

The International Hydrological Programme (IHP)

Internationally Shared Aquifer Resources Management (ISARM) – Africa West and Southern Africa experiences

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Launching ISARM

In June 2000, the Intergovernmental Council of UNESCO's IHP

- Recognized that transboundary aquifer systems are important sources of fresh water in some regions of the world,
- Decided to adopt a resolution to promote studies in regard to internationally shared aquifers



ISARM : Multidisciplinary aspects

- **Legal**
 - eg Treaties, interstate agreements
- **Scientific**
 - Hydrology, hydrogeology, conceptual modelling
- **Socio-economic**
 - Water security, accesibility, efficiency, poverty reduction
- **Institutional Capacity Building**
 - Awareness raising, counterpart agencies
- **Environmental**
 - Sustainability, biodiversity, risks, vulnerability



ISARM Portal: www.isarm.net

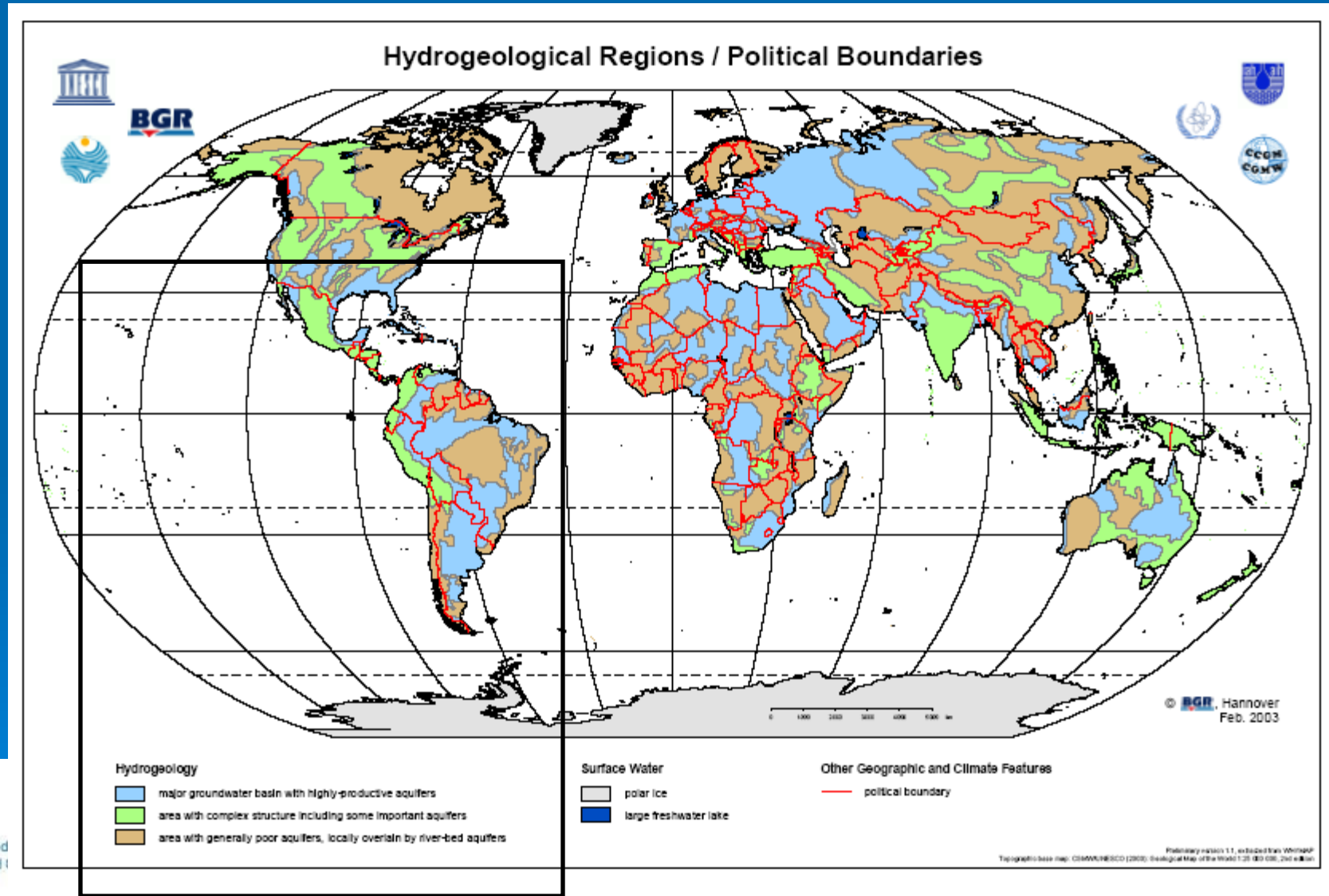


The screenshot shows the ISARM Portal homepage with the following elements:

- Logos:** UNESCO, IAH (International Association of Hydrological Sciences), ILC (International Commission on Large Dams), FAO (Food and Agriculture Organization), OSS (Organization for Shared Aquifer Resources), JAWAB (Joint Action Working Arrangement on Basin Water), and IWLRI (International Water Law Research Institute).
- Text:** "Welcome to"
- Diagram:** A cross-section of the ground showing a transboundary aquifer. A red vertical line represents a national border. Blue arrows indicate water flow from the left side of the border to the right side, and from the right side back to the left, illustrating the shared nature of the resource.
- Navigation Menu (Left):**
 - Initiative
 - Programme
 - Regional Activities
 - People
 - Documents
 - Collaborative Environment
- ISARM Title:** "I S A R M" in large letters, followed by "International Shared Aquifer Resource Management".
- Text on the Right:**
 - "what is a transboundary aquifer?"
 - "how widespread are transboundary aquifers?"
 - "read the ISARM news"
- Footer:** "ISARM contact" and "a global initiative for identification, assessment and sound management of transboundary aquifers".



