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**GROUNDWATER RESOURCES  
GOVERNANCE  
in TRANSBOUNDARY AQUIFERS  
(GGRETA Project)**



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# Presentation of Multi-Country Consultation Mechanisms



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Agency for Development  
and Cooperation SDC



Tales Carvalho Resende  
28 July 2015  
Johannesburg, South Africa

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# Outline

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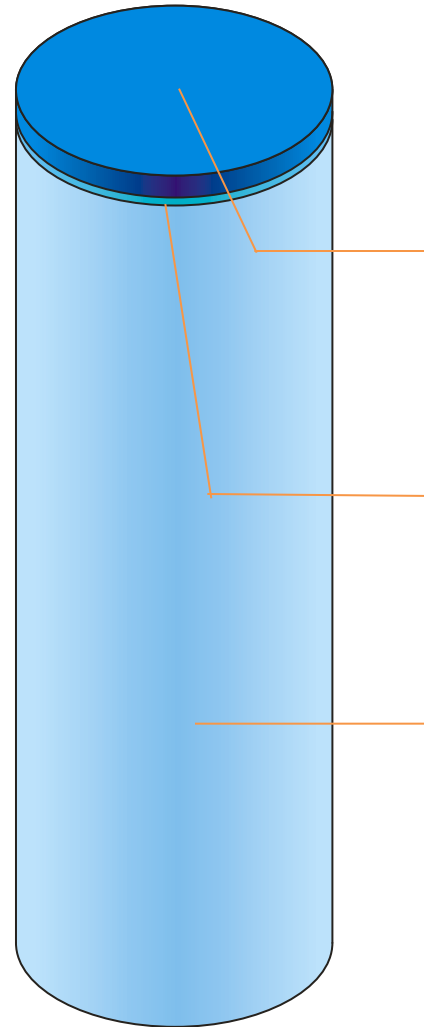
1. The importance of groundwater
2. Transboundary aquifers & International Law
3. Examples of Multi-Country Consultation Mechanisms



# The importance of groundwater



# Global water resources



Volume of water worldwide:  
1400 Million km<sup>3</sup>  
(100%)

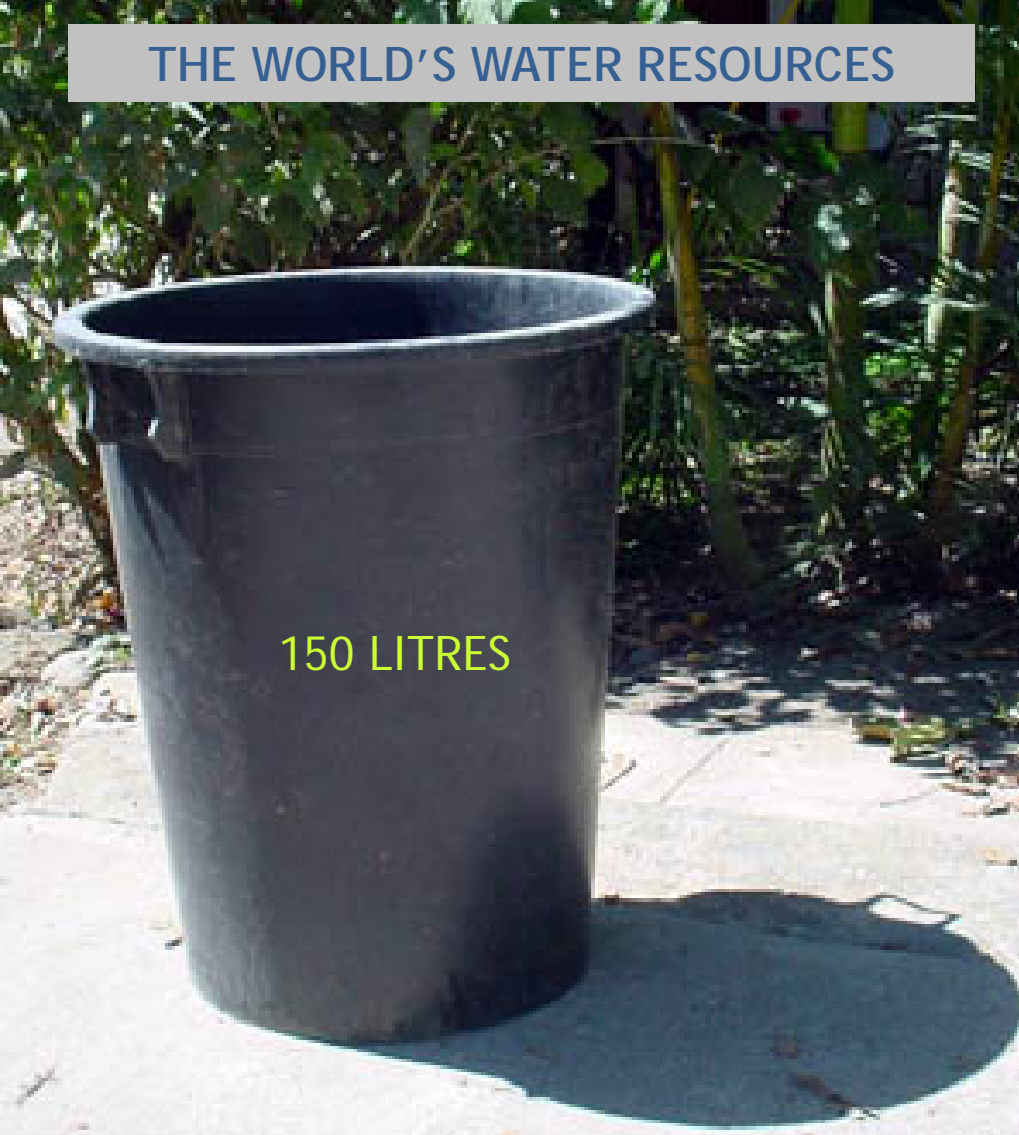
Freshwater:  
35 M km<sup>3</sup>  
(2,5%)

Saline groundwater:  
14 M km<sup>3</sup>  
(1%)

Saltwater of oceans  
and salt lakes:  
1351 M km<sup>3</sup>  
(96,5%)

Source: Water for People, Water for Life - UN World Water Development Report (WWDR); UNESCO 2003.





