



**EGU Leonardo**  
Topical Conference Series  
on the hydrological cycle  
**2012**



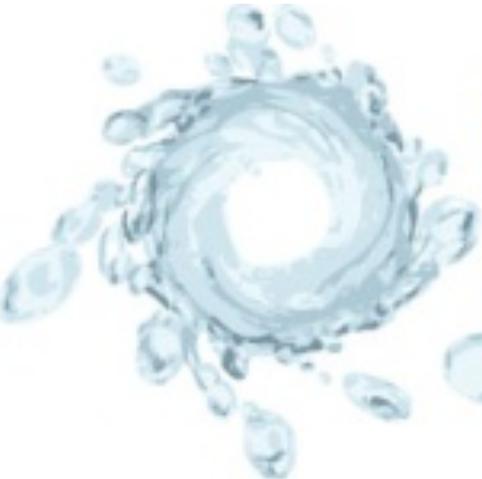
## Seminar Hydrology and Society

14<sup>th</sup> - 16<sup>th</sup> October 2012  
Torino, Italy

# Solutions to harmonize clear water & clean energy

**Maximo Peviani**

*Project Coordinator*  
**RSE – Research on Energy Systems**  
*Milan, Italy*



# SEE HydroPower

*clear water clean energy*

- Challenges
- Main problems
- Main objective
- Tools & methods
- Applications
- Conclusion

# Challenges

# Water Framework Directive implementation issues



Downstream river environmental quality

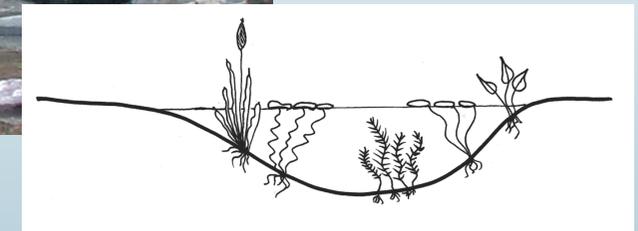
Minimum environmental flow

- PERIFLUVIAL ZONE
- PERIPHYTON

• BENTHIC MACROINVERTEBRATES

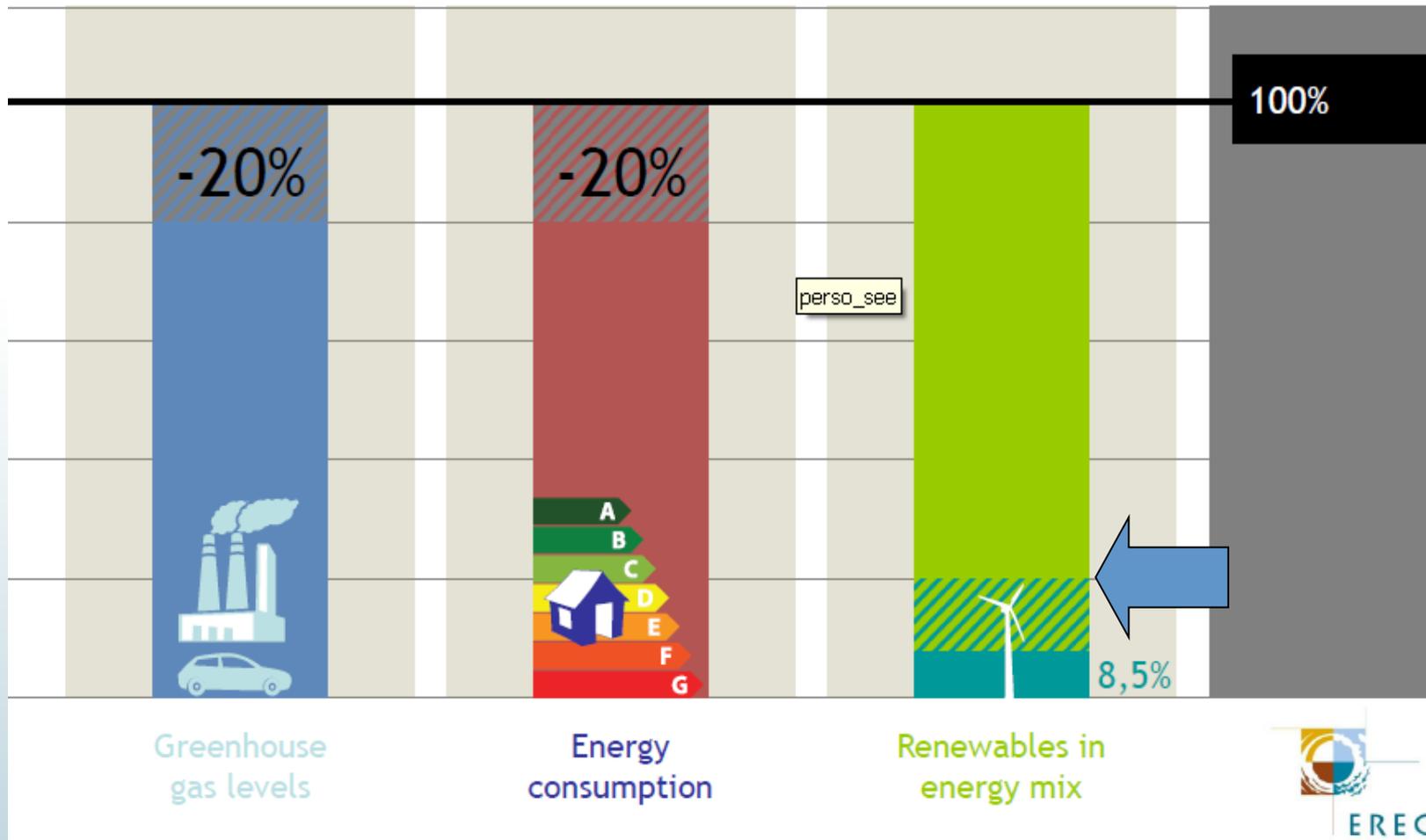
• ICHTHYIC FAUNA

• AQUATIC MACROFITS



# Challenges

## The 20-20-20 EU policy by 2020



# Challenges

## SOLUTIONS to harmonize Water and Energy !

6<sup>th</sup> World Water Forum - Marseille, March 2012



### 5508 – SEE HYDROPOWER, TARGETED TO IMPROVE WATER RESOURCES MANAGEMENT FOR A GROWING RENEWABLE ENERGY PRODUCTION

🔗 [Linked targets](#)

💬 [Comments](#)

11<sup>th</sup> March 2012 by maximo

👤 [maximo](#) (No Ratings Yet)

The SEE HYDROPOWER project aims to a sustainable exploitation of water concerning hydropower production in SEE countries, looking up to renewable energy sources development, preserving environmental quality and preventing flood risk (financed by the EU, South-East Transnational Cooperation Programme, from Sep 2009 to Oct 2012).