Groundwater Map of the World

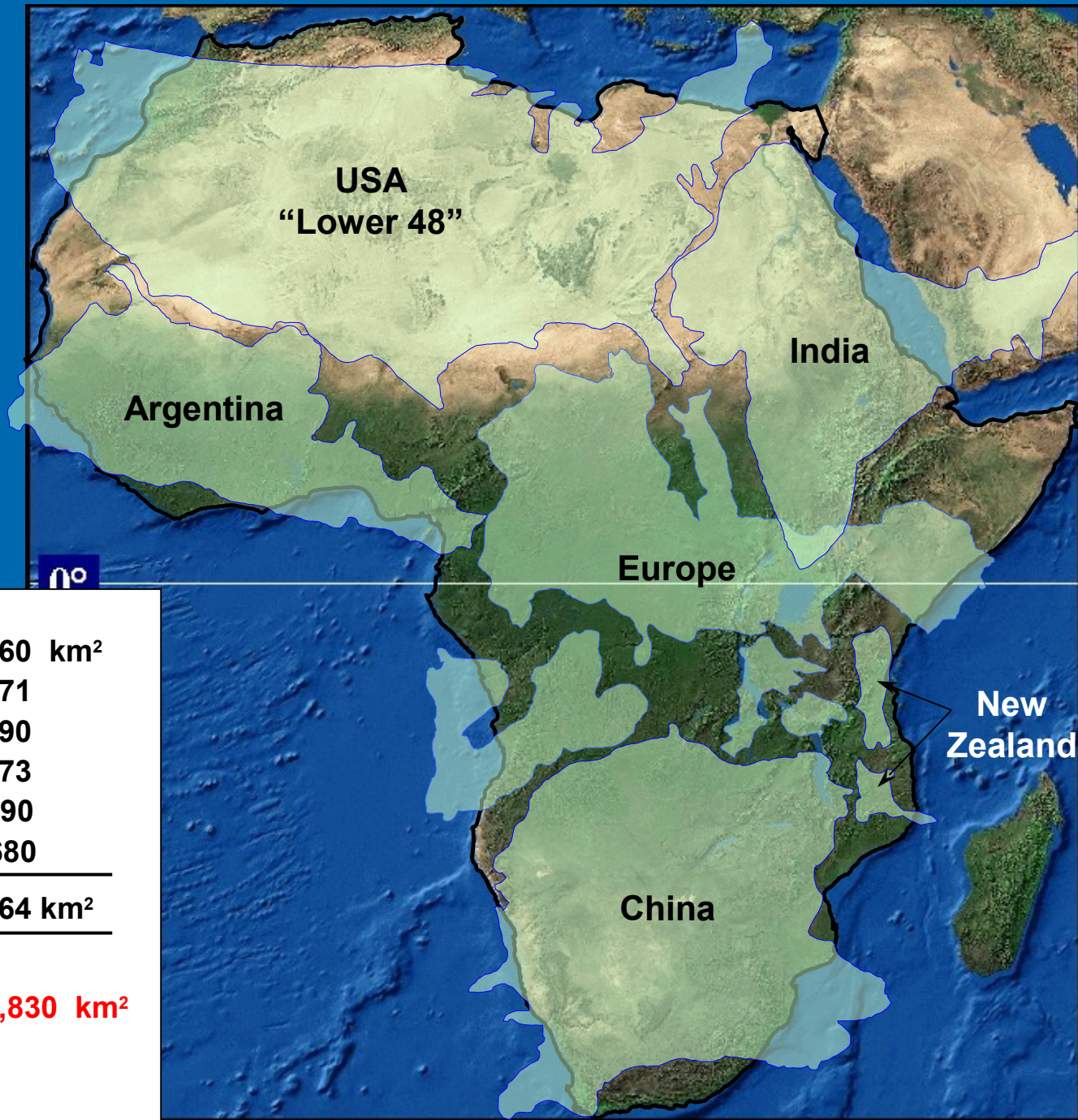


ISARM AFRICA

- In June 2002, UNESCO along with FAO, IAEA, IAH, UNECE, SADC, OSS and OACT organized the International workshop on "Managing Shared Aquifer Resources in Africa". (hosted and supported by the General Water Authority of the Libyan Arab Jamahiriya).
- During the workshop, nineteen transboundary aquifers were identified in the SADC region and forty overall on the Continent
- A recommendation to finalize the inventory and assist for a sustainable management of the TBA was made



The Size of Africa



China	9,596,960 km ²
USA	9,363,071
India	3,287,590
Europe	4,936,973
Argentina	2,766,890
New Zealand	268,680

