



UNESCO CHAIR & NETWORK
INTERNATIONAL NETWORK OF
WATER-ENVIRONMENT CENTRES FOR THE BALKANS
ARISTOTLE UNIVERSITY OF THESSALONIKI, GREECE



« EUROPE-INBO 2015 »
13TH INTERNATIONAL CONFERENCE
FOR THE IMPLEMENTATION OF THE EUROPEAN WATER DIRECTIVES
THESSALONIKI (GREECE) 21 - 24 OCTOBER 2015

UNESCO Chair/INWEB:
An international network for fostering transboundary
water cooperation

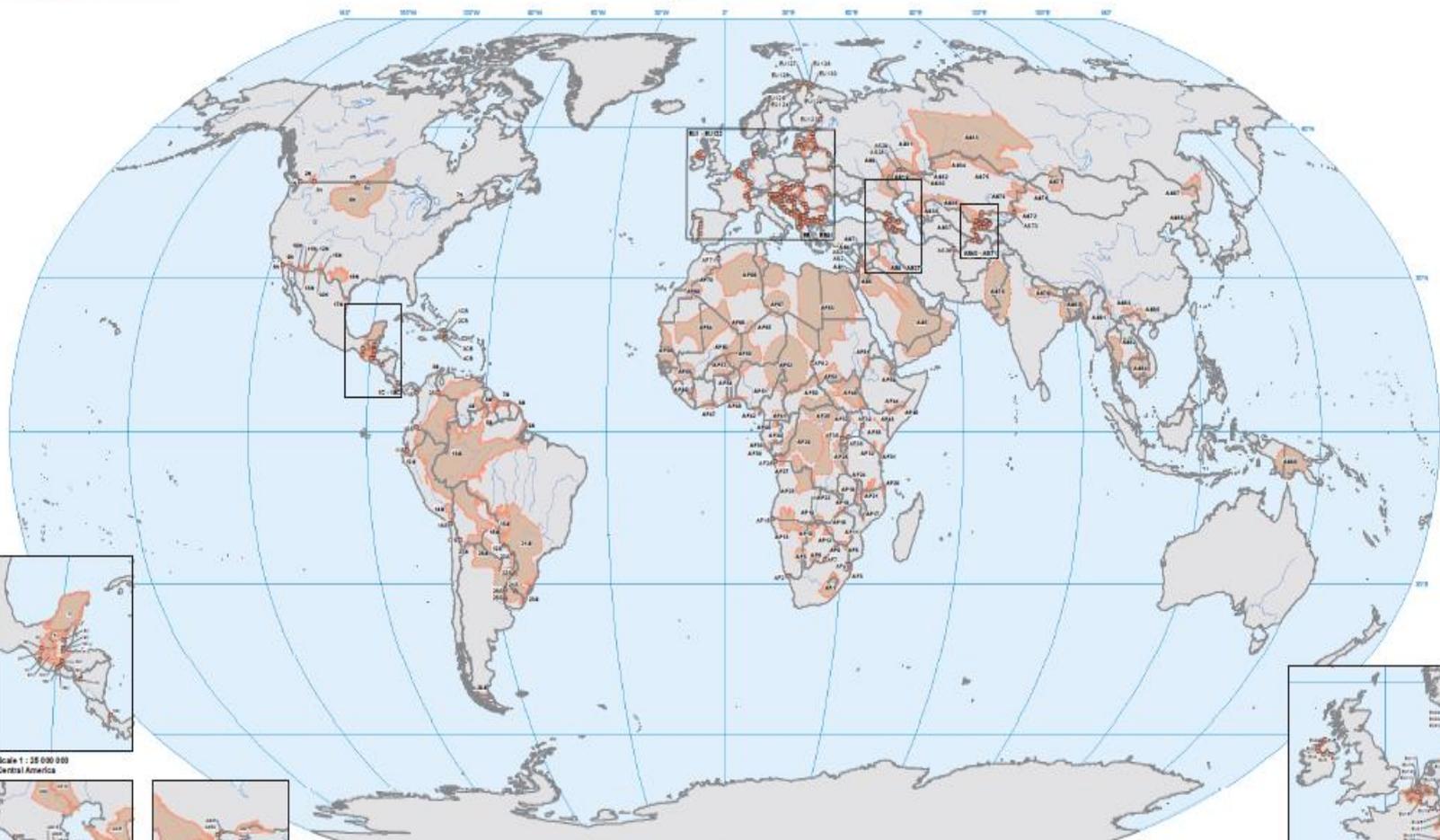
By

Dr. Charalampos Skoulikaris,
Secretary of UNESCO Chair & Network INWEB



Transboundary Aquifers of the World

- Update 2012 -



Legend

Transboundary Aquifers

Occurrence and extent

- aquifer extent
- groundwater body (GWB) extent
- confirmed boundary
- approximate boundary