Imagine:

All the water on the planet =

150 litre container

BUT JUST 4 LITRES  
ARE FRESH !!

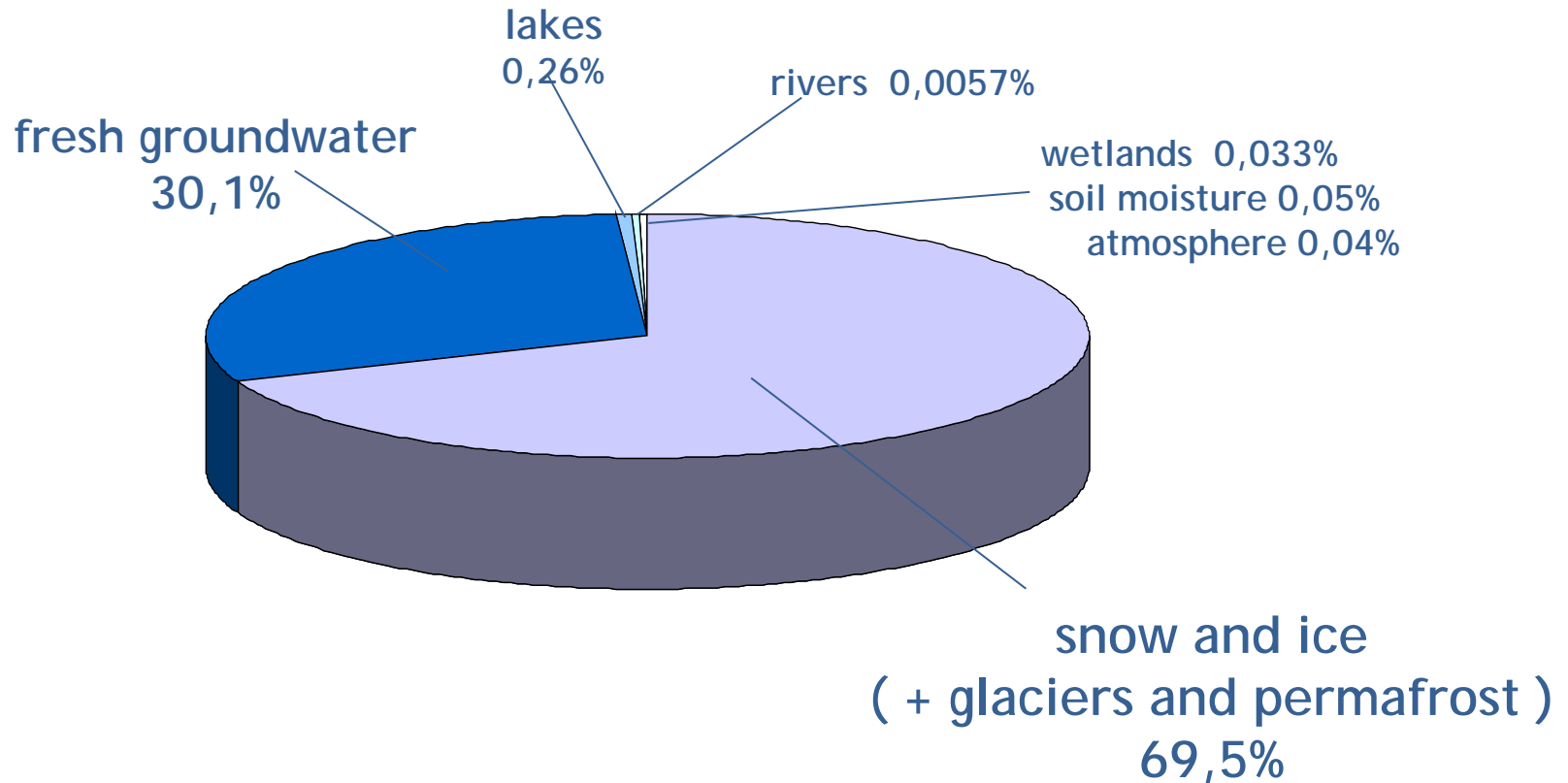


The remaining 146 litres are SEAWATER



Source: Prof Ken Howard, Osaka Cut, 2003

# Global freshwater resources



Source: Water for People, Water for Life - UN World Water Development Report (WWDR); UNESCO 2003.



# Global freshwater resources

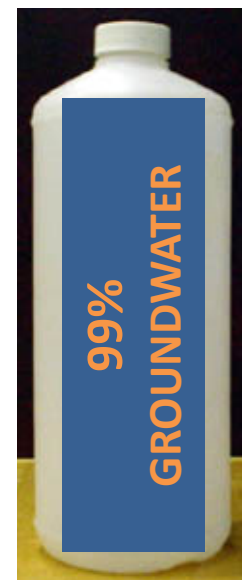
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Out of these 4 litres 3 litres are frozen in the earth's ice caps and in the permafrost regions, ... leaving one lonely litre of fresh groundwater

So, 99% of fresh, available water on this planet is **GROUNDWATER!**

It is essential that we protect and manage groundwater resources effectively!

