

THE UNESCO PROJECT:
**INTERNATIONALLY SHARED AQUIFER
RESOURCES MANAGEMENT (UNESCO/ISARM):
OVERVIEW AND RECENT DEVELOPMENTS IN THE
MEDITERRANEAN AND THE BALKANS**

by

J. Ganoulis

UNESCO Chair/**INWEB**

International **N**etwork of **W**ater/**E**nvironment Centres for the **B**alkans
Aristotle University of Thessaloniki, Greece

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June 2000: 14th Session of IC UNESCO's IHP

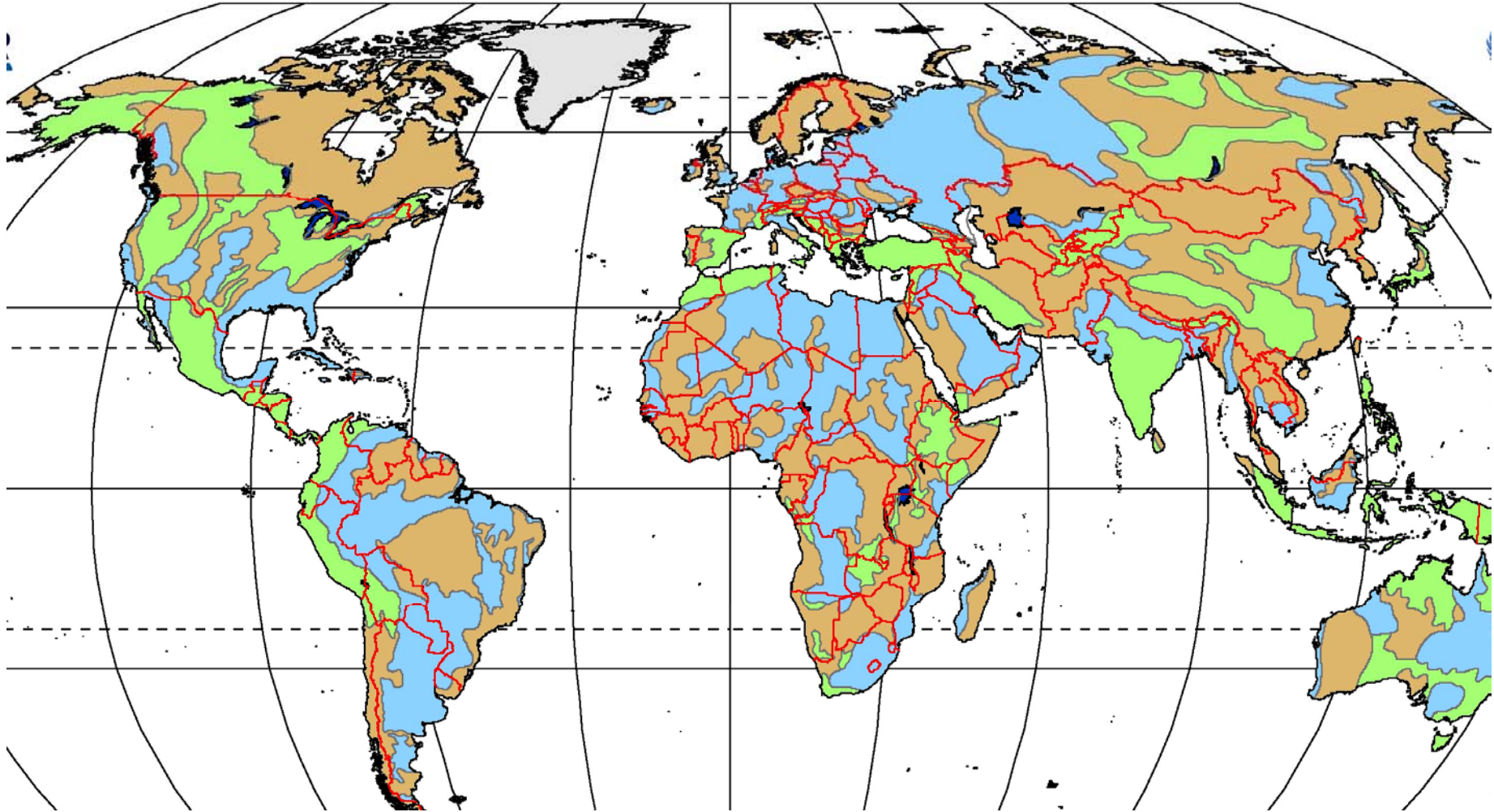
160 Member States, decided to adopt a resolution to promote studies in on internationally shared aquifers

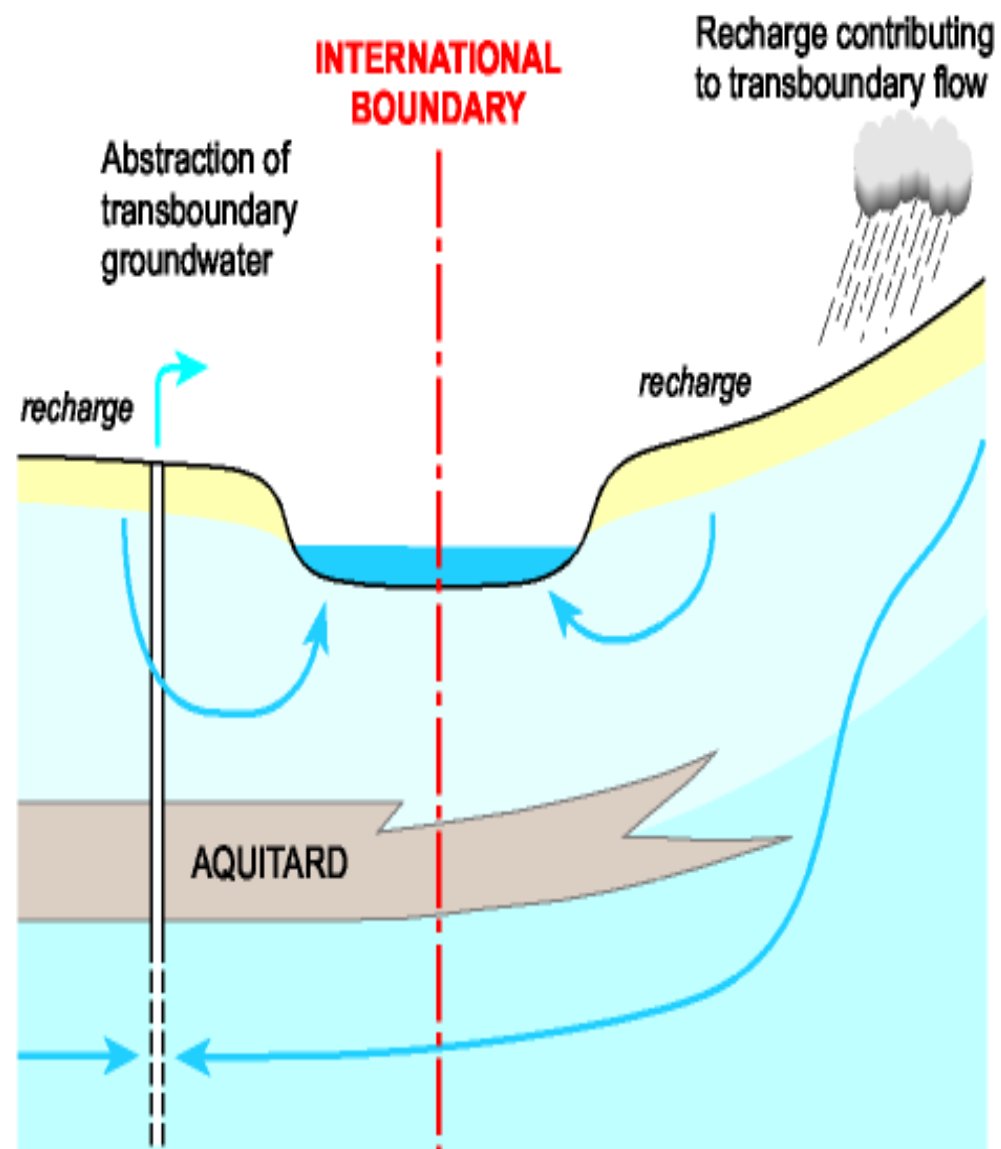
Launch of the Project:ISARM

Objectives

- to improve the existing scientific knowledge
- to provide a comprehensive assessment of human-watershed-aquifer interactions combining all activities to physical and ecological processes

Hydrogeological Regions versus National Boundaries





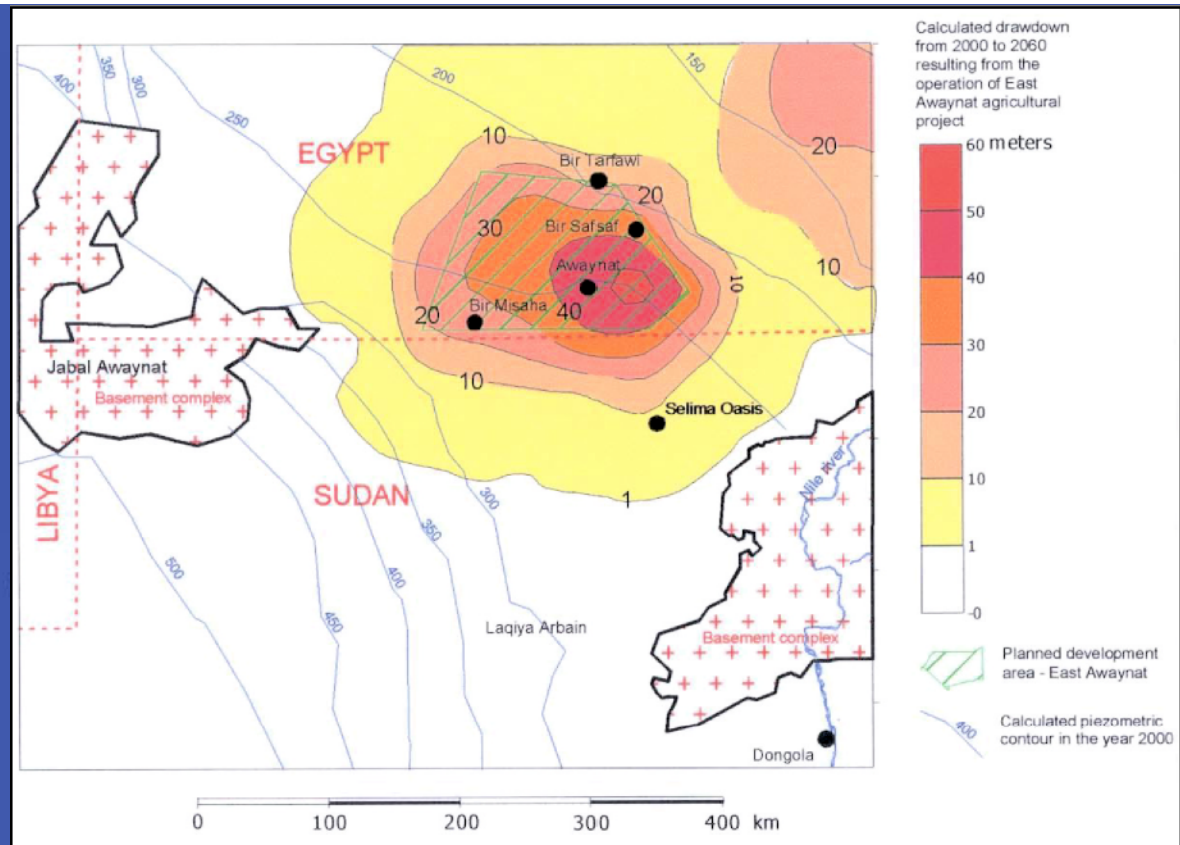
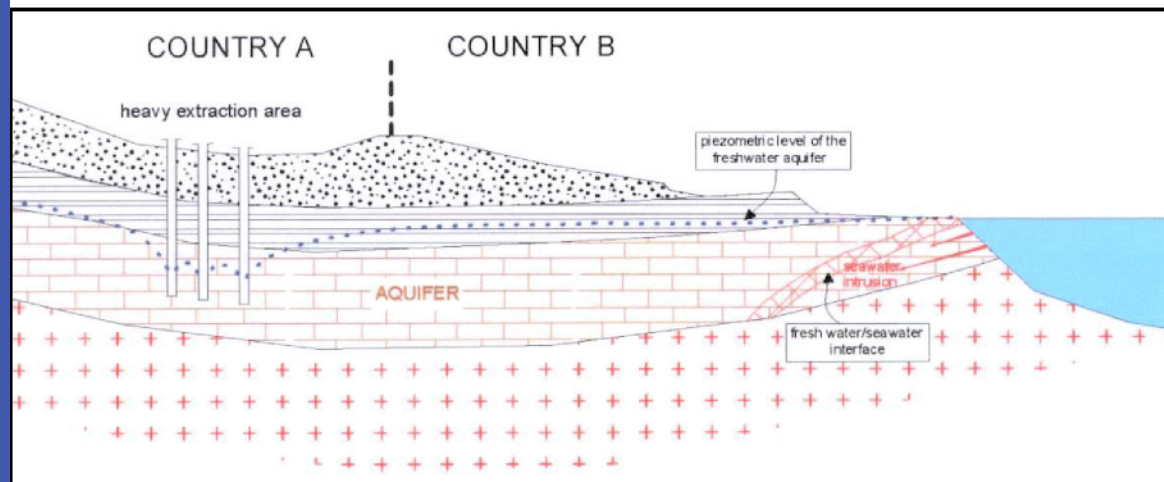