Overlap aquifers/GWBs

- overlapping aquifers
- overlapping aquifers and GWBs

Small Aquifers/GWBs

- small aquifer
- small GWB
- overlapping aquifer/GWB
- exact location/extent of aquifer uncertain

Geographic elements

- river
- lake
- political border

Prepared by IGRAC
 Editor in chief: Hans Kuylenstierna
 Cartography: Lena Hertzberg
 Cover: Frank van Meir
 Photo: Martin Stadel (water level chart, water conducted to UNESCO-HP)

Base maps
 Country borders: http://www.mapping.org
 Rivers and lakes: SAGE (2005)

Map projection
 Robinson projection, geographic coordinates, spheroid WGS84, longitude of central meridian 0°

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Scale 1 : 25 000 000
Central America



Scale 1 : 25 000 000
Caucasus



Scale 1 : 15 000 000
Central Asia



Scale 1 : 25 000 000
Europe

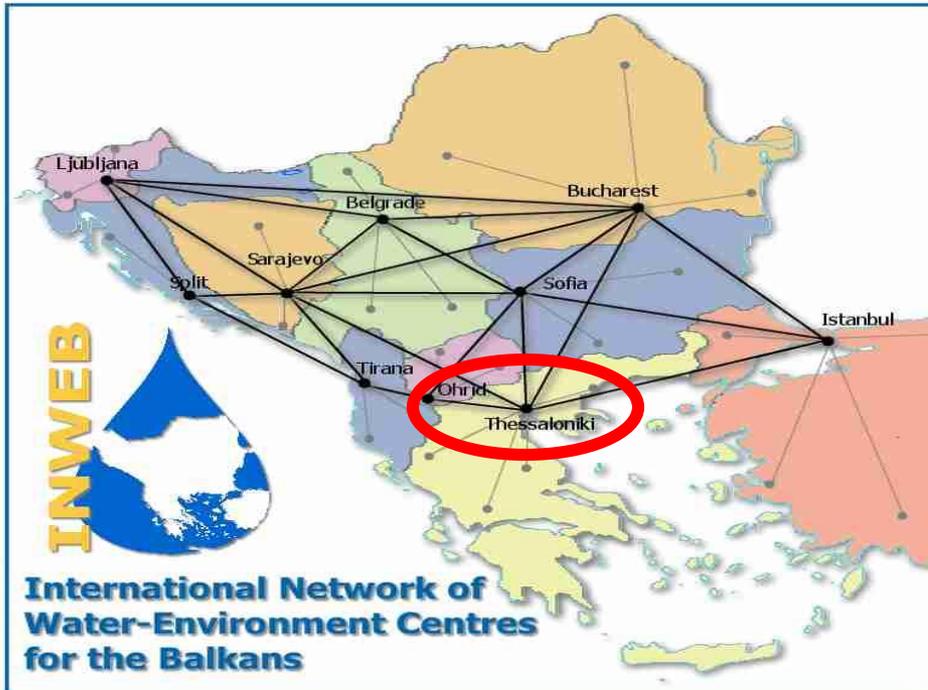
Scale 1 : 50 000 000
Special Edition
 for the 6th World Water Forum, Marseille, March 2012

The world's transboundary river basins



- Cover 45% of the Earth's land surface;
- Affect 40% of the world's population;
- Account for approximately 80% of global river flow;
- Cross the political boundaries of 148 nations.

UNESCO Chair International Network of Water Environment Centres for the Balkans



The UNESCO Chair/International Network of Water-Environment Centres for the Balkans (INWEB) on “sustainable management of water and conflict resolution” was established in July 2003 at the Aristotle University of Thessaloniki (AUTH), Department of Civil Engineering, Division of Hydraulics and Environmental Engineering, Hydraulics Laboratory.

The UNESCO Chair/INWEB cooperates closely with UNESCO’s International Hydrological Programme (UNESCO IHP) (Paris) and UNESCO’s Regional Office for Science in Europe (UNESCO BRESCE) (Venice), as well as other major international organisations such as the United Nations Economic Commission for Europe (UNECE).