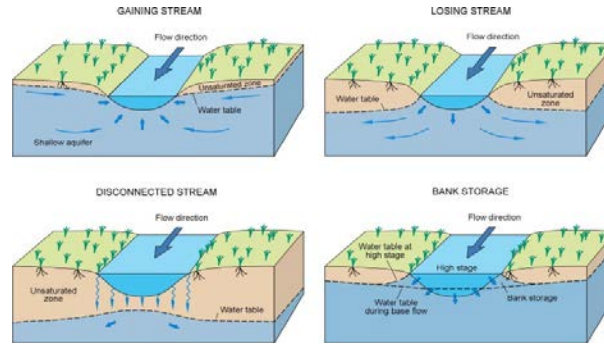


Source: Prof Ken Howard, Osaka Cut, 2003

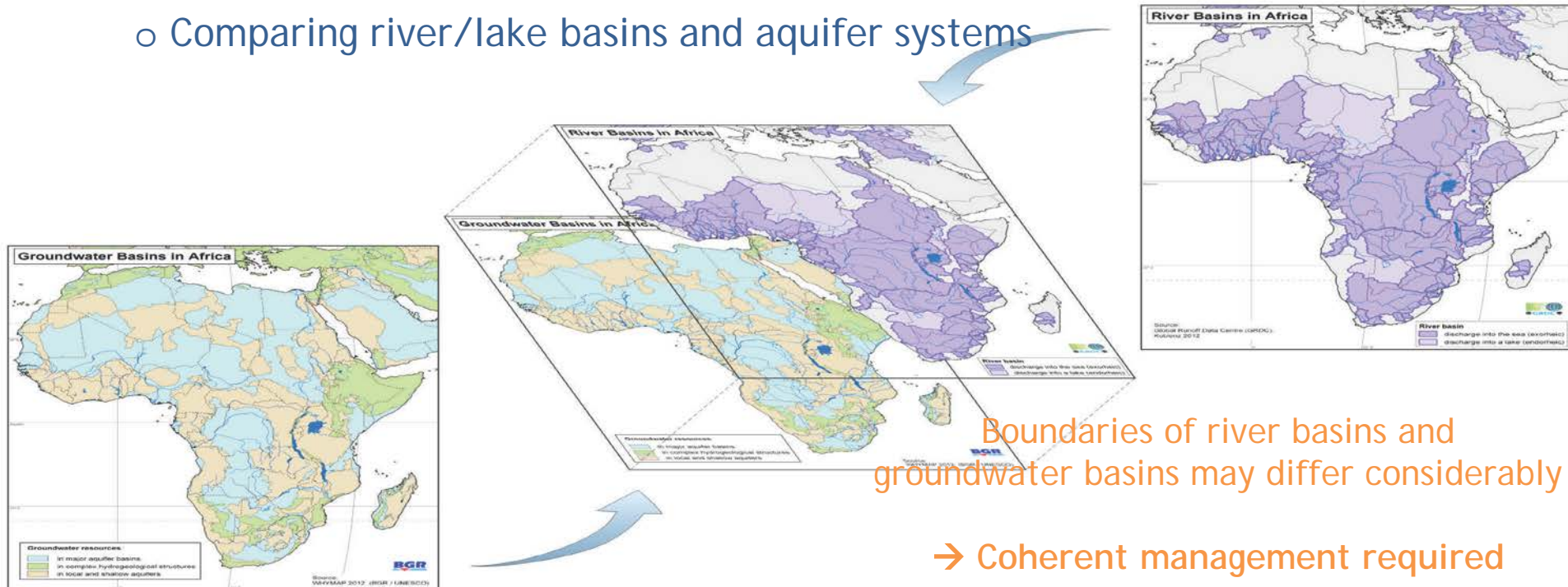


# Groundwater and IWRM

- State of groundwater system critical for river baseflow and other dependent ecosystems



- Surface water vs. Groundwater
  - Comparing river/lake basins and aquifer systems



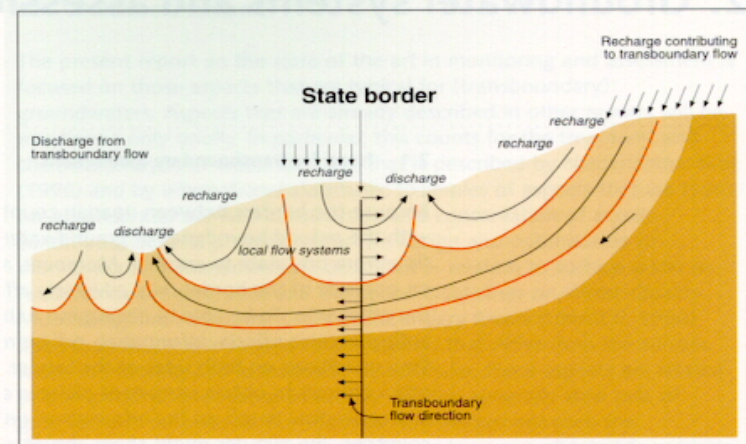
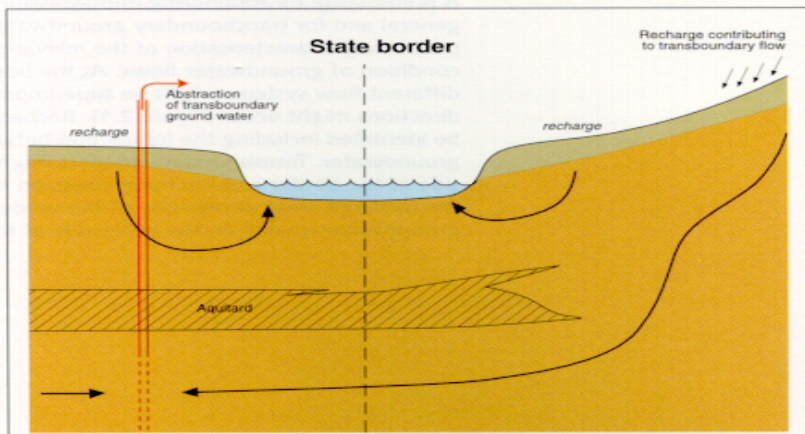


