

EUROGEOSURVEYS

The Geological Surveys of Europe

*Legislazione europea e politiche emergenti
sull'uso del sottosuolo nell'UE: quanto vale
l'acqua? Una sfida anche italiana
Luca Demicheli, Segretario Generale*

Forum Nazionale sull'Acqua
Roma, 18-19 Ottobre 2011

www.eurogeosurveys.org

UNA LUNGA PREMESSA...

Qual è, oggi, il ruolo della geologia in Europa e nel mondo?

Un sottosuolo europeo sempre più sfruttato

Come si inserisce l'acqua in questo contesto?

...e scusate l'eccessivo uso dell'inglese...

Groundwater

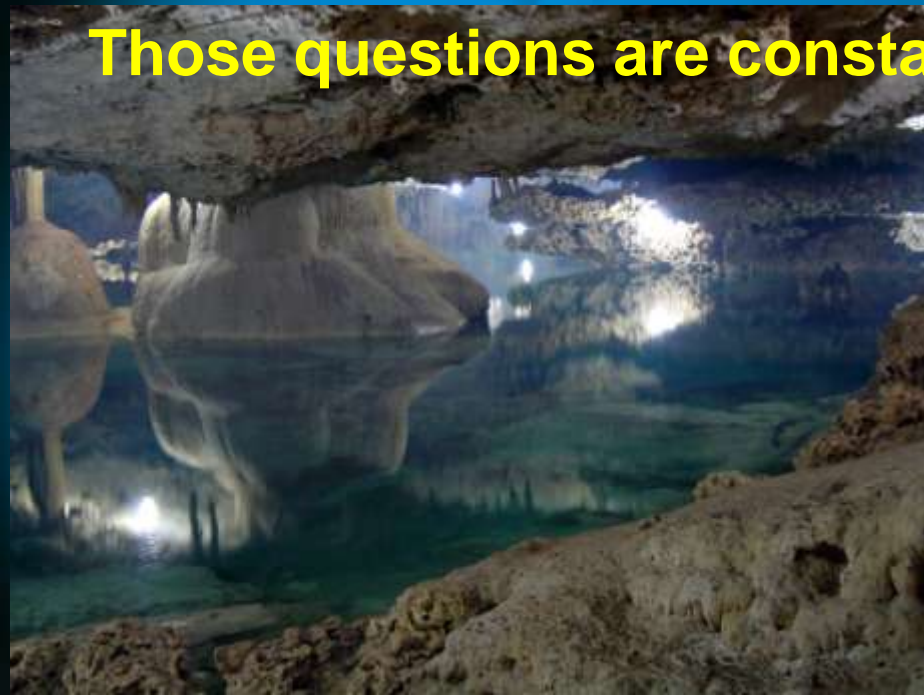
Accounts for about 60% of drinking water in the EU

Where can we find groundwater, how much, how long and at what quality can we guarantee it for the future generations?

What are the flow paths and how does our quest for good drinking water collide with the needs of flora and fauna?

What threatens future water reserves and how can we protect them?

Those questions are constantly in the mind of a geologist



European Union

EC DG ENV (Protection of Water Resources Unit)

EC DG RTD (Management of Natural Resources Unit)

EC DG JRC (Rural, Water and Ecosystem Resources Unit)

EEA (Environmental Data Centre on Water)