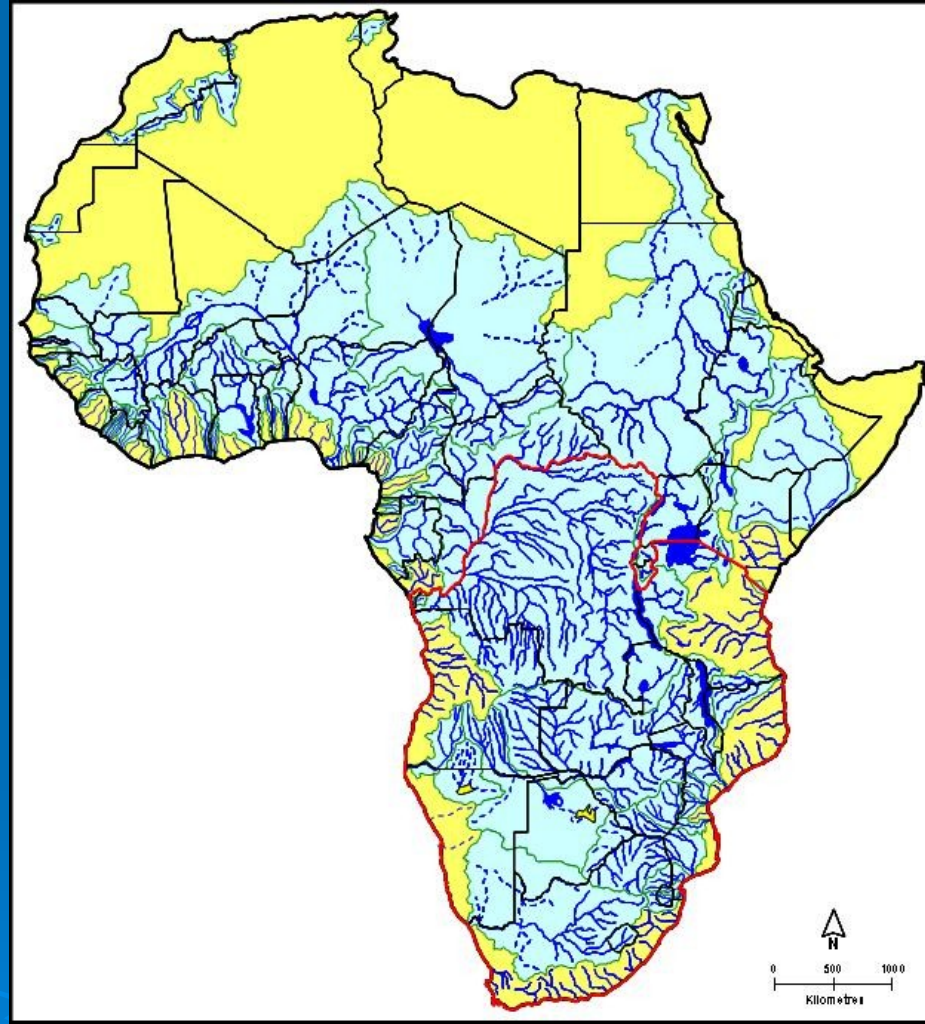
TOTAL : 30,220,164 km²

Area of Africa: 30,318,830 km²

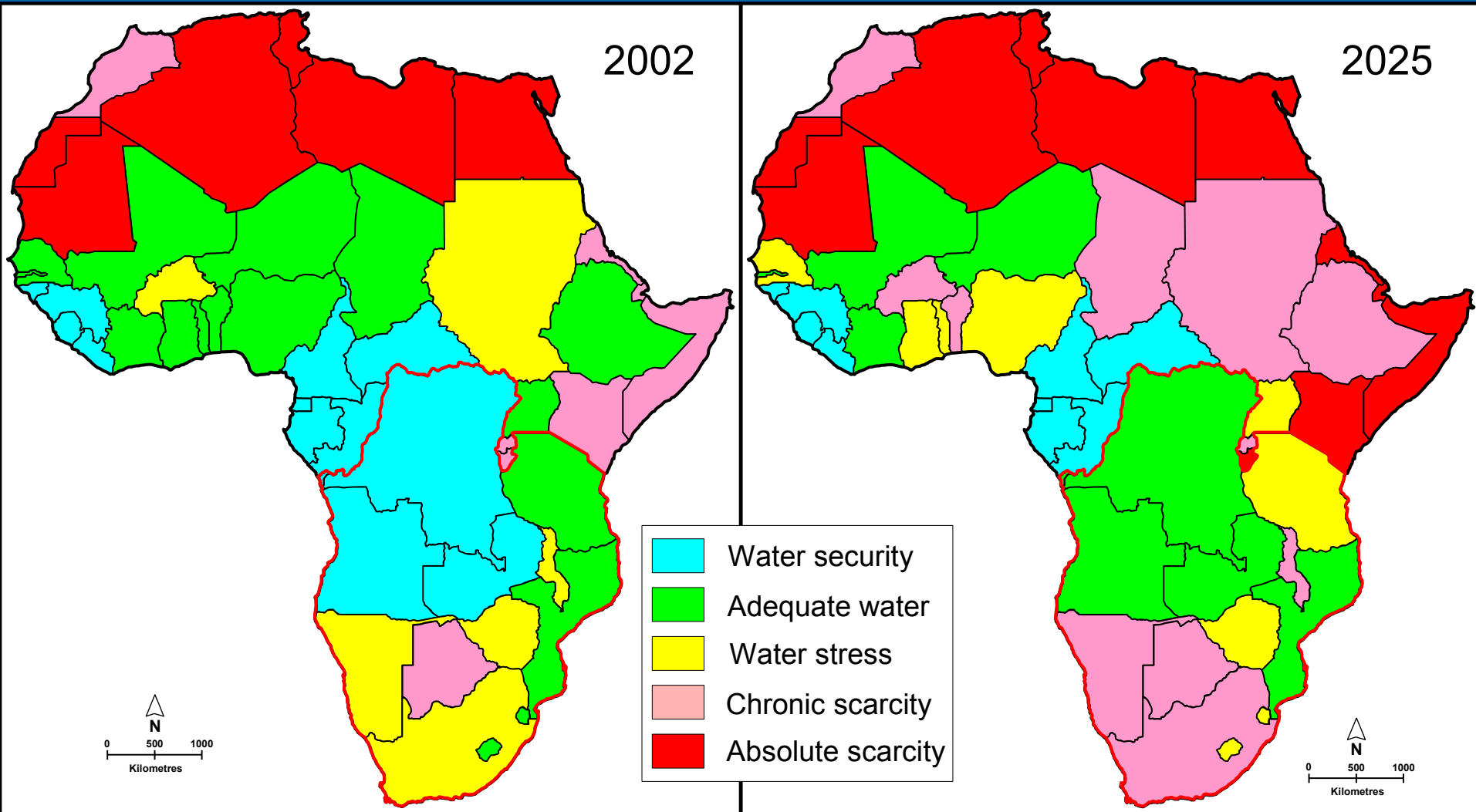
ISARM Africa

Africa's shared river basins contain:

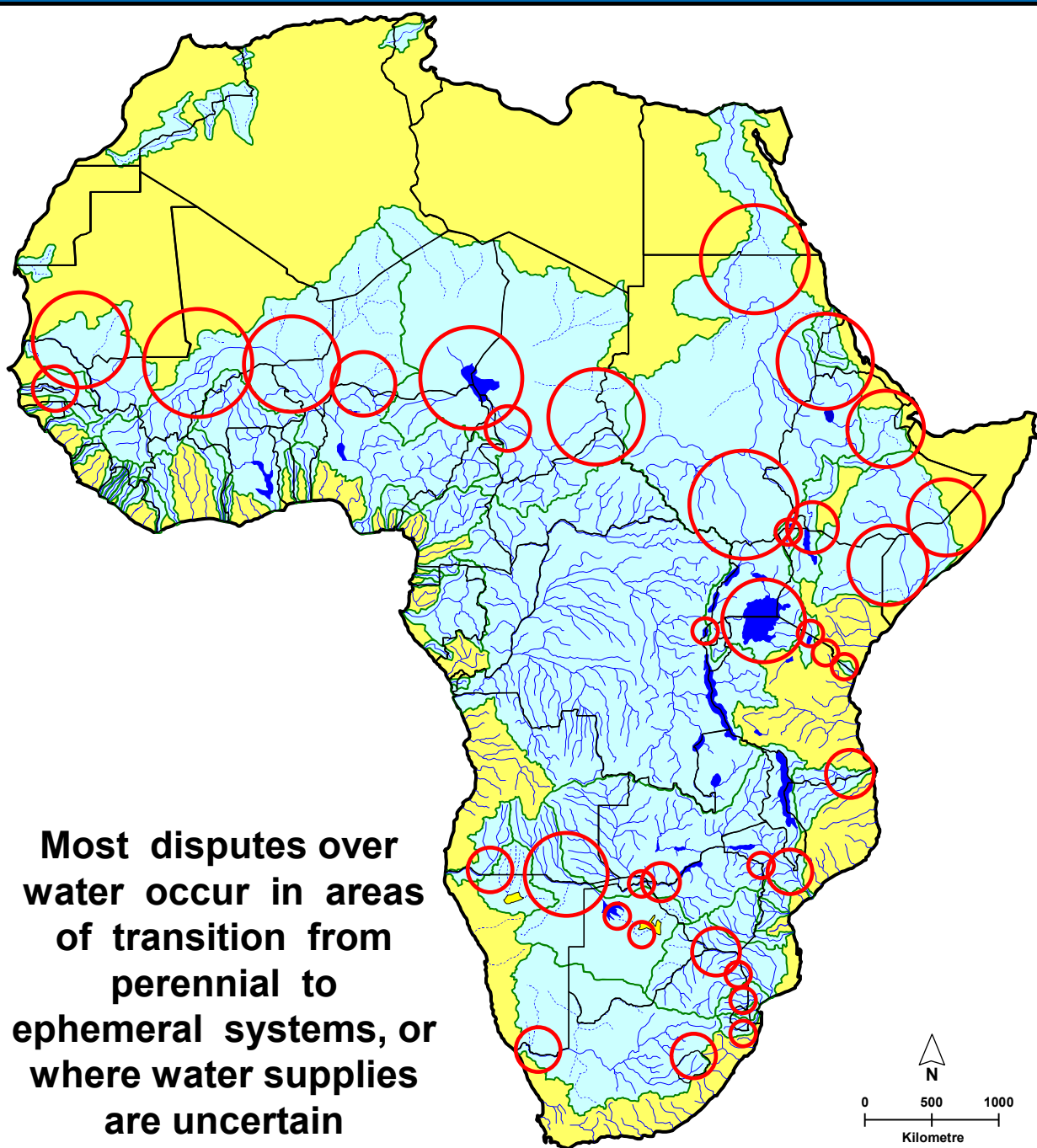
- 61 % of the area
- 77 % of the people
- 93 % of the water



