The RAMOTSWA Project

Antecedents

Karen G. Villholth
IWMI

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RESILIM : Resilience in the Limpopo River Basin Program

CGIAR Research Program on Water, Land and Ecosystems

IWMI International Water Management Institute

igrac International Groundwater Resources Assessment Centre

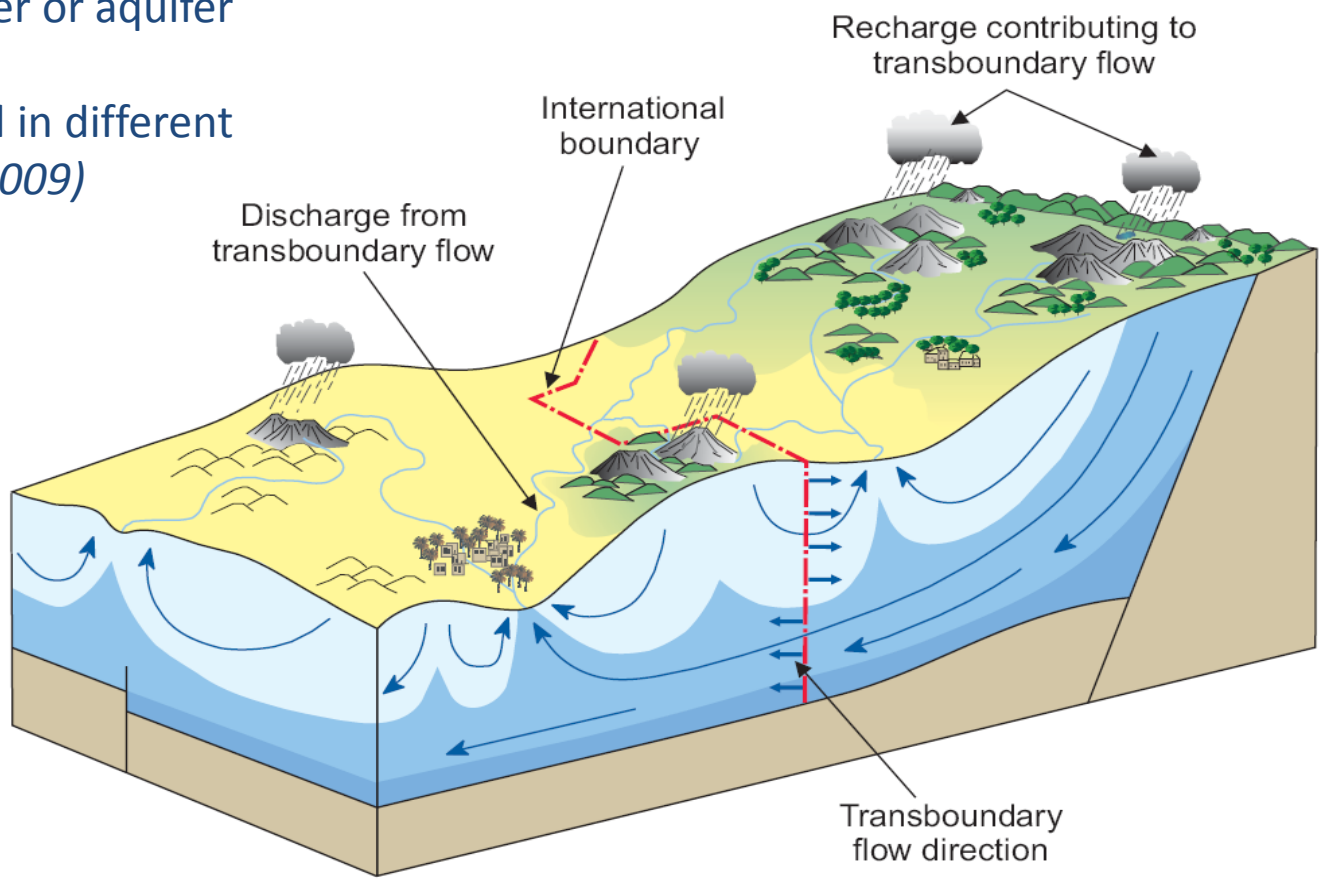
XRI

water & sanitation
Department: Water and Sanitation
REPUBLIC OF SOUTH AFRICA

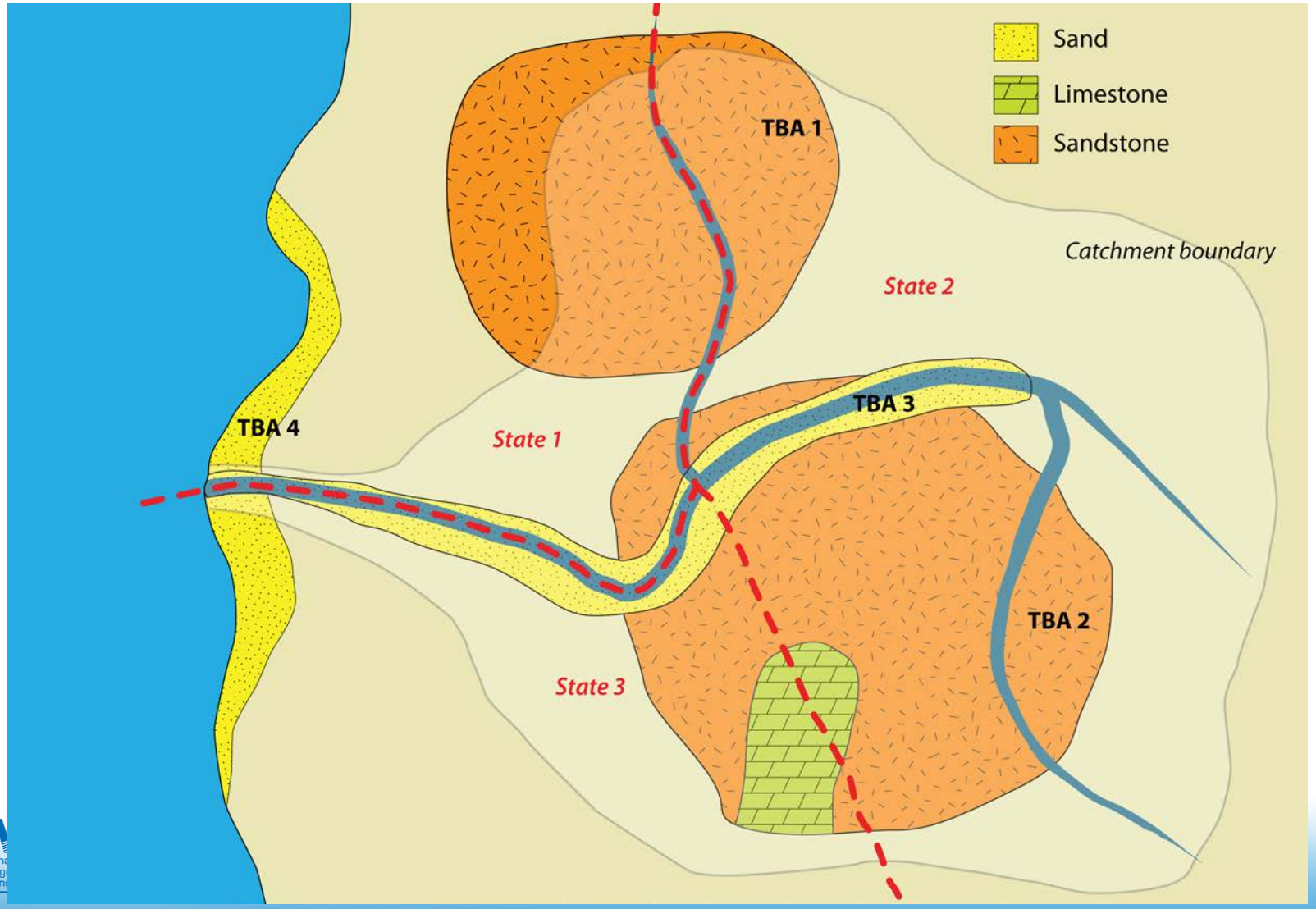
MMEWR
DEPARTMENT OF WATER AFFAIRS

What is a transboundary aquifer

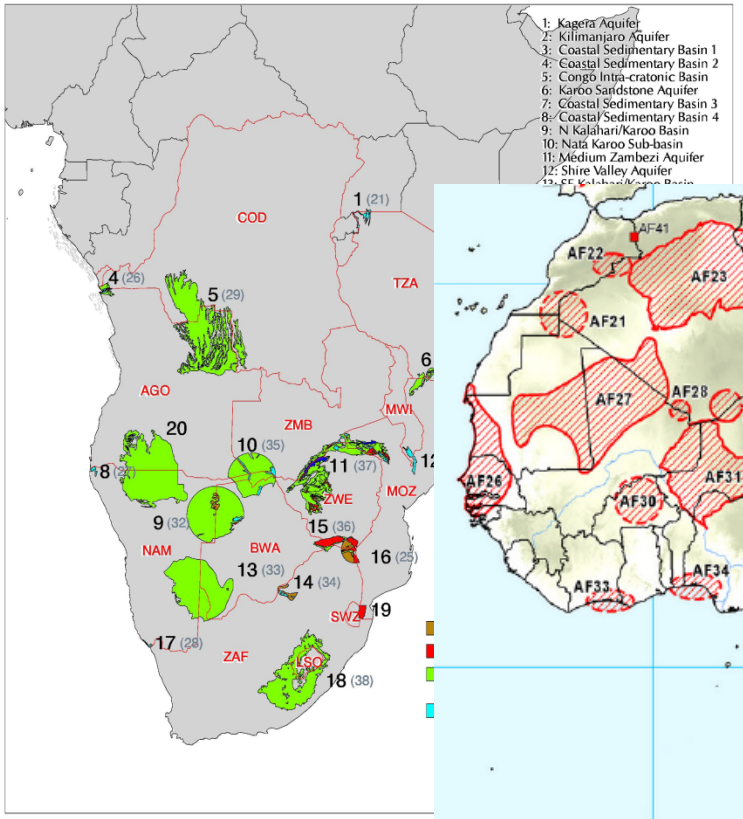
A **transboundary aquifer** or transboundary aquifer system is an aquifer or aquifer system, parts of which are situated in different States *(UNESCO, 2009)*



Different types of transboundary aquifers (TBAs)



Mapping of TBAs



IGRAC (2006)

IGRAC (2009)

IGRAC (2015)

History of TBAs in Africa

- 2000 ISARM Project (International Shared Aquifer Resources Management
- SADC adopted Revised Protocol on Shared Watercourses in 2000
- AMCOW at its 6th Session in Brazzaville, Congo, May 2007, stating the aim to ‘promote the institutionalisation of GW management by river basin organisations’
- 19 draft articles of the UNILC Law of Transboundary Aquifers, adopted by resolution of the UN General Assembly in 2008

