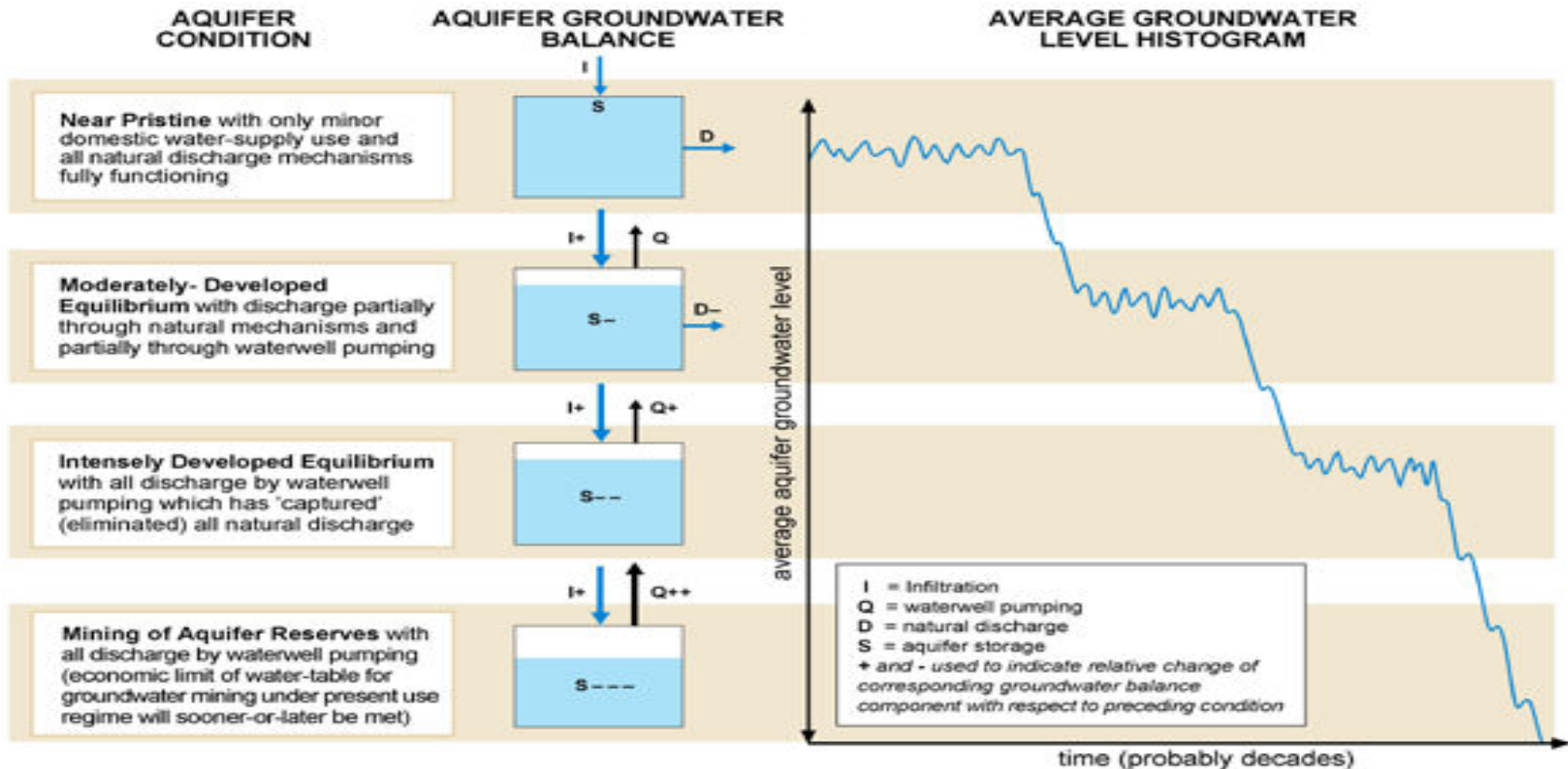
Resource governance – tragedy of the commons

	Subtractable	Not Subtractable
Excludable	Private Goods e.g.: private property such as land, houses, machines etc.	Club Goods e.g.: a golf course, machines or storage facilities owned by a cooperative
Not Excludable	Common Goods e.g.: pastures, irrigation systems, fishing grounds	Public Goods e.g.: lighthouse, weather forecast, public safety