EDUCATION-RESEARCH

The educational and research activities of the UNESCO Chair & Network INWEB cover a wide range of scientific areas related to

- ✓ Integrated management of transboundary water bodies
- ✓ Raise public awareness in the fields of water resources and environmental protection
- ✓ Creation and maintenance of databases (cloud geo information systems) on water and the environment related to transboundary water bodies (rivers, lakes, and coastal waters)
- ✓ Mathematical modelling of hydrological and environmental phenomena
- ✓ Climate change impacts on hydrology
- ✓ Risk assessment of extremes : floods and droughts

Sub-Danubian Transboundary River & Lake Basins in the Balkans



Legend

- - - Country Borders
 - Rivers
 - Lakes
- | | | |
|-----------------------------------|------------------|----------------------------|
| Transboundary River Basins | ■ Mesta/Nestos | Transboundary Lakes |
| ■ Cetina | ■ Neretva | ■ Lake Dojran/Doirani |
| ■ Drin | ■ Sava | ■ Lake Ohrid |
| ■ Drina | ■ Struma/Strymon | ■ Lake Prespa |
| ■ Kupa/Kolpa | ■ Trebisnjica | ■ Lake Skadar/Shkodra |
| ■ Maritza/Evros/Ergene | ■ Tundja/Tunca | |
| | ■ Una | |
| | ■ Vardar/Axios | |
| | ■ Vjosa/Aoos | |



Transboundary Aquifers in South Eastern Europe (SEE)



6TH WORLD WATER FORUM

SD: 1. Ensure everyone's well being

PfA: 1.5 Contribute to cooperation and peace

TSG: 1.5.2 Increase the number of new agreements and revise/enhance the quality of existing agreements related to transboundary surface and/or groundwater

MEDPARTNERSHIP QUESTIONNAIRE ON COASTAL AQUIFERS IN THE MEDITERRANEAN REGION Version:

2.1 Date: 29 March 2012

Please complete using the free Adobe Acrobat Reader, with one one questionnaire for each aquifer, each with a unique file name that includes the name of the aquifer.

Please return by e-mail to: Jose Luis Martin-Bordes, UNESCO IHP, at jl.martin-bordes@unesco.org, with copy to Jacques Ganoulis, UNESCO Chair/International Network of Water-Environment Centres for the Balkans (INWEB), at jganouli@civil.auth.gr

QUESTIONNAIRE ON TRANSBOUNDARY LAKE/RIVER BASIN MANAGEMENT

The aim of this survey is to identify good practices in transboundary aquifer systems management and governance and to report successful case studies and innovative solutions to the 6th World Water Forum, Marseille, France, March 2012. It should take 10-15 minutes to complete the following questionnaire.

Please return it by e-mail to: jganouli@civil.auth.gr with copy to: l.salame@unesco.org

1. NAME OF THE COASTAL AQUIFER, LOCATION & COUNTRY

Please give the name(s) or other identification property of the coastal aquifer, its location (region, province, department) and indicate who is responsible for water management.

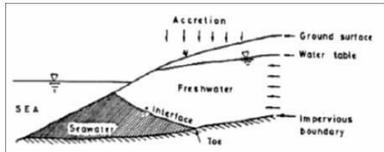
Name of aquifer:

Location:

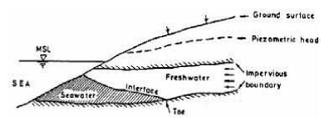
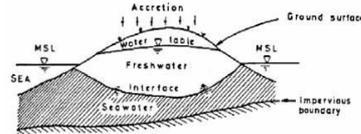
Entity responsible for management:

2. AQUIFER CHARACTERISTICS

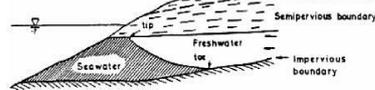
2.1 Please look at the simplified pictures below and indicate which of them most closely characterizes your coastal aquifer. If none are applicable, please provide a conceptual sketch of your coastal aquifer in the blank box below.



Unconfined with toe Unconfined without toe



Confined



Semi-confined

Stratified (multi-layer with or without)

Karst connection between the layers)

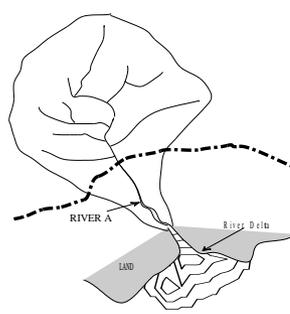
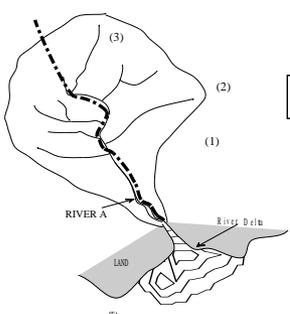
Other (fractured, combination), please click in the space above to insert a sketch or diagramme that best characterizes the aquifer.

1. NAME OF THE TRANSBOUNDARY LAKE/RIVER BASIN, LOCATION & COUNTRIES

Please give the name(s) or other identification property of the shared basin, its approximate location (province, department) and countries sharing it.

2. RIVER BASIN CHARACTERISTICS

Please indicate which of the two pictures below characterises most closely your transboundary river basin.