Figure 9. Impact of saline intrusion from transboundary production



- **The ISARM Project –**
- **Launch of Regional Inventories**

-Links & synergies with parallel activities established:

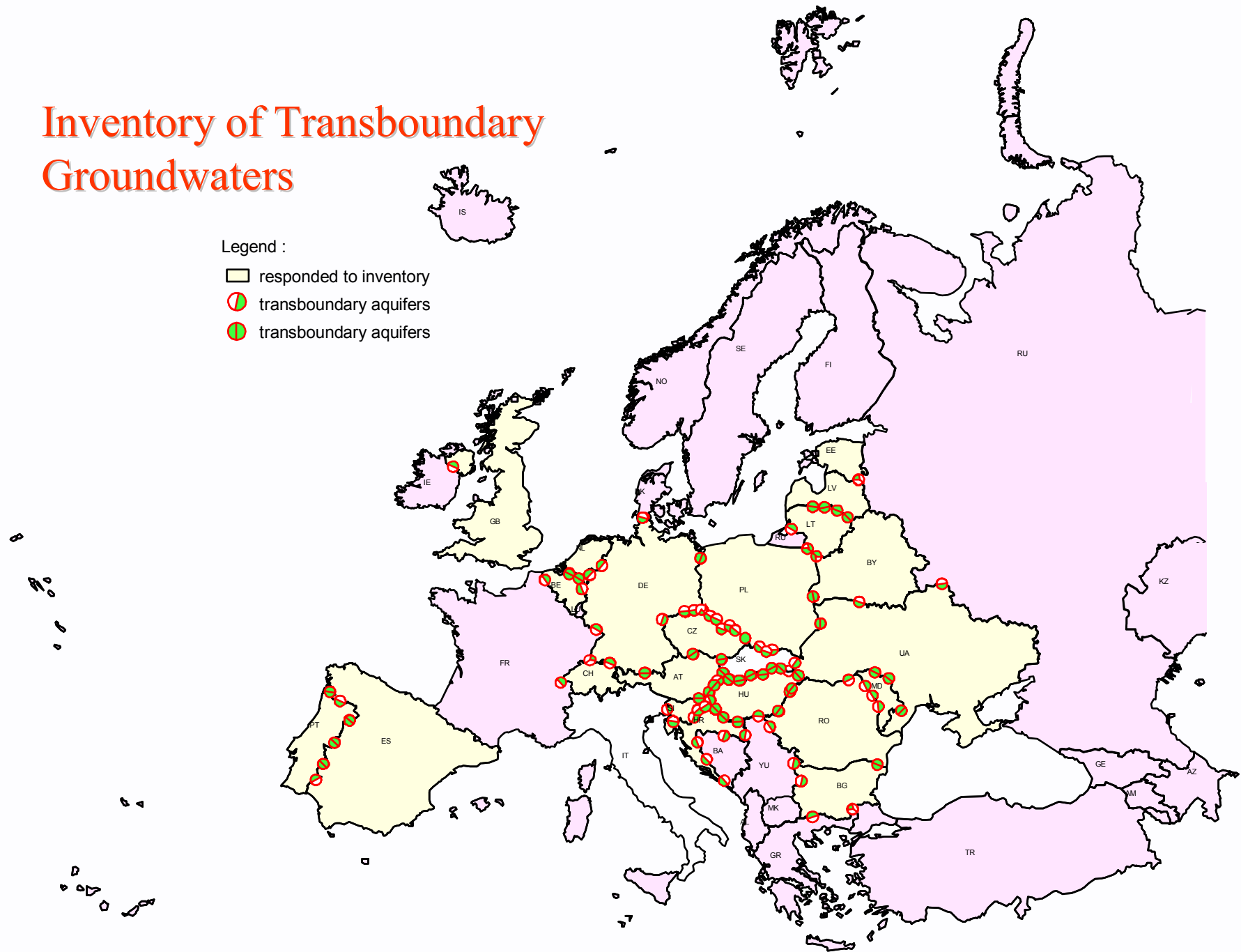
**UN ECE- IAH / FAO / OAS/
UNESCWA/OSS Partnership**

(an example of successful cooperation among UN Agencies, IG Os, NGOs, Scientific International Associations)

Inventory of Transboundary Groundwaters

Legend :

- responded to inventory
- transboundary aquifers
- transboundary aquifers



Multidisciplinary aspects of ISARM

- **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

Scientific-Hydrogeological Scope

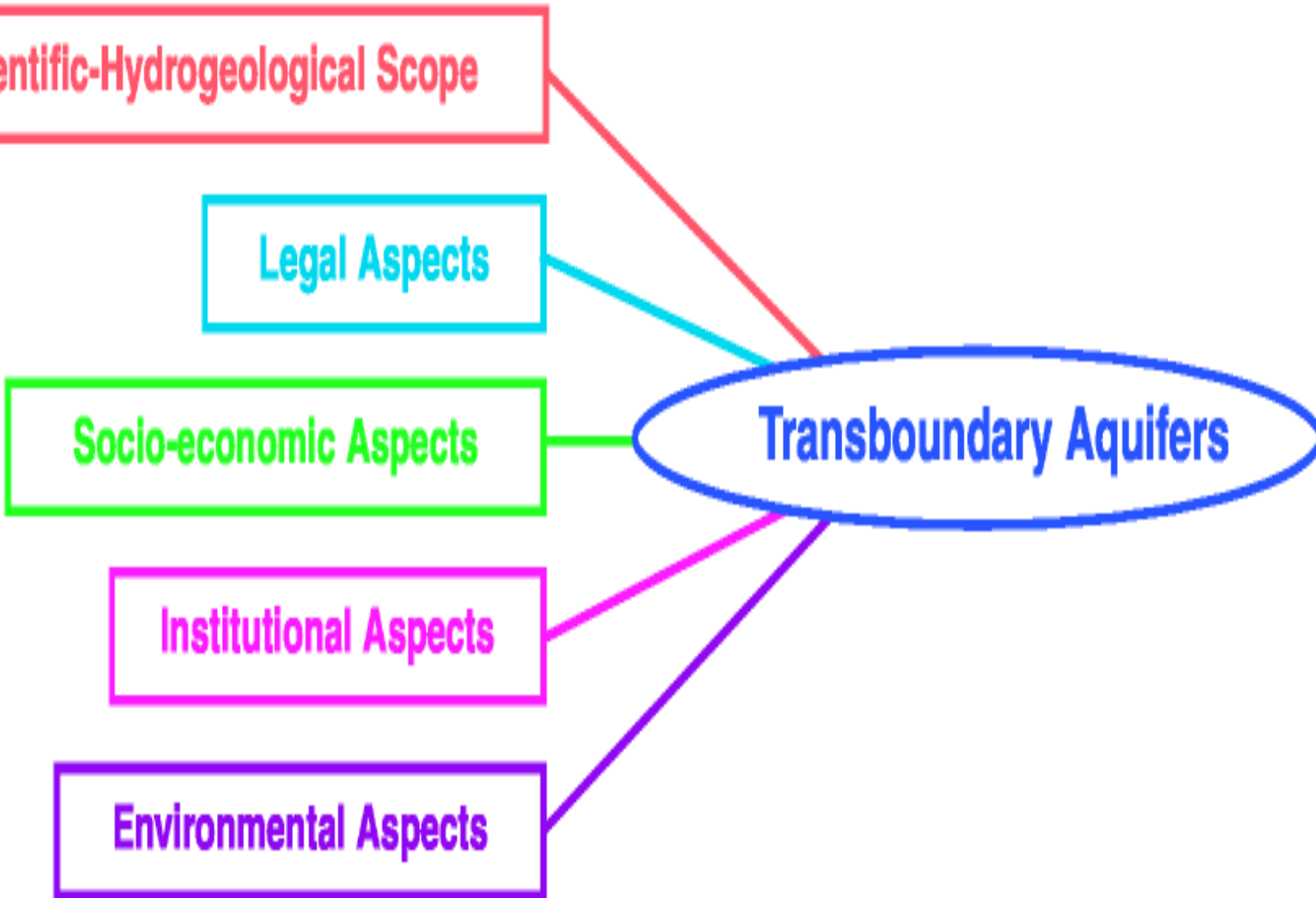
Legal Aspects

Socio-economic Aspects

Institutional Aspects

Environmental Aspects

Transboundary Aquifers



Features of transboundary resources

Spatial distribution of parameters

Groundwater Hydraulics

Resource management

Scientific-hydrogeological Scope



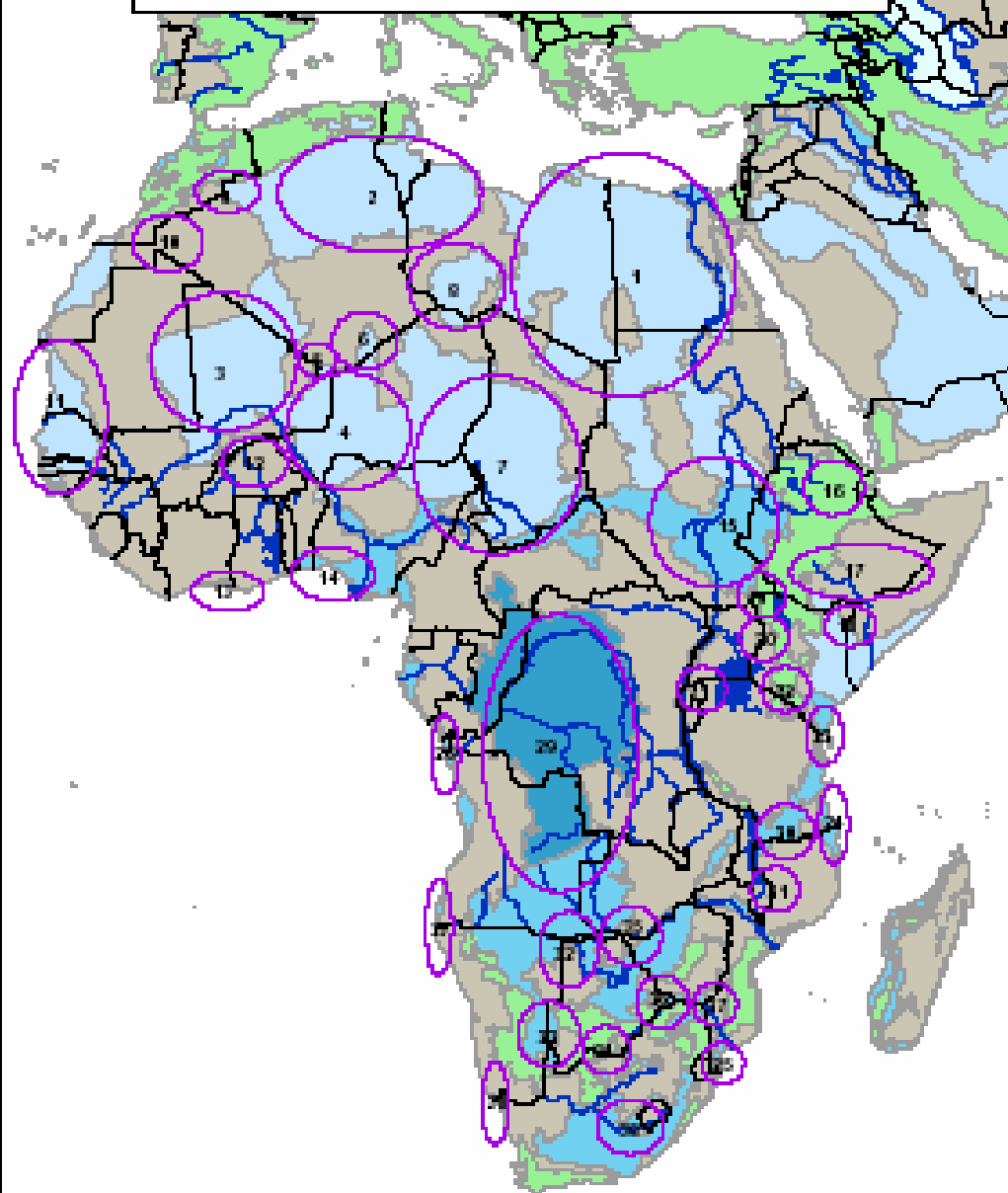
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graph LR; A([Scientific-hydrogeological Scope]) --- B[Features of transboundary resources]; A --- C[Spatial distribution of parameters]; A --- D[Groundwater Hydraulics]; A --- E[Resource management];
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Transboundary Aquifers in the Americas