# Transboundary aquifers & International Law

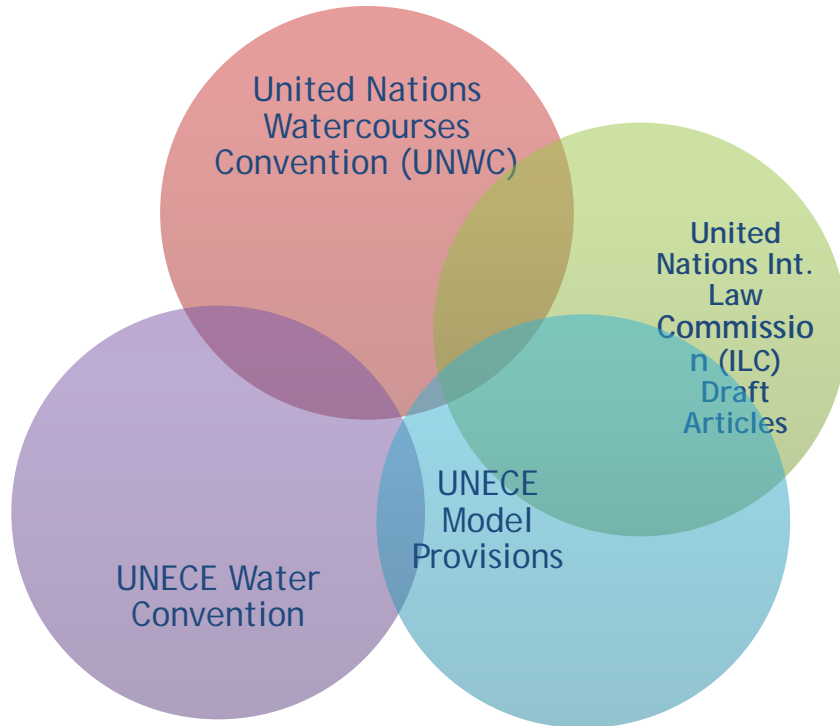


# Transboundary aquifers

- An aquifer consists of two elements:
  - Underground geological formation (container / the rock)
  - Natural resources stored underground in the container (groundwater)
- The key feature of transboundary aquifers is that the flow must cross an international boundary
- Many of these systems may recharge in one country and discharge in another...
- ...although local groundwater flow systems can be modified by human activities with impact on the direction of pollution paths



## *A puzzle/messy picture*



### UNWC:

- Treaty, but limited consideration of GW:
  - Only surface water and connected groundwater with common terminus (International watercourses)
  - Exclusion of a great number of TBA

### UNECE Water Convention:

- Pan-European but covers all GW “which mark, cross or are located on boundaries between two or more States”

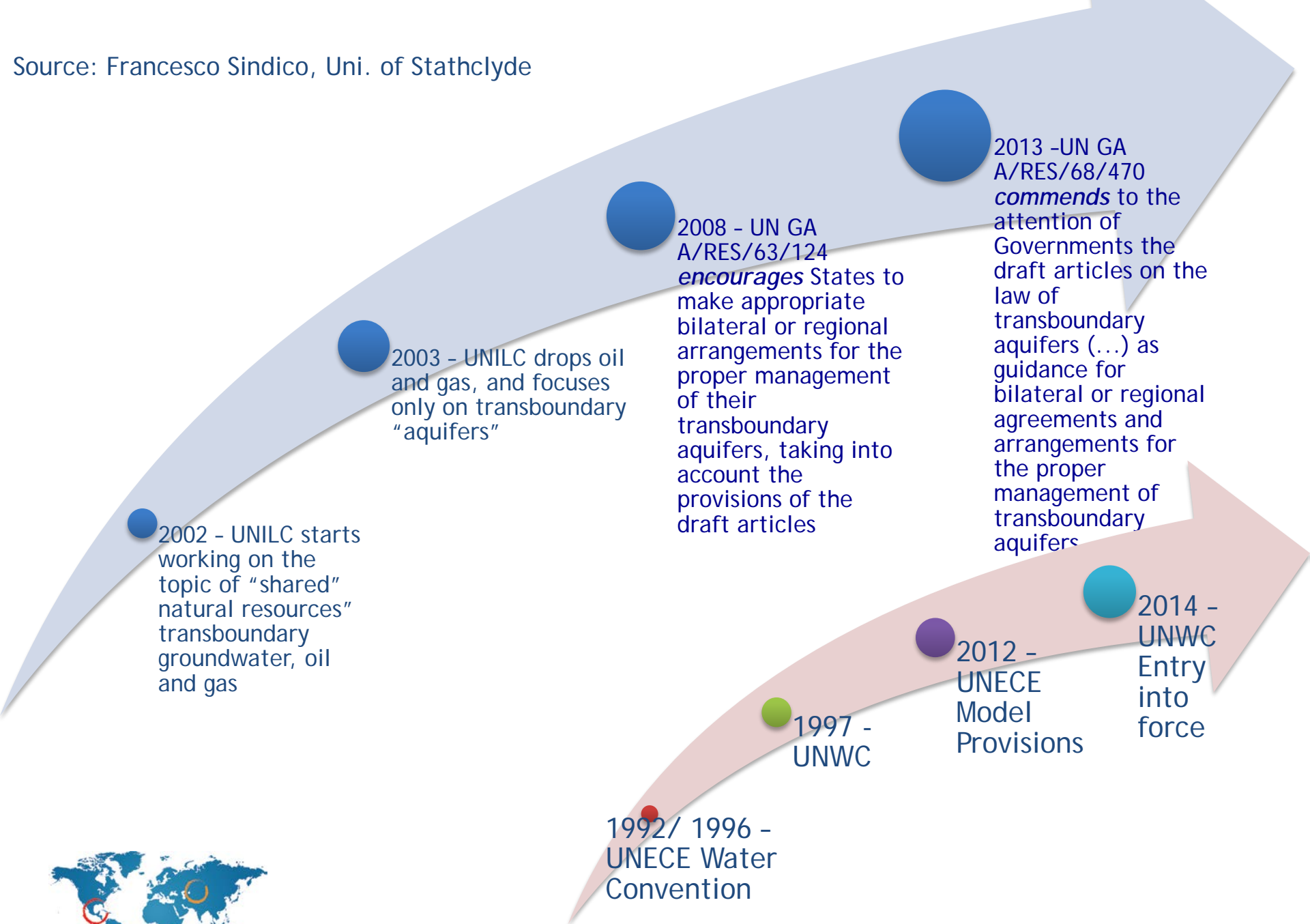
### Model Provisions:

- Pan-European and a decision of a Meeting of the Parties

### Draft Articles:

- Not a treaty, but only instrument covering TBAs

Source: Francesco Sindico, Uni. of Stathclyde



- 2000 SADC Water Protocol
  - ✓ Highly inspired from the United Nations Watercourses Convention (but limited consideration of GW:
    - Only surface water and connected groundwater with common terminus (International watercourses)
    - Exclusion of a great number of TBAs
- ORASECOM Agreement



