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GIS and Water resources management (part 1)

Use of GIS for the management of environmental information. Open-source GIS tools and online data sources. Creation of water related maps.

By

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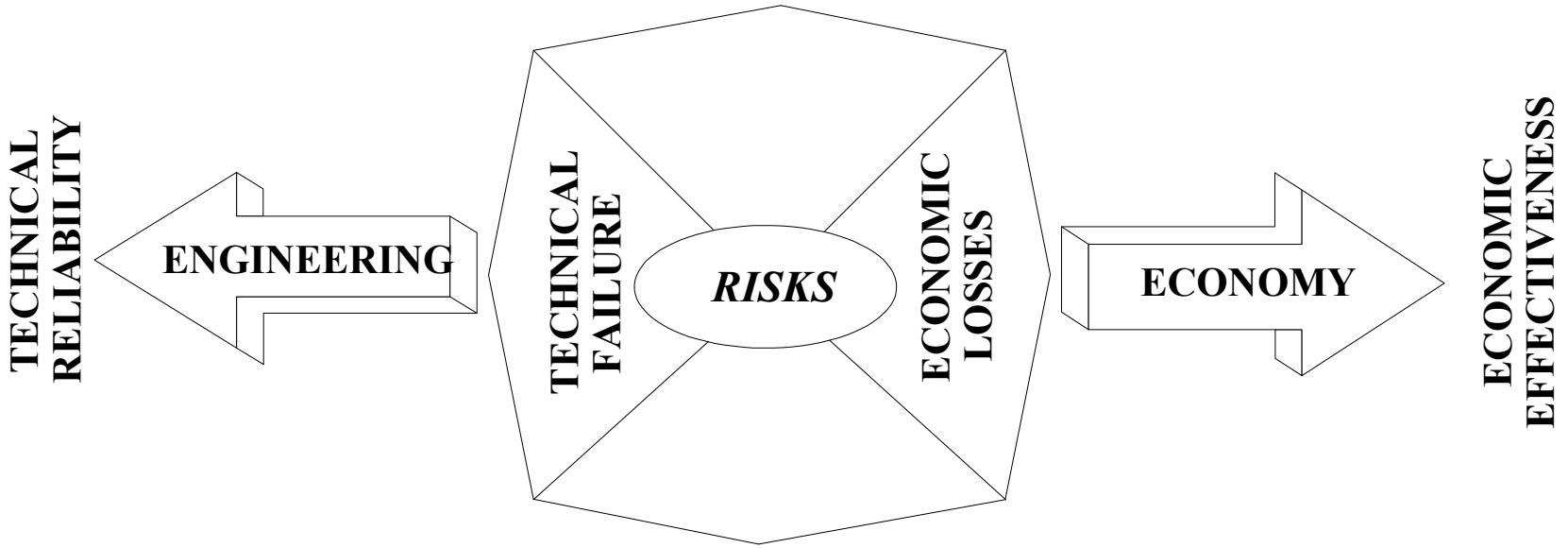
INTRODUCTION

Water Resources Management

- Until the end of the 20th century Water Resources Management was, almost exclusively, oriented to hydrotechnical works focusing on the technical reliability and economic efficiency of projects covering water demands and securing human's life and wealth.



INTRODUCTION

Water Resources Management

- The transition from this dipole development scheme to the current one, where environmental protection and social prosperity forms part of the development equation, emerged with the sustainable development concept (year 1987).