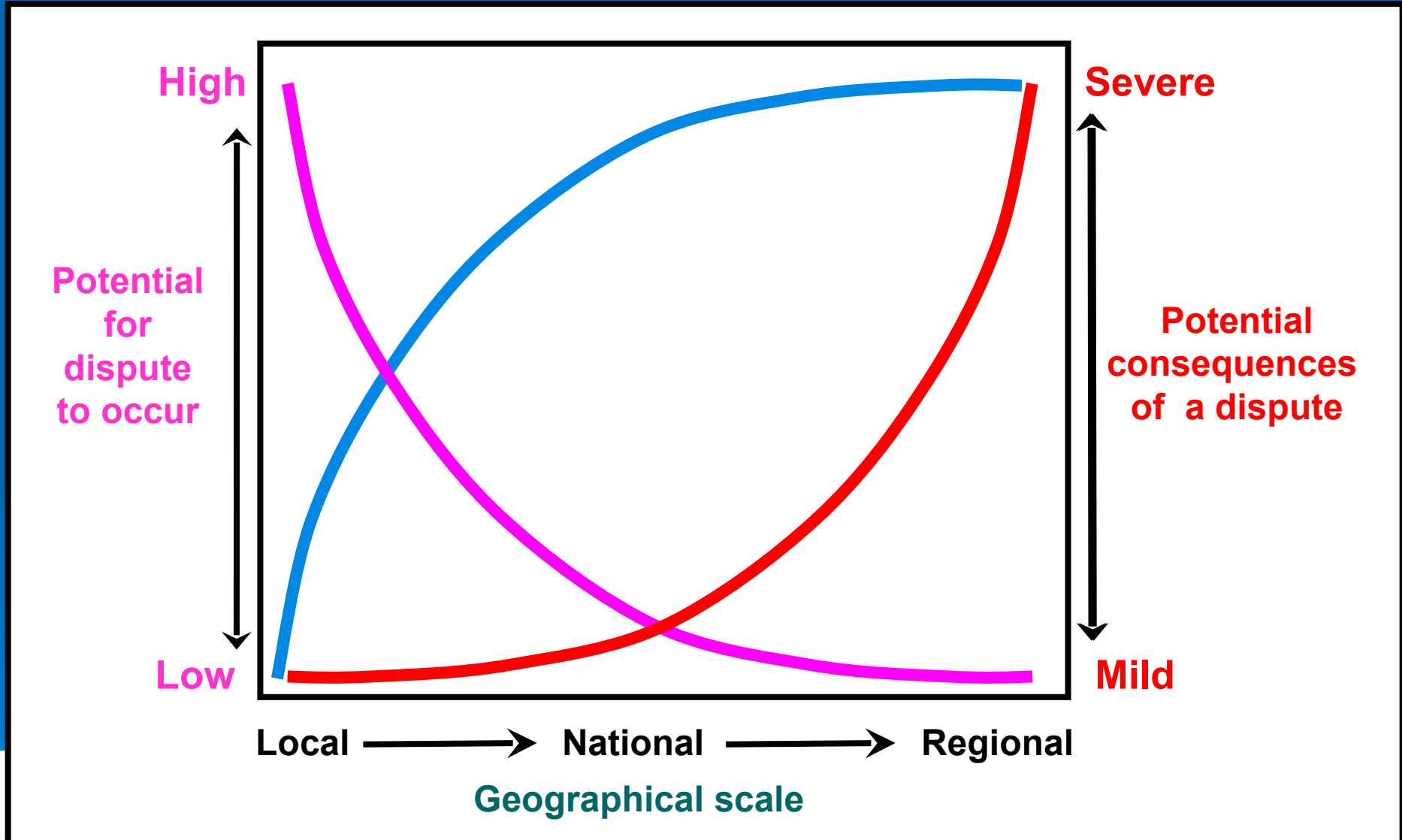
Water Available per Person in 2002 and 2025



Sites of Disputes Linked to Water



The Importance of Scale



ISARM SADC

- In the local context (SADC)
- What do we have?
 - Legislation that covers groundwater (Protocol on Shared Watercourse Systems in the SADC)
 - Commissions for Internationally Shared Water Resources (ORASECOM, OKAKOM, ZAMCOM etc)
 - Variability of available data (quantity and quality) within countries
 - Poverty hitting harder the rural population
 - Climate variability
 - Need for improved Socio Ecological sustainability



ISARM SADC

➤ What do we need?

- Groundwater issues visible at the established Commissions for Internationally Shared Water Resources (ORASECOM, OKAKOM, ZACOM etc)
- Information on groundwater resources' quantity and quality / Standardization of available data
- Communication with surface water to achieve IWRM,
- Address societal needs, with transboundary issues etc



ISARM SADC

➤ Why ISARM SADC?

- No other platform existing
- The appropriate membership will avoid duplication and improve collaboration / complementarity; people ready to contribute
- Flexibility; ability to coordinate limited time project within an agreed framework
- International Organization backing scientifically
- SADC involvement



ISARM SADC

Address the approved SADC Regional Groundwater Management Programme (1998)

3. Establishment of a Regional Groundwater Information System
4. Establishment of a Regional Groundwater Monitoring Network
5. Compilation of a Regional Hydrological Map and Atlas for the SADC Region
8. Regional Groundwater Resource Assessment of Karoo Aquifers



ISARM SADC

- An ISARM SADC initiative supported by UNESCO commenced in March 2007 in Pretoria RSA. The initiative intends to
 - Establish a network
 - Provide a Mechanism for Coordination
 - Provide a TBA Inventory
- Two subsequent meetings were then held in Windhoek 2007 and Stampriet 2008



ISARM SADC

The second ISARM SADC meeting took place in July 2007, in Windhoek and intended to:

- Initiate the efforts of strengthening RBOs in gw
- Develop a concept proposal to be submitted to ORASECOM
- Exchange information on various initiatives in the area



ISARM SADC

- Climate variability will result in increased stress on gw resources
- Latest TDA Analysis on Orange Senqu has no groundwater input
- Need to feature prominently on the Commission's plans
- Opportunity for establishing relative legislation with the adoption of the UN International Law on TBA
- AMCOW decision in Brazzaville
- South Africa chairing AMCOW



ISARM SADC

TRANSBOUNDARY AQUIFER MANAGEMENT INITIATIVE

PROPOSAL TO THE ORANGE-SENQU RIVER COMMISSION

1. Introduction

Groundwater is a strategic resource in meeting the Millennium Development Goals (MDG's), especially goals 1 and 7, dealing with issues such as rural water supply, sanitation and poverty alleviation in the rural environment. The degree, to which the unsustainable and inappropriate utilization of groundwater negatively impact the water resources and often leads to land degradation, requires that groundwater development and management should be given more attention in the Orange-Senqu River Basin.

SADC, through its AMCOW-TAC members recently requested a scoping study of groundwater resources management in the SADC sub-region to give effect to the AMCOW groundwater resolutions at their meeting in Brazzaville.