EP Water Group

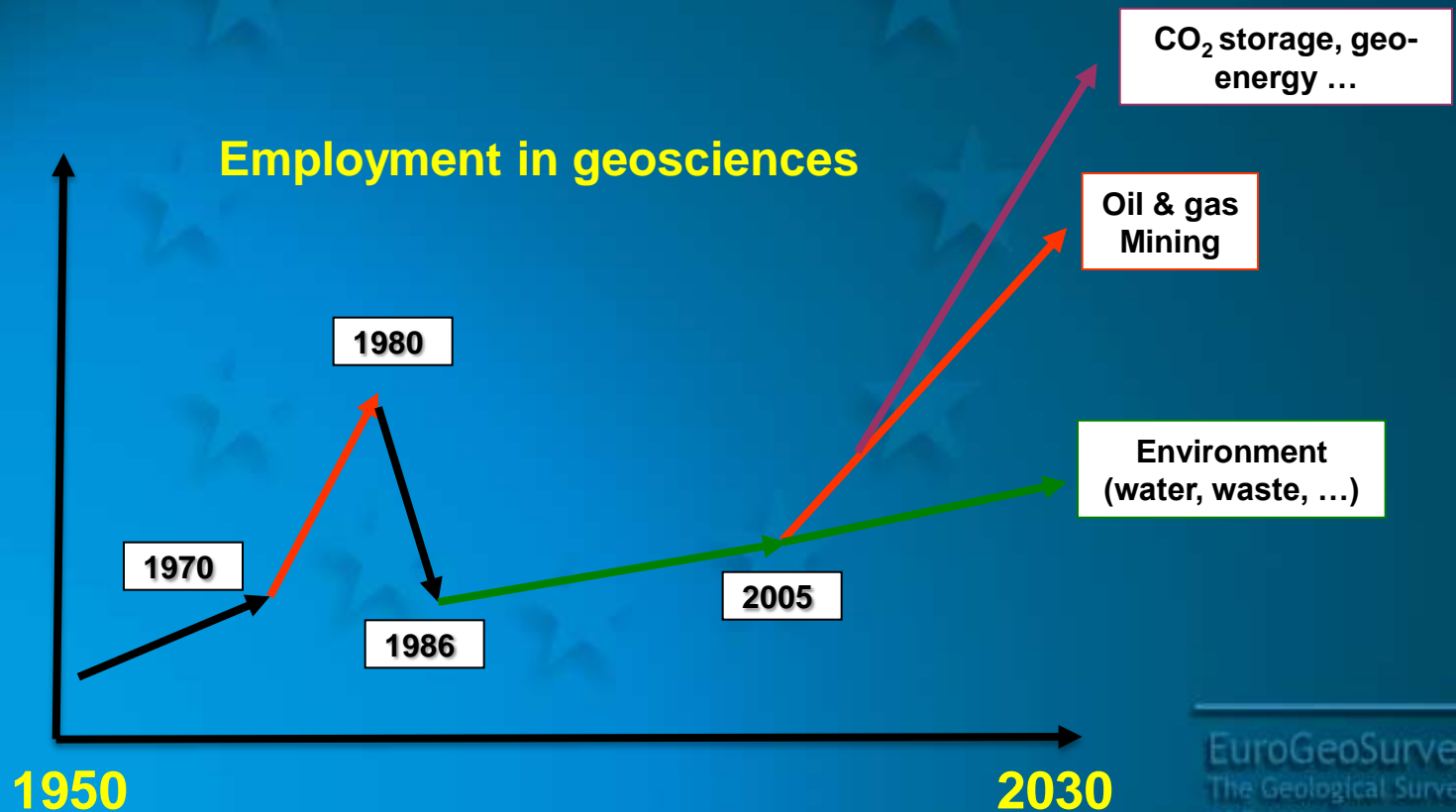
EFBW

EUREAU

EuroGeoSurveys

Geosciences employment *(source: BRGM)*

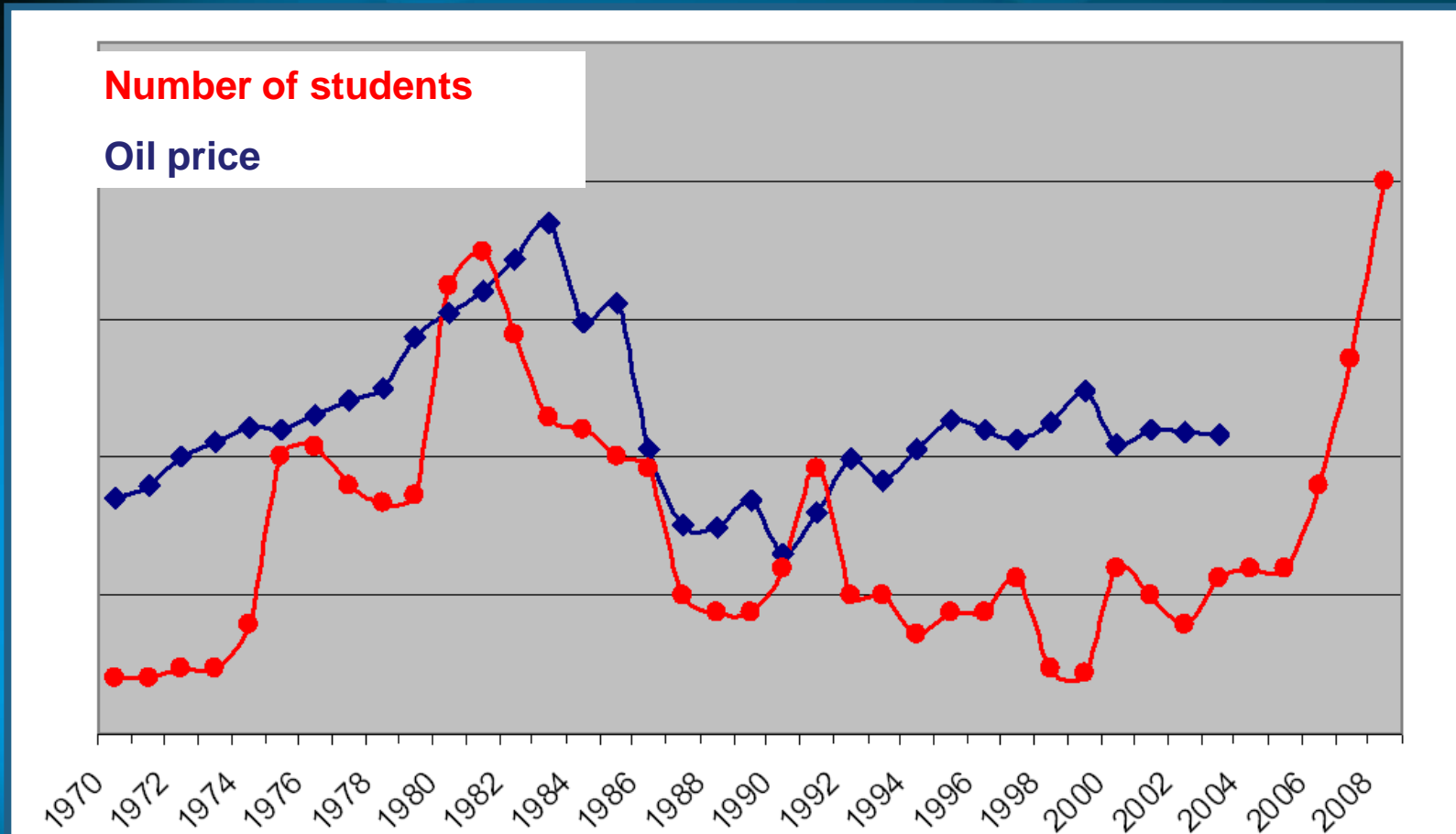
- Projected future demand in geoscience experts (2010-2030)
- Major drivers:
 - growing scarcity of raw materials
 - sustainable development policies



Geosciences employment *(source: BRGM)*

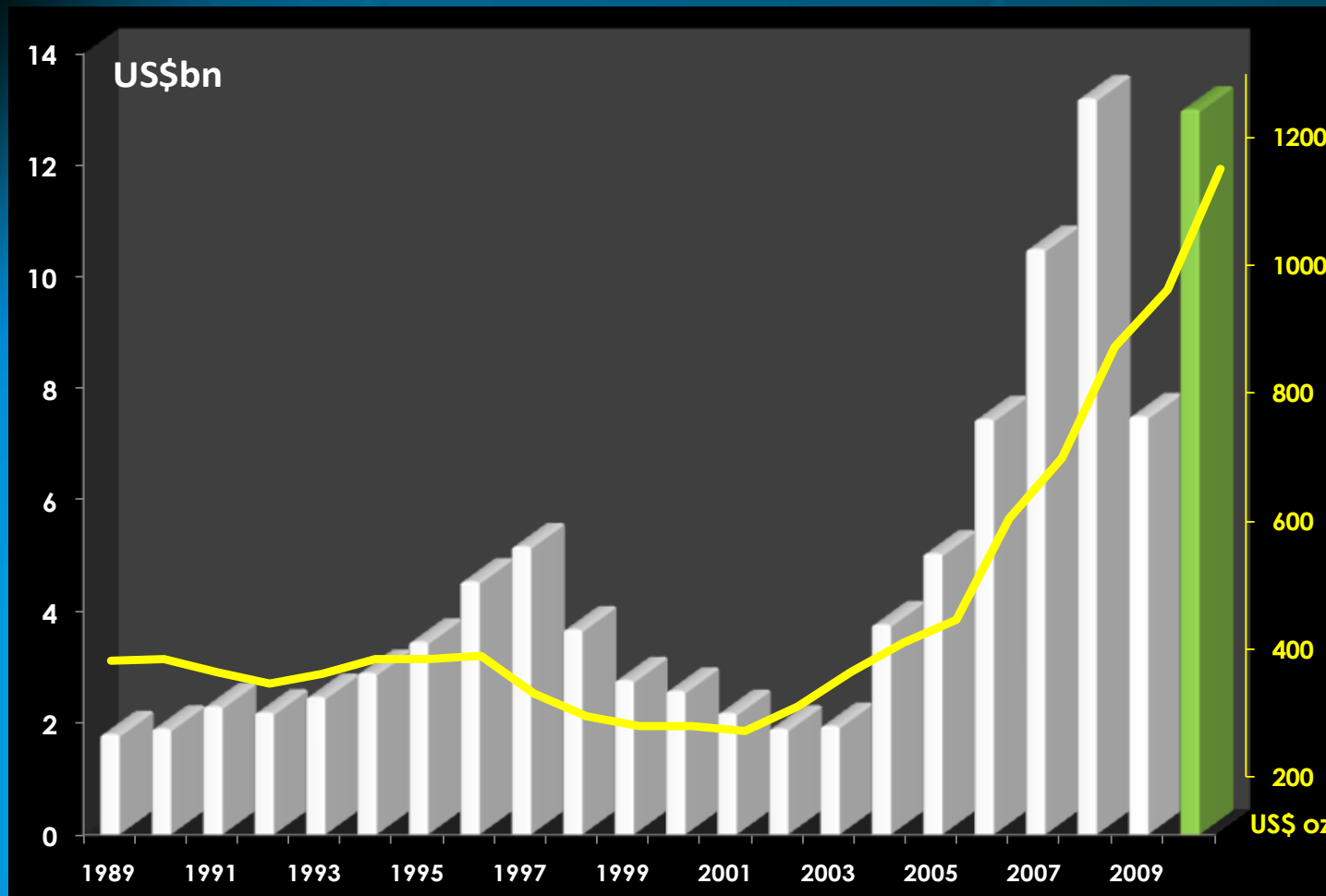
There is a correlation between the number of students in geoscience in the US and oil price