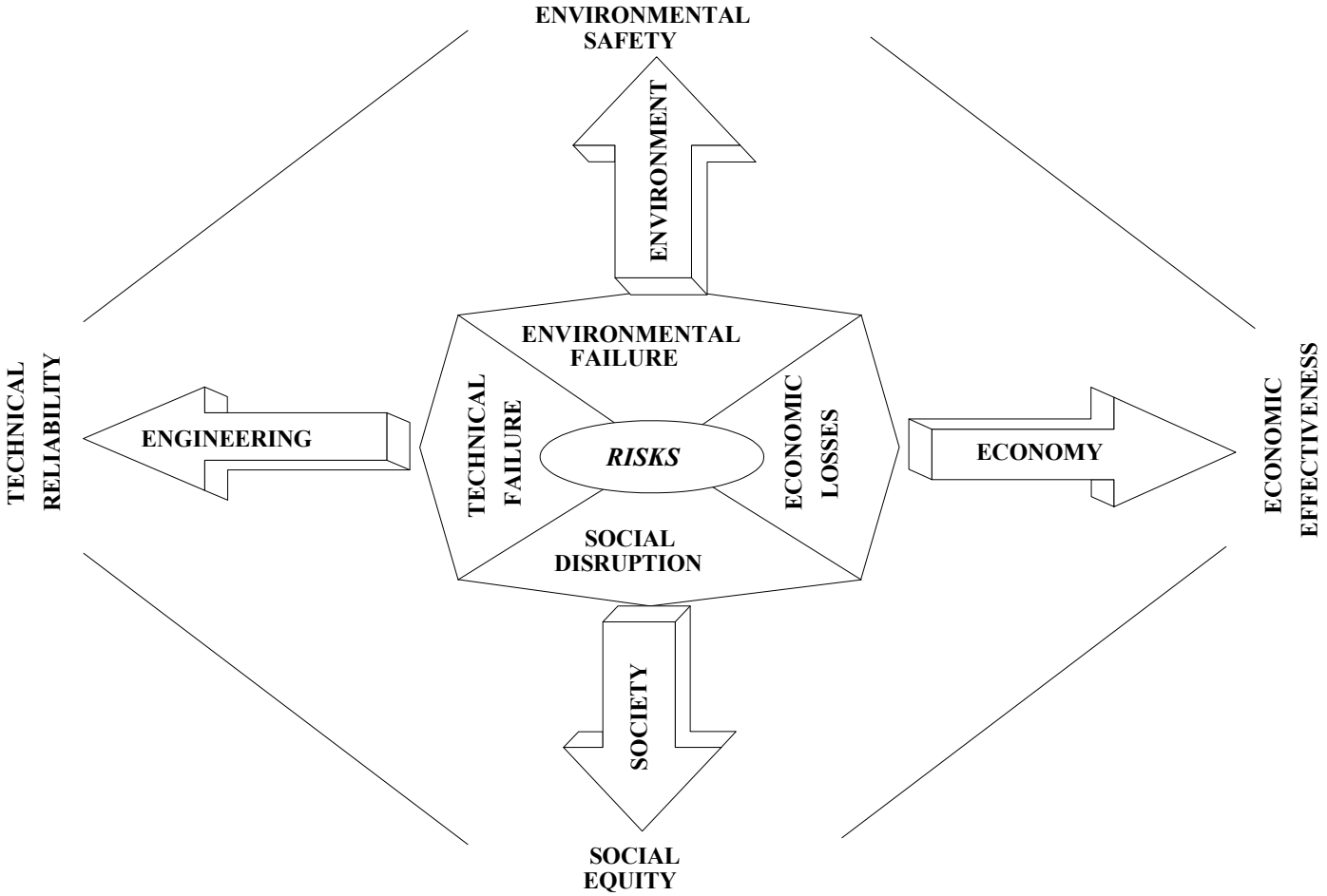
Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

United Nations World Commission on Environment and Development report "Our Common Future", commonly called the Brundtland Report

United Nations' Millennium Declaration identified principles and treaties on sustainable development**, including economic development, social development and environmental protection.**

INTRODUCTION

Water Resources Management



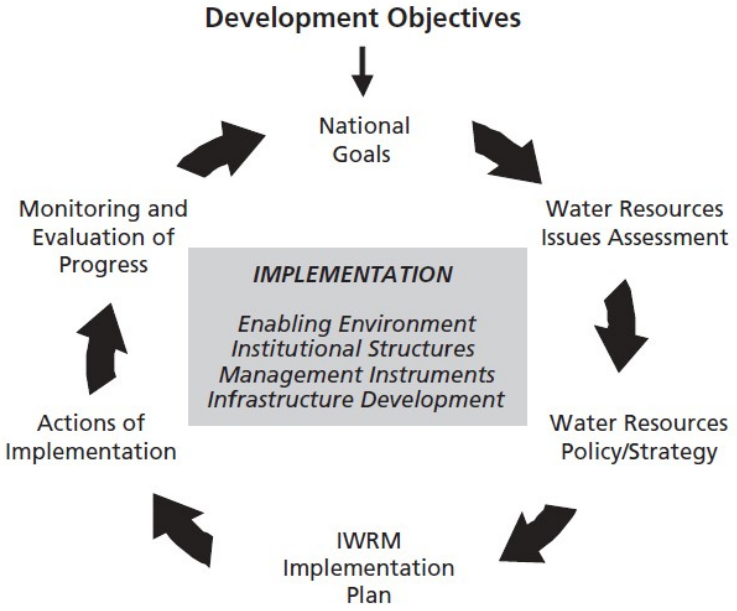
INTRODUCTION

Water Resources Management

- At the same period, integrated water resources management (IWRM) established a multidisciplinary and multisectoral approach on setting the management of waters as part of a system rather than an autonomous process.

"IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

Source: Integrated Water Resources Management in Action. WWAP, DHI Water Policy, UNEP-DHI Centre for Water and Environment, 2009.