Groundwater: easy to appropriate; linked to land ownership; unseen poorly understood



Risk of rapid groundwater resource depletion





adaptive management of groundwater in Africa

AMGRAF case study in Ethiopia

- Anticipating groundwater boom
- Focus on shallow aquifer (<25m deep)

Pilot study
in Ethiopia





AMGRAF premise:

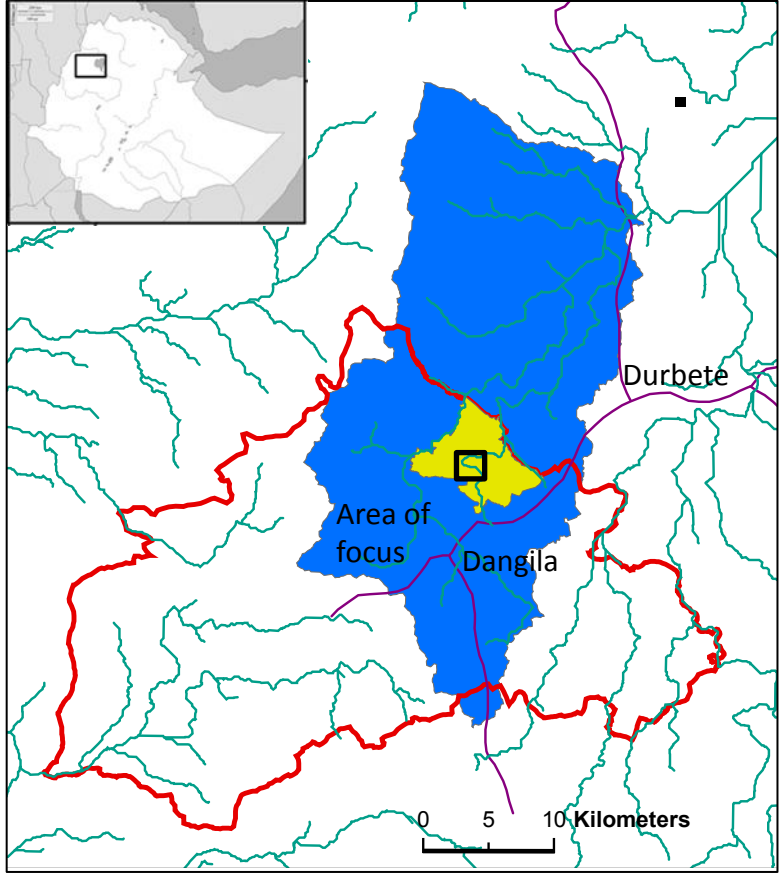
Shallow groundwater resources are most likely to be used by **poor communities** because of **accessibility**, but are **vulnerable** to over-exploitation and climate risk.

Realisation of the potential for poverty reduction therefore requires a focus on how local communities can **assess and manage their own resources**.