2. Background

Following initiatives in the SADC to promote Internationally Shared Aquifer Resources Management (ISARM), several meetings took place between groundwater managers in the Region to discuss the issues that require urgent attention. These ISARM SADC meetings were held in Pretoria, South Africa from 20 to 21 March 2007, and a follow-up meeting in Windhoek, Namibia, from 18 to 19 July 2007. These meetings led to the prioritization of the importance of the different transboundary aquifers in the SADC, in particular those in the Orange-Senqu River Basin. A consensus decision was taken by the representatives of the different countries present at the meeting in Windhoek that Botswana, Namibia and South Africa will submit a brief motivation to the Orange-Senqu River Commission (ORASECOM) to support an aquifer management project to be undertaken in the transboundary Stampriet/Ncojane (South Eastern Kalahari/Karoo) Aquifer System within the Molopo-Nossob River Basin.

The main objective of this project will be to prepare an integrated water resource management program to maximize the sustainable use of all natural resources to the benefit of the local communities and other stakeholders in the sub-basin.

This consensus decision by the representatives at the ISARM meeting is in line with recent recommendations by the African Ministers' Council on Water (AMCOW) at their 6th ordinary session held in Brazzaville from 28 to 31 May 2007. Those important resolutions regarding groundwater resource management require that:

- The institutionalization of groundwater management should be promoted by River Basin Organizations and that

T.Z.M.

P.P.



- Synergy should be created with the Rural Water Supply and Sanitation Initiative (RWSSI) to ensure the inclusion of groundwater in resource assessments and the sustainable management of water resources to the benefit of the local population.

The representatives of Botswana, Namibia and South Africa agreed at the ISARM SADC meeting in Windhoek to submit a joint proposal to their respective Leaders of Delegation to the ORASECOM to request support for a major transboundary aquifer management initiative in the Orange-Senqu Basin.

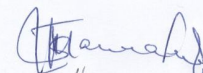
3. Recommendations

It is therefore recommended that the ORASECOM should favourably consider the following proposals:

- 3.1 A Groundwater Technical Committee or Task Force is established by the Commission to assist in ensuring that groundwater issues are adequately addressed in conjunction with surface water issues.
- 3.2 Groundwater is specifically included in the proposed Molopo-Nossob Basin study and the GEF funded study that is at present in the Transboundary Diagnostic Assessment stage.

By approving these recommendations, the ORASECOM will most probably be the first River Basin Institution in the SADC that will give effect to the resolutions of AMCOW and will make a constructive contribution to achieve the MDG's in the Basin.

DONE and signed on this nineteenth day of July 2007 in Windhoek, Namibia by the following representatives from the Orange-Senqu Basin States:



BOTSWANA

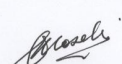
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NAMIBIA

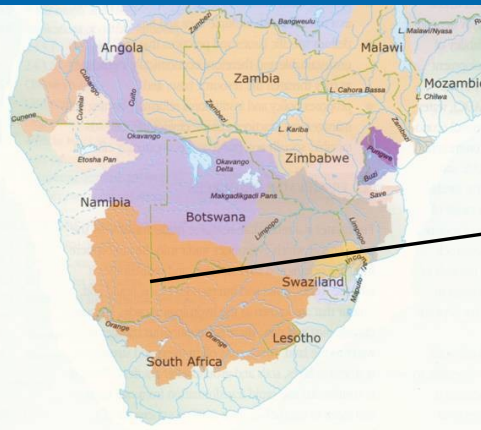
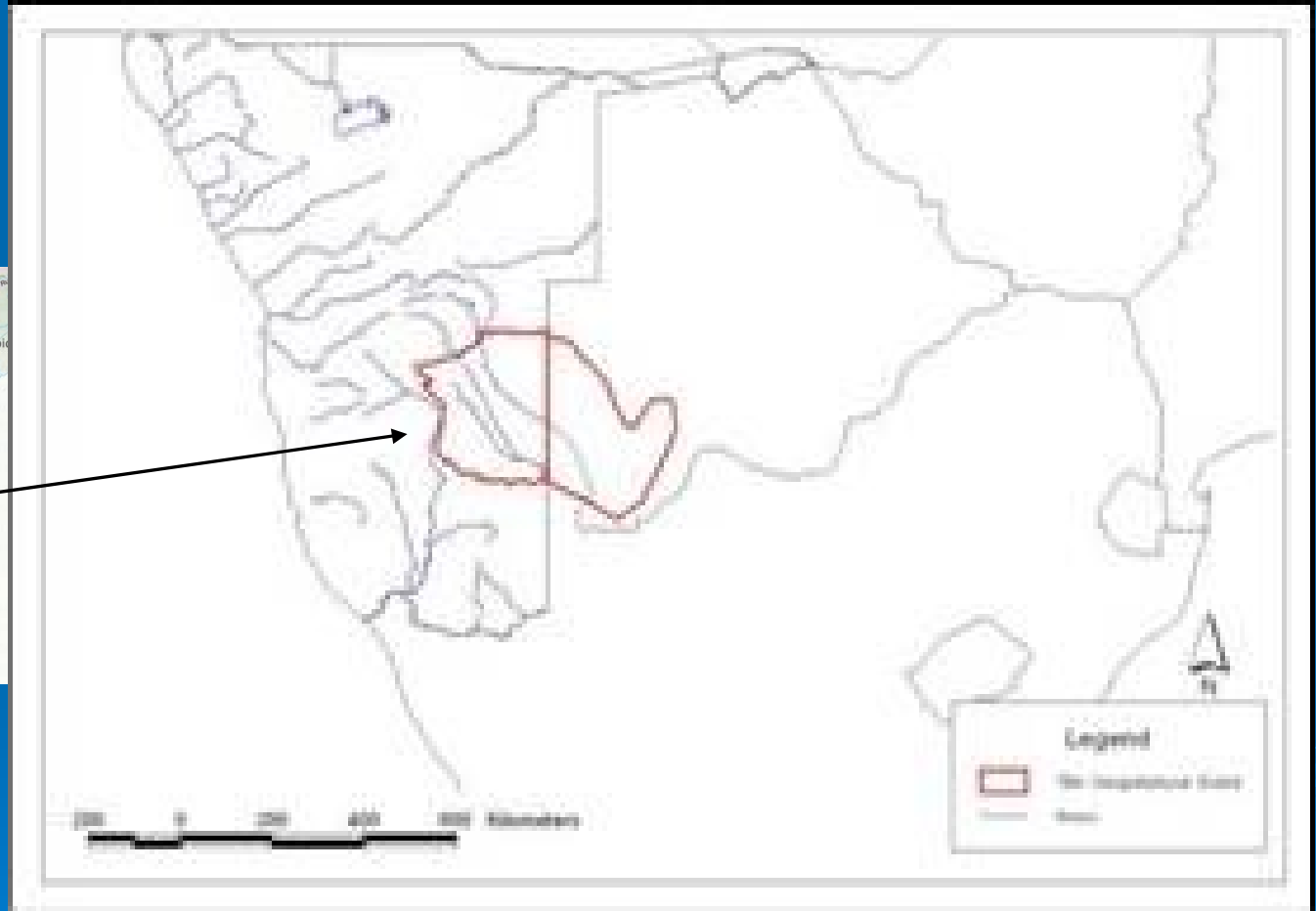
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SOUTH AFRICA 17/07/2007