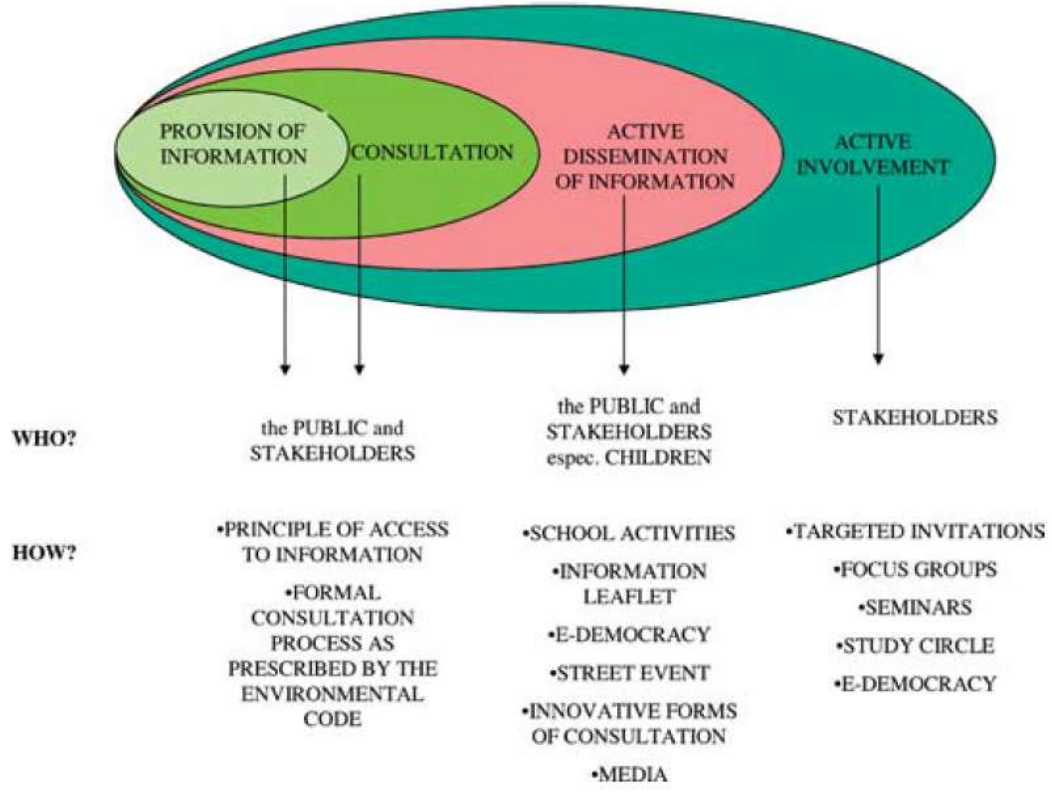


Source: https://www.un.org/waterforlifedecade/iwrm.shtml

INTRODUCTION

Water Resources Management

- One of the latest advancements is attributed to public participation on water management decision making processes, also known as stakeholders' participation, which plays an important role to the water management contemporary era.



Figure's source: Jonsson A. Public participation in water resources management: stakeholder voices on degree, scale, potential, and methods in future water management. Ambio. 2005 Nov;34(7):495-500. PMID: 16435737.