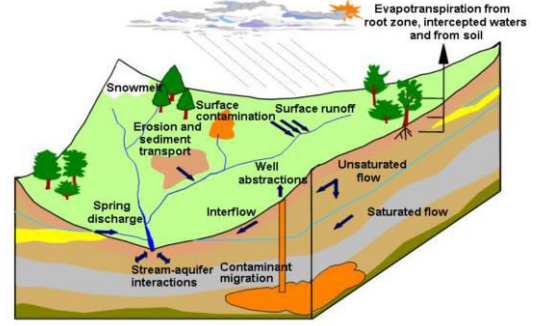


adaptive management of groundwater in Africa



Demonstrate feasibility of community management of shallow groundwater

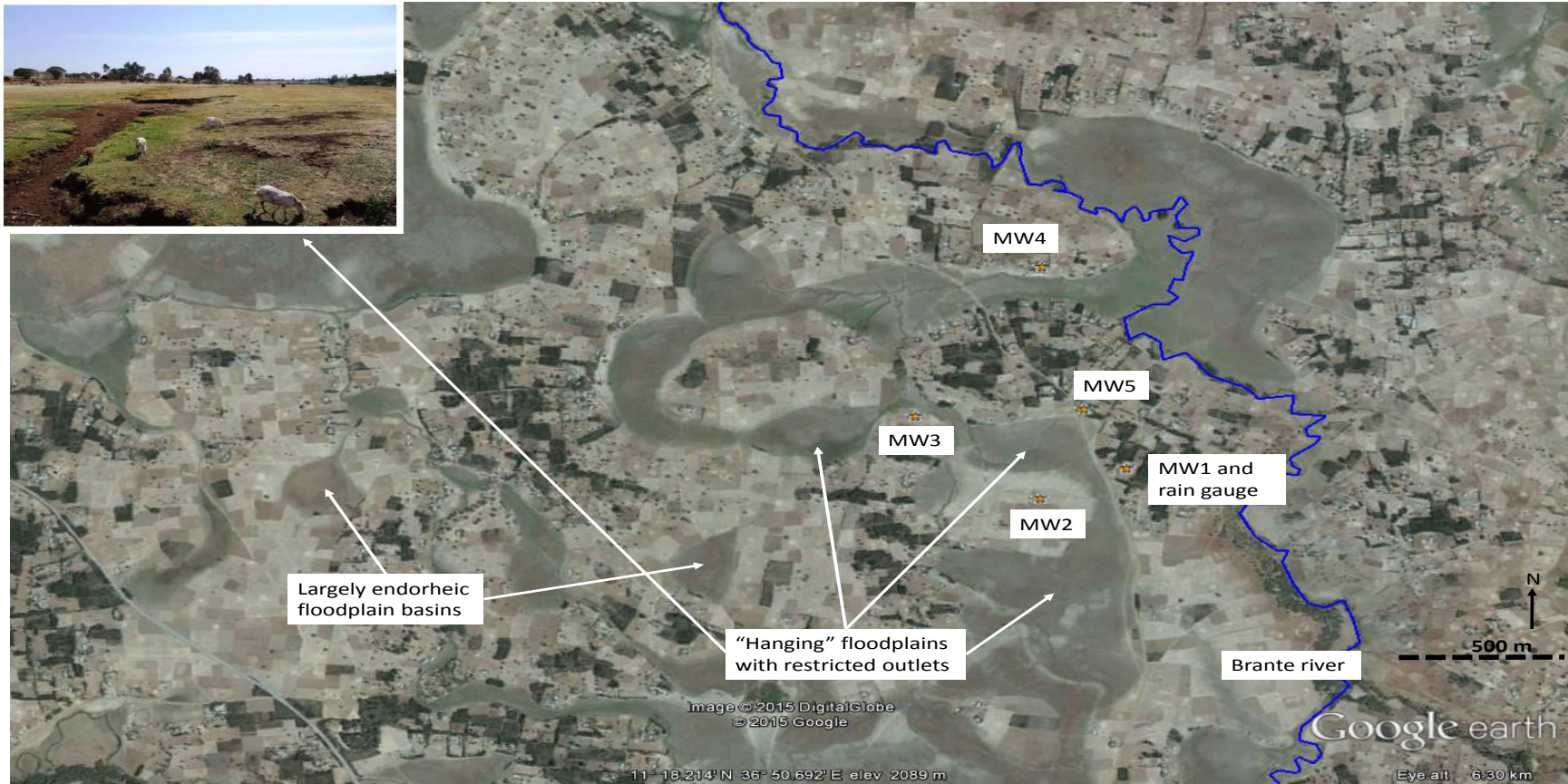
Assess storage and recharge



Participatory monitoring