During the nineties, jobs in the environmental sector helped maintain demand



Geosciences employment *(source: BRGM)*

Since 2006, spending in mining exploration has exceeded twice the 1997 high



DO EUROCRATS KNOW THAT:

China graduates about 40,000 to 50,000 geologists per year

50 times the number of geologists in training in the USA, while China's population is "only" about four times the population of the US

Geology is putting Europe is under
pressure...

...and policies are changing
accordingly

European Union

Are emerging pressures and policies leading to a conflicting use of the underground space in the EU?

Does it affect groundwater?

EUROGEOSURVEYS

The Geological Surveys of Europe

A photograph of two men in dark suits shaking hands on a stage. The man on the left is holding a briefcase. The background is a dark, cloudy sky. The image is tilted slightly to the right.

Representing 33 national geological surveys
(and the regional surveys of three countries)

Albania

Lithuania

Austria

Luxembourg

Belgium

Malta

Bulgaria

The Netherlands

Croatia

Norway

Cyprus

Poland

Czech Republic

Portugal

Denmark

Romania

Estonia

Russian Federation

Finland

Slovakia

France

Slovenia

Germany

Spain

Greece

Sweden

Hungary

Switzerland

Iceland

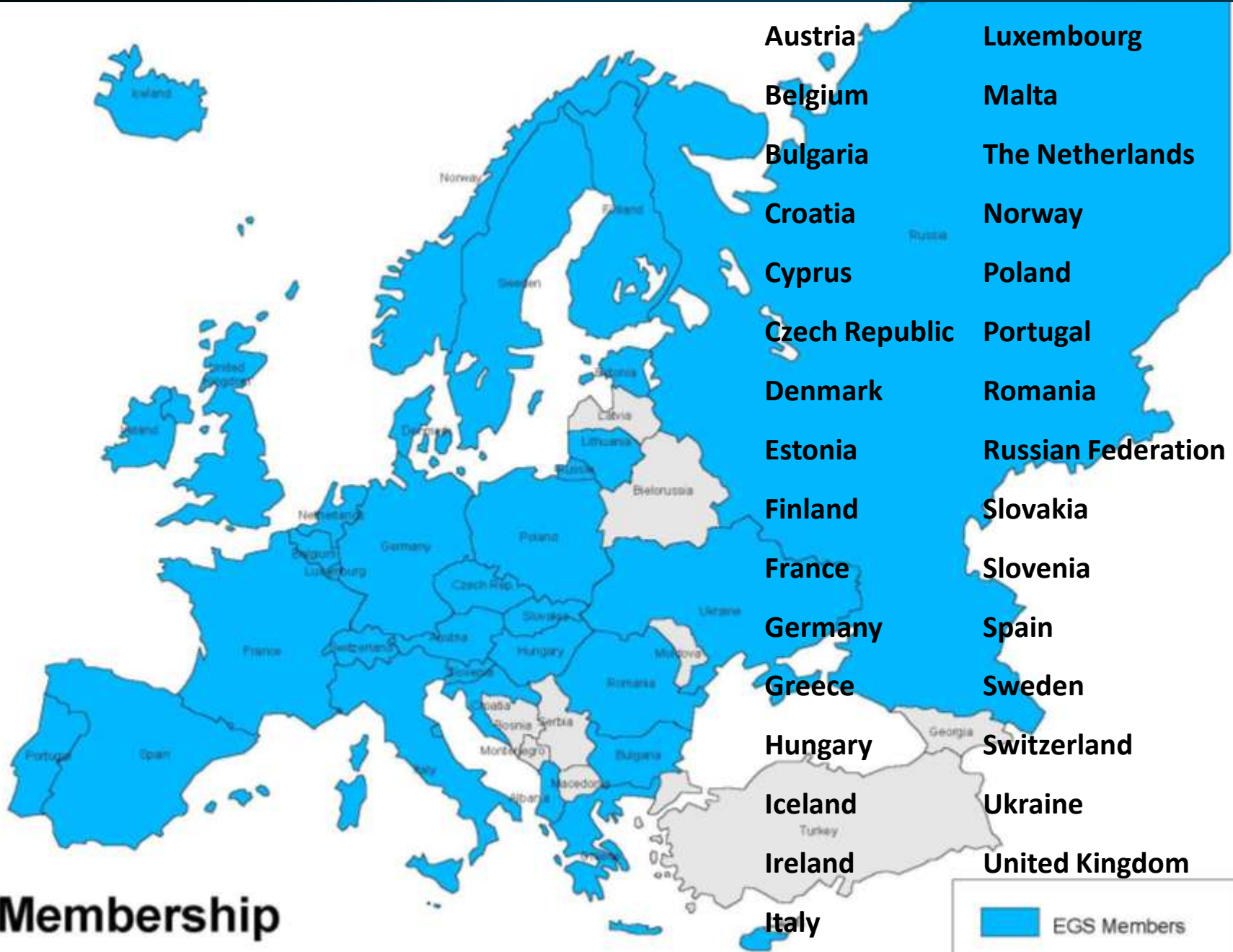
Ukraine

Ireland

United Kingdom

Italy

EGS Members



EGS Membership

EUROGEOSURVEYS

The Geological Surveys of Europe

Operational office in Brussels

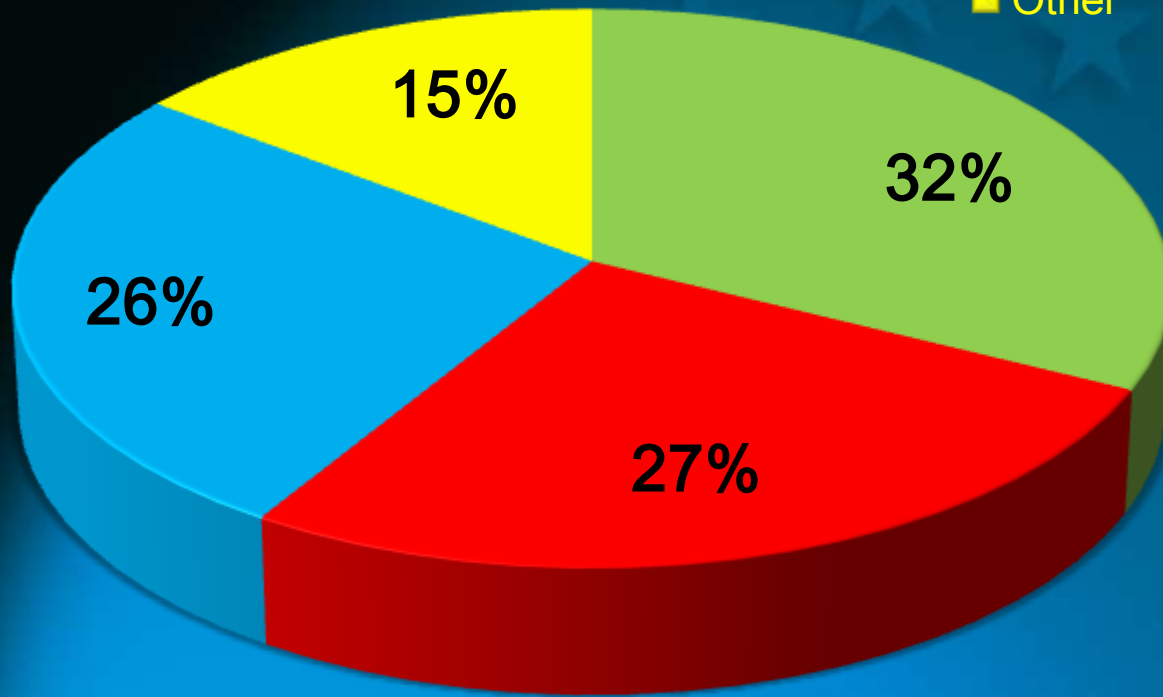
Exists since 1971 (WEGS => FOREGS => EGS)

In 2011 celebrates its 40th anniversary...

Ministries supervising the Geological Surveys of Europe

<i>ENVIRONMENT</i>	<i>RESEARCH, SCIENCE and TECHNOLOGY</i>	<i>ENERGY and/or INDUSTRY and/or ECONOMY</i>	<i>NATIONAL DEVELOPMENT</i>
Bulgaria	Austria	Albania	Hungary
Cyprus	Belgium	Denmark	<i>COMMUNICATION, MARINE AND NATURAL RESOURCES</i>
Czech Republic	Croatia	Finland	Ireland
Estonia	France	Germany	<i>PUBLIC WORKS</i>
Greece	Romania	Iceland	Luxembourg
Italy	Slovenia	Norway	<i>RESOURCES and RURAL AFFAIRS</i>
Lithuania	Spain	Portugal	Malta
Poland	The Netherlands	Turkey	<i>ENVIRONMENT, TRANSPORT, ENERGY AND COMMUNICATIONS</i>
Russia	United Kingdom	Sweden	Switzerland
Slovakia			
Ukraine			

- Environment
- Research, Science & Technology
- Energy and/or Industry and/or Economy
- Other



Ministries supervising the Geological Surveys of Europe

National Geological Surveys

Directors and National Delegates

Secretary General

Participation in EC Working/Expert Groups and Thematic Platforms

WFD Implementation Strategy
Groundwater Directive
INSPIRE
Raw Materials Initiative / ETP-SMR
CCS Directive
Thematic Strategy on the Sustainable
Use of Natural Resources
ETP on Geological Disposal of
Radioactive Waste
Indigenous Fossil Fuels
ETP on Geothermal Electricity
...

Operational EuroGeoSurveys Expert Groups

Water Resources
Mineral Resources
International Cooperation and Development
Geochemistry
Earth Observation (Geohazards)
Marine Geology
Spatial Information (INSPIRE)
Carbon Capture and Storage
GeoEnergy
Soil Resources (Parent Materials)
Communication
...



**SPATIAL INFORMATION
(INSPIRE)**



MINERALS RESOURCES



MARINE GEOLOGY



GEOCHEMISTRY



**SOIL RESOURCES
(PARENT MATERIAL)**



**INTERNATIONAL COOPERATION
AND DEVELOPMENT**



CCS (EGS.CO2)



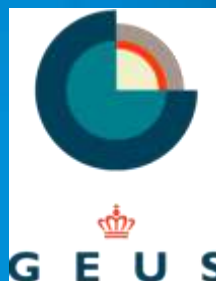
**EXPERT GROUPS
&
TASK FORCES
CHAIRMANSHIP**



**EARTH OBSERVATION
(GEOHAZARDS)**



WATER RESOURCES



GEOENERGY



COMMUNICATION

EuroGeoSurveys
The Geological Surveys
of Europe

Water Resources Expert Group

Scope: focus on groundwater protection

Groundwater aspects of Water Framework Directive (WFD)

Groundwater Directive (GWD 2006)

Common Implementation Strategy (CIS)

Main activities

Support and advise to DG-ENV on technical and policy-related issues

Identify knowledge gaps for the EU research agenda

Sharing experiences between member organizations in WFD and GWD implementation

Group composition

Chair: Hans Peter Broers (TNO)

Over 60 members, 36 of whom are active full members

Active contributions mostly by:

fr, uk, de, dk, no, nl, es, fi, hu, it, ch, pl, gr, kr

Examples of contributions

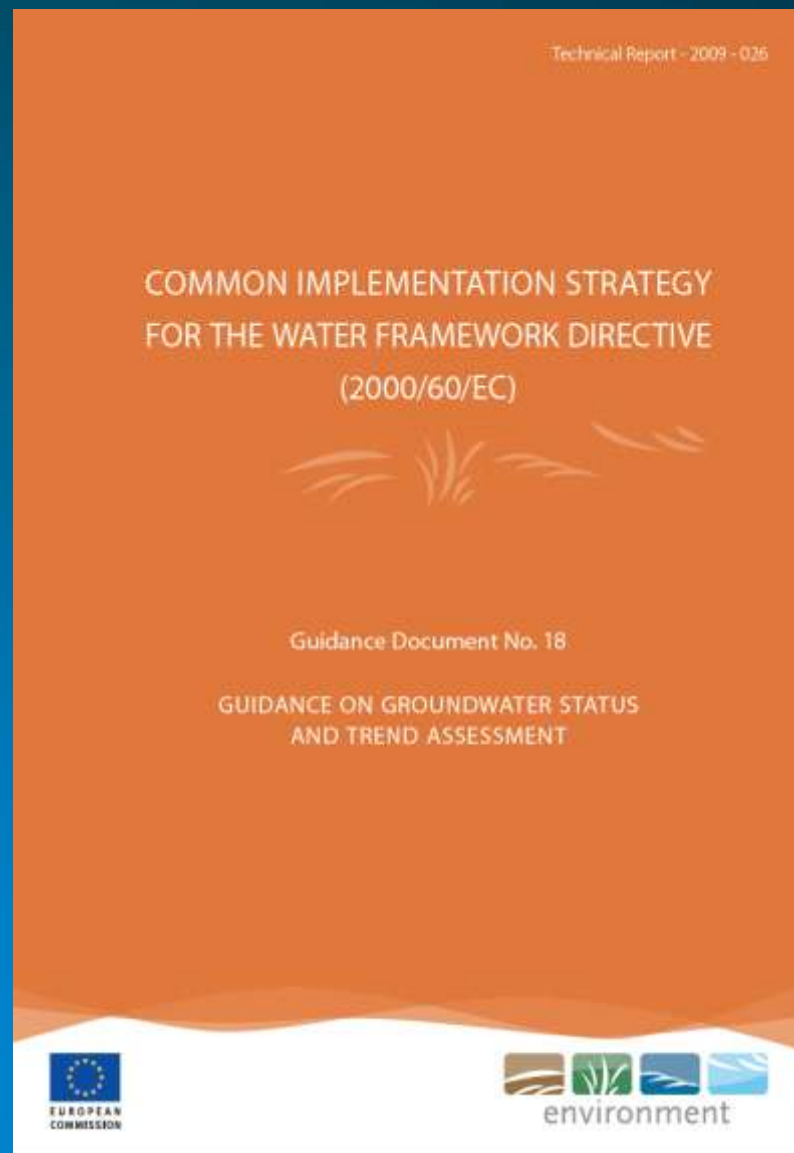
Attendance at EU meetings and EU conferences

Contribution to drafting groups EU Guidances

Contribution to EGS concept notes

Supporting and advising DG ENV

- Active role in the Common Implementation Strategy: drafting 4 Guidances on groundwater aspects WFD and GWD (chairing, contributing)
- Contributions to EU conferences on groundwater policy (Vienna, Paris)
- Invited talks and contributions at international meetings and conferences
- Contributions to Policy-Science Interface (books edited by Ph. Quevauviller, Policy Officer DG-ENV)



Policy-Science Interface

Edited by Philippe Quevauviller

Groundwater Science and Policy

An International Overview



RSC Publishing

Royal Society of Chemistry book '*Groundwater Science and Policy*' (2008): EGS contributions to 12 of the 34 chapters

New Wiley book '*Groundwater Quality Assessment and Monitoring*' (2009). Ed. P. Quevauviller, EGS contributions to 13 of the 27 chapters. Results of FP6 and FP7 projects and Working Group C experiences

WILEY

WATER QUALITY MEASUREMENTS SERIES



Groundwater Monitoring

Edited by
Philippe Quevauviller / Amy-Maria Frutkin / Johannes Gotts / Rob Howland

Supporting and advising DG ENV

New Working Group C mandate, focus on:
exchange of best practices implementation WFD and GWD
contributions to the GWD review of 2013
climate change effects on groundwater

WGC 1 best practices

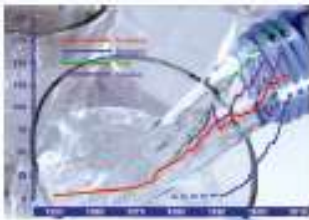
G. Toth (Hungary),
L. Thorling (GEUS),
D. Pennequin/A. Blum (BRGM),
G. Zacharioudakis (IGME Greece),
C. Constantinou (Cyprus)

WGC 2 revision GWD

A. Blum (BRGM), R. Ward (BRGM) (chairing)
H. Broers (TNO)
K. Hinsby (GEUS, Bridge experience)

WGC 3 Groundwater and Climate Change (ad hoc group):

H.P. Broers (TNO) (chair)
K. Hinsby (GEUS)
R. Kozel (Swiss, alpine areas)



Clemens Reimann
Manfred Birke (eds.)



Geochemistry of European Bottled Water

Reimann & Birke (eds.)

Geochemistry of European Bottled Water



Borntraeger
Science Publishers



veys
veys

Geochemistry of European Bottled Water

Gronwater geochemistry: impossible at reasonable cost?

- Difficult to sample (contamination issues)
- Difficult to map => 3D-regional distribution (aquifers)
- High local variation
- What is actually "groundwater"?

Geochemistry of European Bottled Water



Groundwater can be bought readily sampled at the European scale

Geochemistry of European Bottled Water

Analytical programme, BGR-lab:

ICP-MS: Ag, Al, As, B, Ba, Be, Bi, Cd, Ca, Ce, Co, Cr, Cs, Cu, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, I, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, Pb, Pr, Rb, Sb, Sc, Se, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr

ICP-AES: Ba, Ca, K, Mg, Mn, Na, Sr, P, Si

IC: Br⁻, Cl⁻, F⁻, NO₂⁻, NO₃⁻, SO₄²⁻

AFS: Hg

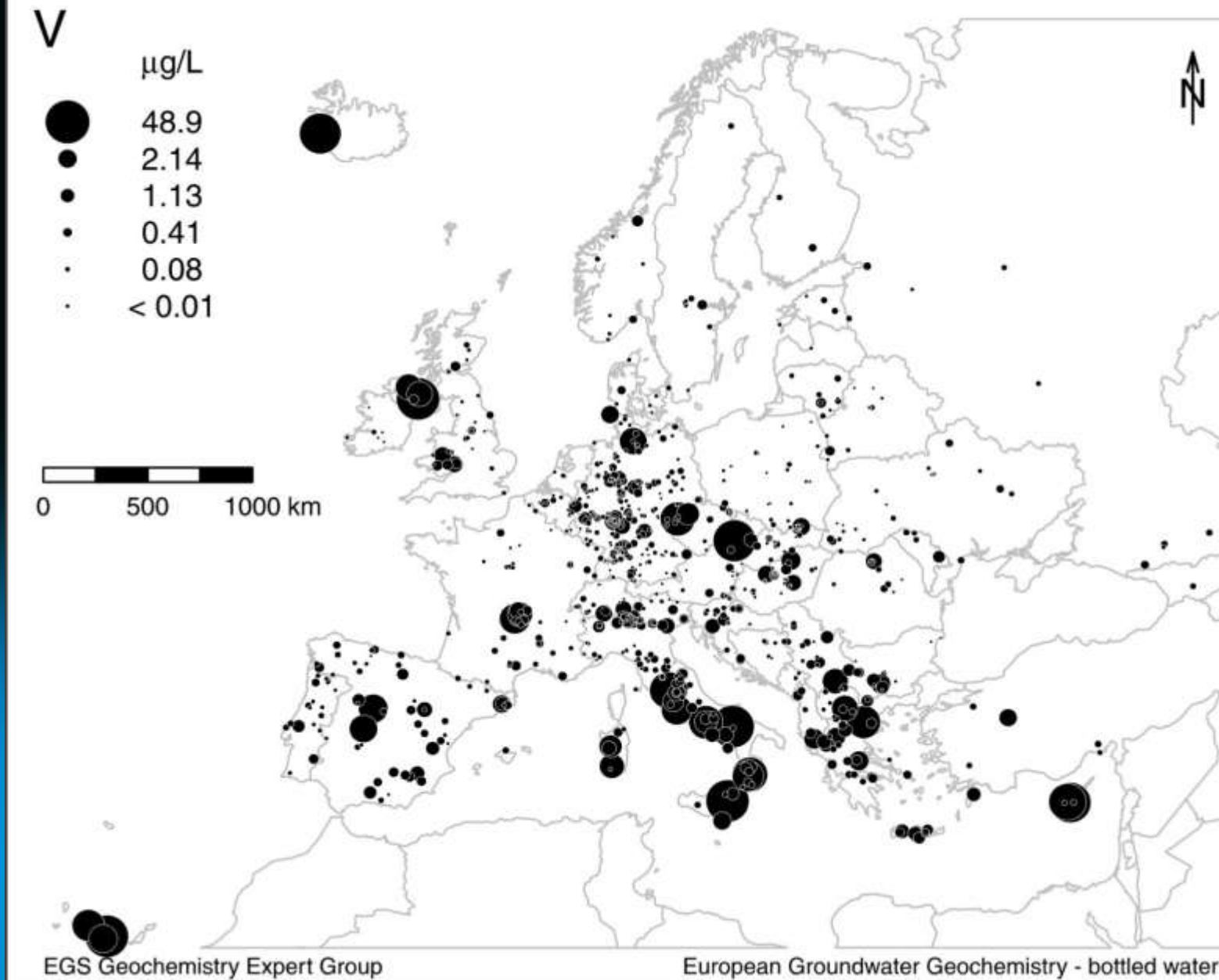
Titration: tAlk - HCO₃⁻

Photometric: NH₄⁺

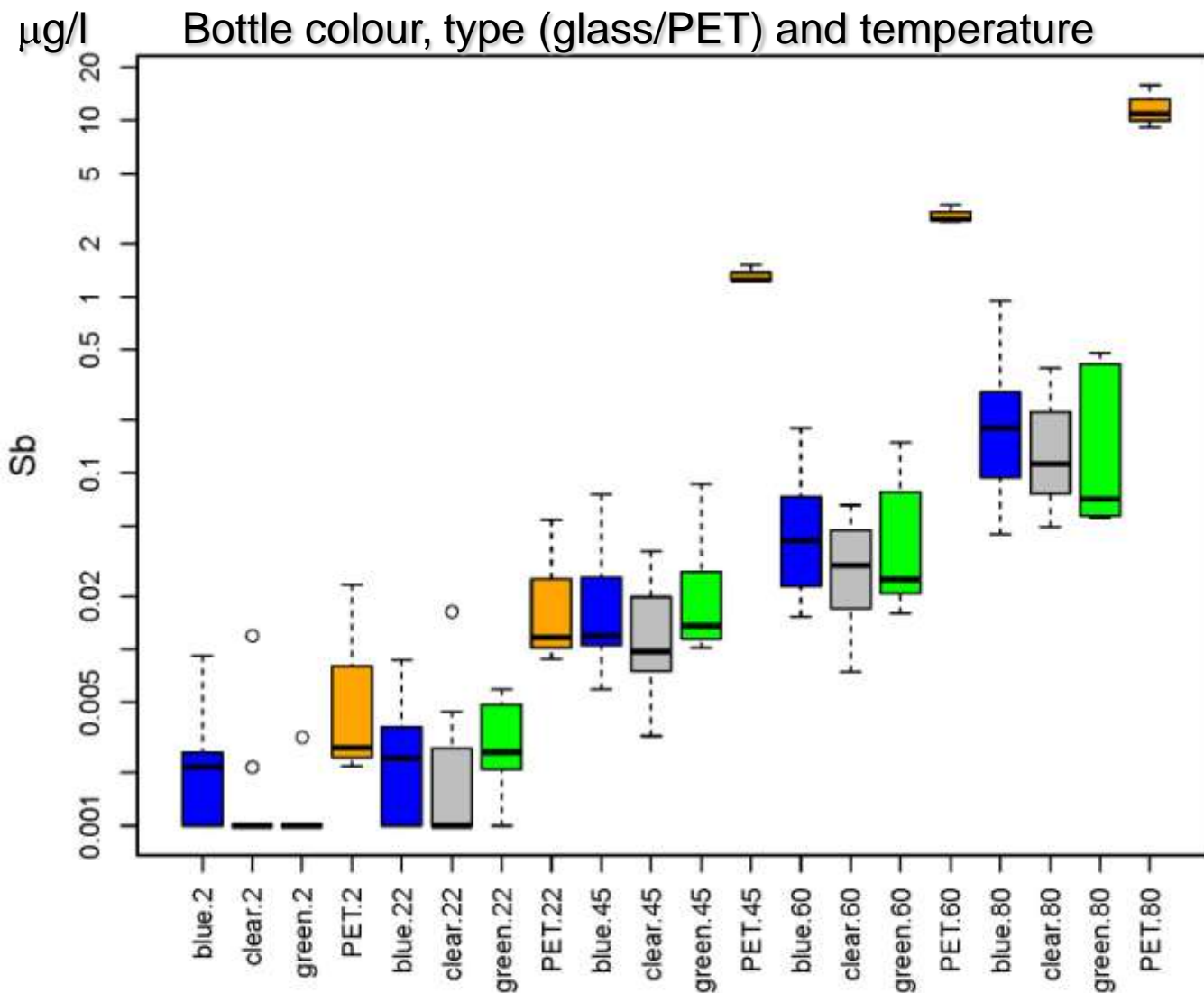
Potentiometric: pH

Conductometric: EC

72 analytical parameters/sample



Vanadium in bottled water: young volcanic centres



Bottle leaching – new results: 1 week leaching at different temperatures (2, 22, 45, 60 and 80 °C)

WFD / Groundwater Directive

A new paradigm for groundwater protection

Shift of emphasis from:

Protection of all groundwater resources, as a prime resource of drinking water supply

towards:

Protection of groundwater to prevent deterioration of:

- surface water ecology

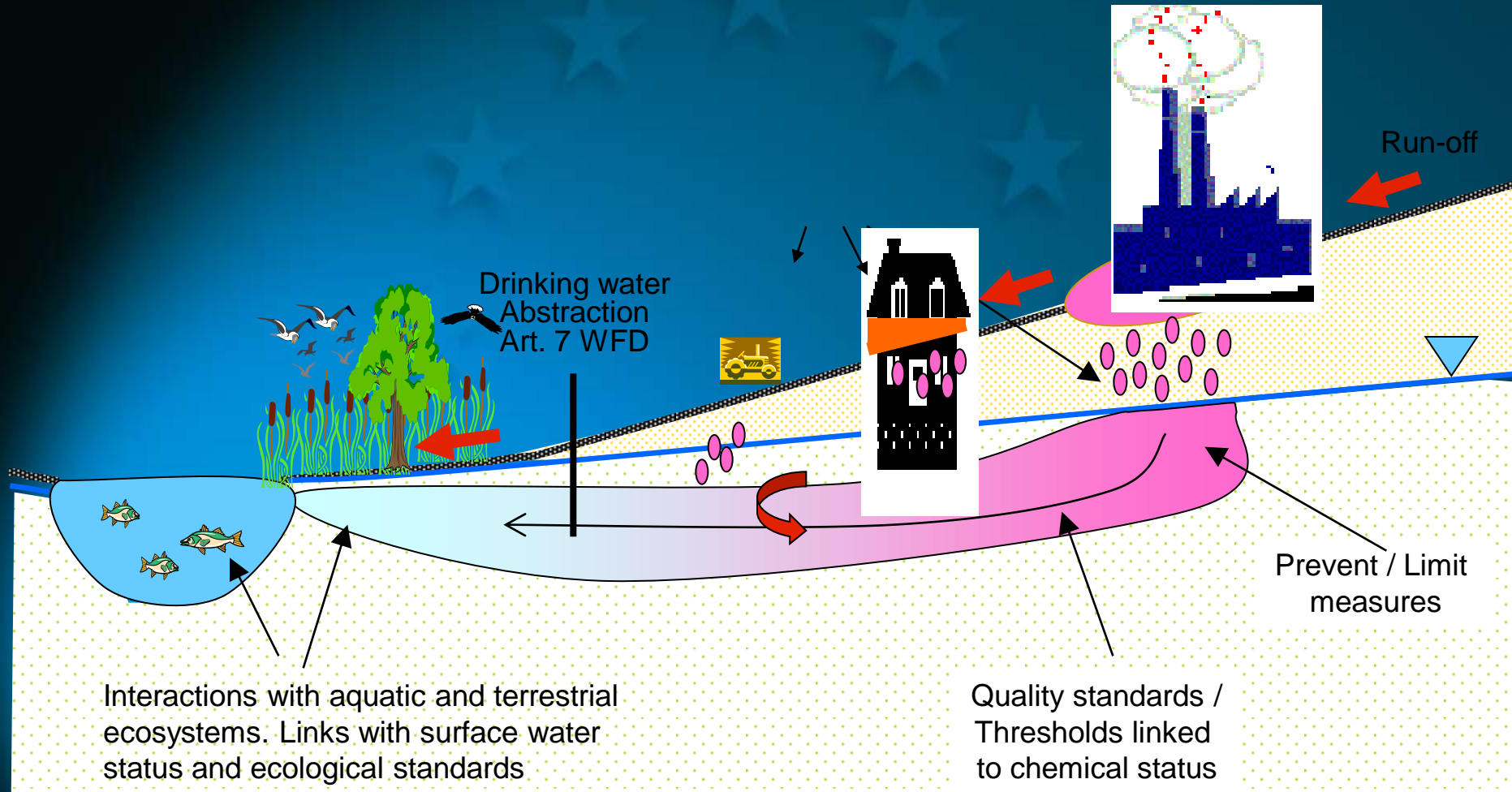
- dependent terrestrial ecosystems (wetlands)

- drinking water supply and other human uses

⇒ New challenge for an integrated protection approach of the whole soil-groundwater-surface water system and corresponding monitoring

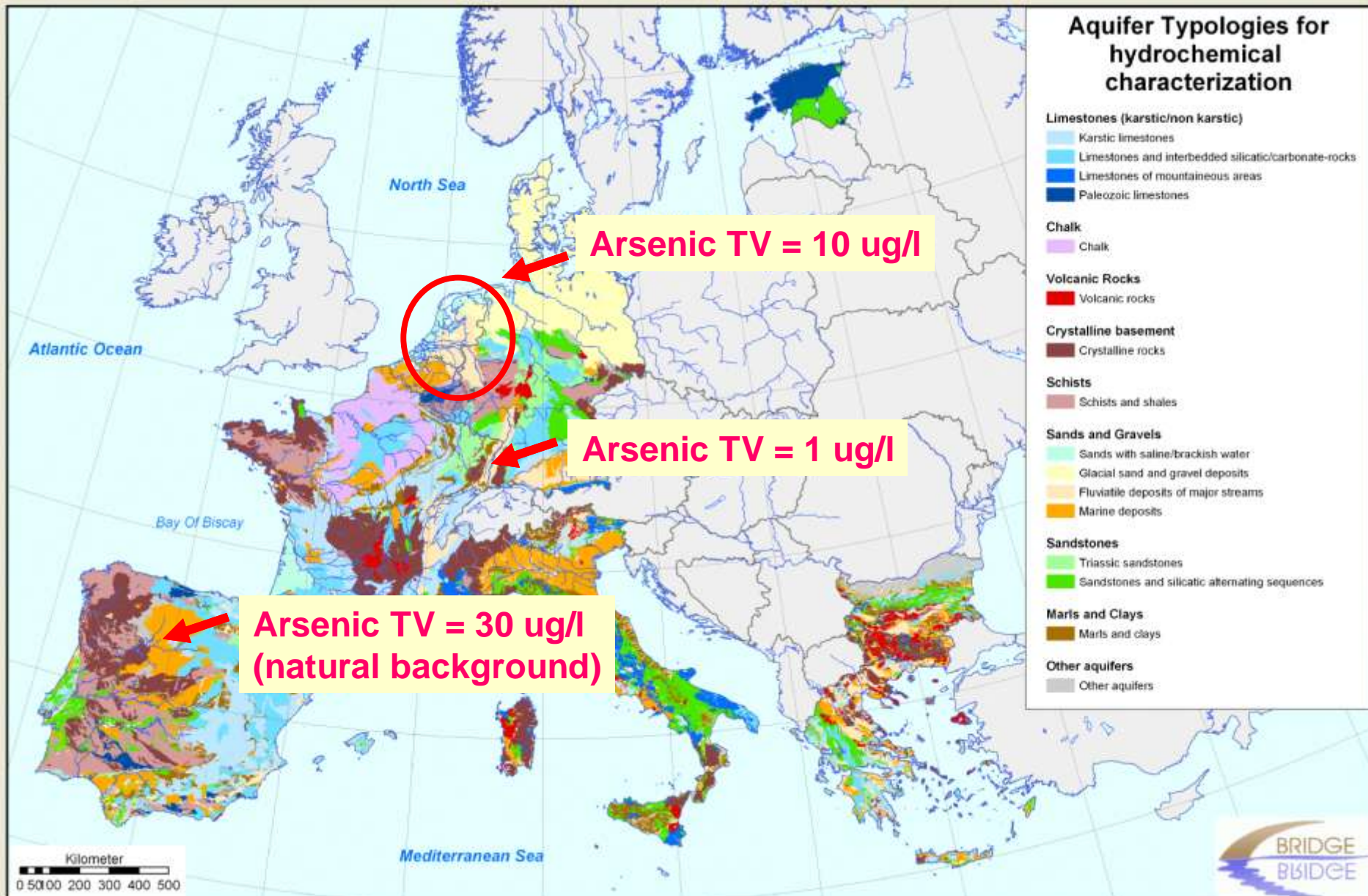
WFD / Groundwater Directive

A new paradigm for groundwater protection



Groundwater = natural resource to be protected against pollution and deterioration, in particular for dependent ecosystems and for use in water supply