INTRODUCTION

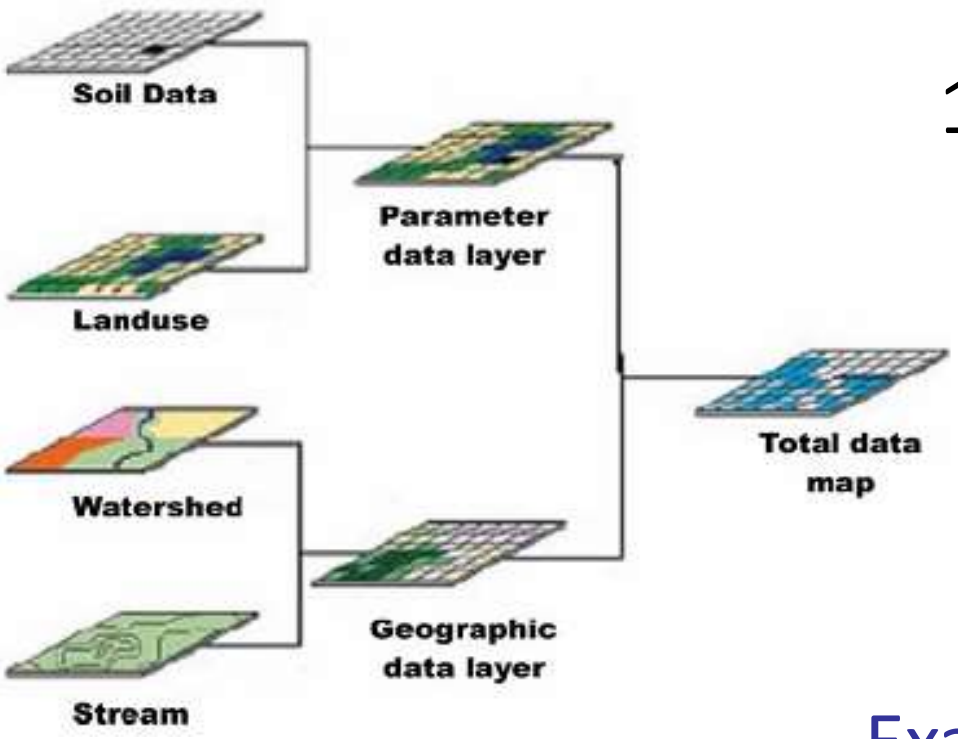
Geographic Information Systems

- Geographic Information Systems -GIS is a modern technology, which is developing rapidly in conjunction with the science of Geoinformatics, which is the sector of information technology that deals with the processing and analysis of geographically reported data.

- GIS is defined as “the equipment, the software, the data, the methods and the human resources for the import, processing, storage and presentation of data – that have spatial information"

INTRODUCTION

Geographic Information Systems



1. Maps overlying and creation of unique outputs

2. DTM Processing and basin properties

Examples:

Soil data maps + Land Use maps → Curve Number (CN)

DTM → flow direction, flow accumulation, slopes…

Use of GIS for the creation of geodatabases

- **Database** is a collection of information organized in such a way that a computer program can quickly select desired pieces of data.

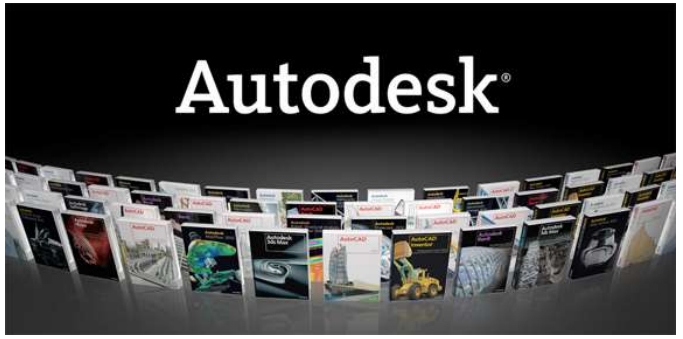
- **Geodatabase** is the common data storage and management framework for ArcGIS. It combines "geo" (spatial data) with "database" (data repository) to create a central data repository for spatial data storage and management.

- The serving of georeferenced data that are stored in geodatabases over the Internet is based on the technology known as **Web Map Service (WMS).**

Commercial GIS products

esri

ArcGIS



Autodesk's Map 3D and Civil 3D products

erdas

The Earth to Business Company

Bentley®

Sustaining Infrastructure

GeoWebPublisher

LIZARDTECH™

LizardTech's Express Server

Freeware, open source (OS) (GIS)

Οι 3 κύριες κατηγορίες των open source GIS (in terms of programming languages) είναι:

- **"C" languages,**
- **Java, and**
- **.NET**

GRASS GIS

Q GIS

SharpMap
Geospatial Application Framework for the CLR

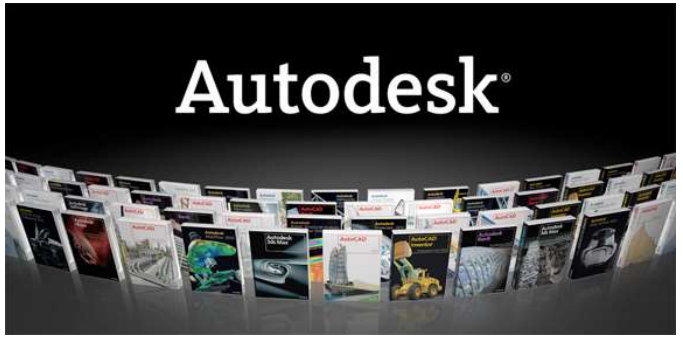
SAGA
System for Automated Geoscientific Analyses

MapWindow GIS

Potlach

Commercial WebGIS products

ArcGIS Server



Autodesk's Map 3D and Civil 3D products

ERDAS Apollo

GeoWebPublisher

LizardTech's Express Server

Freeware, open source WebGIS products

OSGeo
Your Open Source Compass

MapServer
open source web mapping

Open Layers

Google maps

```
<kml
xmlns="http://earth.google.com/kml/2.2">
<Document id="general_map.png">
 <name>general_map.png</name>
 <Snippet></Snippet>
.....
</kml>
```