# Internationally Shared Aquifer Resource Management (ISARM)

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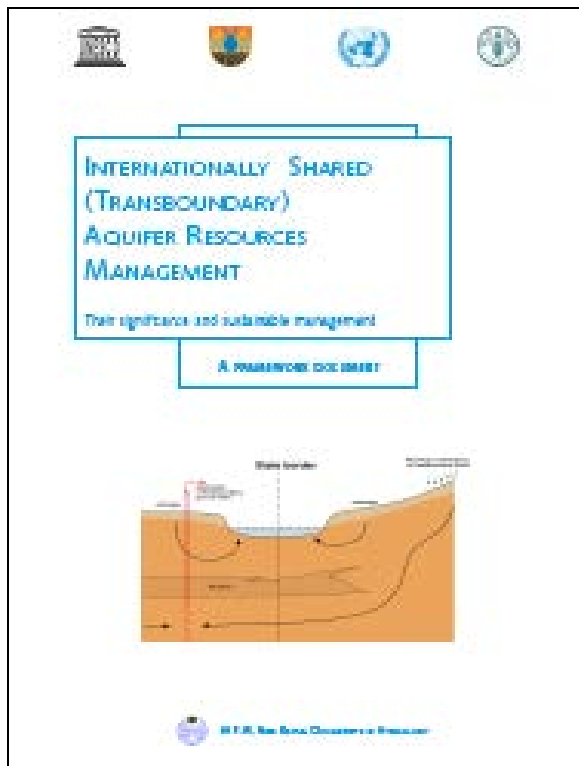
- UNESCO-IHP and partners launched the ISARM initiative in the year 2000 aiming at undertaking an inventory of transboundary aquifers and develop recommendations for improving their management and governance considering scientific, socio-economic, environmental, legal and institutional components.



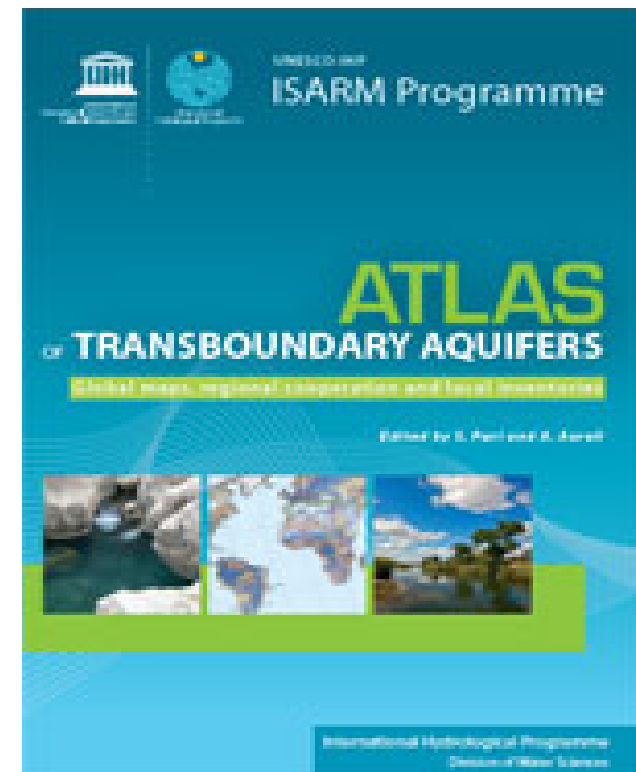
# Internationally Shared Aquifer Resource Management (ISARM)

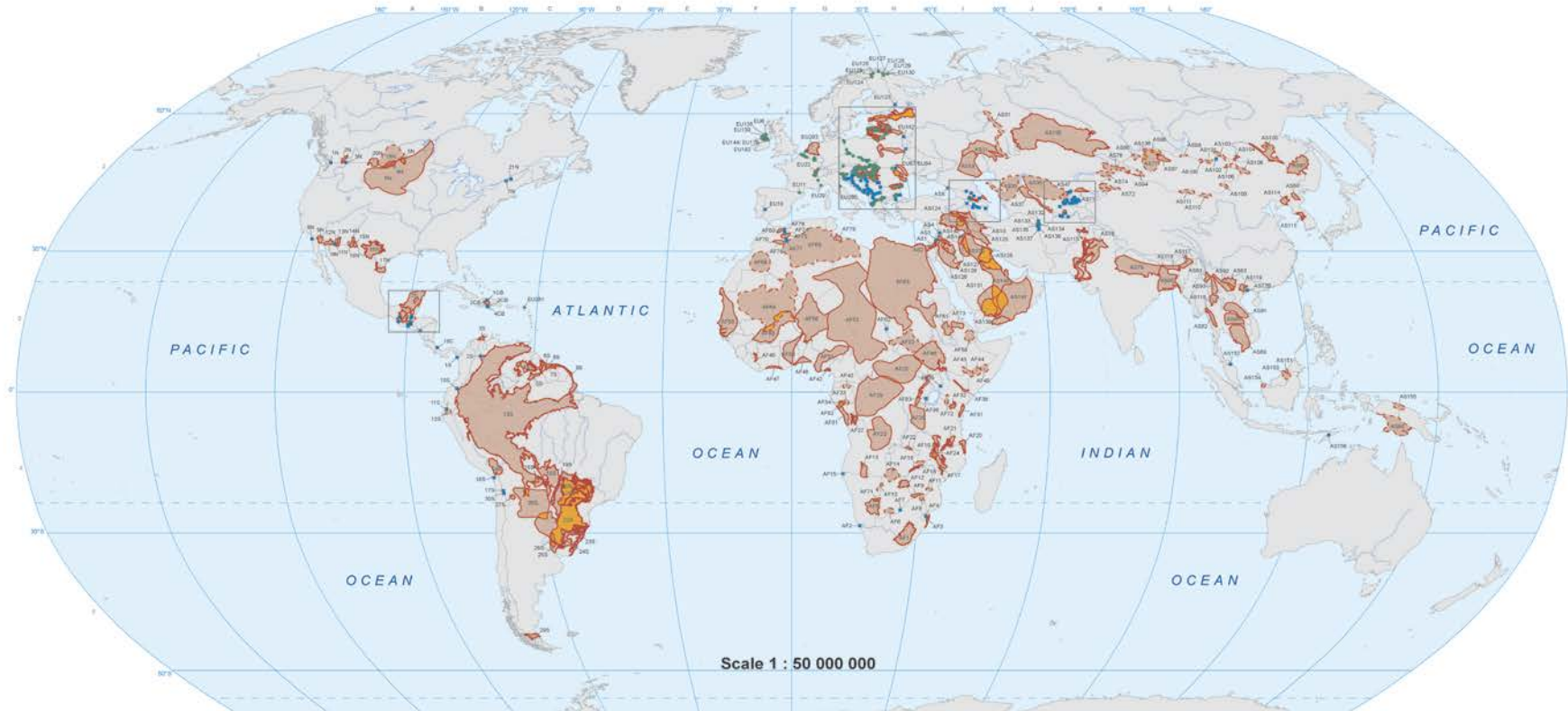
- 2000: starting of the first Worldwide Inventory of Transboundary Aquifers (UNESCO-IHP Resolution XIV-12 -2000)