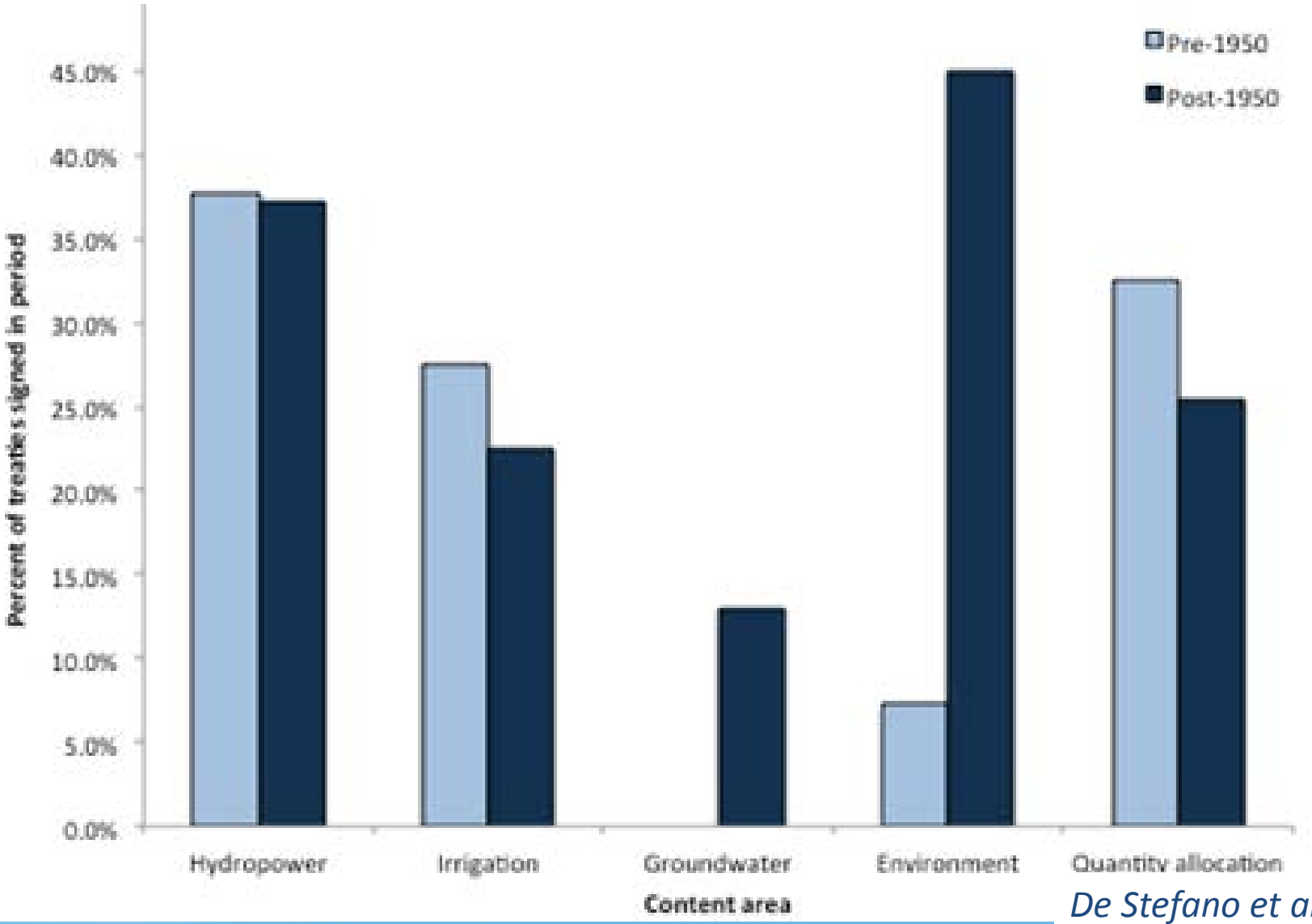
Management of TBAs

- Address transboundary GW issues
- Get GW higher on the agenda and promote GW mgt. in general
- Support to regional cooperation broadly
- Optimize limited resources
- Develop and protect GW resources that in general are more productive and prospective
- Address GW in an interdisciplinary way
- Bring GW benefits to the poor

8 arguments for joint TBA management

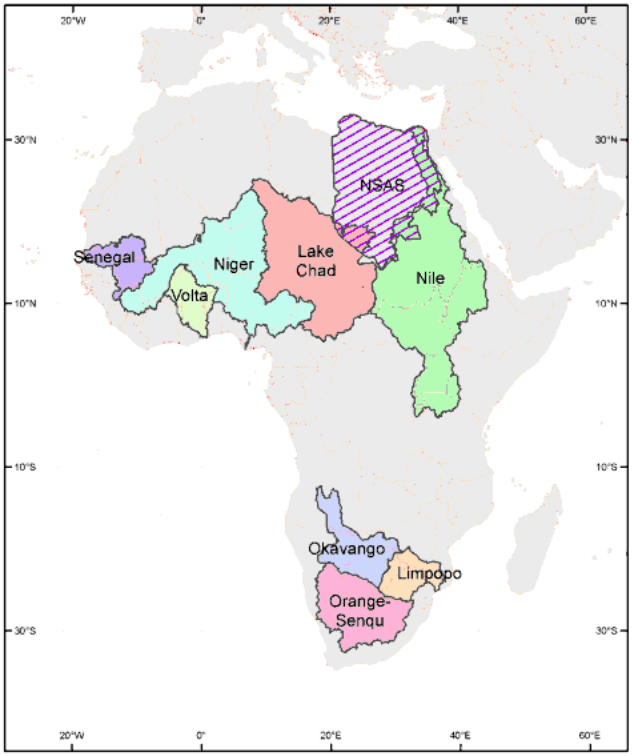
1. Benefits of groundwater (GW) development and management can be equitably shared across borders to avoid climate-induced distress migration and conflicts
2. An integrated and transboundary approach facilitates enhanced understanding of water flows and water balances within the aquifer basin and supports improved delineation of the aquifer, including connected surface water (SW) systems
3. GW impacts across borders may not be obvious without joint long-term monitoring. Costs and results of monitoring can be shared
4. Impacts of unilateral GW development and use in one member state may affect another
5. Developing GW in connection with transboundary SW (conjunctive use) may provide a lot of benefits, e.g. floodwaters may be used to replenish GW in overdrawn aquifers;, and managed aquifer recharge (MAR) and recovery may support water banking and salinity control
6. Lake, river, wetland and estuary water quantity may be threatened by GW abstraction in adjacent upstream aquifer states (mining, intensive agriculture)
7. Lake, river, wetland and estuary water quality may be threatened by GW pollution in adjacent upstream aquifer states (mining, intensive agriculture)
8. No-action and lack of transboundary cooperation may result in significant and long-term risks, e.g. haphazard and chaotic exploitation of aquifers with high remediation costs if at all reversible (like certain types of contamination and land subsidence)