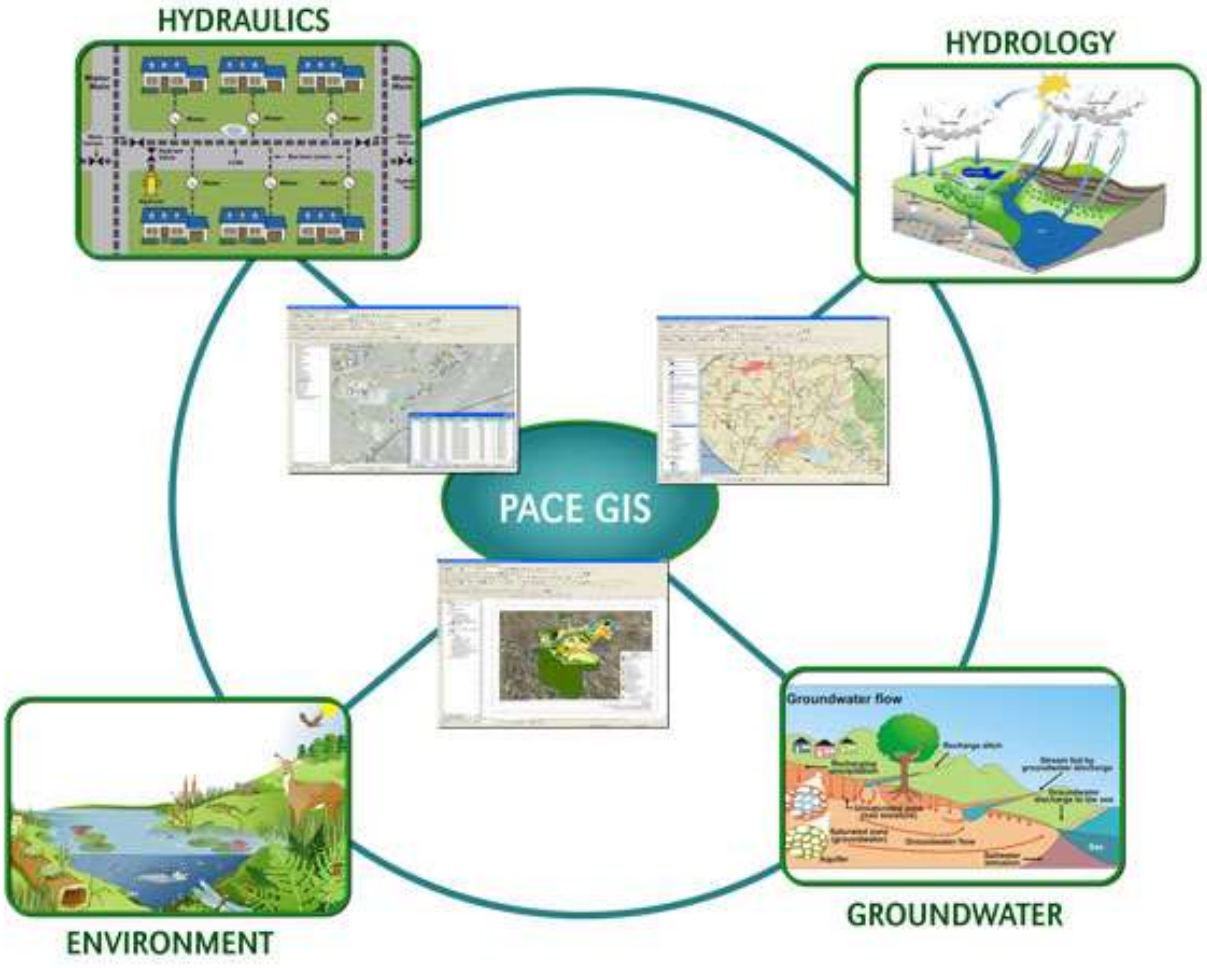
php

Google fusion tables
beta

```
<?xml version="1.0"?>
<ARCXML version="1.0">
<RESPONSE>
<ERROR machine="IMSEmu WINNT;
Apache/2.2.10 (Win32); PHP 5.2.6 cgi-fcgi"
processid="0" threadid="">
XMLParser: Fatal parsing error:
 'Undefined variable: post'
</ERROR>
</RESPONSE>
</ARCXML>
```