**TAGGED IN :**

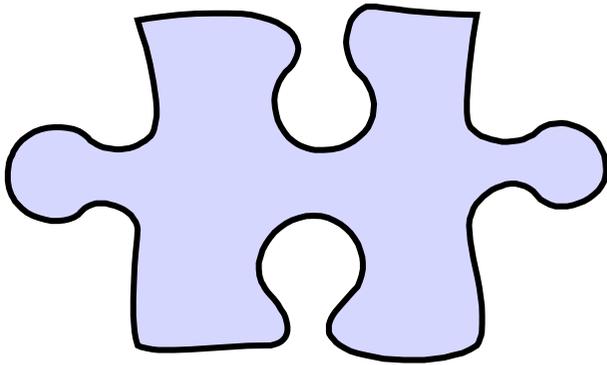
Hydropower, Water Resource Management, Renewable Energy Production, Small Hydropower Development, Mini Hydro, River Ecosystems, Biodiversity, Water Use Conflicts, Flood Control, Multicriteria Approach

**CONTRIBUTOR(S) :**

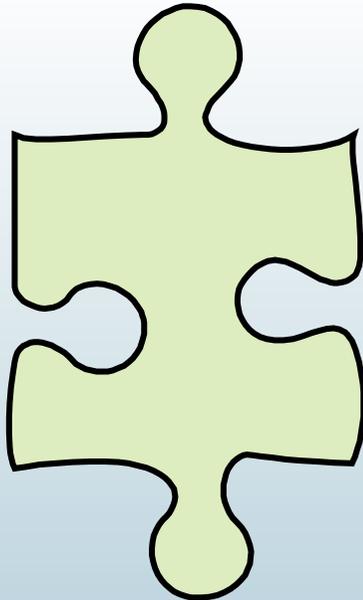
RSE Research on Energy Systems SpA

# Main problems

## Issues to be addressed



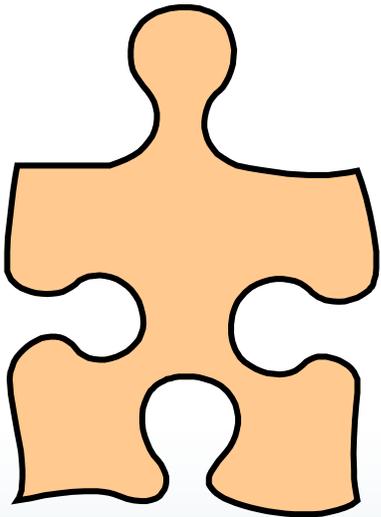
Hydropower is the ***most important renewable resource*** for electricity production in the *EU* countries



Hydroelectric ***production*** has to be ***maintained*** and even ***increased***, reaching the share of renewable electricity production according to ***2001/77/CE RES-e Directive***.

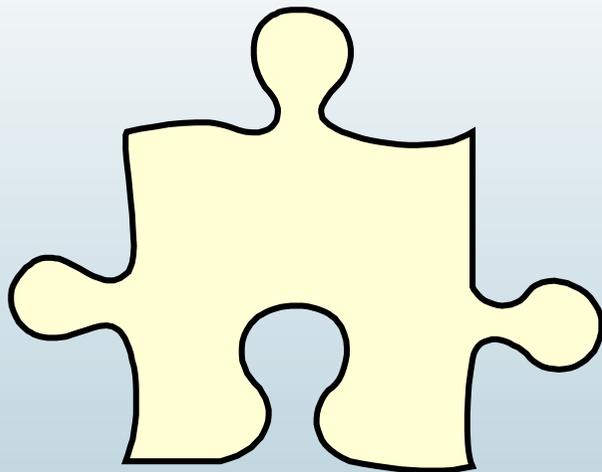
# Main problems

## Issues to be addressed



The **2000/60/CE Water Framework Directive** obliges member States to reach good ecological status in their water bodies.

**Public Administrators** face an **increasing demand** of water abstraction, but lack reliable tools to evaluate the effects of water withdrawal on the river system.



**Competition** between **water users** (for drinking, irrigation, industrial, power, etc.) is becoming a serious problem, and there is a strong need of a more accurate **planning** and **management** of the resources.