Focus of TB water agreements, pre- and post-1950



De Stefano et al., 2013

GW mgt. capacity in African IBOs



Needs Assessment to Support Groundwater Management in International Basin Organisations of Africa

- Karen Villholth
- Richard Owen
- Tamiru Abiye
- David Love
- Sarah I. Vassolo
- Muna Mirghani
- Callist Tindimugaya
- Sven Menge
- Ben Mapani
- Moustapha Diene

January 2013

BMZ Federal Ministry for Economic Cooperation and Development

Strengths

1. Strong political support from riparian states for IWRM
2. AMCOW is supporting integration of GW management into RLABOs
3. Regional development communities (e.g. SADC) are strongly promoting regional cooperation on GW management
4. ISARM has provided tools and networks for further enhancing action on TBA management
5. Multi-governmental agreements exist on the joint management of water resources and the benefits derived from their use
6. Most, though not all, RLABOs have a permanent Secretariat and established organisational structure with agreed shared budget allocations for carrying out their mandate
7. GW generally recognized as supporting the hydrological system
8. Experience with collaboration with various international and bilateral and multilateral partners (e.g. ANBO, INBO, SADC, UNESCO, GWP, etc.) can foster further joint riparian collaboration and financial capacity

Weaknesses

1. No explicit mandate to address GW in legal framework
2. GW development associated mostly with incremental and often private informal, development, not large infrastructure projects, which normally fall ir the realm of RLABOs
3. Little understanding of the TBAs and their potential for human development, a well as their physical extent, connection with other aquifers and SW and their vulnerabilities to development
4. Most RLABOs do not have a water resources strategy or action plan that explicitly considers GW
5. Limited cooperation between RLABOs and national authorities on GW issues
6. Limited collaboration between RLABOs on similar water management issues
7. Lack of tradition in applying data for management of joint GW-SW resources
8. Few resources put into data and knowledge management
9. Unclear data sharing agreements make riparian states reluctant to share data
10. Data monitoring on GW not coordinated across borders => limited concerted knowledge on transboundary impacts
11. Understaffing of RLABOs with respect to hydrogeology expertise
12. Most knowledge is generated through commissioned experts
13. Little stakeholder involvement at all levels

Opportunities

1. RLABOS provide a suitable platform for integrating management of GW into IWRM
2. With GW becoming of increasing interest to the states for other uses than dispersed domestic use and with already emerging GW issues of overuse and degradation, there will be greater emphasis on GW management
3. GW and TBAs management receives increasing attention from multilateral donors
4. There is expressed interest in RLABOs to get more understanding of SW-GW interaction
5. Joint research projects and results on the TBAs are emerging
6. Present organisational frameworks provide for permanent RLABOs for NBI and NSAS
7. ANBO, AMCOW, GWP, UNECE can foster further awareness, focus and capacity on transboundary GW management
8. Regional development communities in various parts of Africa (e.g. ECOWAS) can emphasize GW in their regional IWRM framework
9. Better tools for assessing SW-GW interaction and interdependencies are being developed (e.g. through IAEA on isotopes and tracers)
10. TBA focus may enhance collaboration at local, national and international level on GW, improving overall management
11. Joint GW capacity in RLABOs may level the disparate present national GW capacities
12. Using the international attention to TBAs to raise the national attention to GW

Threats

1. Too little national political commitment and support
2. Duplication or confusion of roles and responsibilities of existing (national) organisations, e.g. on data management
3. General under-capacity of RLABOs for addressing transboundary water management
4. Disparities among riparian states on the capacity and commitment toward joint (ground)water resources management
5. Financing is not continuous and secured
6. Conflicting interests between riparian states
7. Riparian states may reject the role of RLABOs in managing TBAs
8. Science/technology is not integrated into management. Functions independently of policies and regulation
9. Not all riparian states comply with their financial duties
10. Funding requirements for GW management is seen as a competitor to sam for SW
11. RLABOs too water-centered
12. Little collaboration between the international SW and GW community