- ✓ ISARM launched in the Americas Workshop in **Montevideo (Uruguay) September 2003**
- ✓ UNESCO-OAS MoU signed at the 16th session of the UNESCO IHP Intergovernmental Council **September 2004- ISARM of the AMERICAS**
- ✓ 2nd Workshop on Transboundary Aquifers in the Americas, **El Paso, November 2004**
- ✓ Development of case studies
- ✓ UNESCO organized in collaboration with UNILC a Regional Overview, **Paris, March 2005**

Transboundary Aquifers in Africa



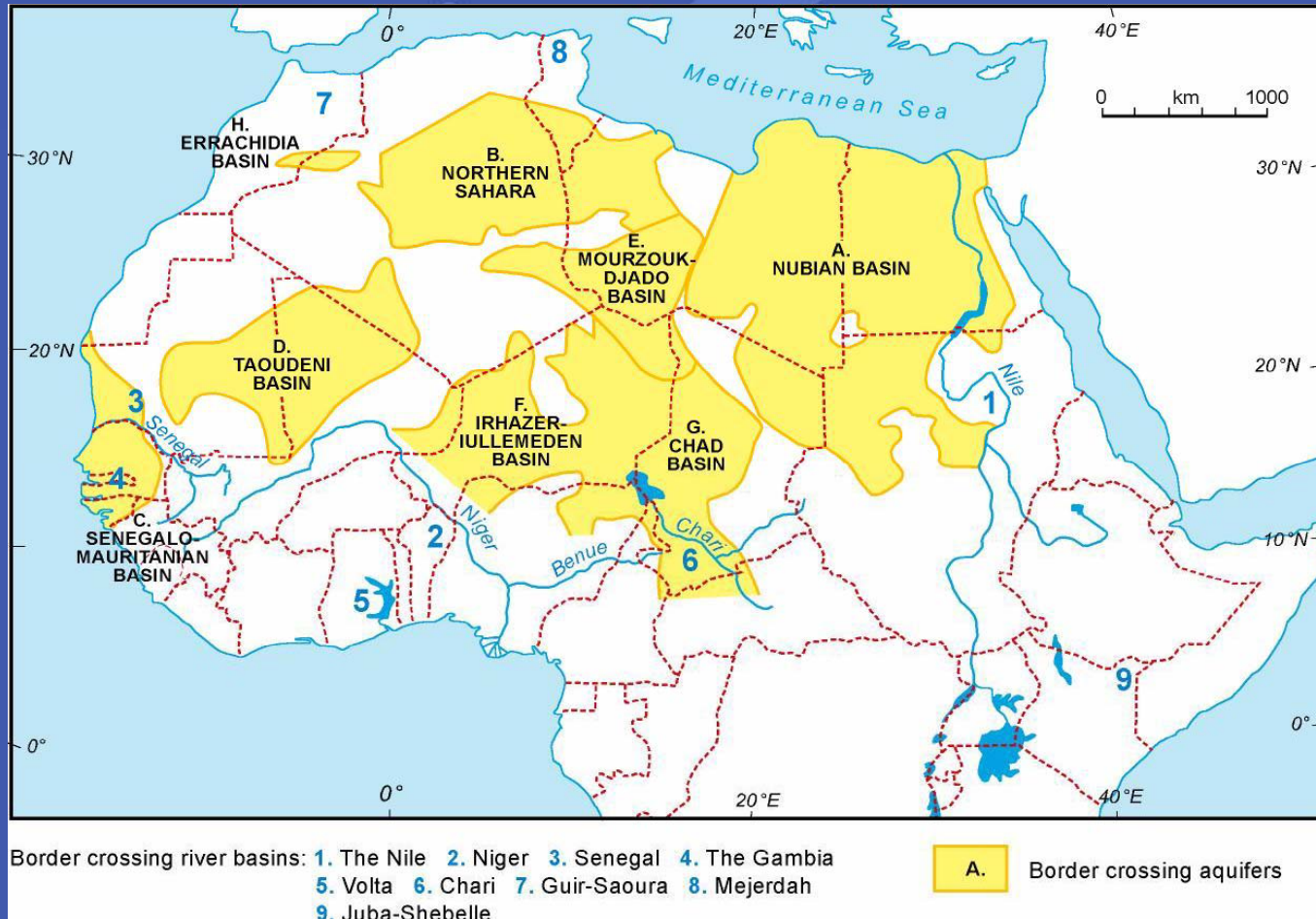
Transboundary Aquifers in Africa

Aquifer	Countries
Nubian Sandstone Aquifer System (NSAS)	Chad, Egypt , Libya, Sudan
Iullemeden Continental Sedimentary Aquifer	Mali, Niger, Nigeria (Algeria, Benin)
Northern Sahara Aquifer System (NSAS) [Grand Erg Oriental]	Algeria, Libya, Tunisia
Coastal Marine Sedimentary basins	Angola, DRC, Mozambique, Namibia, S. Africa, Tanzania
Coastal Marine Sedimentary basins	Kenya, Tanzania
Basement complex aquifers	Tanzania, with Burundi, Rwanda, DRC
Volcanic aquifer systems (Kilimanjaro)	Kenya, Tanzania
Alluvial deposits in deltas (Kagera, Ruvuma)	Tanzania with Uganda resp Mozambique
Congo Intra-cratonic - Continental basin	DRC, Angola
Northern. Kalahari /Karoo basin	Angola, Botswana, Namibia, Zambia
South-Eastern Kalahari /Karoo basin	Namibia, Botswana, S. Africa
Karoo Sedimentary Aquifer	Lesotho, S. Africa
Nata Karoo sub-basin	Botswana, Namibia, Zimbabwe
Tuli Karoo sub-basin	Botswana, South Africa, Zimbabwe
Karoo Sandstone aquifer	Mozambique, Tanzania
Ramotswa Dolomite basin,	Botswana, South Africa
Shire Valley Alluvial aquifer	Malawi, Mozambique
Suture zones, Medium Zambezi	Botswana, Mozambique, S. Africa, Zimbabwe
Limpopo Basin	Mozambique, Swaziland
Rhyolite-Breccia aquifer (Mhlumeni Border)	Mozambique, Swaziland
Merti Aquifer	Kenya, Somalia
Volcanic Aquifers EA Mount Elgon, and Mfumbira resp.	Uganda with Kenya and Rwanda, DRC
Regolith, Rift Aquifers	Uganda with Sudan and with Kenya and Tanzania
“Shallow Quaternary Aquifers”	Burkina-Fasso, Ivory Coast, Mali, Sénégal
Coastal multi-Aquifer System (continental, quaternary, limestone)	Ghana, Ivory Coast
Coastal Sedimentary Aquifer System (Dahomeyan Basin)	Benin, Nigeria, Togo,
Senegal- Mauritania	Gambia, Guinee-Bissau, Mauritania, Senegal
Toudéni	Algeria, Mali, Mauritania
Tin-Séririne basin in the Tassili Oua N’Ahaggar (<i>bassin du Tafassasset</i>)	Algeria, Niger
Djado- Bilma Basin	Niger, Libia, Chad
l’Air (discontinued) cristalline basement aquifer	Algeria, Mali, Niger
Liptako-Gourma, (discontinued) cristalline basement aquifer	Bourkina Fasso, Niger
Chad Aquifer Basin	Central African Republic, Chad, Cameroon, Niger, Nigeria
Errachidia	Algeria, Morrocco
Tindouf	Algeria, Morocco (Sahara),
Morzuk Djado	Algeria, Libya, Niger
Upper Nile (Nubian)	Ethiopia, Sudan
Ogaden - Juba	Ethiopia, Kenya Somalia,
Awash Valley Sedimentary Aquifer	Djibouti, Ethiopia



Transboundary Aquifers in Africa

In common with many parts of the World, Africa too is endowed with transboundary aquifers that have not as yet been completely investigated



Transboundary Aquifers in Africa

ISARM Africa Inventory, 2nd Tripoli Workshop 2002 (preliminary overview will be published in 2005)

UNESCO Study of the lullemeden Aquifer System (Mali, Niger, Nigeria) . GEF-UNEP-OSS operational: UNESCO/IHP-ISARM; ESA/UNESCO-TIGER- Africa - spatial/RS/services;

Support to formulation of proposed GEF-UNDP –IAEA MSP on Nubian Sandstone Aquifer (Egypt, Libya, Sudan, Chad)

Study of the Transboundary West African Coastal Aquifers (Benin, Ghana, Ivory Coast, Nigeria),