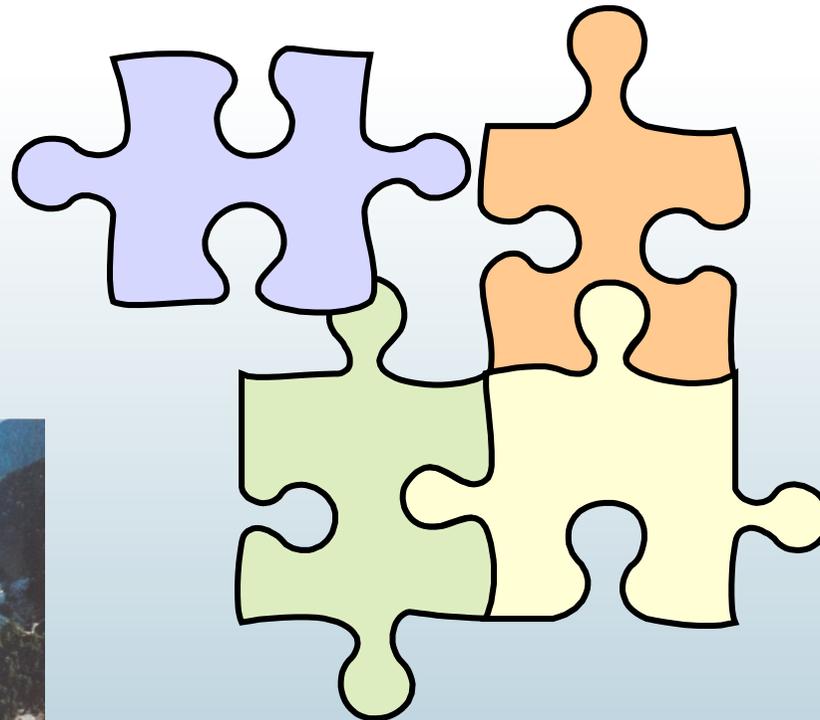
# Main Objective



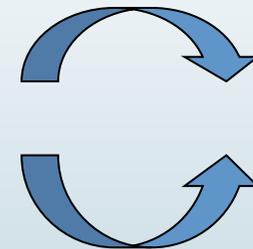
## Environment



## Energy



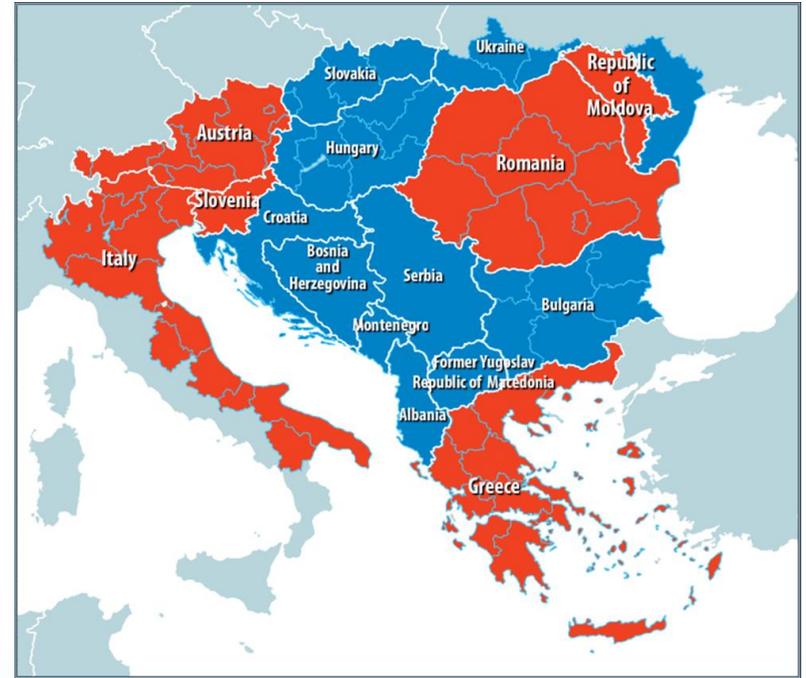
*Water Framework Directive*



*RES-e Directive*

# Partnership

12 Partners and 11 Observer Partners



Italy – Austria – Slovenia – Romania - Greece  
Republic of Moldova – The Netherlands - EU



Prefecture of Serres Province



REGIONE DEL VENETO



## Coordinator



## Research on Energetic Systems Milan, Italy



- Established at the end of 2005 as a separate company currently 100% owned by the **GSE**.
- The mission is to take over funded research programs and contract research at national and international level
- Research activities are centered on the electricity and energy sector with emphasis on experimental pilot applications



# Partnership



**RSE - Research on Energetic Systems (Italy)**



**ARPAV - Regional Land Safety Department (Italy)**

Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto



**Province of Belluno (Italy)**



**TUG – Graz University of Technology (Austria)**



**Government of Styria – Department of water resource management (Austria)**



**University of Ljubljana (Slovenia)**



**Ministry of Environment and Spatial Planning (Slovenia)**



**University "Politechnical" of Bucharest (Romania)**



**National Water Administration "APELE ROMANE" (Romania)**



Prefecture of Serres Province

**Prefecture of Serres Province (Greece)**



**Technical University of Moldova (Republic of Moldova)**



**University of Natural Resources and Life Science of Vienna (Austria)**

# Observer Partners



**Austrian Hydro Power (Austria)**



**Macedonian Power Plants  
(Rep. of Macedonia)**



**European Small Hydropower  
Association (EU)**



**National Association of Electric  
Utilities (Italy)**



**Energy Agency of Padrovje  
(Slovenia)**



**Association of Renewable Energy  
Producers (Italy)**



REGIONE DEL VENETO

**Veneto Region (Italy)**



**Institute for Water Education  
(The Netherlands)**



**Sociedad Colombiana de Ingenieros  
(Colombia)**



**Insitute of Hydroelectric Studies  
and Design  
(Romania)**



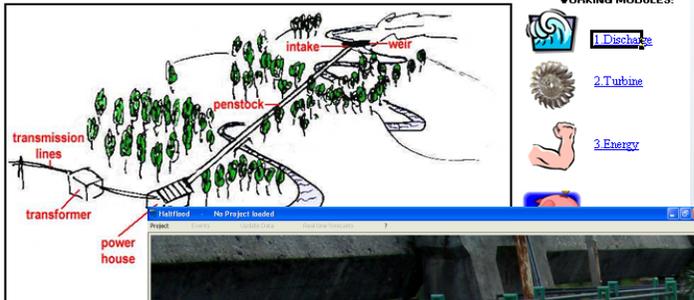
**Facultad Nacional de La Plata  
(Argentina)**

## TOOLS to support Public Administrations



## SMART Mini-Idro

Software for the technical-economic feasibility analysis of small hydropower plants in fluent water courses



WORKING MODULES:

- 1. Discharge
- 2. Turbine
- 3. Energy

Alessandro Davitti

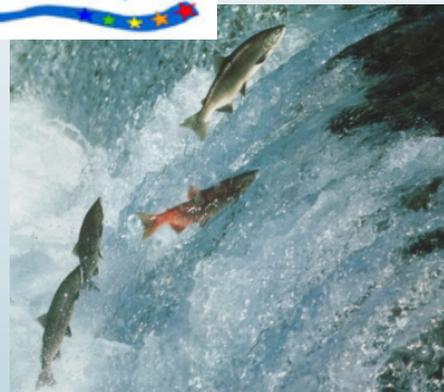
## HALTFLOOD

Hydrology-hydraulics and meteo prediction  
in reservoirs for FLOOD attenuation and delay