 <p style="text-align: right;"><input type="checkbox"/></p>	 <p style="text-align: right;"><input type="checkbox"/></p>
<p>States border cross the river and divide the river basin in two parts, the upstream and the downstream</p>	<p>The river serves as state border, like the lower course of the Danube River, which serves as the border between Bulgaria and Romania.</p>

3. USES AND FUNCTIONS OF TRANSBOUNDARY SURFACE WATERS

Does the surface waters have direct/instream and/or indirect (offstream) uses?

No

or

Yes

If Yes:



UNESCO Subcomponent 1.1 on "Management of Coastal Aquifer and Groundwater"
of the GEF funded UNEP/MAP "Strategic Partnership for the Mediterranean Sea large Marine Ecosystem"

Geo-referenced information system for coastal aquifers in the Mediterranean

Feedback

[Click here to give feedback](#)

Data Catalog

GIS Layers

- Coastal Aquifers
 - Karstic
 - Porous
 - Alternating Marl and sandstc
 - Non defined
- Mediterranean basin boundar
- Basin boundaries
- MedPartnership Project Count
- Country borders

Search

Country

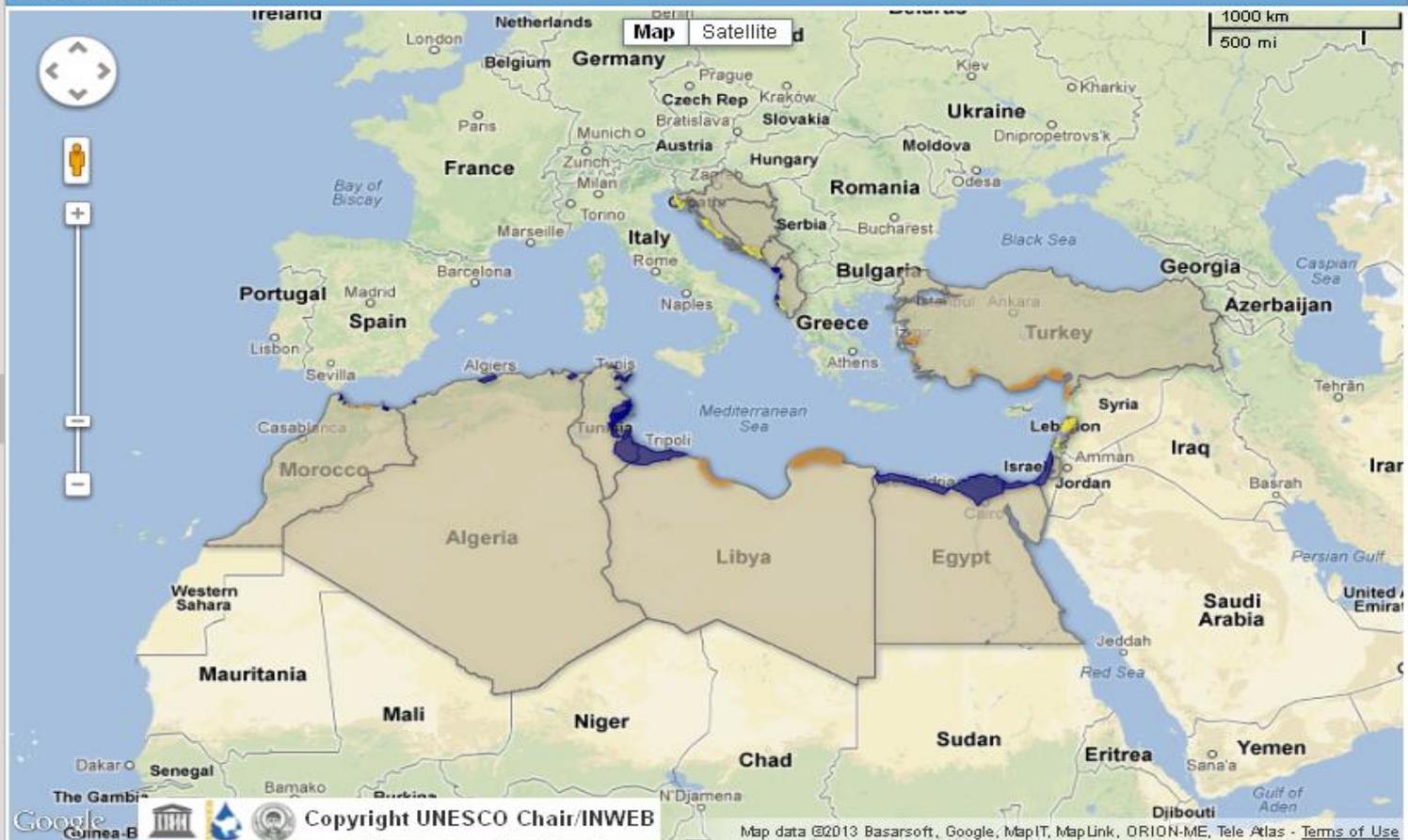
Aquifer Type

Areal extent >= (km²)