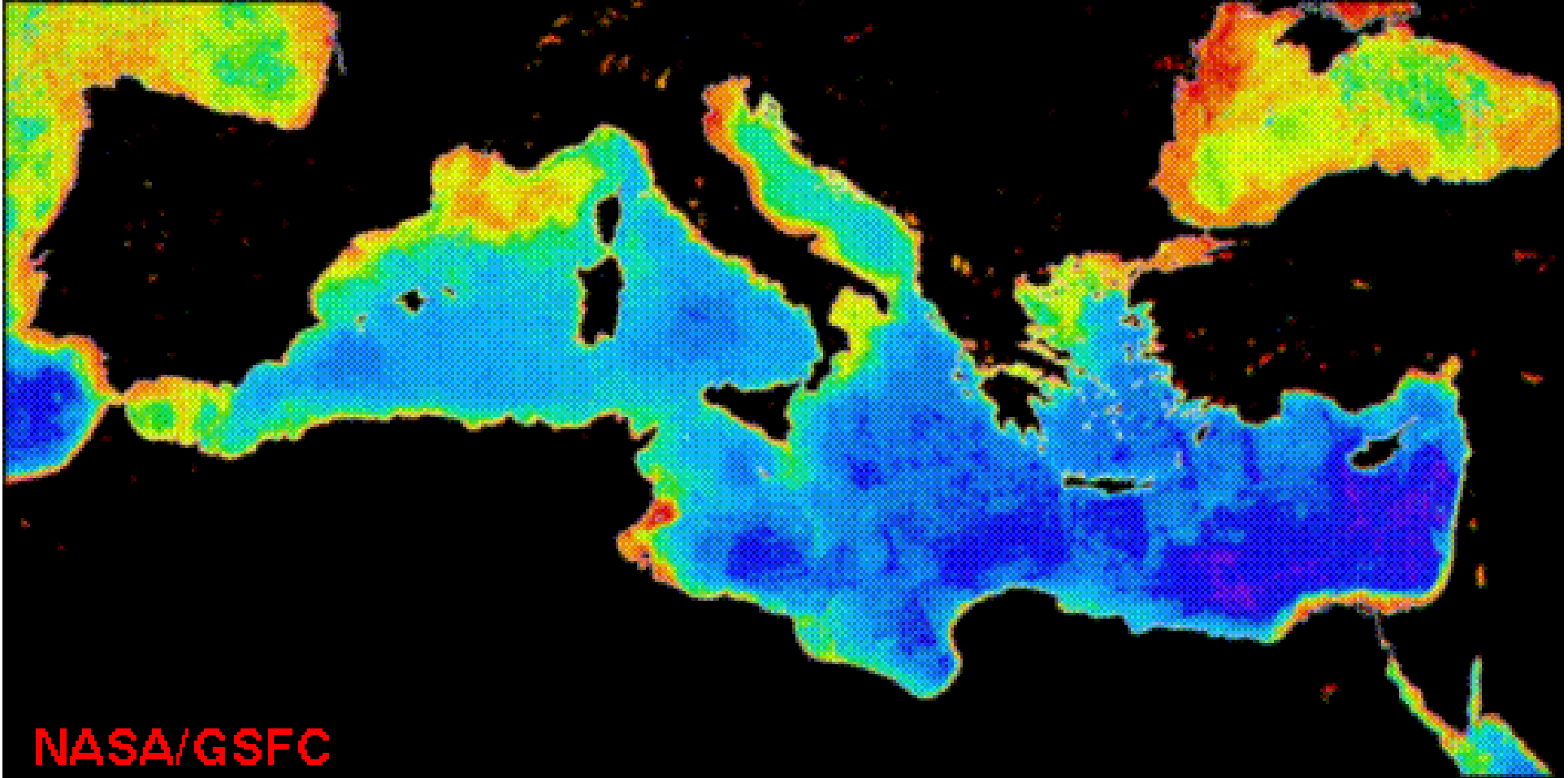


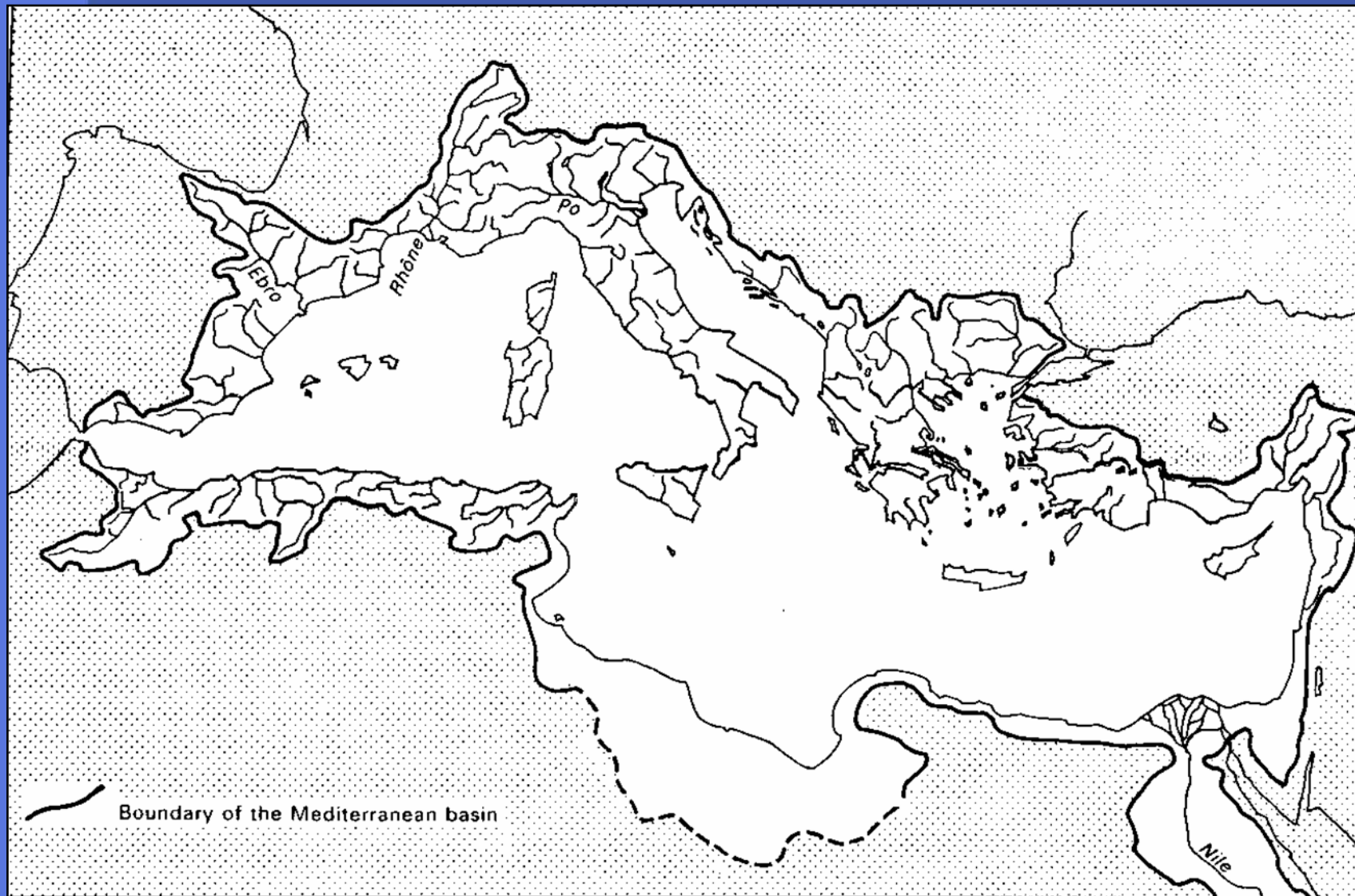
International Hydrological Programme

ISARM-MED

**Aquifer Resources Management,
Mediterranean Consultative Meeting, Balkan
(Petersberg/Athens process)**

Thessaloniki, 21-23 October 2004

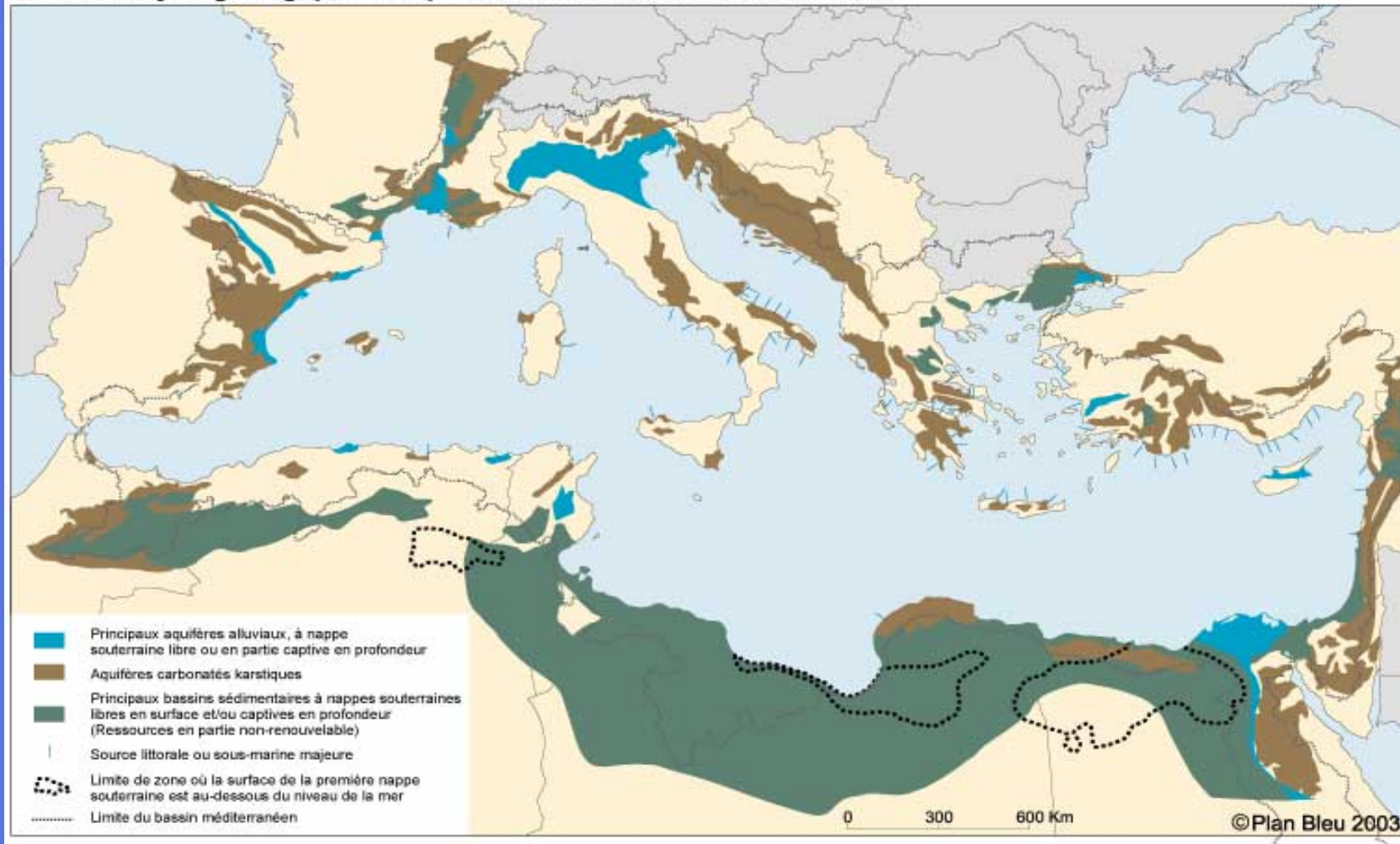




The Mediterranean watershed. For the sake of clarity small rivers are not indicated on this map. Watershed boundaries in very arid areas are approximate.

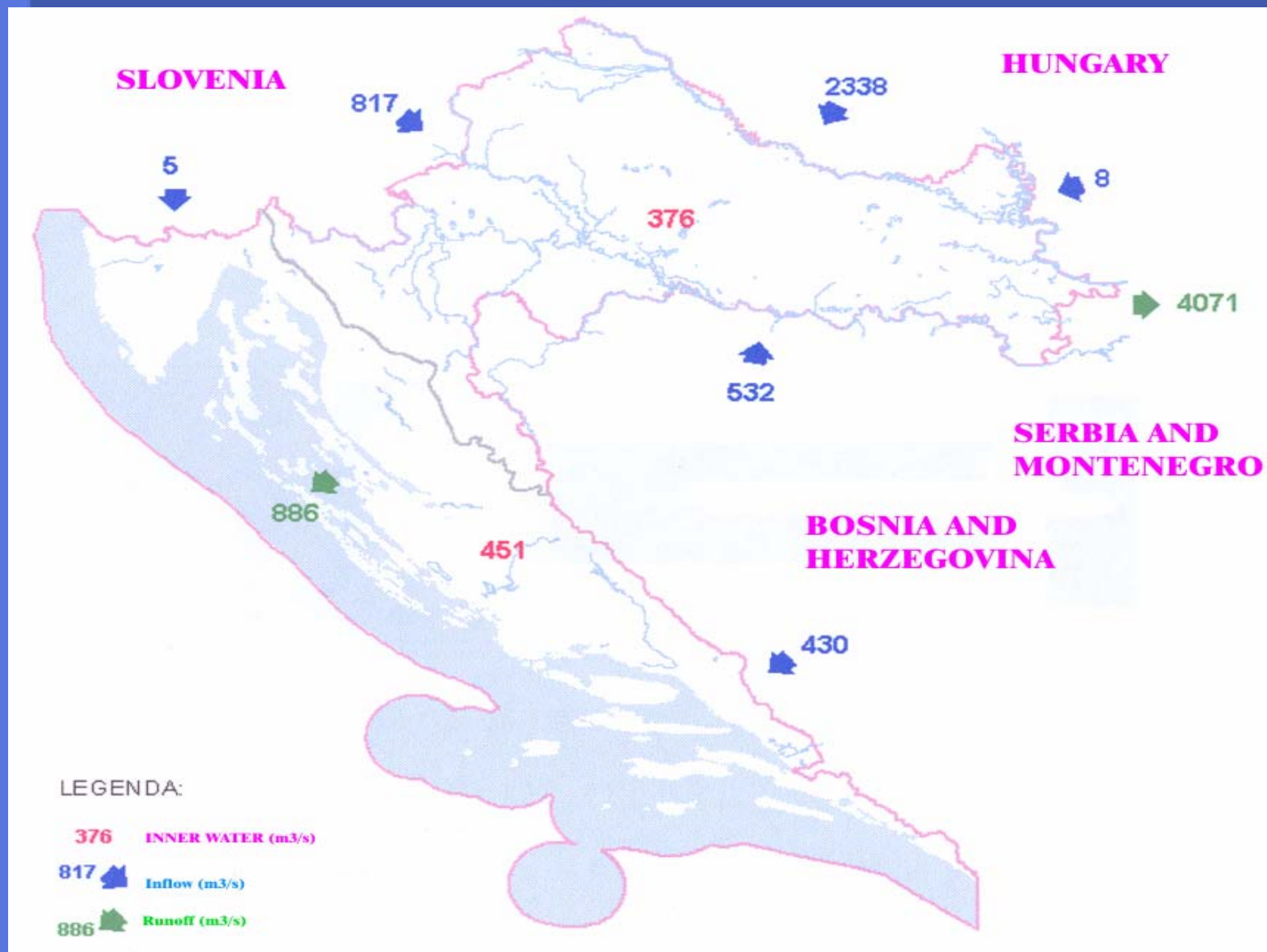
Source: adapted from J. Margat (1988).

Structures hydrogéologiques et aquifères dans le bassin méditerranéen



Hydrogeological structures and aquifers in the Mediterranean basin

The eastern coast of the Adriatic Sea and also the Levantine sub-basin are characterized by the karst hydrogeology with high infiltration and vulnerability, limited surface runoff with submarine groundwater discharge from karstic aquifers and springs.