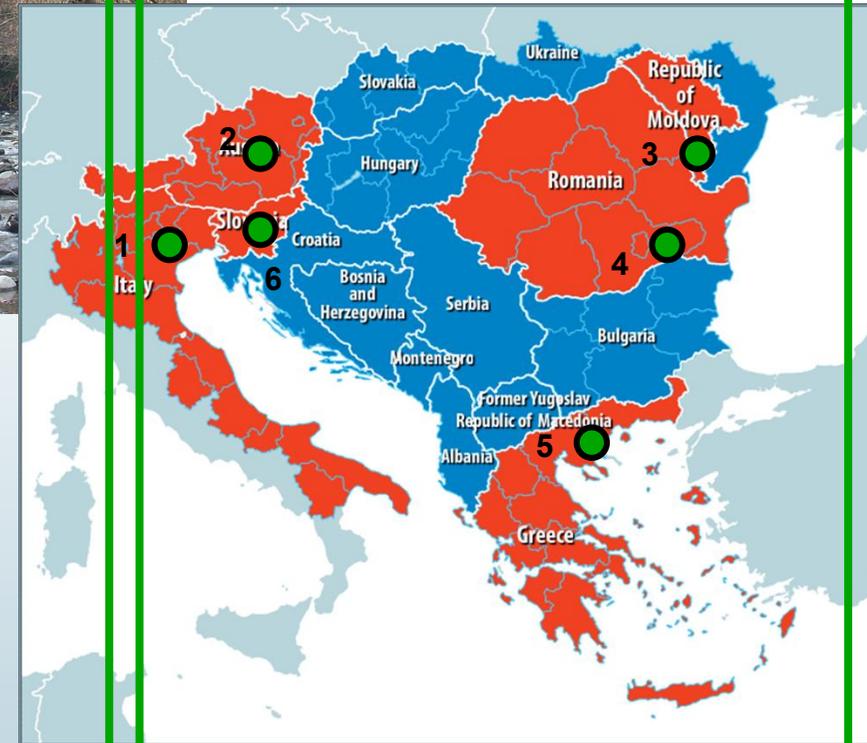
RSE

Version: June 2010

## METHODS to preserve downstream river quality



## APPLICATIONS testing methods & tools in 6 pilot areas



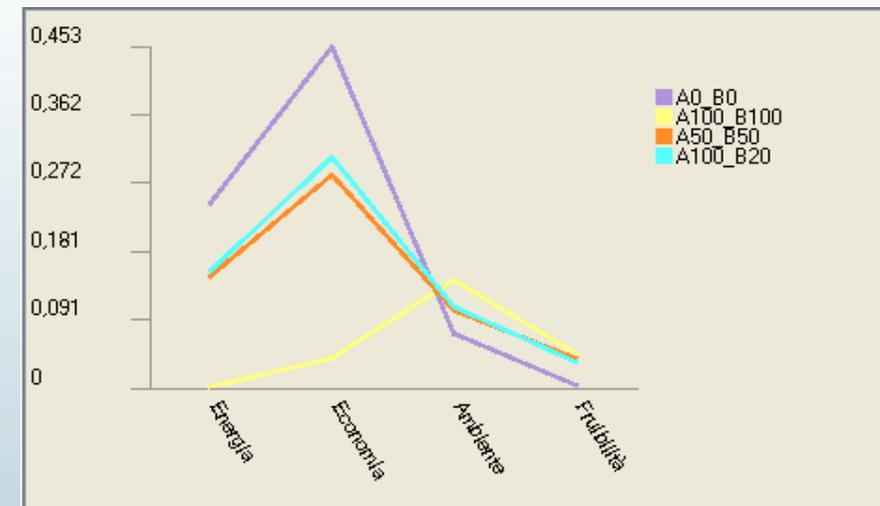
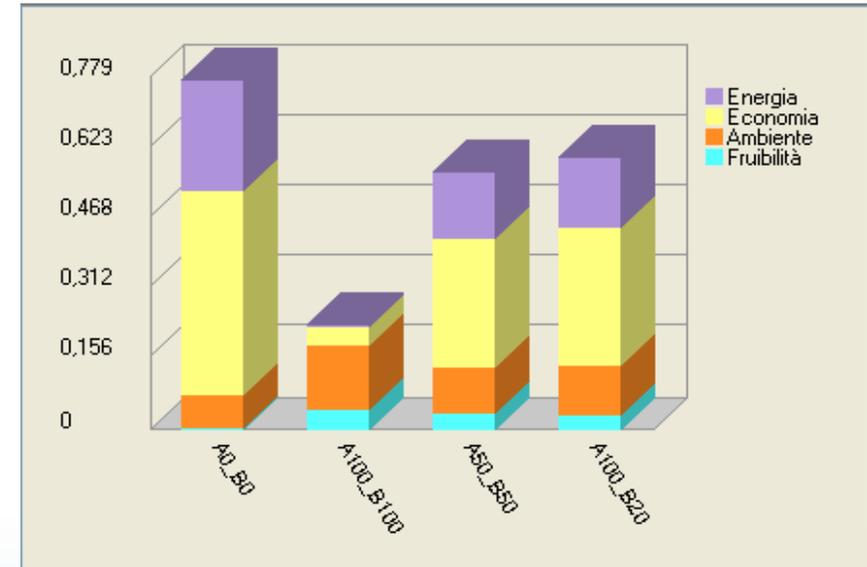
# MCA tool implementation for water management: **SESAMO** software

## Tools (1)

### Multi Criteria Analysis

- Comparison among alternatives
- Pro and cons of each alternative
- One ranking for each stakeholder
- Comparison among rankings

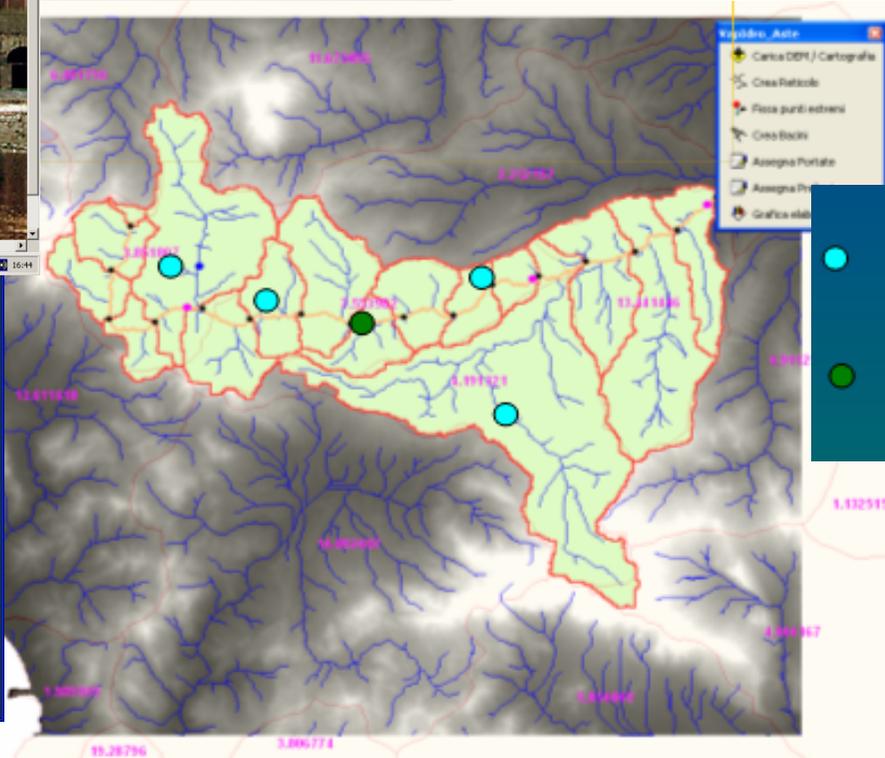
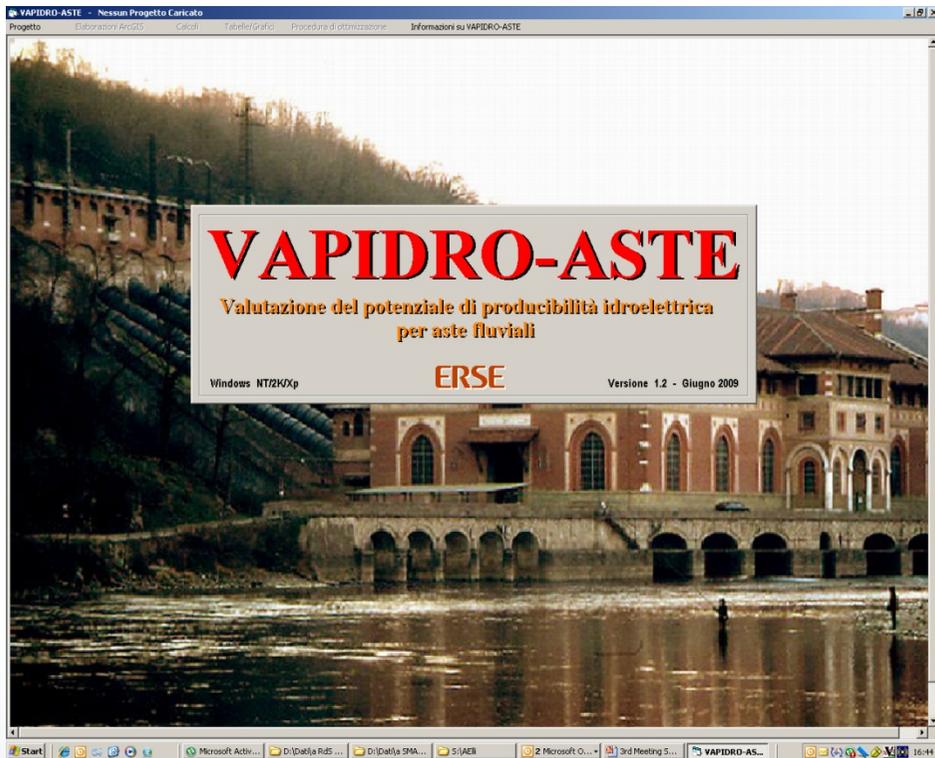
**It does not decide, it supports decision makers**  
**It helps to make transparent decisions**