Population >= (million)

Coastal boundary length >= (km)

Mediterranean basin



Geo-referenced information system for coastal wetlands in the Mediterranean

Actions

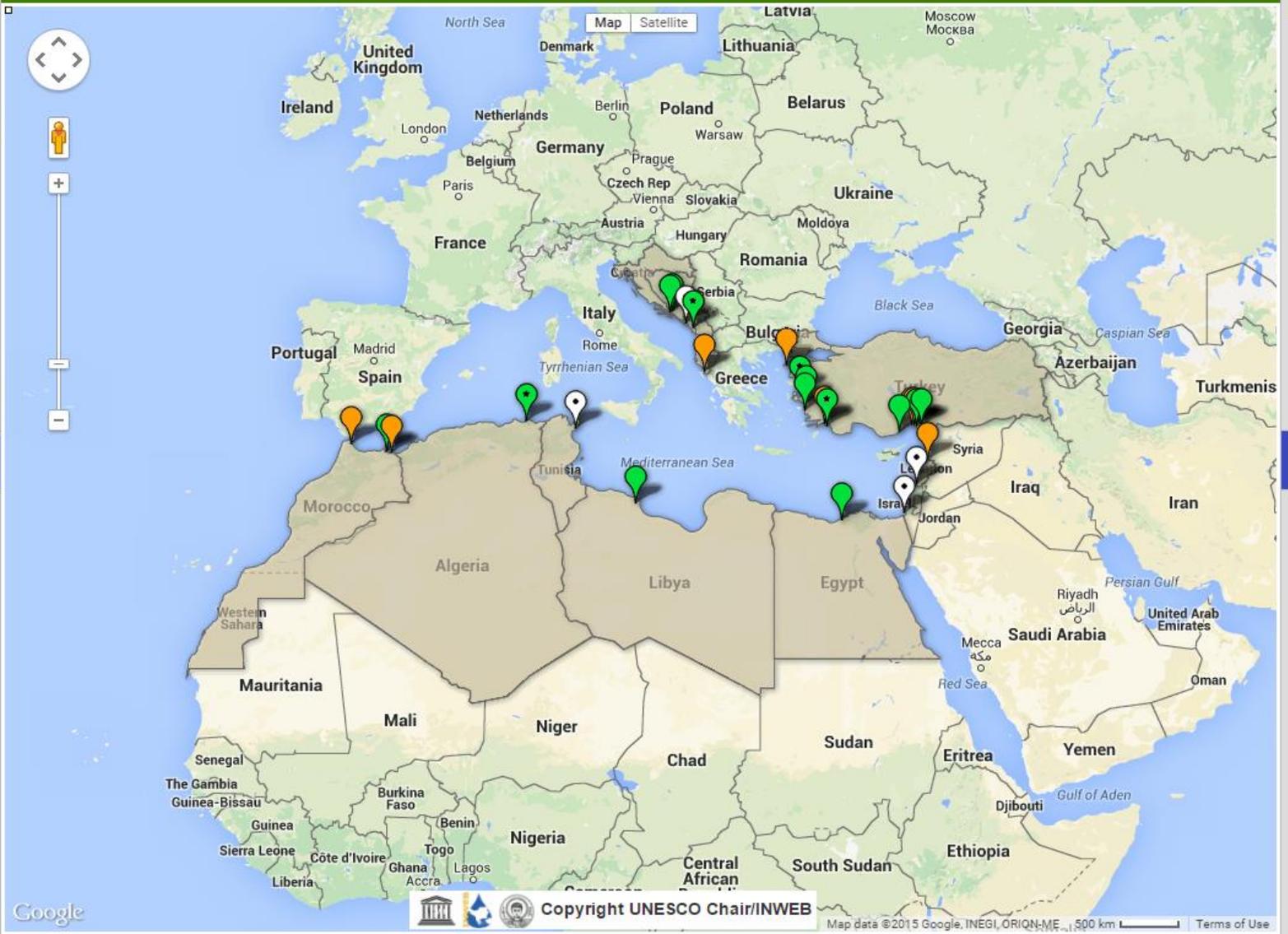
-
-
-

Data Catalog

- GIS Layers
 - Wetlands
 - Area: 0-10 km2
 - Area: 10-50 km2
 - Area: 50-200 km2
 - Area: >200 km2
 - Mediterranean basin bounda
 - Basin boundaries
 - MedPartnership Project Cour
 - Country borders