APACHE
HTTP SERVER

GIS on water resources

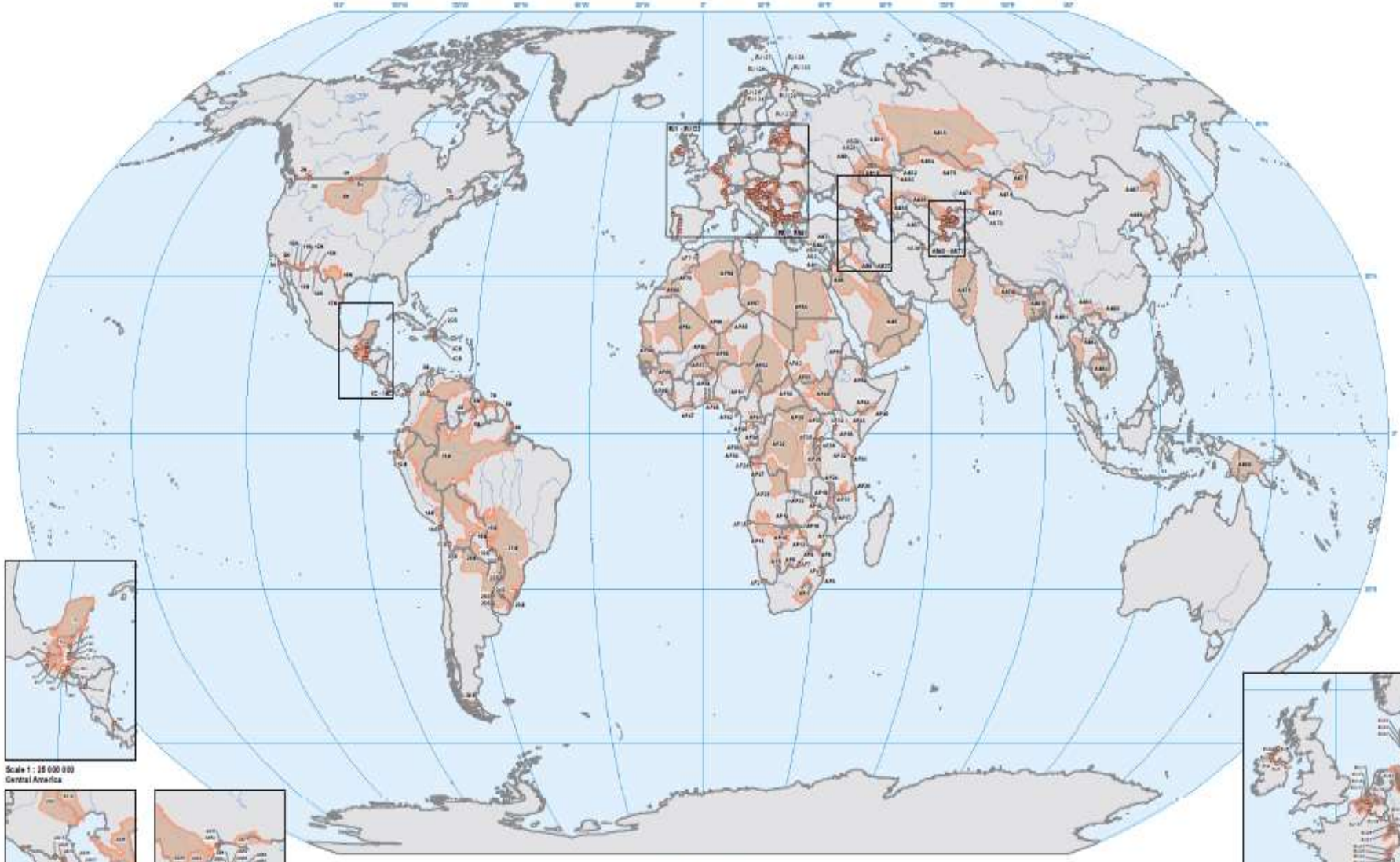


Transboundary River & Lake Basins

- Cover 45% of the land surface of the Earth;
- Affect 40% of the world's population;
- Account for approximately 60% of global river flow;
- Cross the political boundaries of 148 countries

Transboundary Aquifers of the World

- Update 2012 -



Prepared by IGRAC
Author in chief: Frank Kalvelis
Cartography/GIS: Lena Heinrich
Content: Frank van Weert
Maya Marina Stephen (water law expert, senior consultant for UNESCO-IHP)

Base maps
Country borders: http://thematicmapping.org
Rivers and lakes: ARC (2006)