adaptive management of groundwater in Africa



Largely endorheic floodplain basins

"Hanging" floodplains with restricted outlets

Brante river

500 m

N

Image © 2015 DigitalGlobe
© 2015 Google

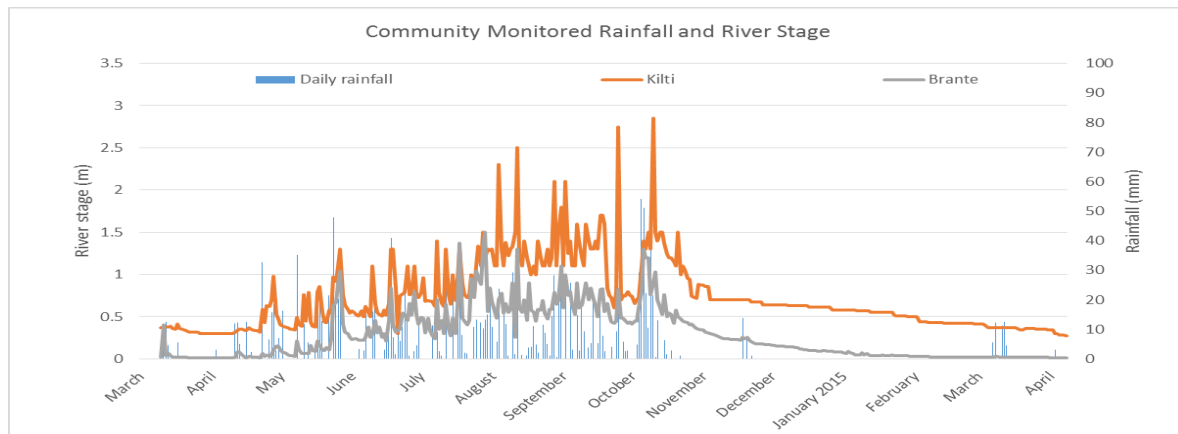
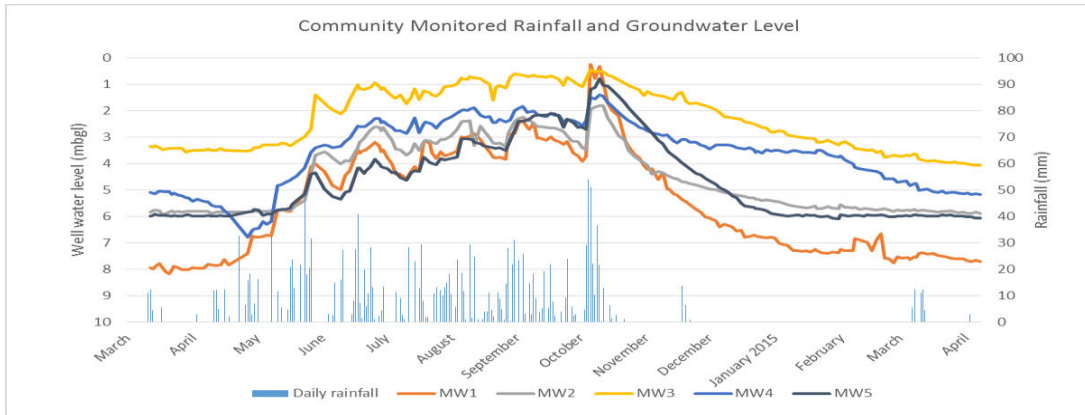
Google earth