Part of the Orange-Senqu Basin



Transboundary Study on Hydrogeology for Stampriet TBA

1. Delineation of the extent of the TBA
2. Collection and collation of existing data, information and knowledge
3. Selection & Definition of study areas, Confirmation of aquifer types
4. Establishment of hydrogeological Sub-Regions
5. Demarcation of recharge & discharge areas and flow dynamics/ Potential of artificial recharge
6. Development of a conceptual model (TBA boundary conditions, various scenarios, water balance, protection zoning, abstraction limits etc)



Socio-Economic Proposed Transboundary Study for Stampriet TBA

1. Land Use & Land Degradation : current and future impacts
2. Water Use/ Water Management Plan (e.g. Irrigation Efficiency, Well Head Protection, Drought Vulnerability, Abstraction Limits)
3. Water Quality (e.g. Nitrates, Salinity, Vulnerability)
4. Community monitoring of groundwater (Awareness of groundwater/ Basin Management Committees)
5. Contribution of groundwater to the economic value of an area/ GW-Dependent Ecosystems

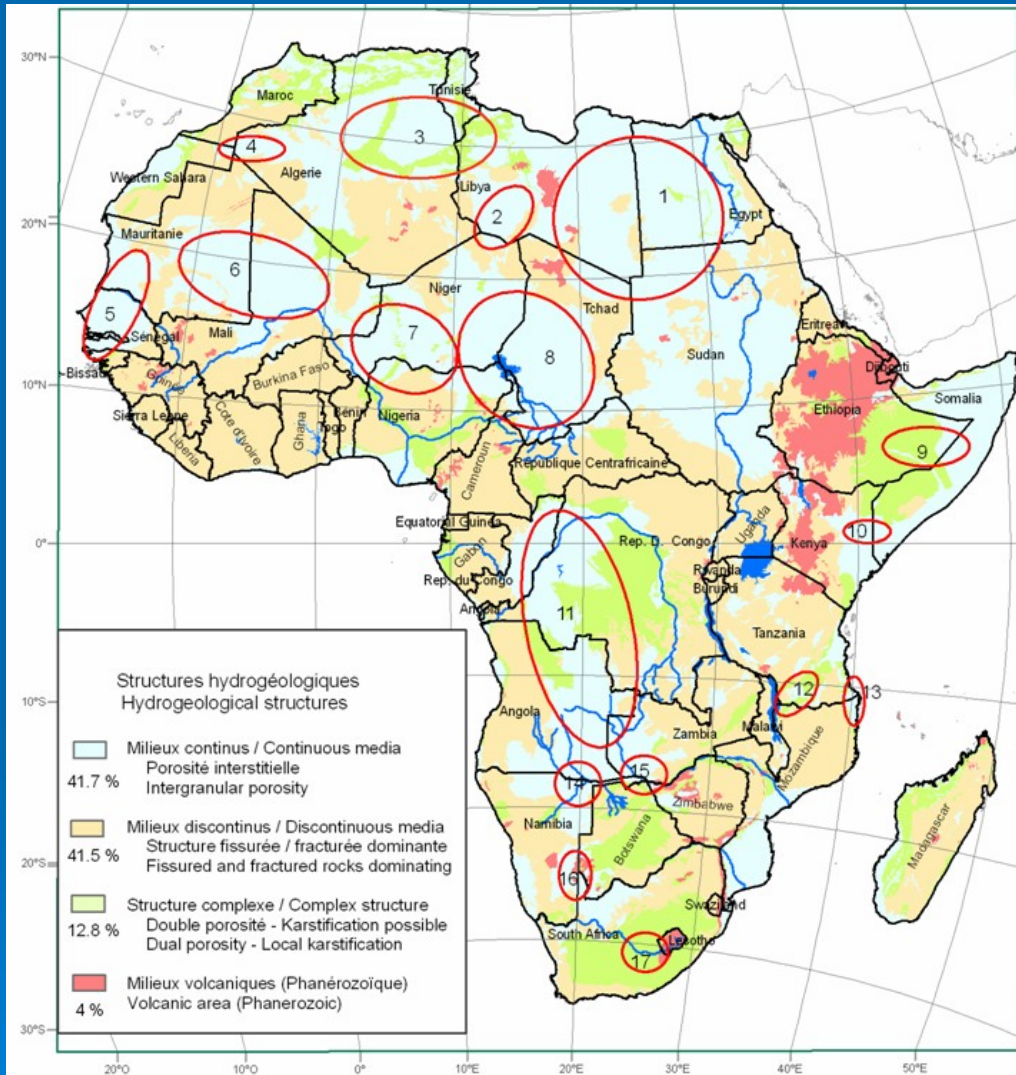


Socio-Economic Proposed Transboundary Study for Stampriet TBA

6. Legal and regulatory framework
7. Work in a full catchment holistic approach
8. Poverty/ Groundwater's contribution: Access to water, Food security
9. Environmental Protection
10. Links to IWRM plans and process



The picture before



- 1 - Nubian Sandstone Aquifer System (Egypt, Libya, Sudan, Chad)
- 2 - Murzuk Basin (Libya, Niger, Algeria)
- 3 - Northwest Sahara Aquifer System (Algeria, Libya, Tunisia)
- 4 - Tindouf Aquifer (Algeria, Morocco)
- 5 - Maastrichtian Aquifer (Mauritania, Senegal, Gambia, Guinea Bissau)
- 6 - Taoudeni Basin (Algeria, Mauritania, Mali)
- 7 - Iullemeden Basin (Mali, Niger, Nigeria)
- 8 - Chad Basin (Niger, Nigeria, Chad, Cameroon)
- 9 - Ogaden-Juba Aquifer (Ethiopia, Somalia)
- 10 - Merti Aquifer (Kenya, Somalia)
- 11 - Congo intra-cratonic Basin (DR of Congo, Angola)
- 12 - Karoo Sandstone Aquifer (Mozambique, Tanzania)
- 13 - Coastal Sedimentary Basin (Mozambique, Tanzania)
- 14 - Northern Kalahari/Karoo Basin (Angola, Botswana, Namibia)
- 15 - Nata Karoo Sub-basin (Botswana, Namibia, Zambia, Zimbabwe)
- 16 - Kalahari/Karoo Basin (Botswana, Namibia, South-Africa)
- 17 - Karoo Aquifer (South-Africa, Lesotho)

Principaux aquifères transfrontaliers
Main transboundary aquifers

*(Managing Shared Aquifer Resources in Africa
 UNESCO - IHP/ISARM 2004
 Series on groundwater n° 8)*