Online Manual

Mediterranean basin



Inventory of transboundary aquifers in Africa



Actions

Search

Aquifers List

Click here to give feedback

Click on aquifer to get more information

Data Catalog

GIS Layers

- Africa Aquifers
- Aquifers

International Groundwaters in the African Continent

Experimental open source platform developed by UNESCO chair INWEB

Search

Country:

Aquifer Type:

Areal extent >= (km²)

Population >= (million)

Coastal boundary length >= (km)

Aquifer Name:



Name: Nubian Sandstone Aquifer System

Countries: Chad, Egypt, Libya, Sudan

Description: Large aquifer basins

[Summary Information](#)

Summary Information

1. NAME OF THE COASTAL AQUIFER, LOCATION & COUNTRY

Country	N/A
Name of aquifer:	Nubian Sundstone Aquifer System
Location:	N/A
Entity responsible for management:	N/A

2. AQUIFER CHARACTERISTICS

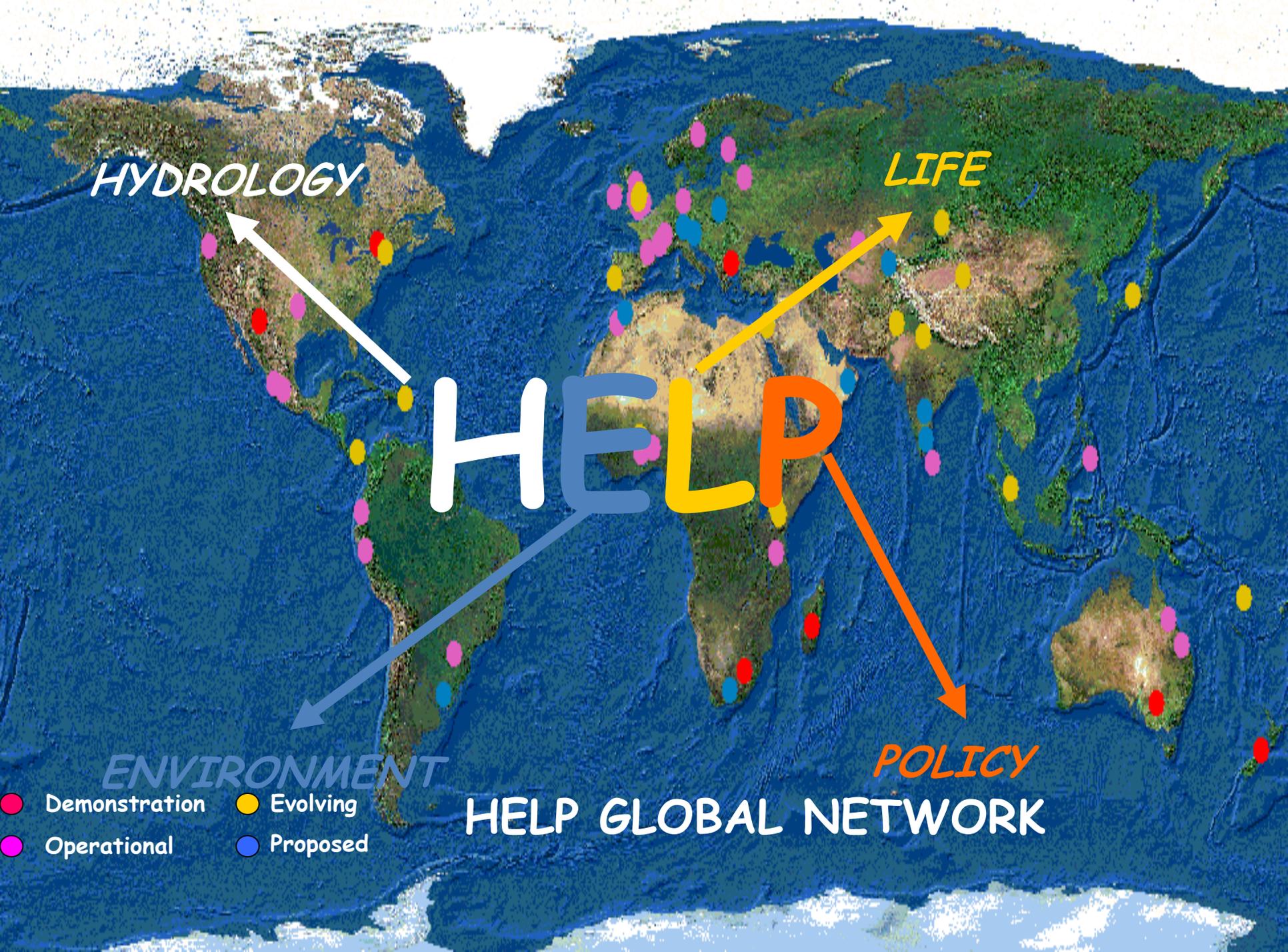
Aquifer hydrogeological type:	N/A
Predominant lithology:	N/A
Stratigraphic age:	N/A
Areal extent (km ²):	N/A
Population in this area:	N/A
Area of coastal area concerned by the aquifer (km ²):	N/A
Land use overlying area:	N/A
Is this a transboundary aquifer?	N/A
Mean aquifer thickness (m) :	N/A
Maximum aquifer thickness (m) :	N/A
Depth of the exploitable groundwater (m):	N/A
Coastal boundary length (km):	N/A
Dominant groundwater flow direction:	N/A
Link with surface water systems:	N/A
Are there coastal ecosystems that depend on this aquifer?	N/A