Consultative meeting hosted by Volta Basin Authority

Ouagadougou, Burkina Faso, 12 -14 Feb. 2013

INTEGRATION OF GROUNDWATER MANAGEMENT

into Transboundary Basin Organizations in Africa

TRAINING MANUAL

FORMATION:

INTEGRATION DE LA GESTION DES EAUX SOUTERRAINES DANS LES ORGANISMES DE BASSIN EN AFRIQUE

- Adaptable à chaque organisme de bassin
- Basée sur les demandes des organismes de bassin et sur les problèmes spécifiques des eaux souterraines du bassin
- Une formation réussie pour la Commission du fleuve Orange-Senqu (ORASECOM) du 23 au 27 septembre 2013 au PDH, Wits University, Johannesburg, South Africa

Eaux souterraines: une ressource stratégique

Les eaux souterraines joue un rôle primordial pour l'approvisionnement en eau en Afrique (eau domestique, élevage, irrigation, industrie). Les nouveaux challenges que doivent affronter les eaux souterraines en Afrique s'articulent autour du contexte de la croissance démographique, de la sécurité alimentaire et du changement climatique:

- la demande en eaux souterraines devrait accroître pour l'urbanisation et l'intensification de l'irrigation
- la dépendance aux eaux souterraines devrait augmenter pour assurer la résilience aux sécheresses.
- les aquifères transfrontaliers et les eaux souterraines internationales partagées, actuellement identifiées et caractérisées, seront sous plus forte pression pour le développement de leur utilisation.

Eaux souterraines: une ressource à gérer par les organismes de basin

Les eaux souterraines font parties du cycle naturel de l'eau. De fortes interactions lient les eaux souterraines aux eaux de surface. Les systèmes aquifères (profonds ou peu profonds) sont souvent essentiels pour le débit de base des rivières et les écosystèmes aquatiques tels que les marais ou étangs. La gestion des eaux souterraines par les organismes de basin permet d'améliorer la gestion intégrée des ressources en eau (GIRE) et par conséquence, un développement économique durable et le bien-être de l'être humain. .

Qui est l'audience cible de la formation?

Du technicien au cadre, tout le personnel des organismes de bassin est ciblé ainsi que les personnes pertinentes des institutions/organismes nationaux ou locaux qui travaillent en collaboration avec les organismes de basin. C'est une formation technique mais facile d'accès de sensibilisation à la gestion des eaux souterraines. Cela permet de comprendre la ressource et d'identifier les principaux problèmes de la gestion à l'aide d'éléments théoriques et d'exercices pratiques.

Developed by:

Commissioned by:

Sponsors:

REPORT ON THE TRAINING COURSE ON "INTEGRATION OF GROUNDWATER MANAGEMENT INTO AFRICAN BASIN ORGANISATIONS" ORANGE-SENQU RIVER COMMISION (ORASECOM)

Date: 23-27 Sept. 2013
Venue: PDH: Wits University, Johannesburg, South Africa

Facilitators:

1. Dr Richard Owen (AGWNET)
2. Dr Karen Villholth (IWMI)
3. Prof Tamiru Abiye (AGWNET)
4. Ms Vanessa Vaessen (BGR)

Guest Lecturers

1. Dr Shafick Adams (WRC)
2. Dr Andrew Stone (American Groundwater Trust)
3. Prof Eberhard Braune (UWC)
4. Dr Nicole Lefore (IWMI)

Opening session officials

1. Prof Roger Gibson (Wits University)
2. Mr Phera Ramoeli (SADC)
3. Ms Vanessa Vaessen (BGR)
4. Dr Karen Villholth (IWMI)
5. Mr Rapule Pule (ORASECOM)

Closing session official

1. Mr Lenka Thamae (ORASECOM Executive secretary)

Sept 2013, AGWNET, Johannesburg

African Network of Basin Organisations

Global Water Partnership

GROUNDWATER
DEVELOPMENT OPPORTUNITIES & MANAGEMENT RESPONSIBILITIES
the Mission for African Basin Organisations

KEY MESSAGES:

- groundwater is the preferred (and sometimes only) source to meet new water-supply demands, and is vital for rural life and livelihoods
- basin organisations provide a unique platform to explore beneficial conjunctive management of groundwater and strategic use of aquifer storage for climate-change adaptation
- sound groundwater management is of paramount importance for the conservation of important aquatic and terrestrial ecosystems
- groundwater systems and their surface water interactions, need to be better understood – and appropriate training provided for water resource professionals
- leadership is much needed to strengthen the institutional framework for managed ground water development and thus improve water-security for urban centres and irrigated agriculture
- transboundary cooperation on groundwater will reduce potential conflict, promote rational development, and share the costs of investigation and monitoring

WHAT IS THE ROLE OF GROUNDWATER IN SOCIAL AND ECONOMIC DEVELOPMENT?