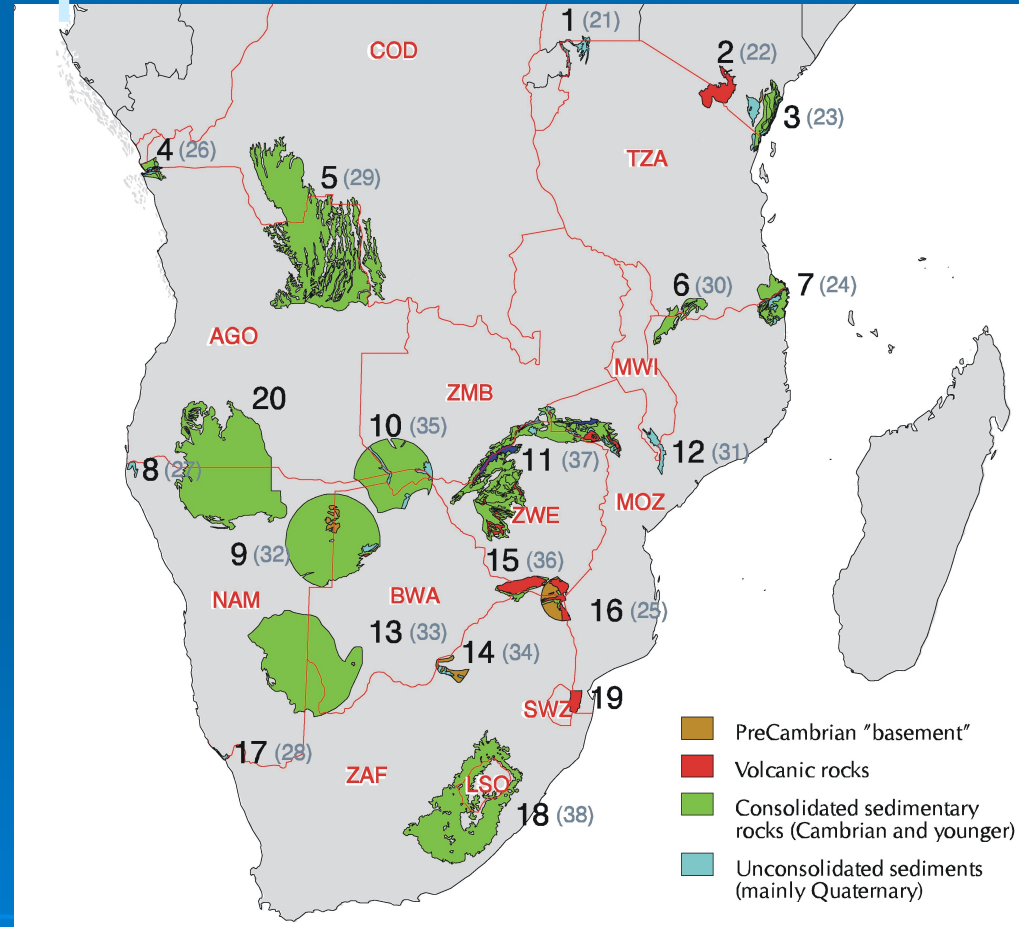
On SIG Afrique/Africa GIS background



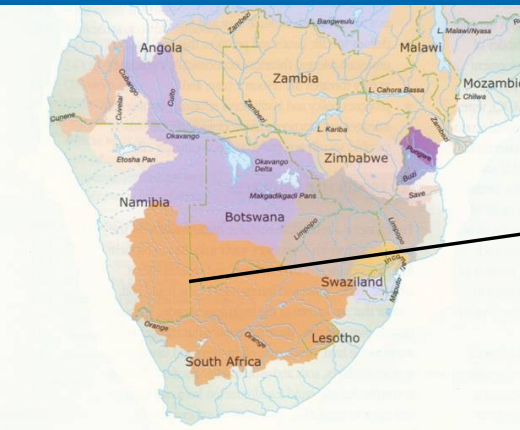
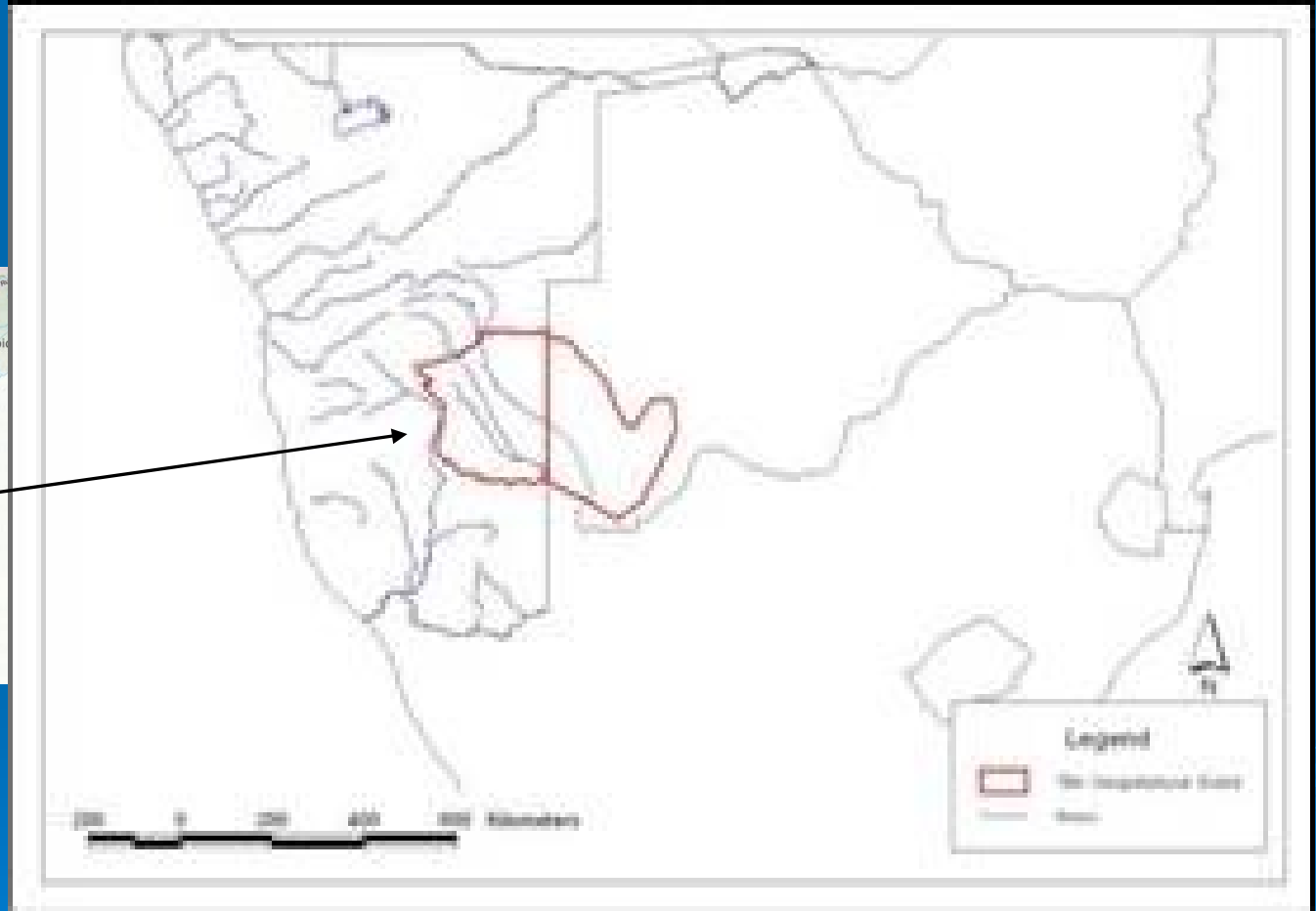
ISARM SADC