3. HYDROLOGICAL/HYDROLOGICAL CHARACTERISTICS AND G...

Rainfall: average annual and seasonal distribution:	N/A
Level changes (m/year)	N/A
Reasons for these changes	N/A
Total available non-renewable groundwater reserves (Mm ³)	N/A
Total available annually renewable groundwater reserves (Mm ³ /yr)	N/A
Total groundwater abstractions	N/A

Aquifers List

- African Rift Valley Aquifer
- Ain Beni Mathar
- Arangua Alluvial
- Baggara Basin
- Coastal Sedimentary Basin I
- Coastal Sedimentary Basin II
- Coastal Sedimentary Basin III
- Coastal Sedimentary Basin IV
- Coastal Sedimentary Basin V
- Coastal Sedimentary Basin VI
- Congo Intra-cratonic Basin
- Cuvelai and Ethosa Basin
- Cuvette Centrale
- Dawa
- Disa
- Dolomitic Basin
- Eastern Kalahari Karoo Basin
- Errachidia Basin
- Gedaref
- Irhazer-Jullemeden Basin
- Jubba
- Kagera Aquifer
- Kalahari/Katangian Basin
- Karoo Sandstone Aquifer
- Karoo Sedimentary Aquifer



HYDROLOGY

LIFE

HELP

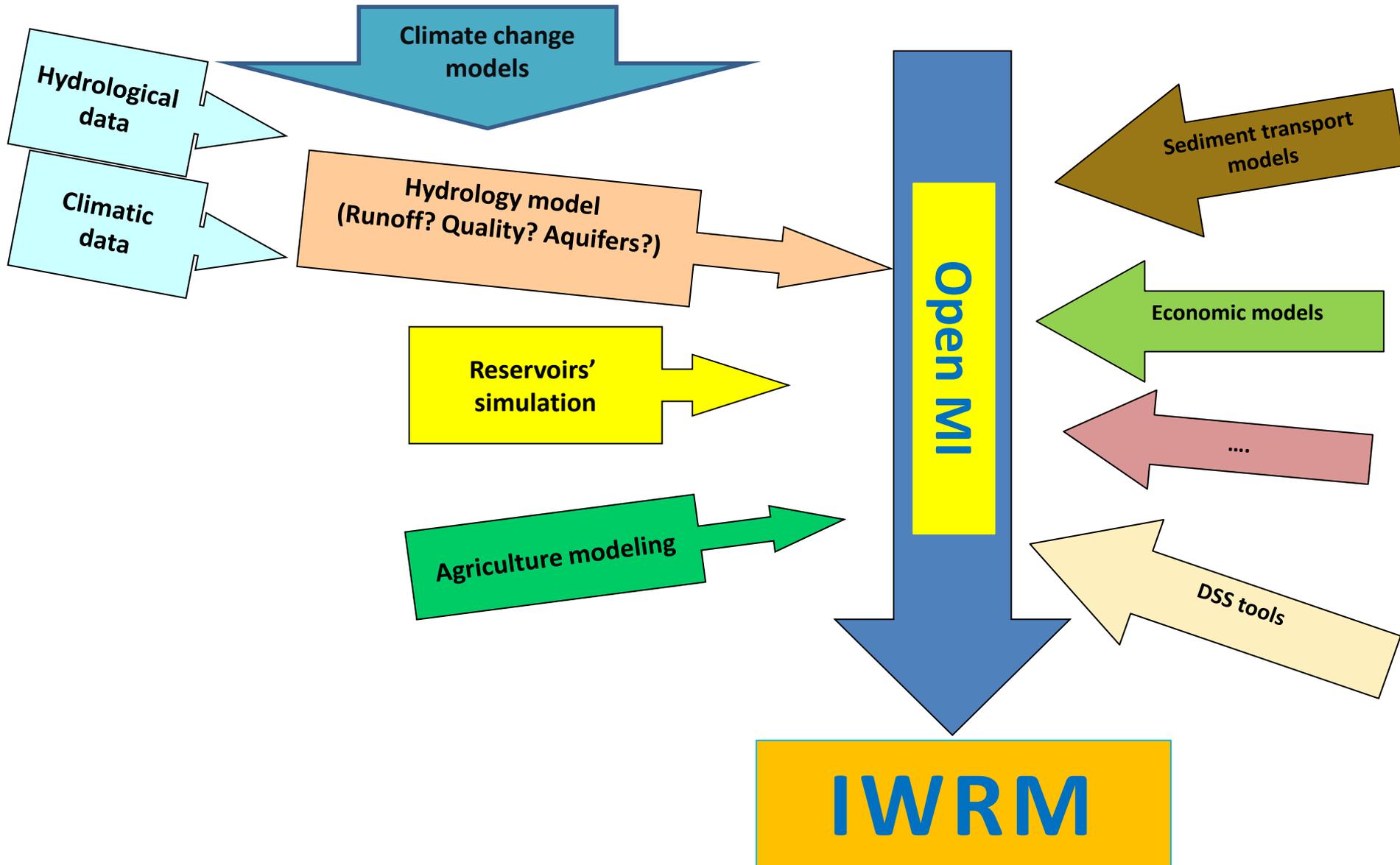
ENVIRONMENT

POLICY

HELP GLOBAL NETWORK

- Demonstration ● Evolving
- Operational ● Proposed

Modeling Coupling for the Integrated Water Resources Management





Coordinator of UNESCO/INWEB

Jacques Ganoulis, Special Secretary for Water



J. Ganoulis is Emeritus Professor of Civil Engineering at the Aristotle University of Thessaloniki (Greece), Ph.D. (Doctorat d'Etat) in Natural Sciences from the University of Toulouse (France) and visiting scholar at the Universities of Erlangen (Germany), McGill (Canada), Melbourne (Australia), and Paris VI (France). He has more than 35 years experience in integrated water resources management, risk analysis, climate change and transboundary water management, including transboundary aquifer resources and conflict resolution.

He was born in Siatista Kozanis and is married with two children. He is the Director of the UNESCO Chair/International Network of Water-Environment Centres for the Balkans (INWEB-<http://www.inweb.gr/>) and Senior Consultant and Greece representative in UNESCO's International Hydrological Programme (IHP), Paris.