2000: Framework document



2008: First TBA Map





**Legend**

Occurrence of  
 aquifers  
 groundwater  
 overlaps  
 small TBAs  
 small TBAs

TBAs type of  
 confirmed  
 approximate  
 aquifer

Geographic  
 countries  
 details  
 rivers  
 lakes

Prepared by IGRAC  
 Base maps  
 Country borders: ES  
 Rivers and lakes: ES  
 Map projection  
 Robinson projection,  
 spherical WGS84, false  
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**ABOUT THIS MAP**  
 This map is about  
 the state of information  
 and extent of TBAs  
 overview of these  
 and intends to assist  
 them. The map  
 of many active work  
 procedures for pre-  
 Map completion  
 of transboundary  
 exchange between  
 informed transboundary  
 contribute to raise  
 governance of trans-  
 needed global knowledge

Since its establishment  
 the identification  
 within the framework  
 assessment, GEF  
 International Shared  
 initiative led by UN

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2015 UNESCO-IHP & IGRAC Transboundary Aquifers Map

How many transboundary aquifers have been identified?





- ✓ 592 TBAs identified
- ✓ Almost 400 TBAs out of the EU region
- ✓ Approximately 70 TBAs in Africa
  - South Africa: 9
  - Botswana: 7
  - Namibia: 6

How many transboundary aquifers have a legal agreement for cooperation?



# Examples of Multi-Country Consultation Mechanisms



# Existing legal and institutional frameworks for transboundary groundwater resources

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- But out of the 592 TBAs ... only 5 have a legal agreement for cooperation
  - ✓ *Americas*
    - *Guarani Aquifer System (Argentina, Brazil, Paraguay and Uruguay)*
  - ✓ *Europe:*
    - *Genevese Aquifer (Switzerland, France)*
  - ✓ *Africa*
    - *North-western Sahara Aquifer System (Algeria, Tunisia & Libya)*
    - *Nubian Aquifer System (Egypt Libya, Sudan, Chad)*
    - *Iullemeden Aquifer System (Algeria, Mali, Niger and partly in Nigeria)*
- Although approximately 450 agreements on international waters have been signed from 1820 to nowadays



# Guarani Aquifer System

- The Guaraní Aquifer System (GAS), covers an approximate area of 1.100.000 km<sup>2</sup> within the territories of Argentina, Brazil, Paraguay and Uruguay