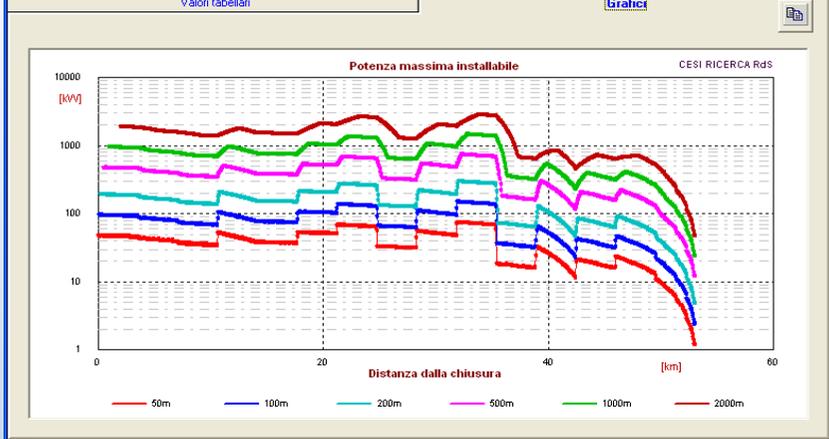
## Tools (2)

Model to determine the **optimal small hydropower exploitation scheme** and **most suitable sites**

### Residual potential hydropower



● User withdrawal points  
● User restitution points



### Installable power of potential mini hydro plants

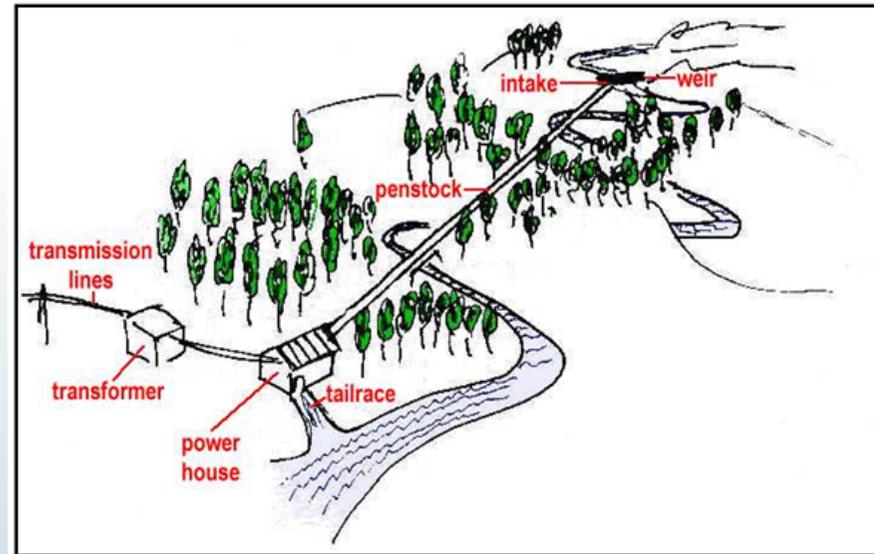
## Tools (3)

# SHP Cost / Benefit detailed analysis



## SMART Mini-Idro

Software for the technical-economic feasibility analysis of small hydropower plants in fluent water courses



WORKING MODULES:

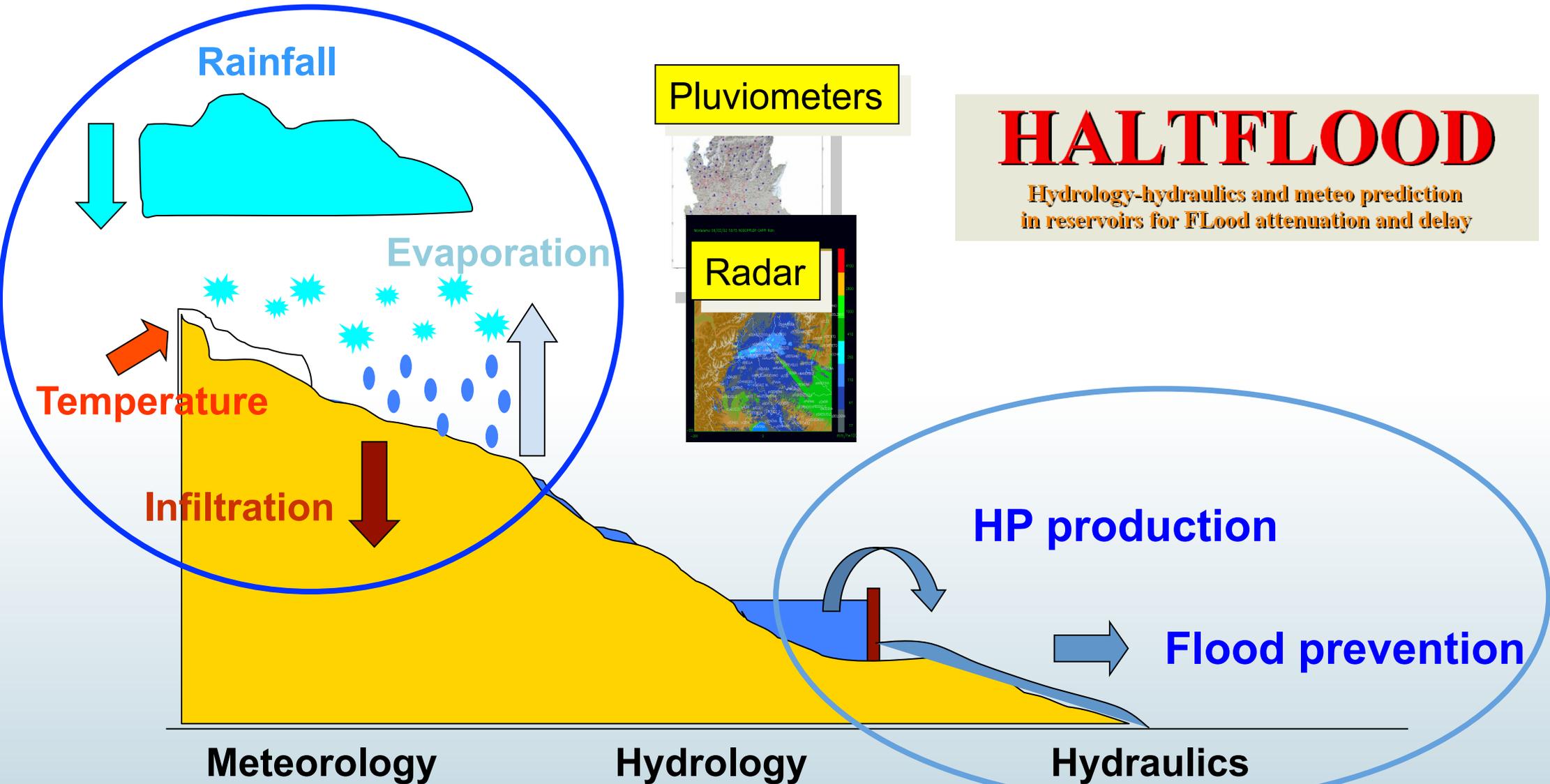
-  [1. Discharge](#)
-  [2. Turbine](#)
-  [3. Energy](#)
-  [4. Costs](#)
-  [5. Financial Analysis](#)
-  [User Guide](#)