He published more than 200 papers in International Journals and Conferences and is the co-editor/author of 10 books including *Transboundary Water Resources Management: a Multidisciplinary Approach* (WILEY, 2011) and *Risk Analysis of Water Pollution* (WILEY, 2009; 2nd edition; translated into Chinese). In July 2013, the French Government, in recognition of his outstanding contribution in the field of water-environmental sciences, has granted to him the title of "Knight of the Academic Order".

Contact

e-mail: j.ganoulis@prv.ypeka.gr

Address: Special Secretariat for Water, 2 M. Iatridou str. & Kifissias Ave., 115 26 Athens, Greece

Tel. +30 210 6931 250-1, **Fax:** +30 210 699 4355

RELEVANT PUBLICATIONS

Skoulikaris, C., Ganoulis, J. (2011). "Assessing Climate Change Impacts at River Basin Scale by Integrating Global Circulation Models with Regional Hydrological Simulations." *European Water* (34), 53-60.

Ganoulis, J., Skoulikaris, Ch. (2011). "A Conceptual Model for Implementing Integrated Transboundary Water Resources Management (ITWRM)." *Journal of Hydrologic Environment*, 7(1), 155-158.

Skoulikaris, Ch., Ganoulis, J., Karapetsas, N., Katsogiannos, F. & Zalidis, G. (2014) Cooperative WebGIS interactive information systems for water resources data management. In: *Hydrology in a Changing World: Environmental and Human Dimensions* (ed. by T. Daniell et al.). IAHS Publ 363, 342–347. IAHS, Wallingford, UK.

Ganoulis, J., & Skoulikaris, Ch. (2013). "Interactive open source information systems for fostering transboundary water cooperation." In: *Free Flow - Reaching Water Security Through Cooperation*, J. Griffiths, & Lambert, R., ed., United Nations Educational, Scientific and Cultural Organization (UNESCO) & Tudor Rose, 96-99.

Skoulikaris Ch., Ganoulis J. (2012). Climate Change Impacts on River Catchment Hydrology Using Dynamic Downscaling of Global Climate Models. in: Fernando, H., et al. (eds.), *National Security and Human Health Implications of Climate Change, NATO Science for Peace and Security Series C: Environmental Security*, 2012, 281-287, DOI: 10.1007/978-94-007-2430-3_240.

Thank you for your attention