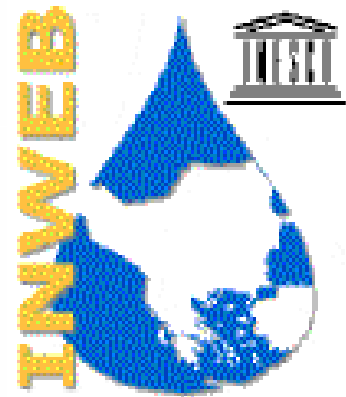
Transboundary flows of the predominantly karstic aquifers which, in most cases, are collected into one country (e.g. Croatia) and discharged into the Adriatic

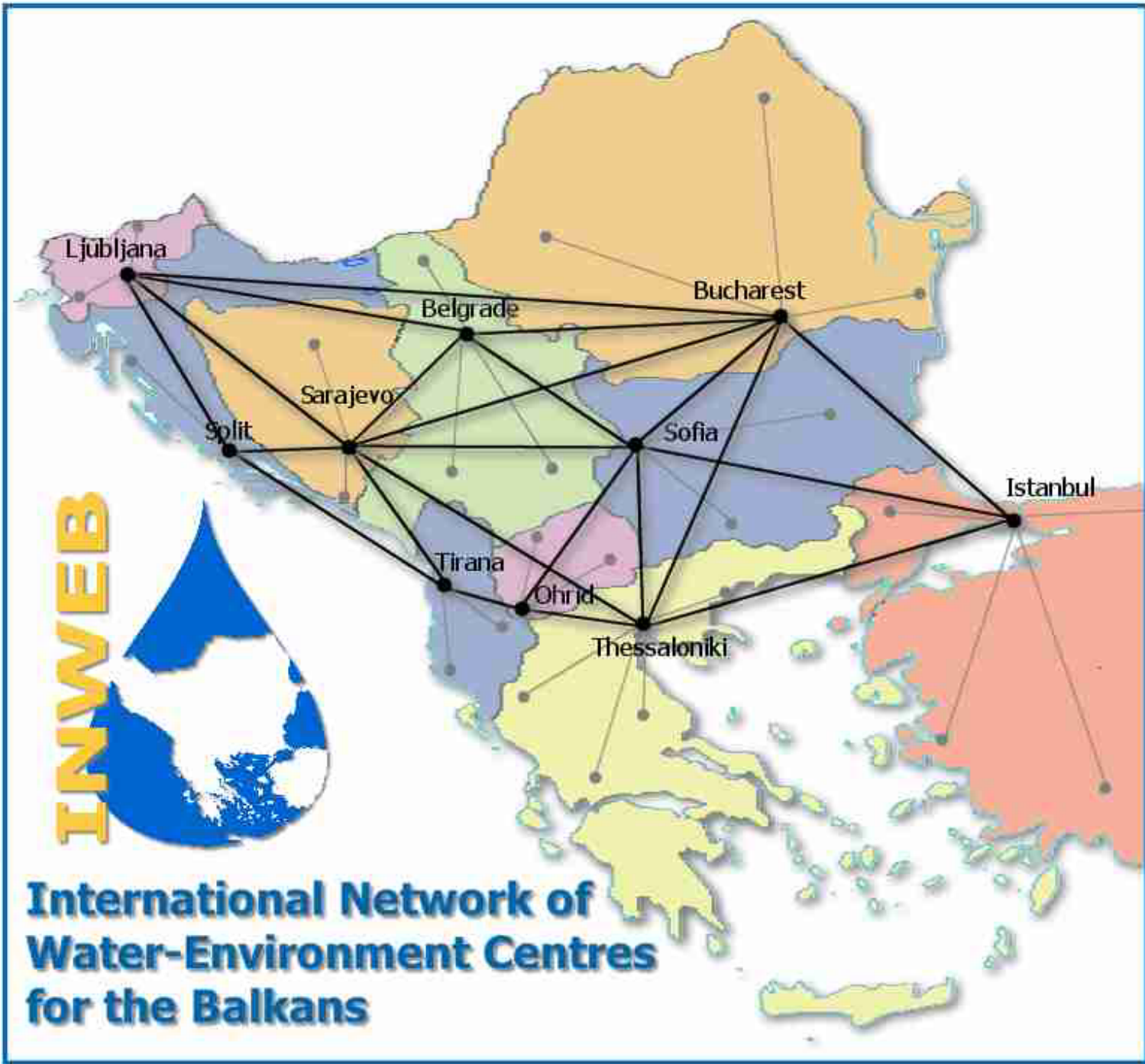


DEVELOPING AN INVENTORY OF INTERNATIONALLY SHARED WATERS IN THE BALKANS

Jacques Ganoulis

INWEB, Thessaloniki, Greece







Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety



icpdr **iksd**

International
Commission
for the Protection
of the Danube River

Internationale
Kommission
zum Schutz
der Donau



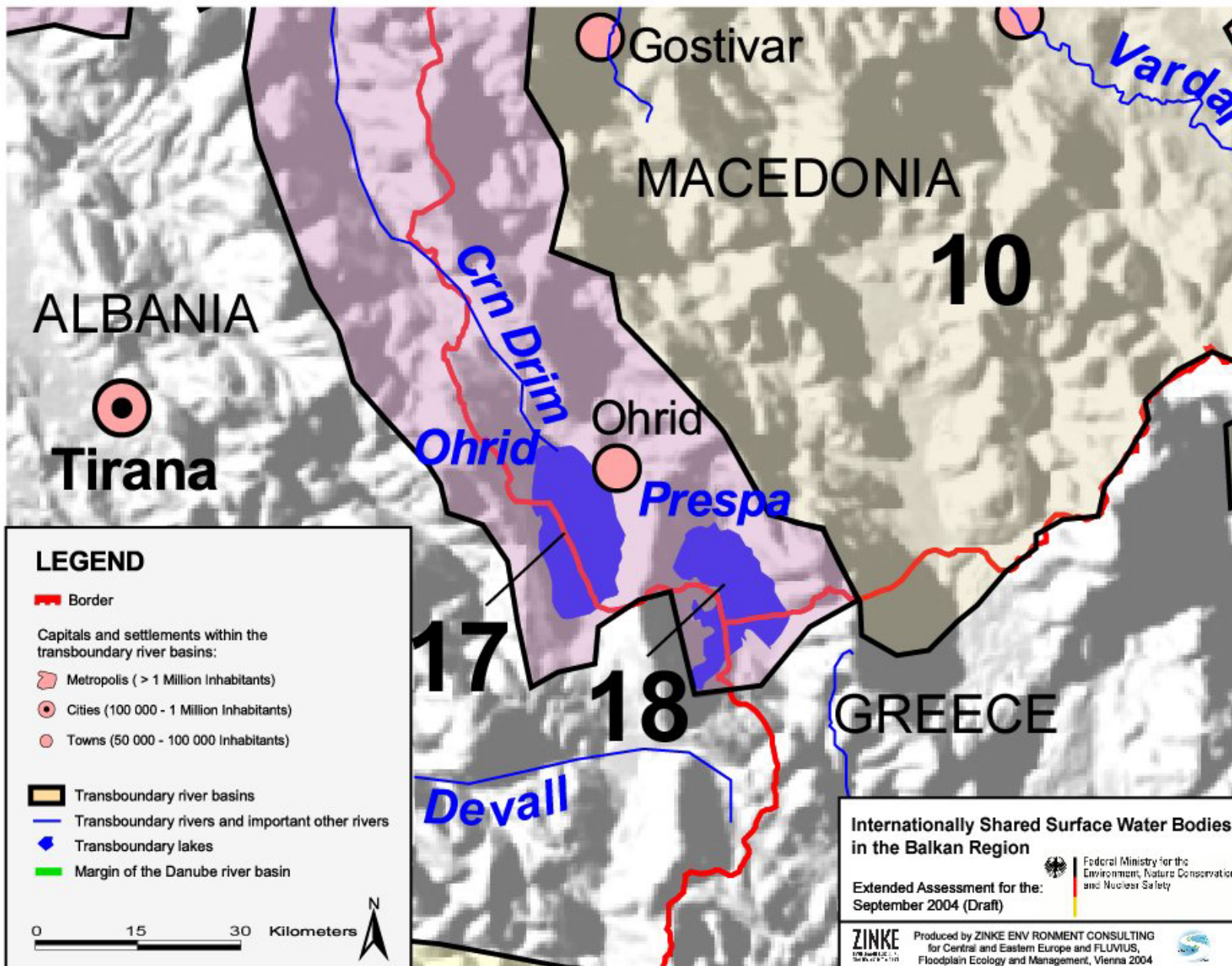
Global Water
Partnership
Mediterranean



1. Sava River Sub-basin



17. Ohrid Lake Sub-basin



Internationally Shared Surface Water Bodies in the Balkan Region

Extended Assessment for the: September 2004 (Draft)

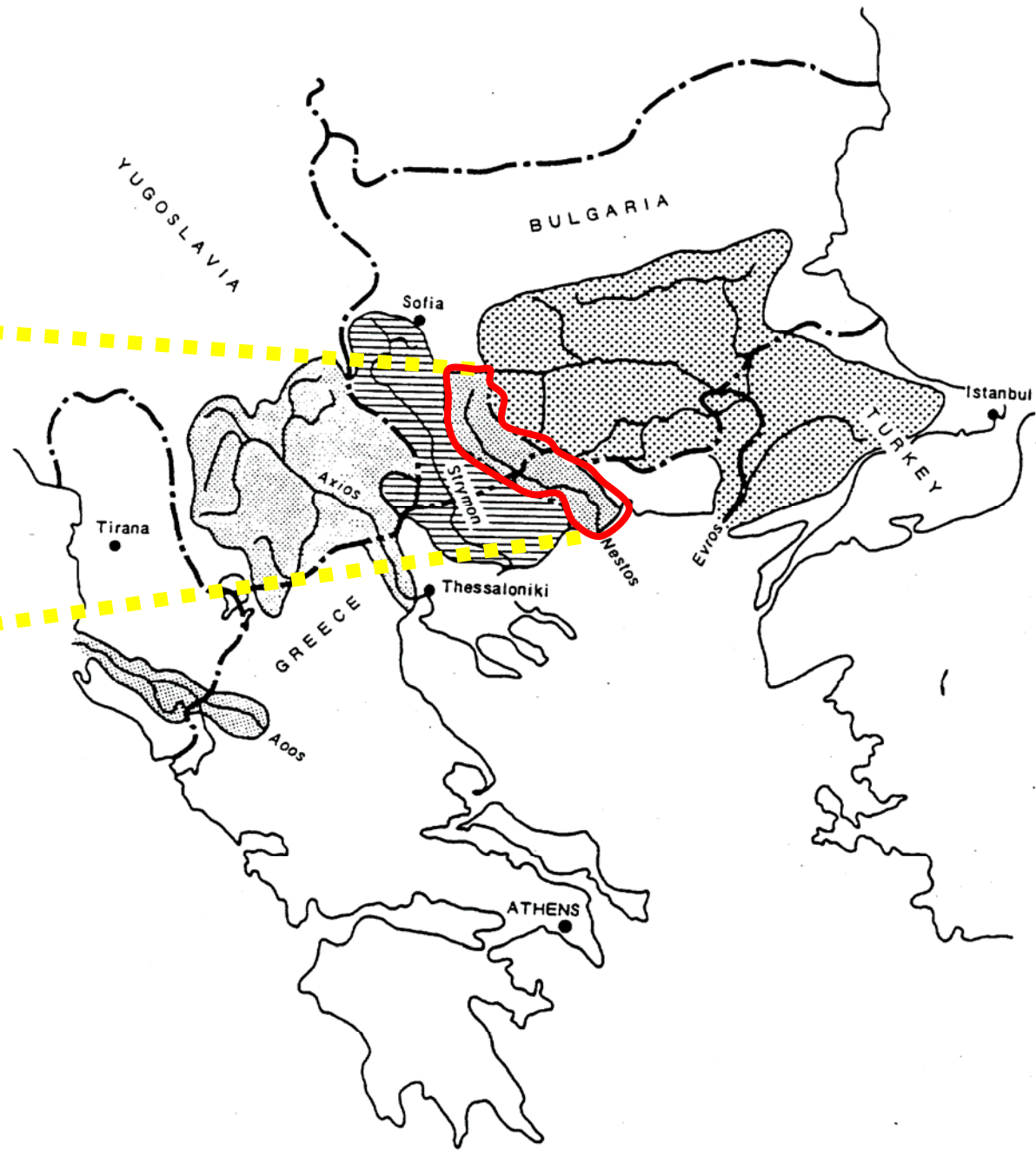
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

ZINKE Produced by ZINKE ENVIRONMENT CONSULTING for Central and Eastern Europe and FLUVIUS, Floodplain Ecology and Management, Vienna 2004