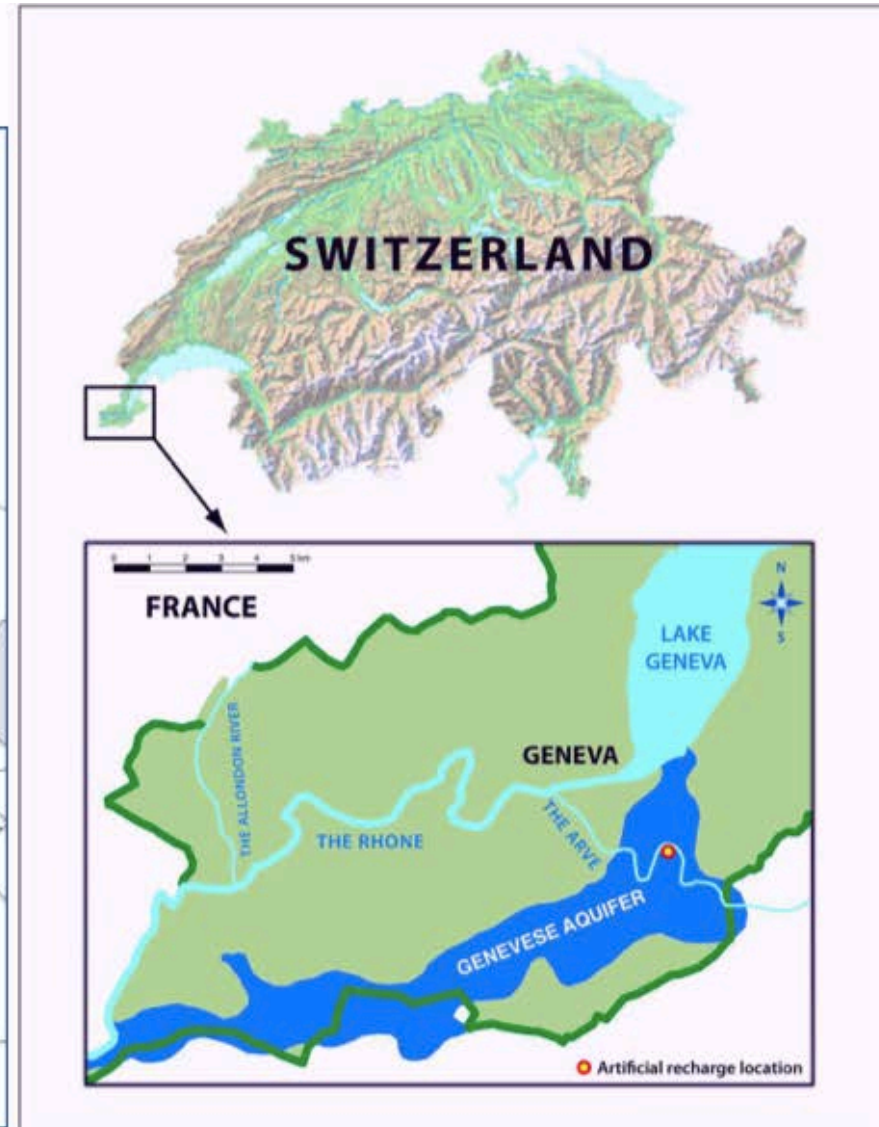
# Guarani Aquifer System

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- The Guaraní Aquifer System (GAS), covers an approximate area of 1.100.000 km<sup>2</sup> within the territories of Argentina, Brazil, Paraguay and Uruguay
- In August 2010: Agreement on the Guaraní Aquifer - first shared-management agreement for a transboundary aquifer in Latin America.
- The Agreement on the Guaraní Aquifer is unique in many ways:
  - ✓ (i) it is the first international convention signed under the influence of the International Law Commission's Draft Articles of 2008;
  - ✓ (ii) the aquifer has been the subject of many cooperation initiatives since the 1990s; and,
  - ✓ (iii) a range of actors have participated in these initiatives, including regional academic research networks, governments, international organizations, and private companies.
- The Agreement follows the main guidelines of the United Nations Draft Articles on the Law of Transboundary Aquifers:
  - ✓ especially in relation to the following principles: sovereignty, the equitable and reasonable use of water resources, the obligation not to cause harm, cooperation, and the exchange of data and information.
- The GAS Agreement establishes a Commission under the 1969 La Plata Basin Treaty in order to "coordinate the cooperation among such Parties for complying with the principles and objectives of this Agreement" (Article 15 of the GAS Agreement).



# Genevese Aquifer



# Genevese Aquifer

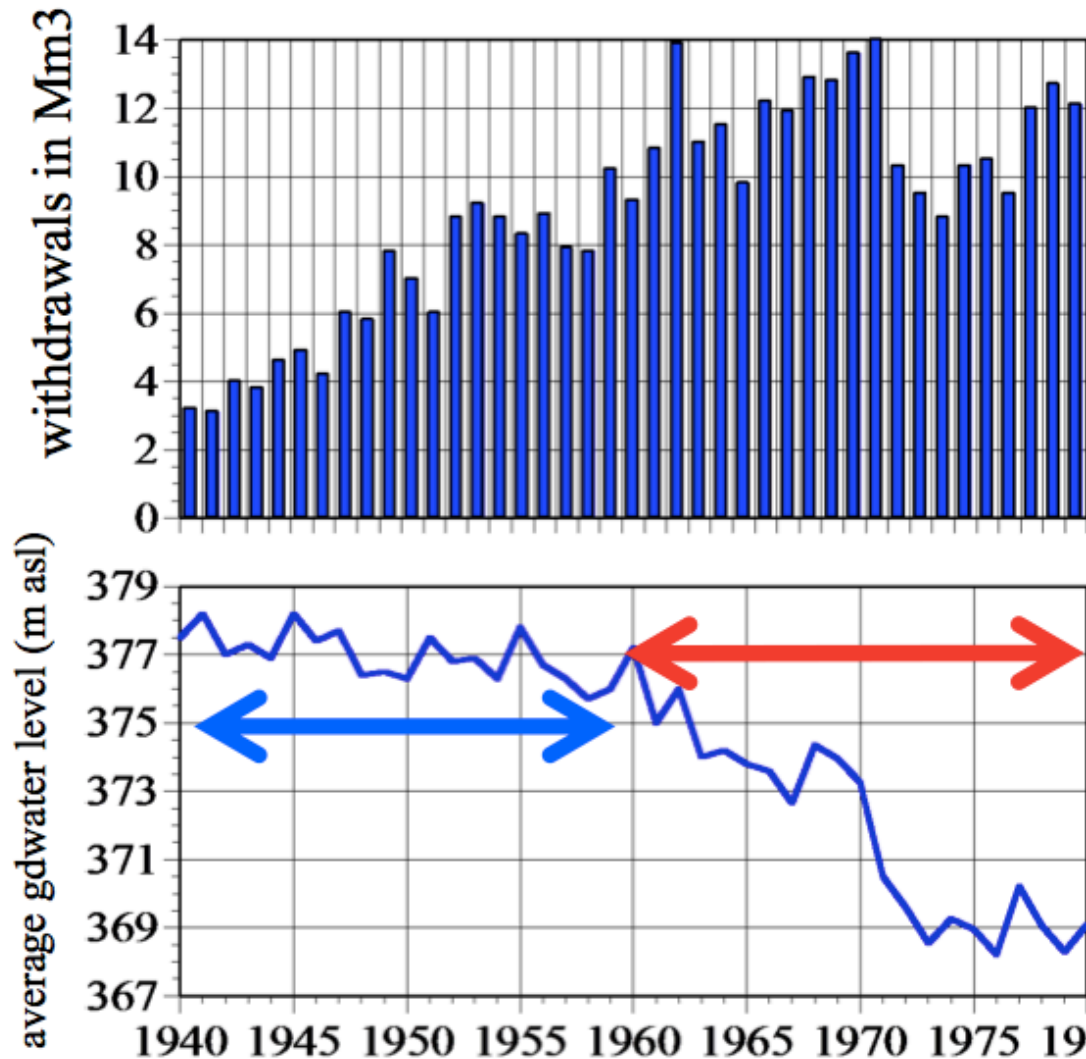
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- The 1978 Arrangement on the Protection, Utilization, and Recharge of the Franco-Swiss Genevese Aquifer is the first example from Europe of a transboundary legal and institutional framework on the management and protection of a transboundary aquifer.
- In 2008 the Convention on the Protection, Utilization, and Recharge of the Franco-Swiss Genevese Aquifer, was adopted by the Canton of Geneva and the French communities of the greater Annemasse region, to succeed the thirty-year 1978 Arrangement.
- This agreement is a rare example of a transboundary aquifer management agreement at the sub-national level, in this case between a Swiss canton and French/European Union communities.