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

Scale 1 : 25 000 000
Central America

Scale 1 : 25 000 000
Caucasus

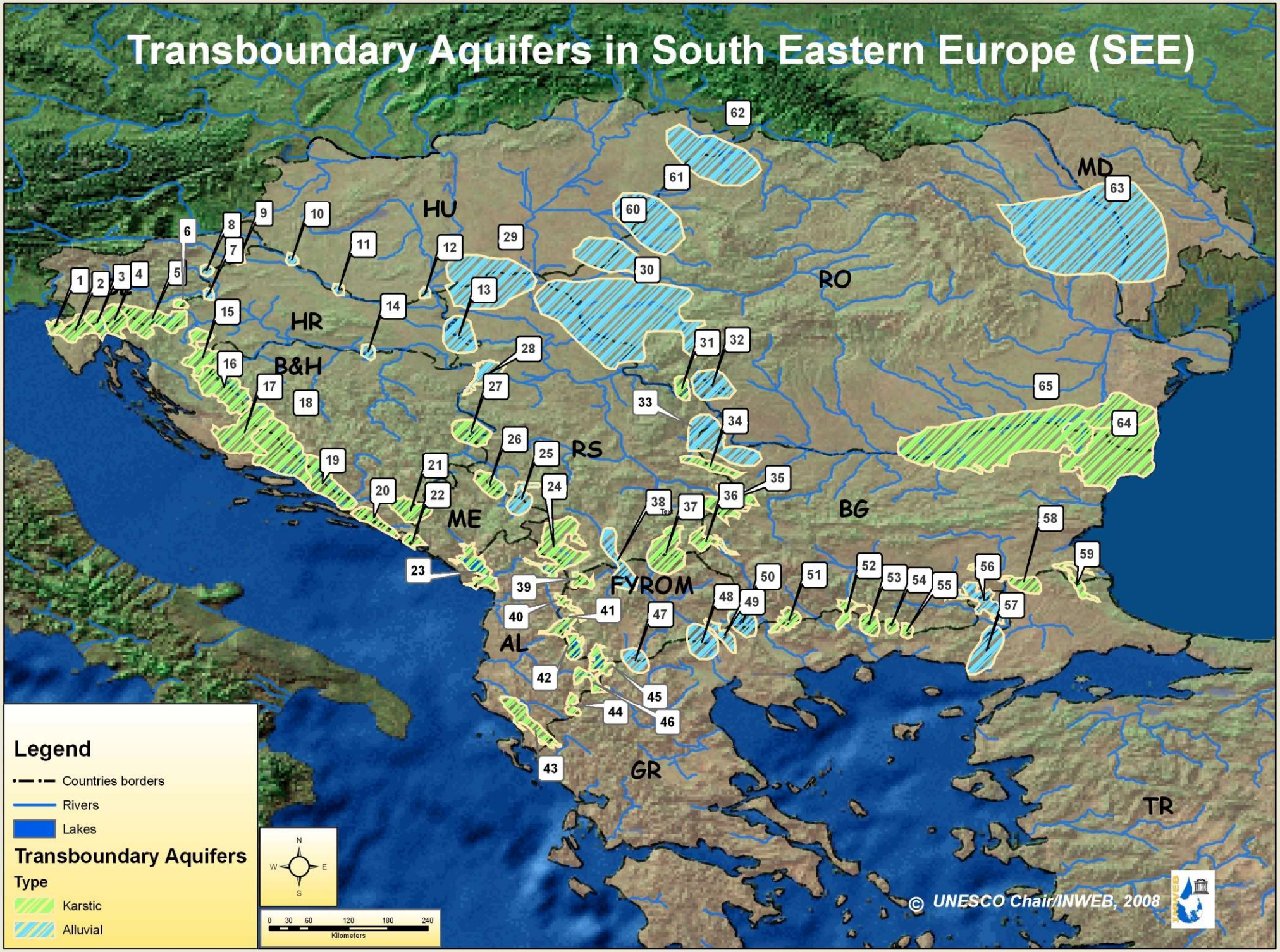
Scale 1 : 15 000 000
Central Asia

Scale 1 : 20 000 000
Europe

Scale 1 : 50 000 000

Special Edition

for the 6th World Water Forum, Marseille, March 2012


Transboundary Aquifers in South Eastern Europe (SEE)
HU
MD
RO
HR
B&H
RS
ME
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AL
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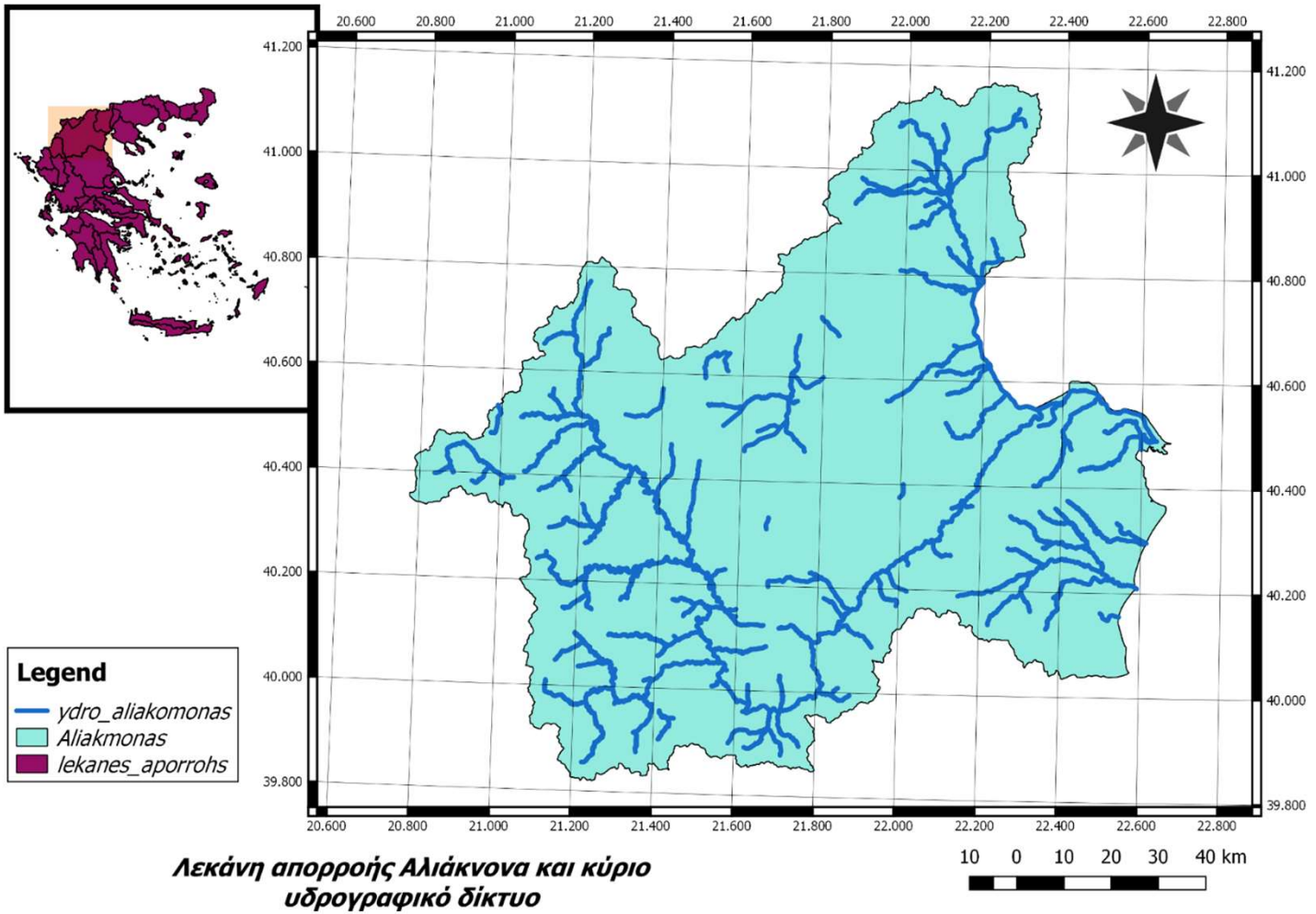
64
65
Legend
Countries borders
Rivers
Lakes
Transboundary Aquifers
Type
Karstic
Alluvial
N
W
E
S
0 30 60 120 180 240
Kilometers
© UNESCO Chair/INWEB, 2008


Sub-Danubian Transboundary River & Lake Basins in the Balkans
HU
MD
RO
SL
HR
B&H
RS
BG
ME
FYROM
TR
AL
GR
1. Sava
2. Kupa/Kolpa
3. Una
4. Drina
5. Cetina
6. Neretva
7. Trebisnjica
8. Drin
9. Vjosa/Aoos
10. Vardar/Axios
11. Struma/Strymon
12. Mesta/Nestos
13. Maritza/Evros/Shkodra
14. Lake Skadar/Shkodra
15. Lake Ohrid
16. Lake Prespa
17. Lake Dojran/Doirani
18. Tundja/Tunca
Legend
Country Borders
Rivers
Lakes
Transboundary River Basins
Cetina
Drin
Drina
Kupa/Kolpa
Maritza/Evros/Ergene
Mesta/Nestos
Neretva
Sava
Struma/Strymon
Trebisnjica
Tundja/Tunca
Una
Vardar/Axios
Vjosa/Aoos
Transboundary Lakes
Lake Dojran/Doirani
Lake Ohrid
Lake Prespa
Lake Skadar/Shkodra
N
W
E
S
0 40 80 160 240 320
Kilometers
© UNESCO Chair/INWEB, 2008



Λεκάνη απορροής Αλιάκνονα και κύριο υδρογραφικό δίκτυο

Thank you for your attention!

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