13. Maritza/Meric/Evros River Sub-basin

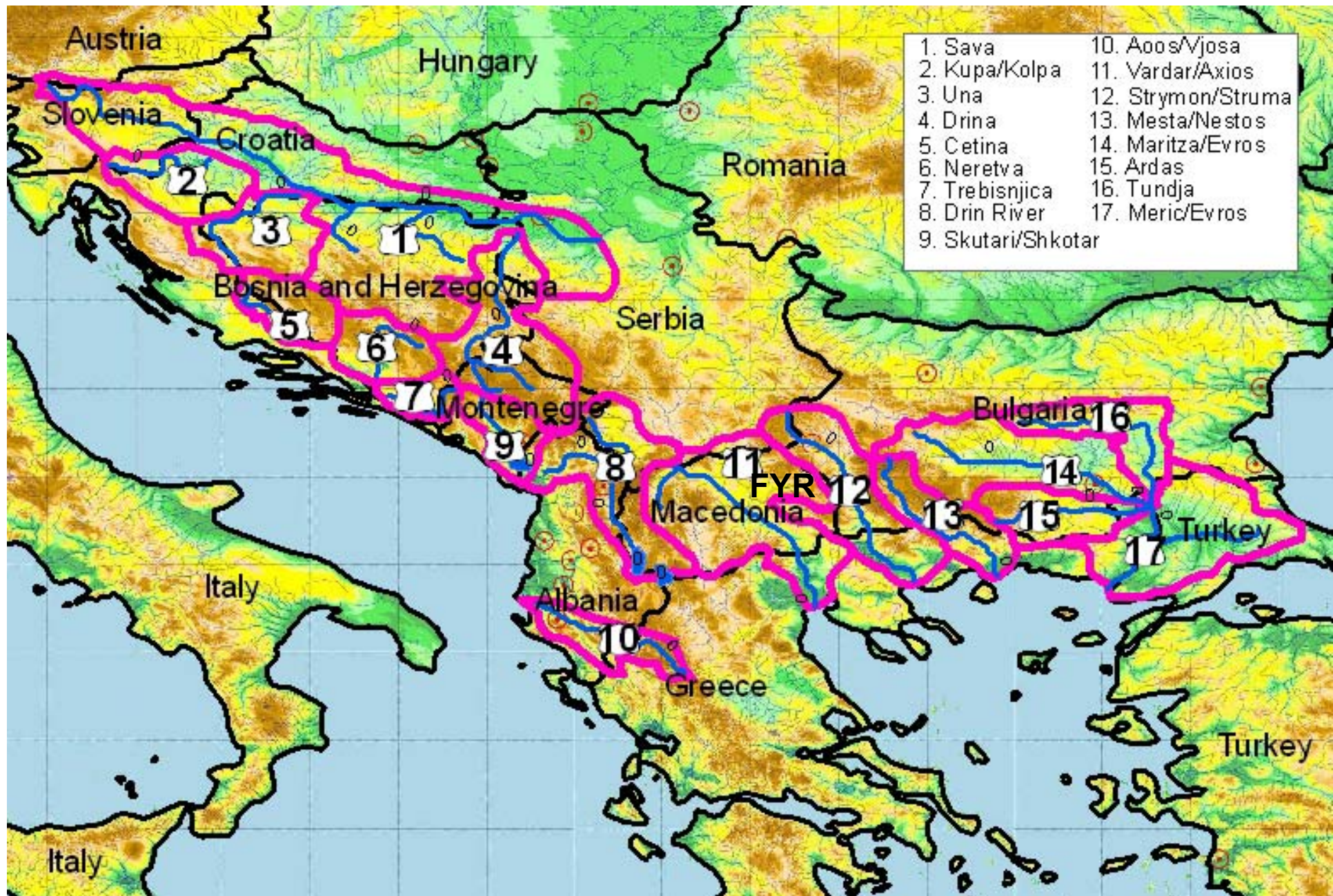


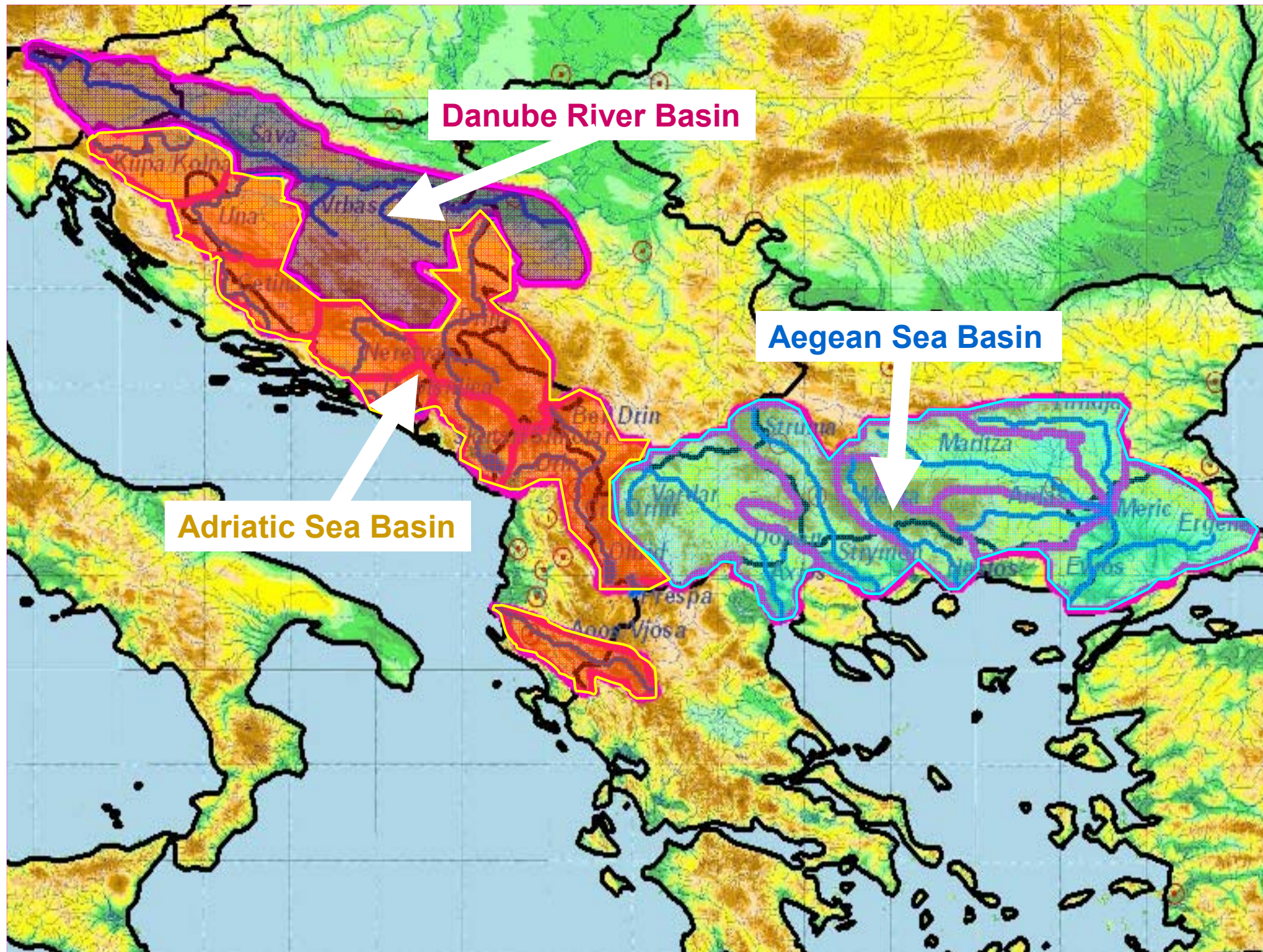
The Nestos/Mesta River Basin







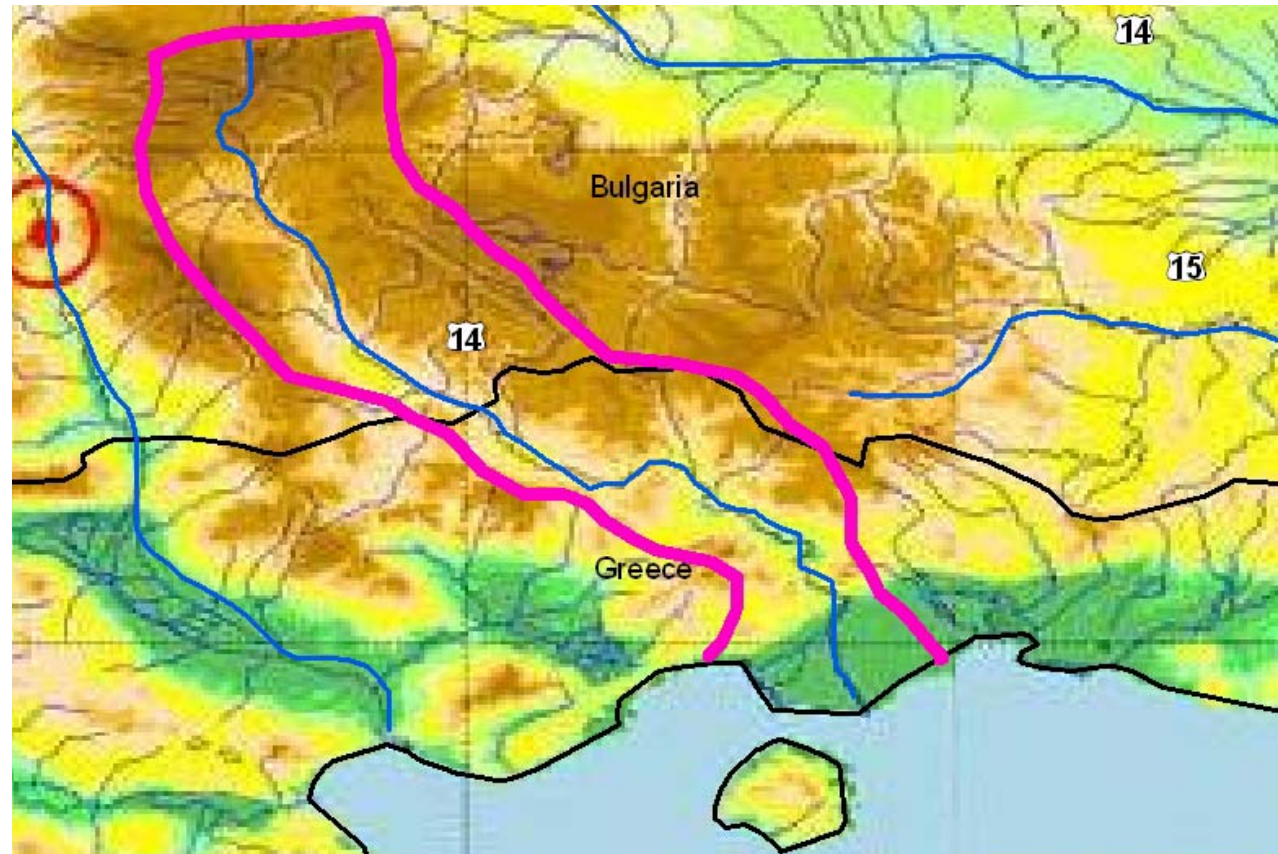
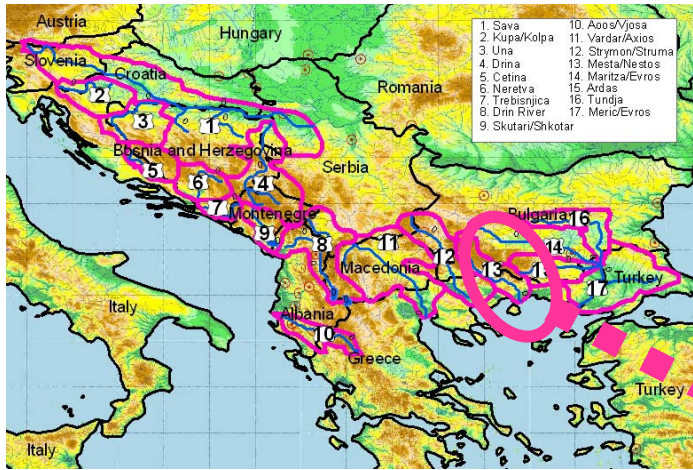