# Genevese Aquifer

## Behaviour of the “Genevois” groundwater level before A.R.



Between 1940 and 1960 the groundwater level was slowly decreasing without serious effects

Between 1960 and 1980 the aquifer was overdrafted with withdrawal rates up to 14 Mm<sup>3</sup>/year.

This overpumping lowered the groundwater level by more than 7 m in 20 years



# Genevese Aquifer

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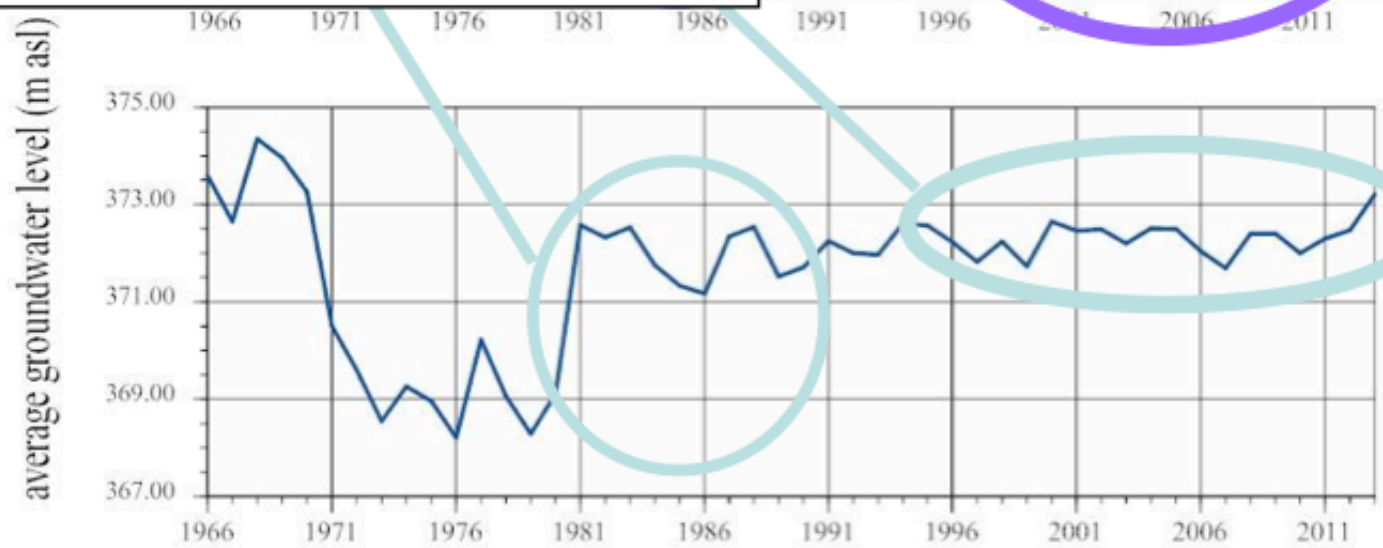
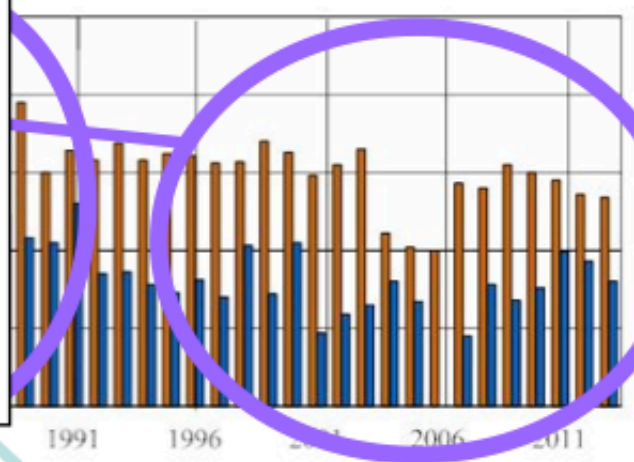
- During the 1960s, as a result of uncontrolled over-pumping and the lack of coordination among the entities exploiting water resources, groundwater levels fell drastically, to the point that certain wells had to be closed. The problem not only affected Geneva but also the French region as well.
- The main reason for the 1978 Arrangement reached between the State Council of the Republic and Canton of Geneva, on the one hand, and the Prefecture of Haute Savoie, on the other, was “the need to establish a system for joint use of Genevese groundwater so as to protect that natural resource and preserve its water quality.”



- Reconstruction of groundwater storage
- Adjustment of the A.R. according to the withdrawal and the variations in groundwater level

artificial recharge

- Annual total pumpage between 15 and 17 Mm<sup>3</sup>/year
- Total artificial recharge between 8 and 10 Mm<sup>3</sup>/year
- Good balance between withdrawals A.R. and average groundwater level



# North-western Sahara Aquifer System

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# North-western Sahara Aquifer System

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- Cooperation efforts are also ongoing with regard to the North-Western Sahara Aquifer System (NWSAS or SASS in the French acronym) shared by Algeria, Tunisia, and Libya. These countries reached an agreement in 2002 to establish a “Consultation Mechanism” for the NWSAS.
- The Minutes of the 2002 meeting create a Consultation Mechanism composed by a Steering Committee, a Coordination Unit and an ad hoc Scientific Committee.
- The functions of the NWSAS Project, according to the Consultation Mechanism, are:
  - ✓ (a) to manage the hydrogeologic database and simulation model;
  - ✓ (b) to develop and oversee a reference observation network;
  - ✓ (c) to process, analyze, and validate data relating to the NWSAS;
  - ✓ (d) to develop databases on socio-economic activities in the region in relation to water uses;
  - ✓ (e) to develop public indicators on the resource and its uses in the three Member States;
  - ✓ (f) to promote and facilitate the conduct of joint or coordinated studies and research by experts in the three Member States;
  - ✓ (g) to formulate and implement training programs;
  - ✓ (h) to update the NWSAS model on a regular basis; and
  - ✓ (i) to formulate proposals relating to the evolution of the Consultation Mechanism.



# North-western Sahara Aquifer System

