Deutsches Institut für Entwicklungspolitik
German Development Institute

Cooperation on Africa`s Transboundary Aquifer Systems

Research and Consultancy Project

Kampala (Uganda), June 2008

Waltina Scheumann and Elke Herrfahrdt-Paehle (eds.)

Marianne Alker, Malte Grossmann, Oscar Schmidt, Insa Theesfeld, Theresa Steyrer

Background of our study

For decades, research has focused on cooperation on transboundary rivers / lakes

Growing importance of (transboundary) groundwater resources, where surface water is scarce and/or polluted, or absent:

- Increasing water demand for agriculture
(potential for irrigation in SSA = 40 million hectares)
- Supplying water (Millenium Development Goals)
- Climate-induced changes

Main questions

(1) Are there transboundary impacts from national usage?

(2) Are there hydrogeological features that cause regular impact patterns?

(3) Record of cooperation?

(4) What drives states to initiate, or not, joint activities?

(5) Recommendations

5 desk studies

Non-renewable/not connected to rivers/lakes:

Northwest Sahara Aquifer System

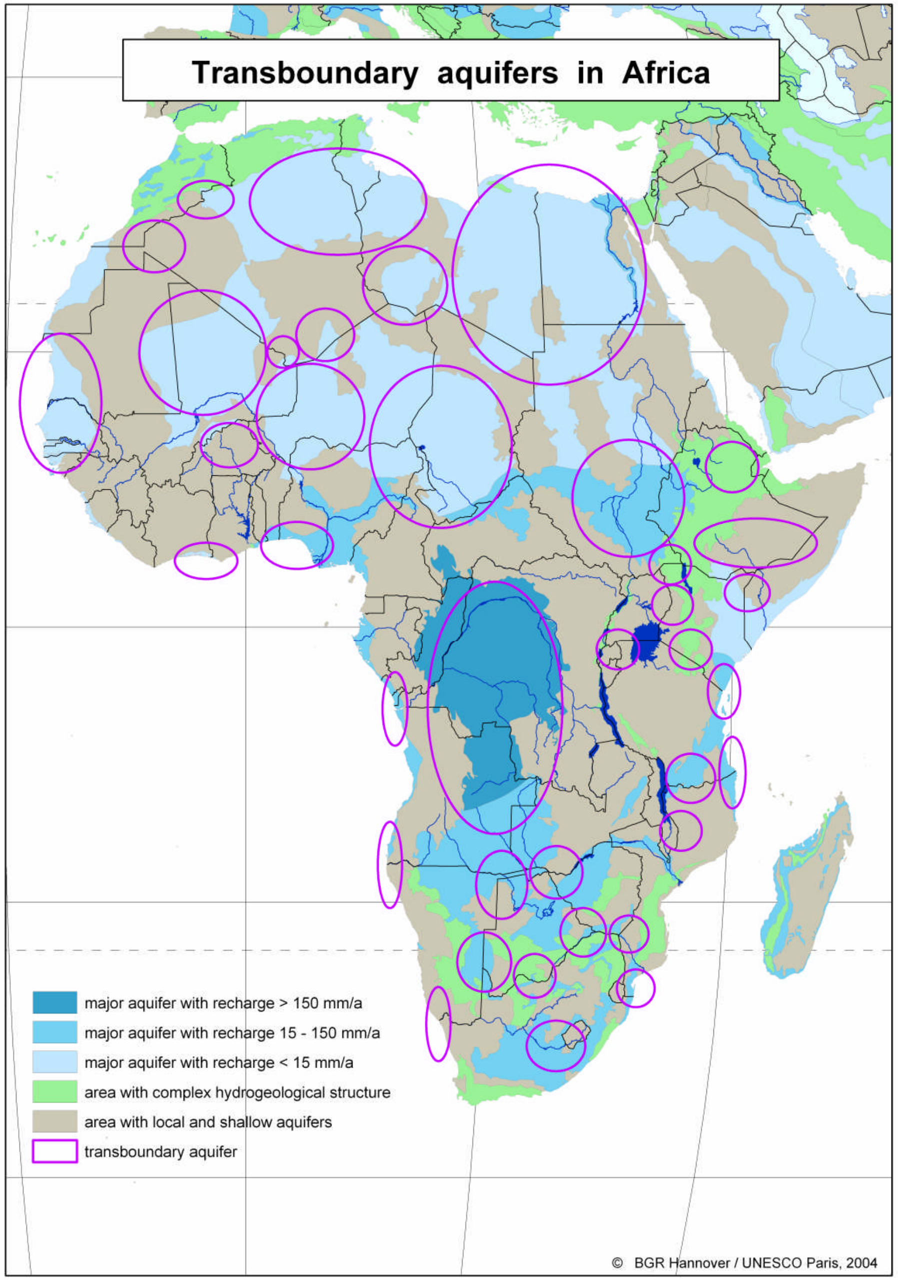
Nubian Sandstone Aquifer System

Renewable/connected to rivers/lakes:

Lake Chad Basin Aquifer System

Stampriet Artesian Aquifer

Kilimanjaro Mountain Aquifer



Aquifers establish physical interdependencies among states:

Activities in State A affect activities in State B
resulting in use conflicts over quantity and/or quality

„One state‘s solution becomes another state‘s problem“
(Stephen Foster)

(1) Are there transboundary impacts from national uses?