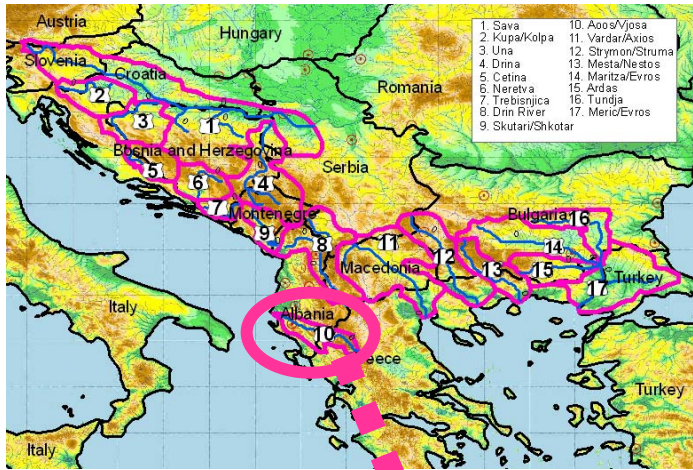


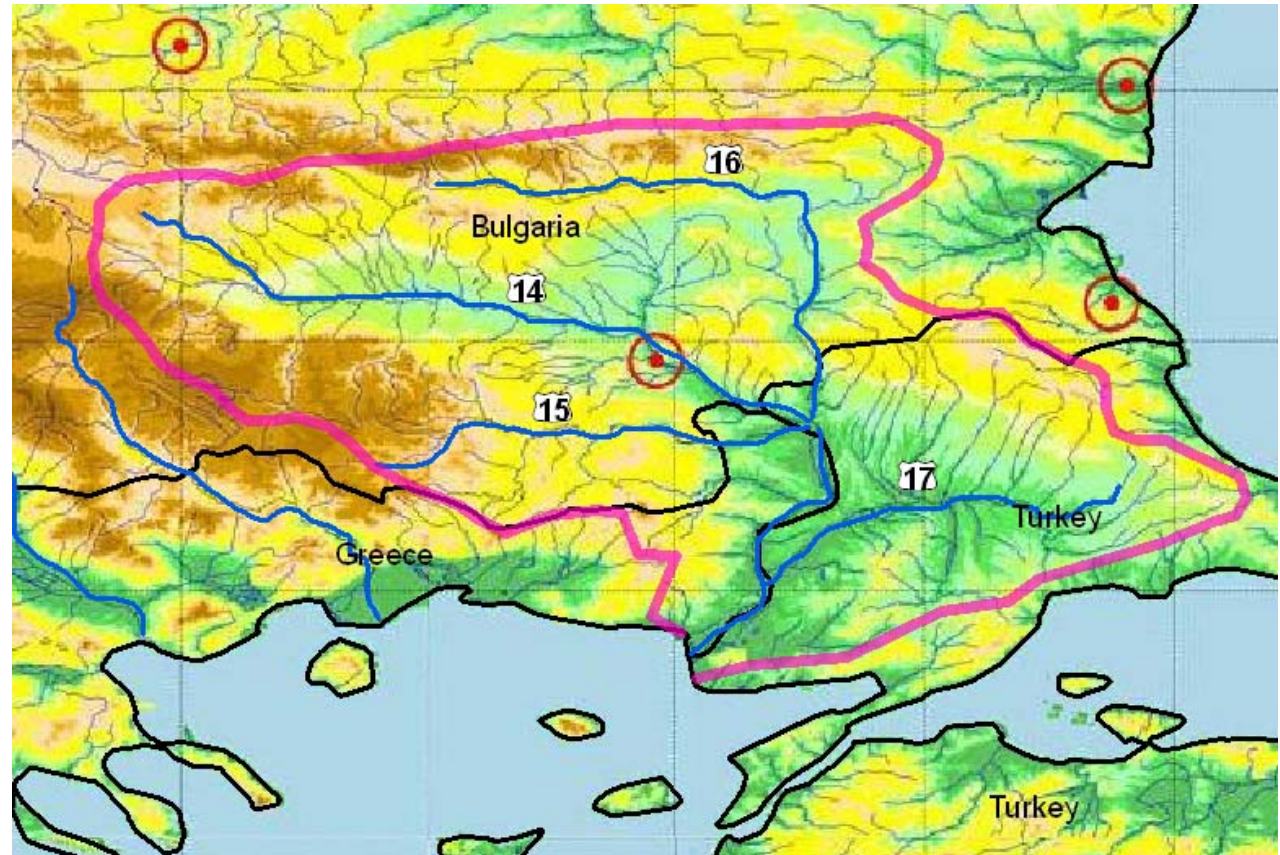
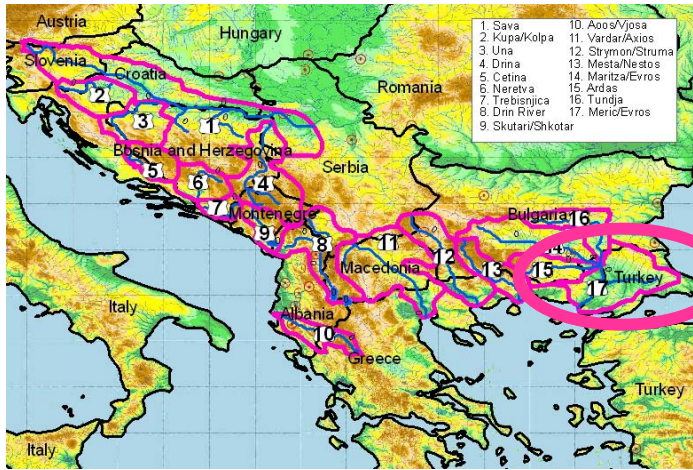
Danube River Basin

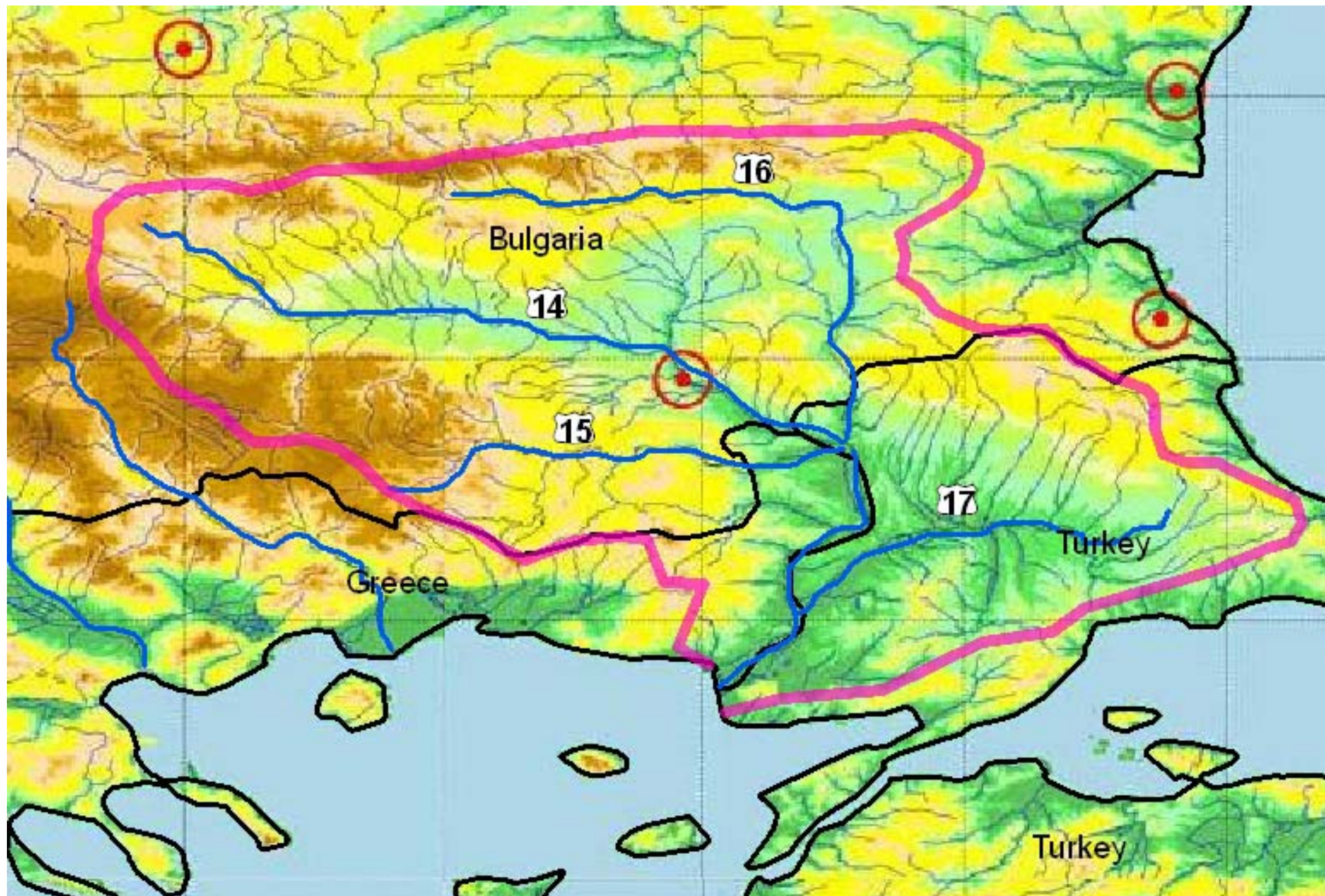
Aegean Sea Basin

Adriatic Sea Basin











No	Name of shared aquifers	Countries involved
1	Dragonja	Slovenia & Croatia
2	Kupa	Slovenia & Croatia
3	Kupa	Croatia & Bosnia Herzegovina
4	Una	Croatia & Bosnia Herzegovina
5	Cetina	Croatia & Bosnia Herzegovina
6	Neretva	Croatia & Bosnia Herzegovina
7,8	Sava	Croatia, Bosnia Herzegovina & Serbia Montenegro
9	Backa & Banat	Croatia, Hungary & Serbia Montenegro
10	Srem, Macva & Posavo-Tamnava	Croatia, Bosnia Herzegovina & Serbia Montenegro
11,13	West Serbia	Bosnia Herzegovina, Serbia Montenegro & Former Yugoslav Republic of Macedonia
12	SW Serbia	Bosnia Herzegovina, Serbia Montenegro, Albania & Former Yugoslav Republic of Macedonia
14,20	Central Serbia	Serbia Montenegro, Former Yugoslav Republic of Macedonia & Romania
15	Zemen	Serbia Montenegro & Bulgaria
16,17,18	Gaver-Nesla, Znepole, Tran	Serbia Montenegro & Bulgaria
19	East Serbia	Serbia Montenegro, Bulgaria & Romania
21	Upper Pannonian/Lower Pleistocene	Serbia Montenegro & Romania
22	Middle Sarmatian/Pontian GWB	Romania & Moldova
23,24	Sarmatian, Upper Jurassic/Lower Cretaceous GWB	Bulgaria & Romania
25	Vjosa/Pogoni	Albania & Greece
26	Mourgana	Albania & Greece
27	Prespes	Albania, Greece & Former Yugoslav Republic of Macedonia
28	Gallica	Albania & Greece
29	Pelagonija/Florina catchment	Former Yugoslav Republic of Macedonia & Greece
30	Gevgelija	Former Yugoslav Republic of Macedonia & Greece
31	Lake Dojran	Former Yugoslav Republic of Macedonia & Greece
32	Sandansky-Petrich	Bulgaria, Greece & Former Yugoslav Republic of Macedonia
33	Gotze Delchev/Agistro-Orvilos	Bulgaria & Greece
34,35	Nastan-Trigrad, Smolyan	Bulgaria & Greece
36,37	Rudozem, Erma Reka	Bulgaria & Greece
38	Svilengrad/Orestiada/Edime Aluvion	Bulgaria, Greece & Turkey
39	Meric/Evros Aluvion	Turkey & Greece