Aquifer typologies as input for setting threshold values (TV) for groundwater (EU FP7 BRIDGE project)



Developments relevant for groundwater research and management

Increased emphasis on aquatic and terrestrial ecosystems and on the mutual influence between groundwater and surface waters (WFD and GWD)

Pressures on groundwater systems tend to increase due to:

- Effects of climate change
- Associated human induced changes of surface and subsurface water management

Secondary impacts of climate change resulting from human intervention in water systems are expected to have the largest short-term effects on groundwater resources

Developments relevant for groundwater research and management

Examples of secondary impacts:

- *Increase of water demands* and abstractions of groundwater for irrigation
- higher evaporation -> falling water tables + salt water intrusion
- Increased *production of biofuel* which may change groundwater quality
- Increased fertilizers and pesticides use and increased water needs -> net groundwater recharge ↓
- More intensive use of the groundwater compartment in relation to *energy policy*
- Sharp increase of aquifer thermal energy storage facilities in western Europe
- *Storage of CO₂* in deep aquifers or gas fields
- Possible effects on the quality of more shallow groundwater resources and groundwater receptors

Eurogeosurveys Concept Note on groundwater research needs under FP7

June 2010

Executive Summary

Through this concept note Eurogeosurveys, the Association of European Geological Surveys, would like to draw attention to research needs in the field of groundwater. Groundwater research needs are especially related to the implementation of the Water Framework Directive (WFD) and the Groundwater Directive (GWD) but also related to EU policy initiatives on 'Water Scarcity and Droughts' and 'Climate Change Adaptation and Mitigation'. For example, the second and third River Basin Management Plans for the WFD and GWD are supposed to be fully climate resilient by 2015. Moreover, different policy objectives may have contradictory effects; implementing the EU policy on renewable energy by introducing subsurface thermal energy storage or CO₂ storage for example, might have adverse effects on the protection of groundwater systems, which asks for a balanced groundwater management approach.

Important information for this paper was obtained through a common meeting of the Eurogeosurveys Water Resources Expert Group, together with four EU officials: Mr. Pi. Quevauviller (scientific officer DG Research), Mr. C. Fragakis (scientific officer DG Research), Mr. B. Horvath (policy officer responsible for the implementation of the GWD) and Mr. J. Grathy (co-chair of EU Working group C).

Eurogeosurveys identified five knowledge gaps related to the field of integrated management of surface water and groundwater resources, based on experiences of the geological surveys of Europe in previous and current FP research and Interreg projects (i.e. BaseLine, Aquaterra, Bridge, SWIFT-WFD, FOOTPRINT, FLOOD1, CLIWAT, BaICICA, Big-CCS, SKINT, MARE, FRC, SAWA, RISCS), coordination actions (RiskBase, Sednet, Harmoni-CA) and on Eurogeosurveys support to the EU Working Group C on Groundwater. By writing this Concept Note, Eurogeosurveys hopes to be of assistance in realizing climate proof and resilient groundwater management and would like to contribute in bridging the gap between science and policy.

Identified Knowledge gaps

Since 2006, the combination of WFD and GWD involves a new paradigm in protection of groundwater, with increased emphasis on aquatic and terrestrial ecosystems and on the mutual influence between groundwater and surface waters. Up to now groundwater and surface water research was often performed in 'separate worlds' and really integrated research on soil-groundwater-surface water relations, including integrated modelling, monitoring and evaluation of measures is scarce. Moreover, pressures on groundwater systems tend to increase, partly as a result of the effects of climate change and associated human induced changes of surface and subsurface water management. Especially, so-called secondary impacts of climate change, resulting from human intervention in water systems, are expected to have the largest short-term effects on groundwater resources. Examples of secondary impacts are:

1. → the increase of water demands and abstractions of groundwater for irrigation due to higher evaporation which may lead to falling water tables and salt water intrusion
2. → the increased production of biofuel which may change groundwater quality by introduction of fertilizer and pesticides and increased water needs which may also effect the net groundwater recharge
3. → more intensive use of the groundwater compartment in relation to energy policy, for example by a sharp increase of aquifer thermal energy storage facilities in western Europe
4. → the start of extensive storage of CO₂ in deep aquifers or gas fields which may or may not have effects on the quality of more shallow groundwater resources and groundwater receptors.

Although the response of surface water systems to climate change effects are relatively well studied in relation to flooding risks and prolonged droughts, the primary and secondary impacts of climate change on groundwater systems are relatively unknown. Only a number of very recent studies give some information of the changes in groundwater recharge rates and renewal, the fluxes towards ecosystems and surface water receptors and related changes in groundwater and surface water quality. Even less knowledge is available on the response of groundwater systems on aquifer thermal energy storage facilities and CO₂ storage facilities. However, groundwater to be recirculated in ATEs facilities in the Netherlands, for example, is estimated to exceed amounts of groundwater abstraction for drinking water by 12 times in 2050. So, the amounts of groundwater which may be influenced by the new uses of groundwater are huge.



Figure: Pressures on groundwater systems have increased in time, partly in response to climate change. As a result, subsurface functions may interfere (shown: aquifer thermal energy storage installations in an urban environment)

Eurogeosurveys highlights five priority areas for further research in order to scientifically support the implementation of the Water Framework Directive, the Groundwater Directive and EU policy initiatives on water scarcity and droughts and climate change adaptation and mitigation.

1. → Developing predictive tools and monitoring systems to evaluate the effects of subsurface CO₂ storage on groundwater systems and groundwater receptors above storage facilities. CO₂ storage is done under different hydrogeological conditions and with different techniques, and increased knowledge of interactions between storage facilities and water systems will help selecting effective strategies for Europe and balance water and energy interests.

European Union

Conflicting use of the underground space?

- Mining (and deep mining)
- Carbon Capture and Storage (CCS)
- Geological disposal of radioactive waste
- Geothermal energy
- Shale gas
- Groundwater

Conclusions

The role of geology is nowadays key again to societal development

Even if economic growth is the driving factor, it still seems that environmental protection is the most important issue to deal with

Water is crosscutting to all the emerging challenges geoscience has to face

Geologists have new responsibilities, we must quickly learn to cope with

It is a unique opportunity

WE CANNOT FAIL

THANK YOU!

EuroGeoSurveys
info@eurogeosurveys.org