11° 18.214' N 36° 50.692' E elev 2089 m

Eye alt 6.30 km

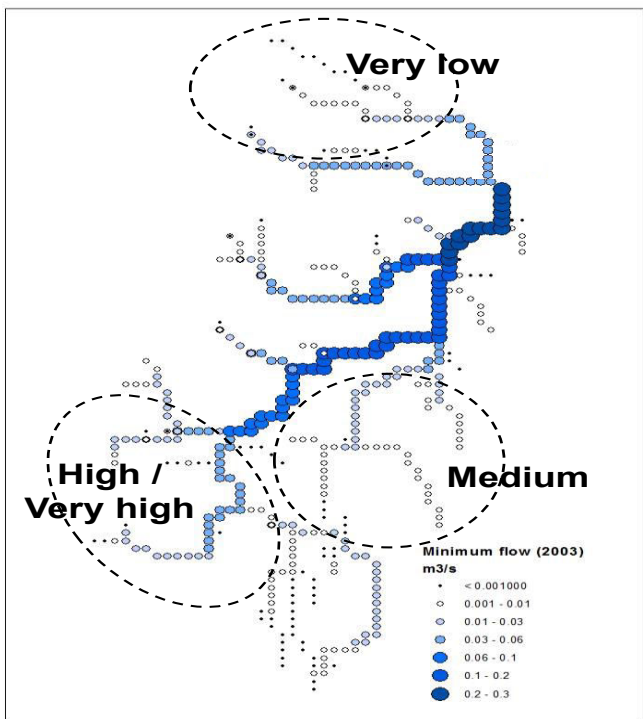


adaptive management of groundwater in Africa





adaptive management of groundwater in Africa



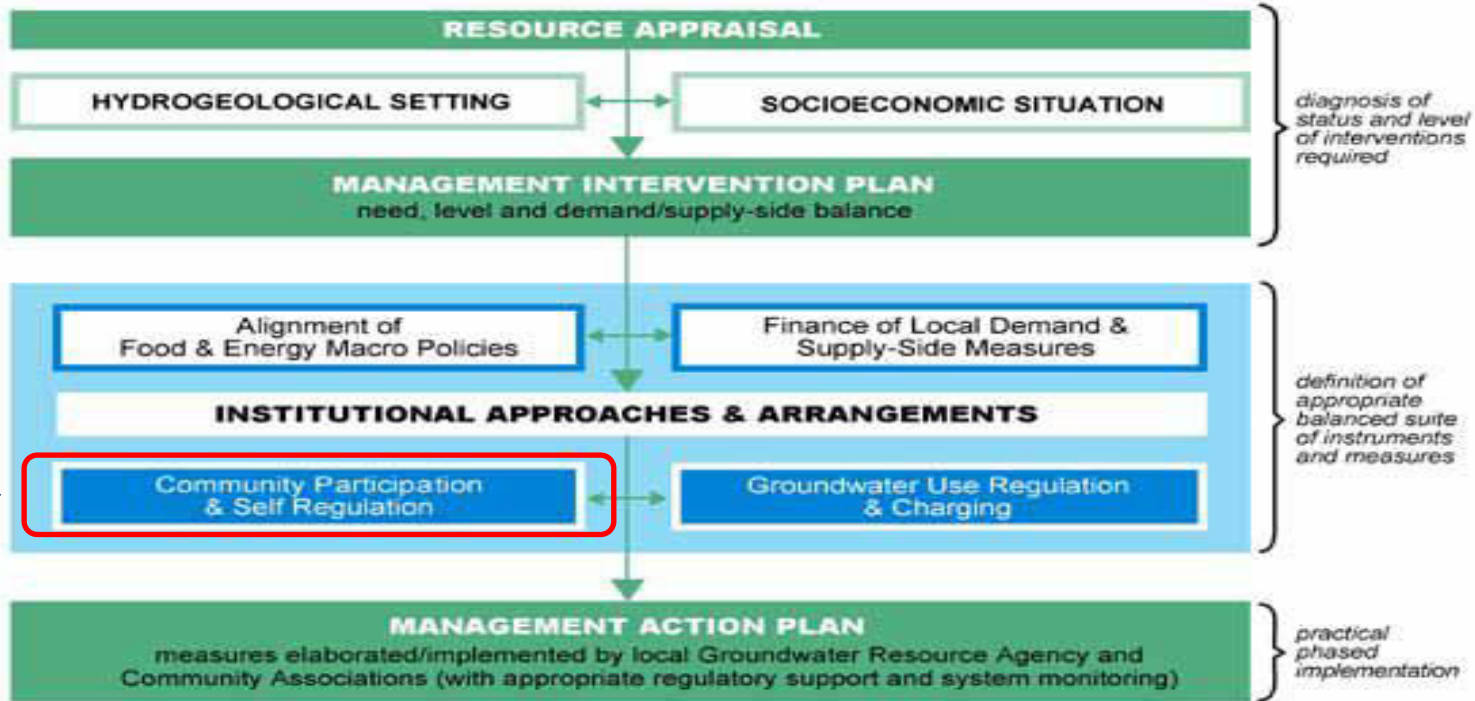
Simulated streamflow (with groundwater potential zones)



Will groundwater pumping reduce d/s river flow?



Groundwater management: requires community self-regulation



Source: GWP, 2012



adaptive management of groundwater in Africa

The legal framework for groundwater management should provide answers to key questions such as:

- Who can access groundwater, under what conditions?
- How are aquifers protected against depletion/pollution?
- What kind of monitoring and planning tools to be used?
- How will private and public interest be balanced and how are stakeholders to be involved in decision-making and management processes?



www.research.ncl.ac.uk/amgraf

Co-authors: Geoff PARKIN, Jaime AMEZAGA,
Liz OUGHTON, Nathan FORSYTHE

Collaborators:

Water Research
Institute (Ghana)



Council for Scientific
& Industrial Research



Geological Survey
of Ethiopia



International Water
Management Institute