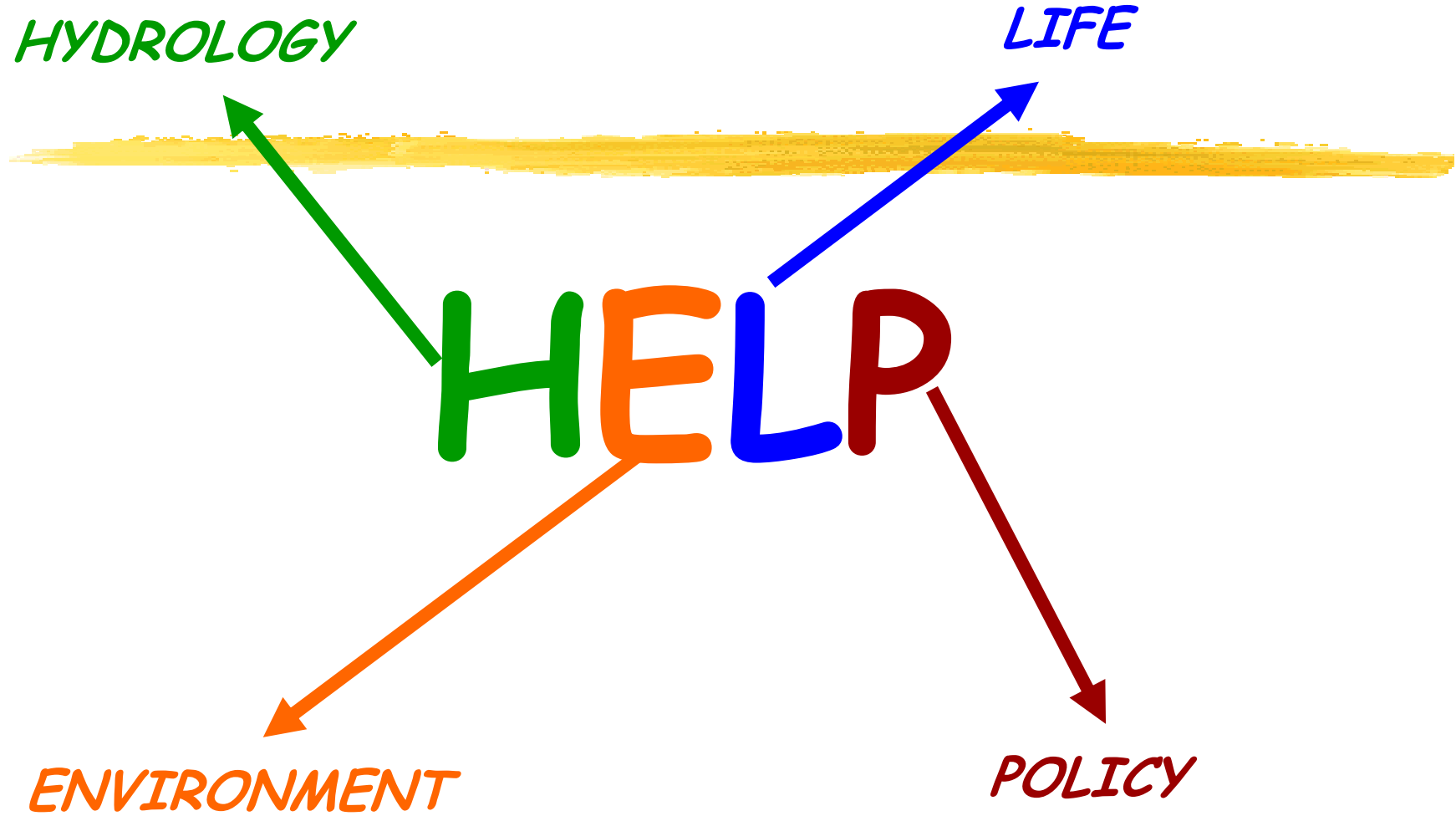
HYDROLOGY

LIFE

HELP

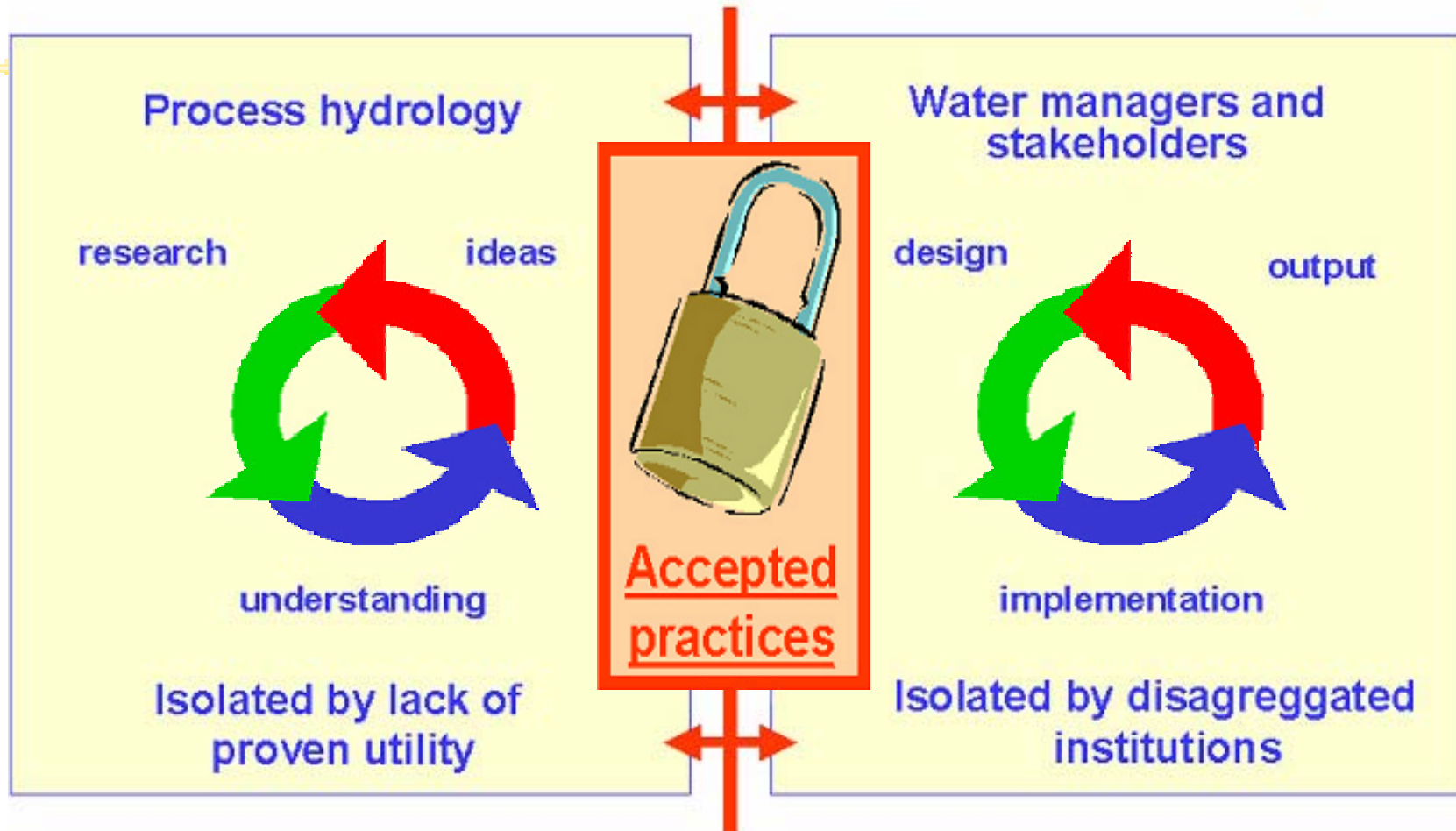
ENVIRONMENT

POLICY



“Paradigm Lock”

.....based on outdated knowledge and technology

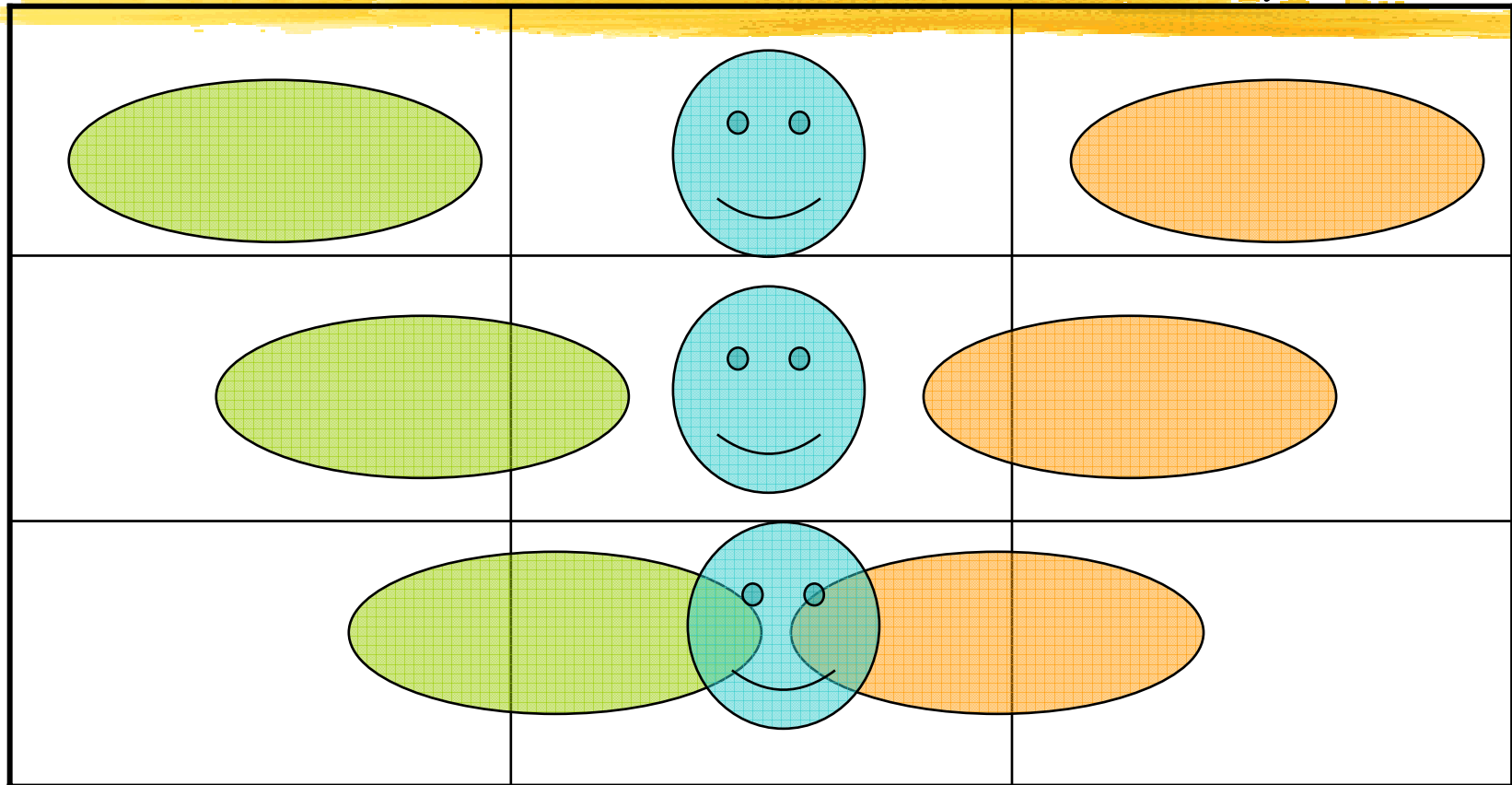


Bilateral Agreements & Regulation (EUWFD, . . .)

Country A

Policy

Country B



Public Participation

Whatcha Doin' About Air Pollution?

CARPOOL
OR BIKE!

DON'T
WASTE
ENERGY!

RAKE IT.
DON'T
BLOW IT!

GET THE
WORD OUT!

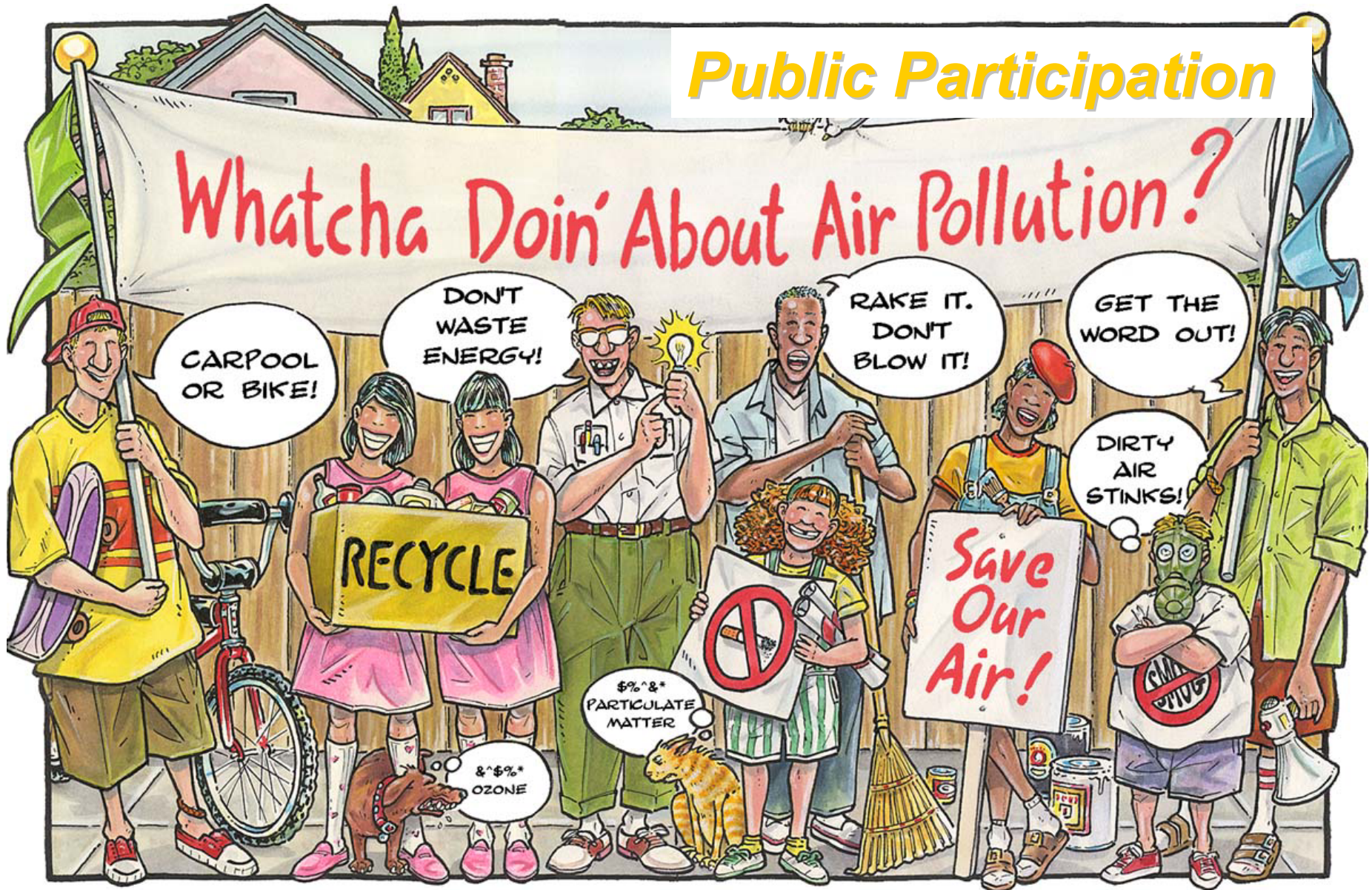
RECYCLE

DIRTY
AIR
STINKS!

Save
Our
Air!

\$%^&
PARTICULATE
MATTER

&^\$%*
OZONE



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- contact one of INWEB's main partners in all 10 Balkan countries

www.INWEB.gr invites you...



! UNESCO WORKSHOPS THESSALONIKI 18-23 OCT. 2004 !

UNESCO Workshop
TRANSBOUNDARY SURFACE WATERS

-  PRESENTATIONS
-  PAPERS
-  PHOTOS



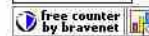
UNESCO Workshop
TRANSBOUNDARY GROUNDWATERS

-  PRESENTATIONS
-  PAPERS
-  PHOTOS

International Network of Water-Environment Centres for the Balkans



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Thank you !