Improving Rural Water-Supply — The Continuing Need

Groundwater is **critical for human survival and livelihoods** across very extensive drought-prone areas of Africa. Traditionally it was access to groundwater in springs, seepages and dugwells that controlled the extent of human settlement beyond the main riparian tracts. But the introduction of drilling rigs and borehole pumps from the 1970s **enabled human settlement to expand** greatly.

Today the **dependence of rural water-supply on groundwater** (for domestic use, livestock rearing, vegetable plots and village industry) is put at over 75%. It is the presence of successful waterwells that allows villages, clinics, schools, markets and livestock posts to function over very large land areas. This **critical social function** cannot be overstated. In the future it will be essential that groundwater be further developed to meet the basic need of the growing rural population for a secure and safe water-supply. For this better use of hydrogeologic expertise and improved community maintenance will be needed to reduce **waterwell failure levels** due to insufficient yield and/or inadequate quality.

The New Agenda — Expanding Use for Urban Supply & Agricultural Irrigation

In numerous countries of Sub-Saharan Africa the strategic water agenda is already undergoing rapid change - due to demographic pressure, climatic variability and economic transformation. New policy questions are widely having to be faced :

- What is the scope for a major increase of **groundwater use in irrigated agriculture** (at both subsistence and commercial scale) with associated investment risks minimised and sustainable outcomes assured?

Transboundary aquifer mapping and management in Africa: a harmonised approach

Yvan Altchenko · Karen G. Villholth

Abstract Recent attention to transboundary aquifers (TBAs) in Africa reflects the growing importance of these resources for development in the continent. However, relatively little research on these aquifers and their best management strategies has been published. This report recapitulates progress on mapping and management frameworks for TBAs in Africa. The world map on transboundary aquifers presented at the 6th World Water Forum in 2012 identified 71 TBA systems in Africa. This report presents an updated African TBA map including 80 shared aquifers and aquifer systems superimposed on 63 international river basins. Furthermore, it proposes a new nomenclature for the mapping based on three sub-regions, reflecting the leading regional development communities. The map shows that TBAs represent approximately 42 % of the continental area and 30 % of the population. Finally, a brief review of current international law, specific bi- or multilateral treaties, and TBA management practice in Africa reveals little documented international conflicts over TBAs. The existing or upcoming international river and lake basin organisations offer a harmonised institutional base for TBA management while alternative or supportive models involving the regional development communities are also required. The proposed map and geographical classification scheme for TBAs facilitates identification of options for joint institutional setups.

Keywords Transboundary aquifer · Africa · Groundwater management

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Introduction

According to the United Nations International Law Commission's (UNILC) Draft Articles on the Law of Transboundary Aquifers, a transboundary aquifer or a transboundary aquifer system (TBA) is defined as "an aquifer or aquifer system, parts of which are situated in different States" (Article 2c, Stephan 2009). While in principle the term 'transboundary' also refers to local jurisdictional boundaries (of e.g. a community, municipality, province, or region), or to river catchment delineation, the UNILC definition is adhered to here. While not spelled out in the short definition of a TBA, in practical identification and verification of a TBA, the spatial delimitation, hydrogeological similarity, recharge and discharge mechanisms and zones, and significant hydraulic connectivity between the national compartments of the TBA are important and should be established and agreed upon between aquifer-sharing states. The UNILC definition of TBAs does not imply that groundwater resources in border regions outside of TBAs do not exist or manifest similar properties as TBAs. However, the extent and significance of such resources are considered of limited transboundary importance or their transboundary extent have not been identified or acknowledged.

This report focuses on the internationally shared aquifers in Africa. While progress in understanding the importance and extent of these water resources and incipient management frameworks are evident from many reports, relatively little attention has been accorded these resources in the scientific literature. TBAs have been highlighted only since the beginning of the century, initially by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and specifically with the launch in 2000 of the International Shared Aquifer Resources Management Project (ISARM) by UNESCO's Intergovernmental Scientific Cooperative Programme in Hydrology and Water Resources (UNESCO-IHP; Puri and Aureli 2005; UNESCO 2010, 2008, 2004).