**Optimized B/C solution**

# Dynamic operation of reservoirs

## Tools (4)



Security and optimal management of HP reservoirs

# The "European Fish Index +" a numerical tool for Ecological Status Assessment

## Tools (5)



Sitename	IBE FIR95	IBE USA60
Oroftiana Eastern Plainses	27	12
Bajura	32	15
Hersodhrea	32	15
Radauti	24	13
Cotu Miculinti	32	13
Romanesti	22	15
Hernesti	28	15
Sendreat	25	16
Uagbani	20	14
Opriseni U	24	13
Opriseni D	14	11
Cotu Salageni	30	13
Drasceni	26	13
Poganesi Pontic Province	24	15
Brascostei	24	10
Bumbata	20	10
Falcku	22	16
Carja	22	13
Oncea	16	13
Feltesil	20	9
Pietrossa	18	15
Giurgalesti Garla	12	12
Giurgalesti	28	16

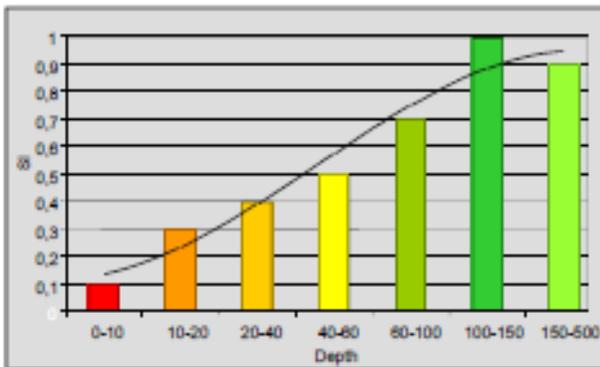


**University of Natural Resources  
and Life Science Vienna**

# Habitat modeling with preference curves

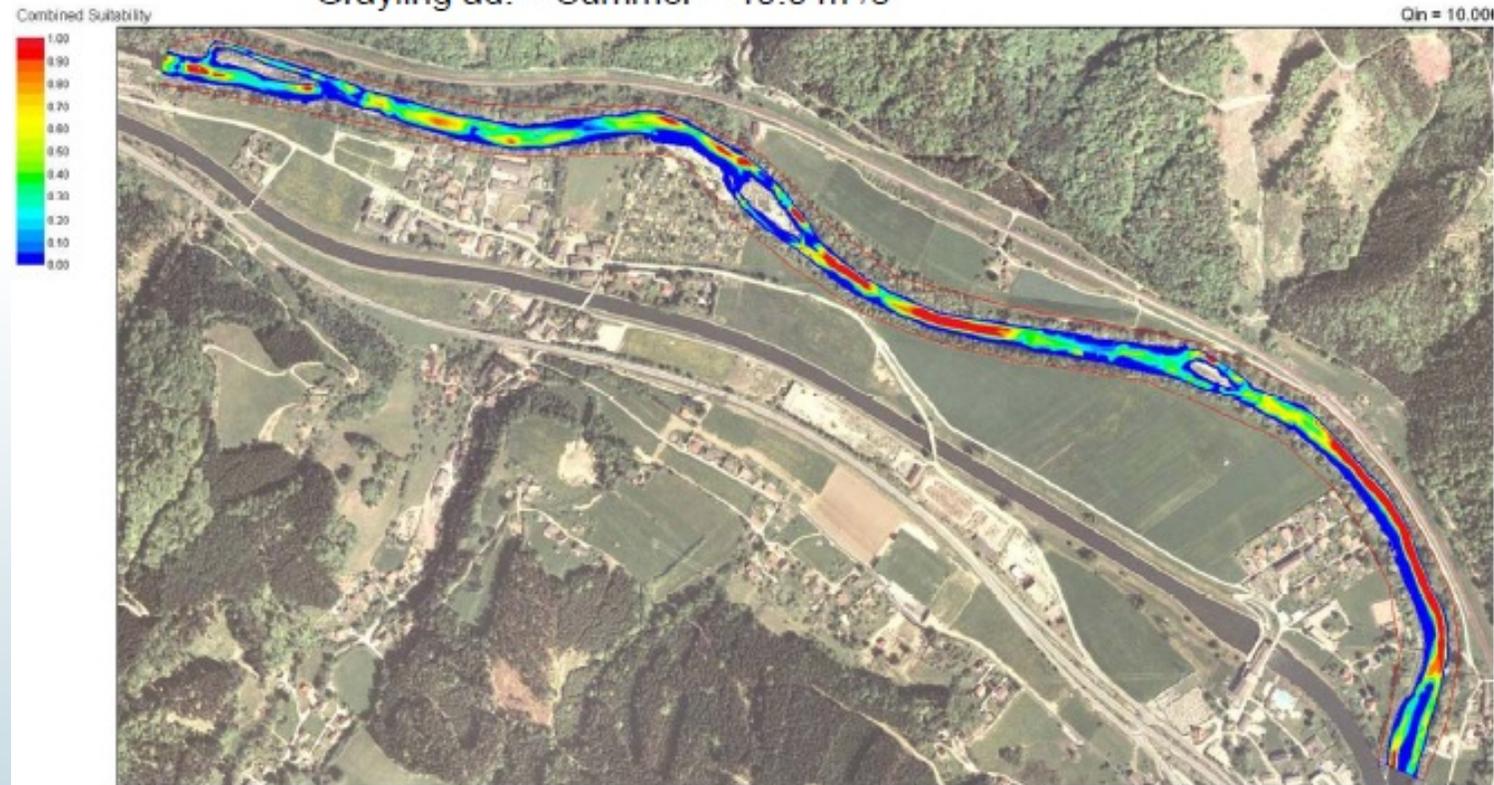
## Tools (6)