Transboundary Aquifers Systems Intensity of national use	**Local/National Impacts**	**Transboundary Impacts (actual/*potential*)**
North-West Sahara Aquifer System High intensity in Algeria, followed by Tunisia and Libya	Declining groundwater levels, drying up of outlets in Tunisia	*Potential* impact on Libya of projects planned by Algeria; and on Tunisia and Algeria of projects planned by Libya
Nubian Sandstone Aquifer System Very high intensity; most intensively used in Libya and Egypt	Declining groundwater levels in Egypt and Libya, pollution in Libya	Not reported, *likely* in Sudan
Lake Chad Basin Aquifer System High intensity in Chad, Nigeria	Declining groundwater levels, nitrate and faecal contaminants	*Likely* (decreasing recharge, increasing extraction), impact on flood plains and river base flows
Kilimanjaro Aquifer In Kenya and Tanzania not intensively developed	Increased surface runoff, reduced gw recharge	Reduced inflow into Lake Jipe affects ecosystem; shrinking forest belt affects recharge; *Kenya's plan to divert water from Lake Chala is likely to have an impact on Tanzania*
Stampriet Artesian Aquifer Basin Intensively used in Namibia	No information	Overuse is still contained within national boundaries (Namibia)
Literature: Scheumann, W. / E. Herrfahrdt-Pähle (eds.), 2008, Conceptualizing cooperation on Africa's transboundary groundwater resources, Deutsches Institut für Entwicklungspolitik, Studies 32, Bonn		

(2) Are there hydrogeological features that cause regular impact patterns?

Characterization of aquifers

- geographical location of riparians in relation to groundwater flow, recharge and discharge areas
- location of groundwater resources in relation to state borders
- interrelation to (transboundary) surface water bodies

Constellations

Negative effects (transboundary externalities) move with groundwater flow

Recharge area in state A, flow and outcrop in state B

Symmetrical situation (both states pollute, both are affected)

(2) ... regular patterns

... are difficult to establish:

- ✓ utilization of deep / shallow aquifers, and from different layers
- ✓ knowledge gaps, e.g. demarcation, attributes, national use patterns ...
- ✓ resource boundaries and user domain boundaries are difficult to demarcate
- ✓ difficult to identify cause-effect patterns

Need for in-depth studies

(3) Record of cooperation

- ✓ Aquifer organizations (NSAS, NWSAS)
- ✓ River / lake basin organizations
  extend mandate and include groundwater (LCBC, ORASECOM, OMVS)
- ✓ Groundwater as part of a cross-border dialogue on the Pangani River (IWRM)

Cooperation is in an early stage (esp. in SSA):
measuring and forecasting systems