Prior to 2000, limited knowledge of TBAs was available, and this certainly was not commensurate with the level of knowledge and management tools and approaches bestowed internationally shared river systems. Hence, an immediate need was to identify, delineate, and map the TBAs at various scales, from local, to regional, to global. The first results of TBA mapping in Africa appeared in 2004 when ISARM

Altchenko and Villholth, 2013

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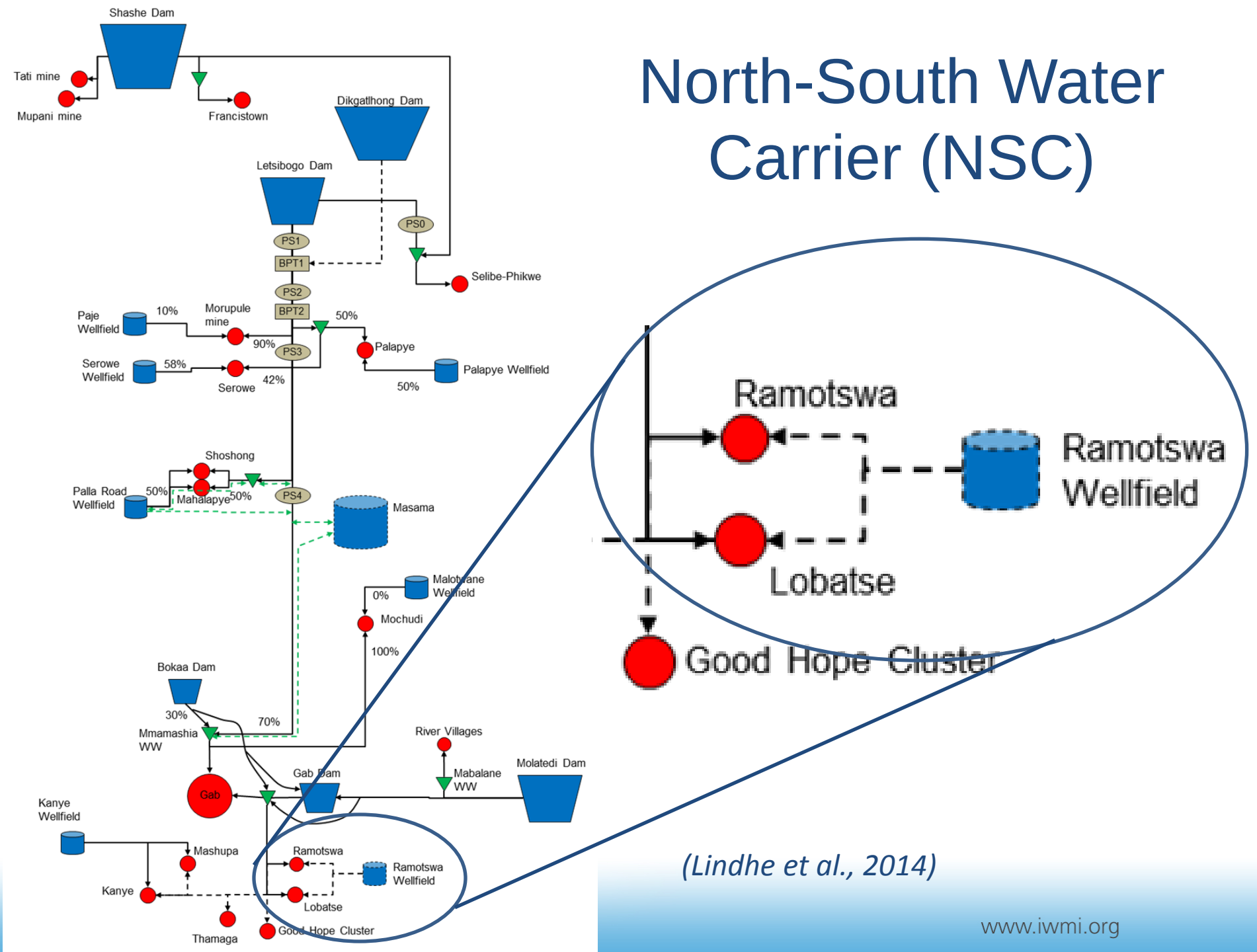
North-South Water Carrier (NSC)



(Lindhe et al., 2014)

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THANK YOU

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