Univariate suitability curve for key species/-life stage



### Model Output - Fish habitat changes at different discharges

Grayling ad. – Summer – 10.0 m<sup>3</sup>/s



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and Life Science Vienna

# Sediment transport and river morphology

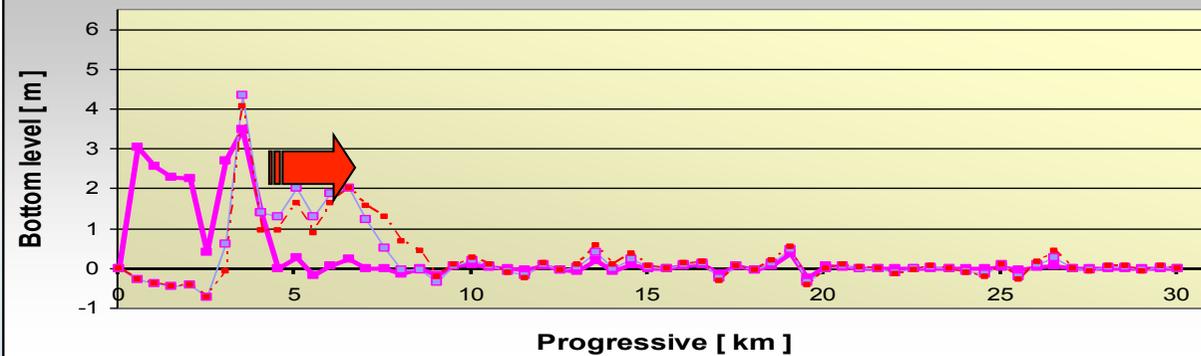
## Tools (7)

### Mathematical model GIS integrated

### Controlled FLUSHING OPERATION of HP reservoirs



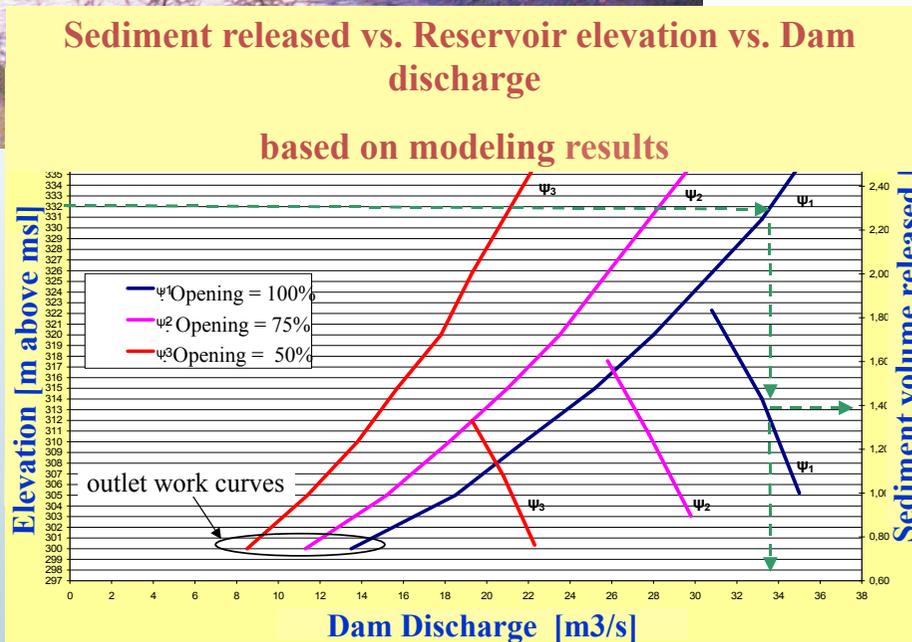
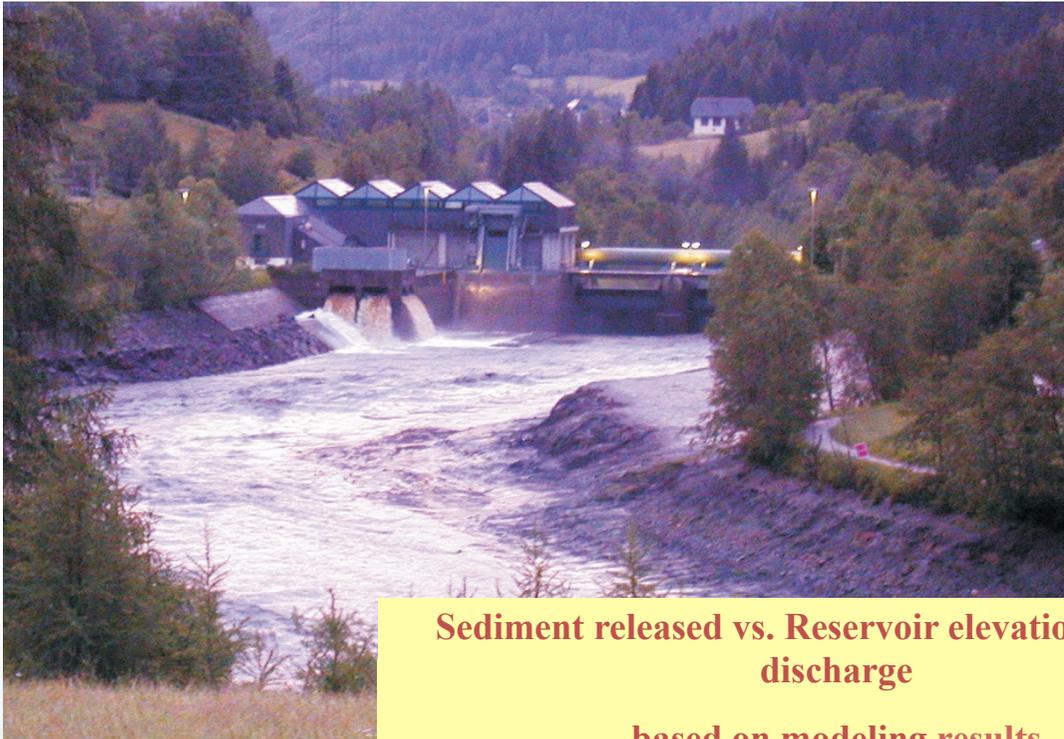
Bottom level evolution