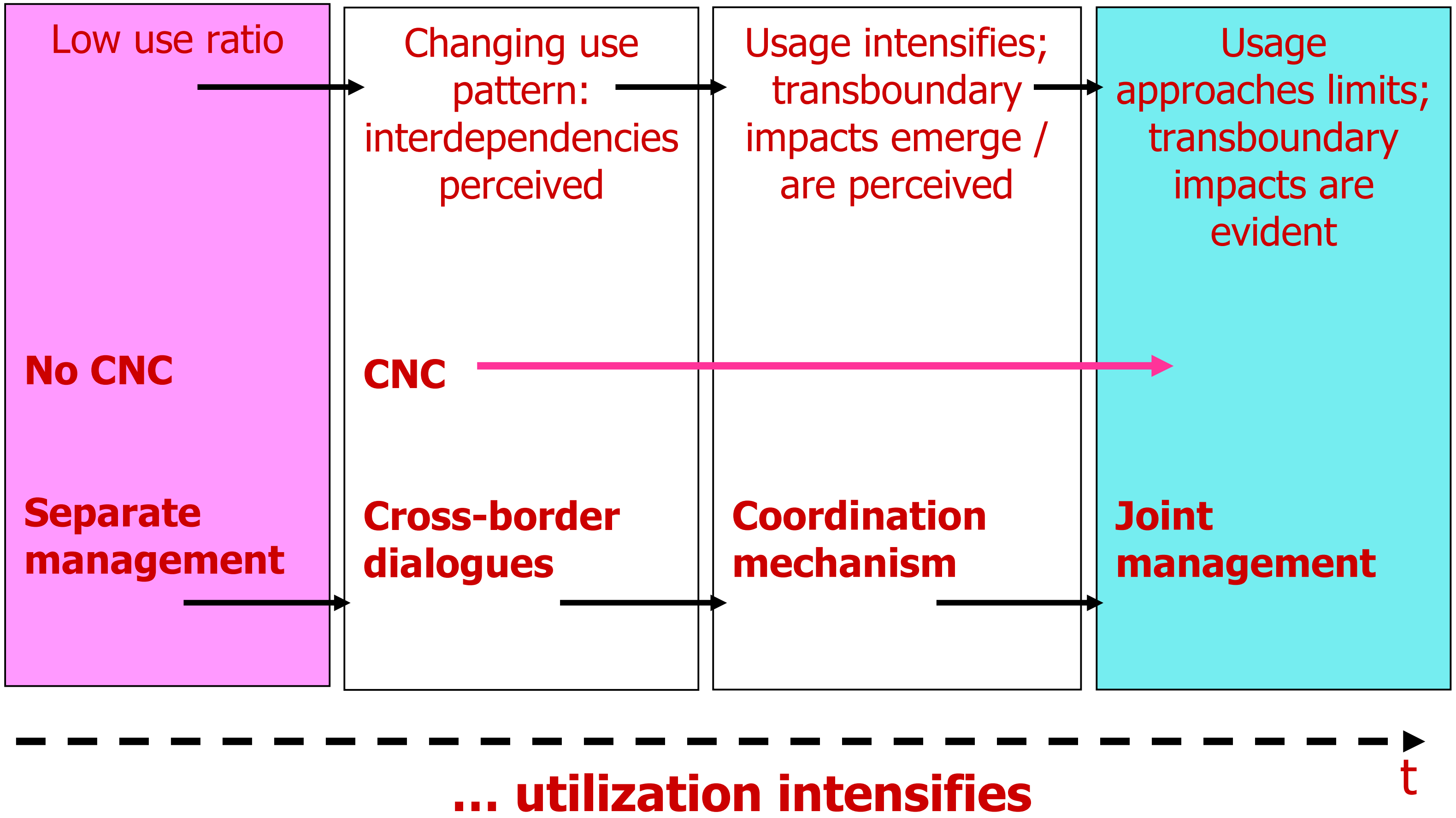
(4) What drives states to cooperate?

- ✓ Strategic role for a country‘s economic and social development in the absence of surface water (NWSAS, NSAS): economic strength
- ✓ … if surface water is scarce (Namibia from Stampriet Aquifer)
- ✓ Unequal dependency / use is highly asymmetric (Stampriet Aquifer)
- ✓ Low cost technology pumps (Kilimanjaro Aquifer)
- ✓ Cost of non-cooperation are yet not perceived / not known. Threat of potential impacts!

As yet no „race to the pumphouse“.

Joint initiatives in an early stage are promising and less contentious

Cooperation becomes imperative if …



(5) Recommendations

- Engage in transboundary aquifer management
  (scientists, decision-makers)

- Understand the resource
  water balance, interaction between aquifers and rivers/lakes, recharge and discharge mechanisms
- Understand the users
  sectors, and development trends
- Understand govt. policies (and their constraints)
  what governments should do, what others can do
- Build scientific, technical and institutional capacities
  for national / transboundary management
- Integrate groundwater into relevant policy fields
  (land use / sanitation) with a view to reducing or preventing groundwater pollution

Thanks for listening!

The study is available online and can be ordered as a hard copy from

www.die-gdi.de

Contents

Attributes	Transboundary rivers	Transboundary aquifers
Hydro-geo-physical	Yearly replenishment (drought), always from upstream. Provenance (rainfall, snow, aquifers). Visible boundary demarcation	Long period of replenishment, from any place. Unclear provenance (surface water, leakage from adjacent aquifers). Invisibility
Human interventions	(1) Large-scale abstractions (interbasin transfers, dams for irrigation, water supply,energy) •centrally planned •high intensity investment decisions	(1) Small- to medium-scale abstractions (domestic supply, irrigation) •millions of individual pumping decisions •low intensity investment decisions [Great Man-Made River Project]
	(2) Pollution from industry, cities (point sources) •can be monitored •cause and effect pattern •technical means (treatment). Diffuse return flows from agriculture.	(2) Pollution from diffuse and dispersed sources •seepage (urban a. rural); •unclear cause-effect pattern •irreversible losses.
Transboundary implications	Large volume storage / abstractions have immediate impacts downstream. Pollution from industry, cities has immediate impact downstream.	Impact of millions of individual abstractions is local and regional, in any direction, emerges in substantial distance from generation. Pollution from diffuse sources emerges with considerable time lag, in any direction, difficult to predict. Uncertainty in assessing national shares.