Part of the picture after

No.	Aquifer name	Countries
1	Kagera Aquifer	Tanzania, Uganda
2	Kilimanjaro Aquifer	Tanzania, Kenya
3	Coastal Sedimentary Basin I	Tanzania, Kenya
4	Coastal Sedimentary Basin II	DR of Congo, Angola
5	Congo Intra-cratonic Basin	DR of Congo, Angola
6	Karoo Sandstone Aquifer	Mozambique, Tanzania
7	Coastal Sedimentary Basin III	Mozambique, Tanzania
8	Coastal Sedimentary Basin IV	Angola, Namibia
9	Northern Kalahari/Karoo Basin	Namibia, Botswana
10	Nata Karoo Sub-basin	Angola, Namibia, Zambia, Botswana
11	Medium Zambesi Aquifer	Zambia, Zimbabwe, Mozambique
12	Shire Valley Alluvial Aquifer	Malawi, Mozambique
13	SE Kalahari/Karoo Basin	Namibia, Botswana, South Africa
14	Ramotswa Dolomite Basin	Botswana, South Africa
15	Tuli Karoo Sub-basin	Botswana, South Africa, Zimbabwe
16	Limpopo Basin	Zimbabwe, South Africa, Mozambique
17	Coastal Sedimentary Basin V	Namibia, South Africa
18	Karoo Sedimentary Aquifer	Lesotho, South Africa
19	Rhyolite-Breccia Aquifer	Mozambique, Swaziland
20	Cuvelai and Etosha Basin	Angola, Namibia

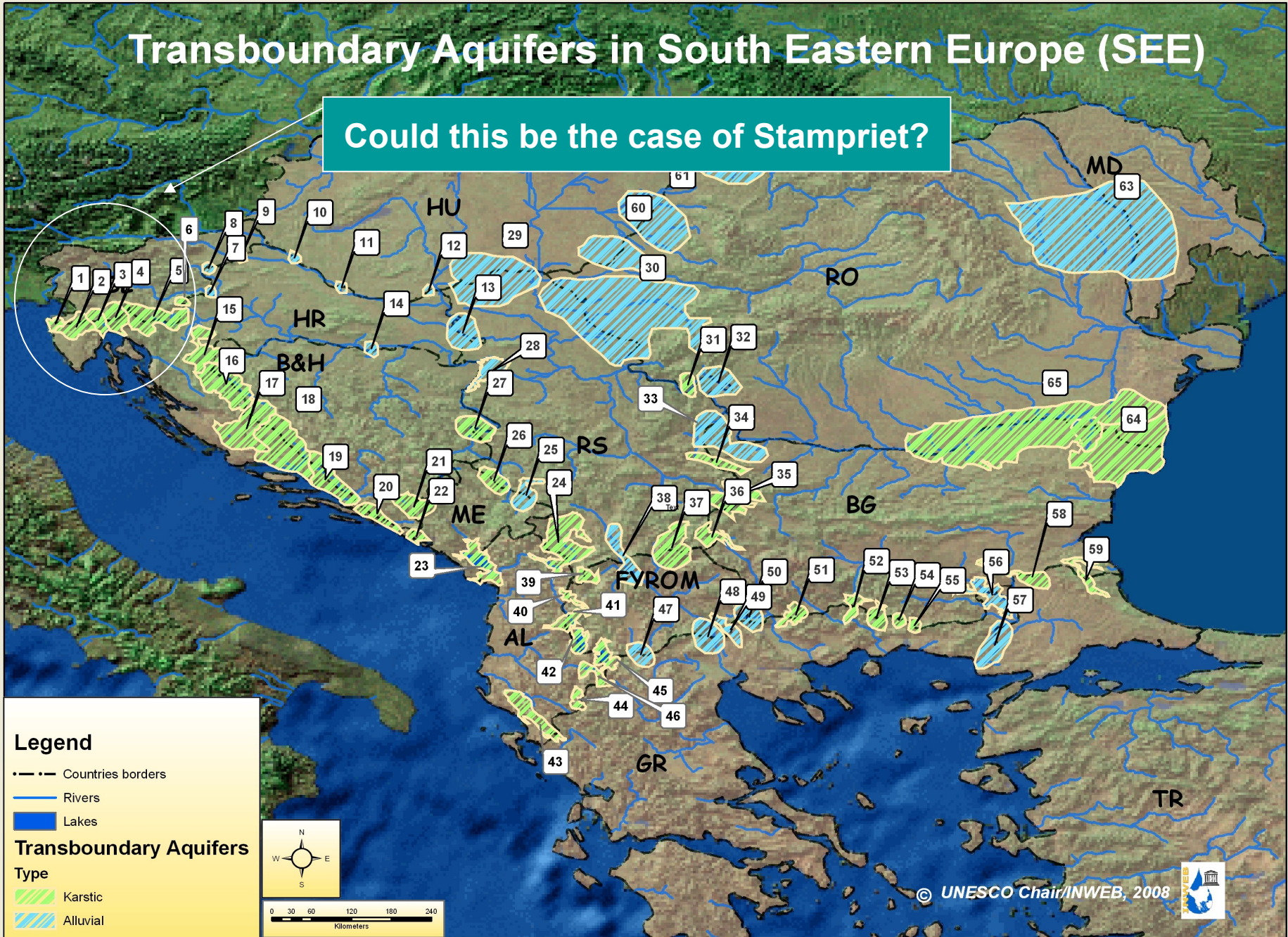


Part of the Orange-Senqu Basin



Transboundary Aquifers in South Eastern Europe (SEE)

Could this be the case of Stampriet?



ISARM West Africa

Objectives:

Status of data and information available:

- Gap Analysis and improvement of the inventory
- To Identify mechanism for cooperation and the finalization of the data collection;
- To Identify the main products for ISARM West Africa and a timetable of actions
- To identify case studies



ISARM West Africa

- Nine potential transboundary hydrogeo-systems considered:
 - Iullimeden
 - Senegalo-mauritania
 - Lake Chad
 - Taoudeni
 - Basin of Tano
 - Basin of Keita
 - Volta
 - Djado-Mourzouk
 - Bilma-Agadem

ISARM West Africa

- Gap Analysis for each potential system
 - Transboundary nature of different aquifers;
 - Monitoring status (quantity and quality)
 - Availability of database systems;
 - Level of pressure on the aquifers (pollution, over-exploitation,..);
 - Modelling



ISARM West Africa

- Action plan for the preparation of Atlas on West Africa TBA
 - Data collection and analysis at national level for each TBA system;
 - For each TBA system concertations between the national focal points;
 - A team leader proposed for each system to coordinate activities;
 - Validation of the Atlas at sub-regional level



ISARM West Africa

- ISARM ongoing in West Africa
- Gap analysis made on the preliminary data and information collected;
- transboundary nature of many aquifers needs to be precised or documented ;
- Action plan for TBA Atlas in West Africa for the next two years;
- Partnership



**...It has to start somewhere
It has to start sometime
What better place than here
What better time than now ... (RATM)**

**THANK U 4 UR @ENTION
ΣΑΣ ΕΥΧΑΡΙΣΤΩ**