- **Suspended concentration**
- **Embeddedness**
- **Aggradation level**

# Sediment management of reservoirs

## Methods (1)



**Optimal reservoir  
disaltation**

# Downstream river quality preservation

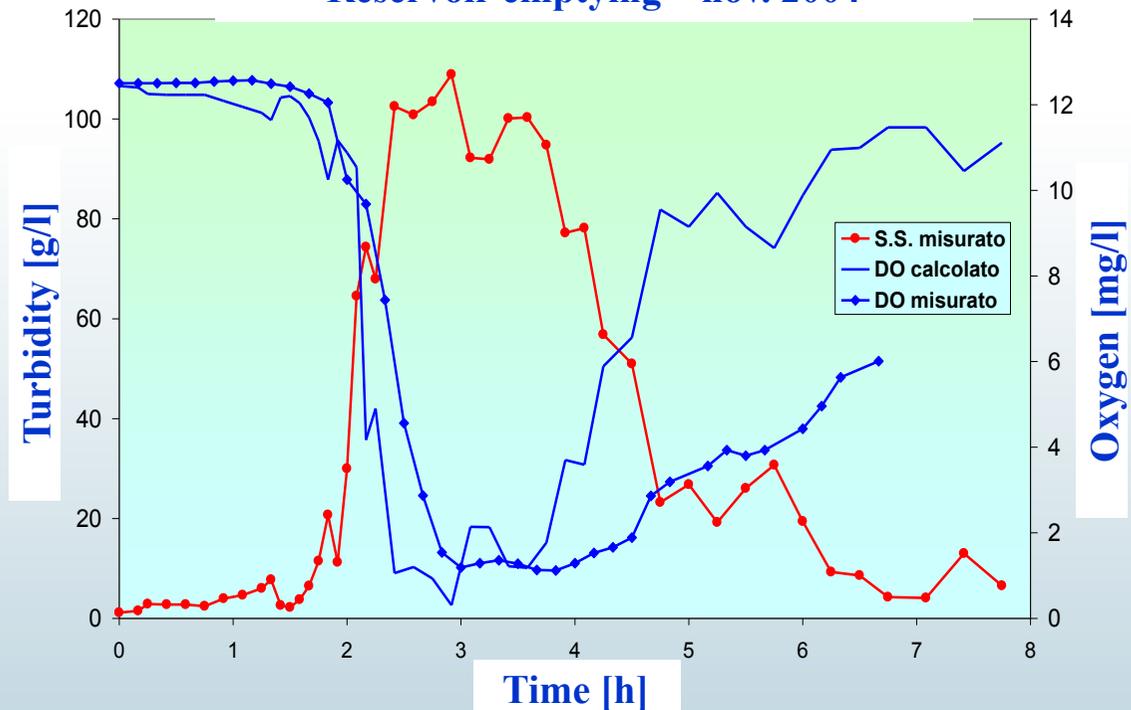
## Methods (2)



- **Flushing operation of reservoirs:**
  - Evaluation of sediment concentration
  - And water dissolved oxygen depletion



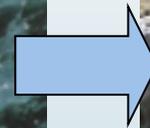
Reservoir emptying – nov. 2004



# Water and biological continuity

## Methods (3)

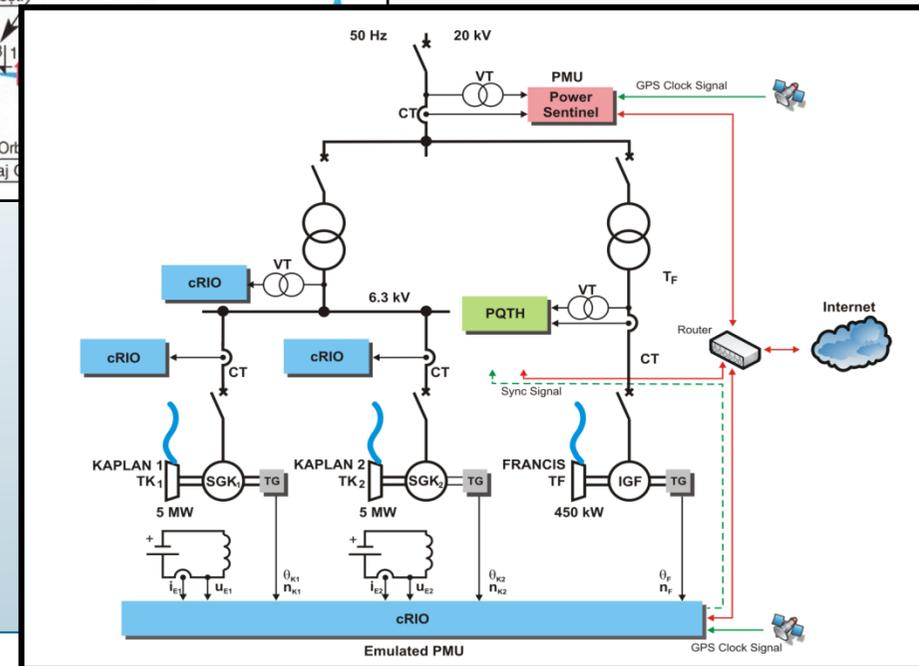
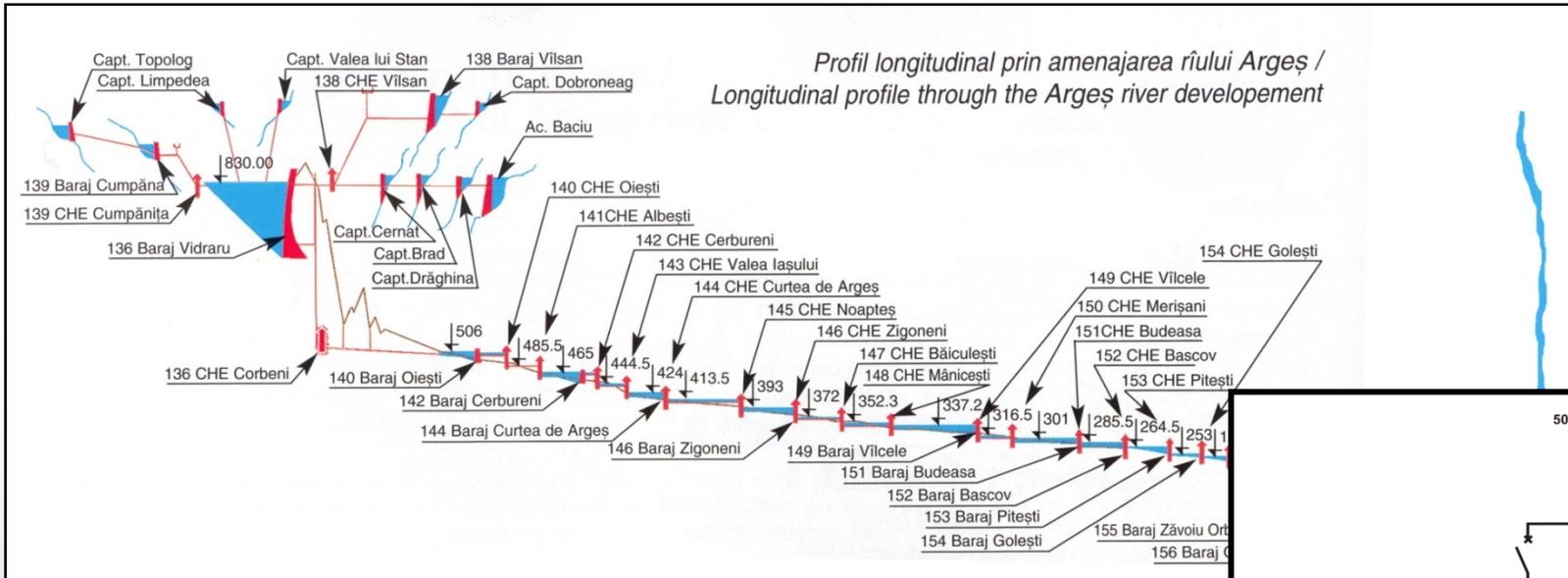
- Fish migration
- Refuges
- New river areas
- Nutrient
- Reproduction zones
- Environmental flow
- Improve water quality
- Temperature, O<sub>2</sub>



# SCADA Application

## Methods (4)

Monitoring of hydropower unit (mechanical and electrical parameters, voltages, currents) through the web

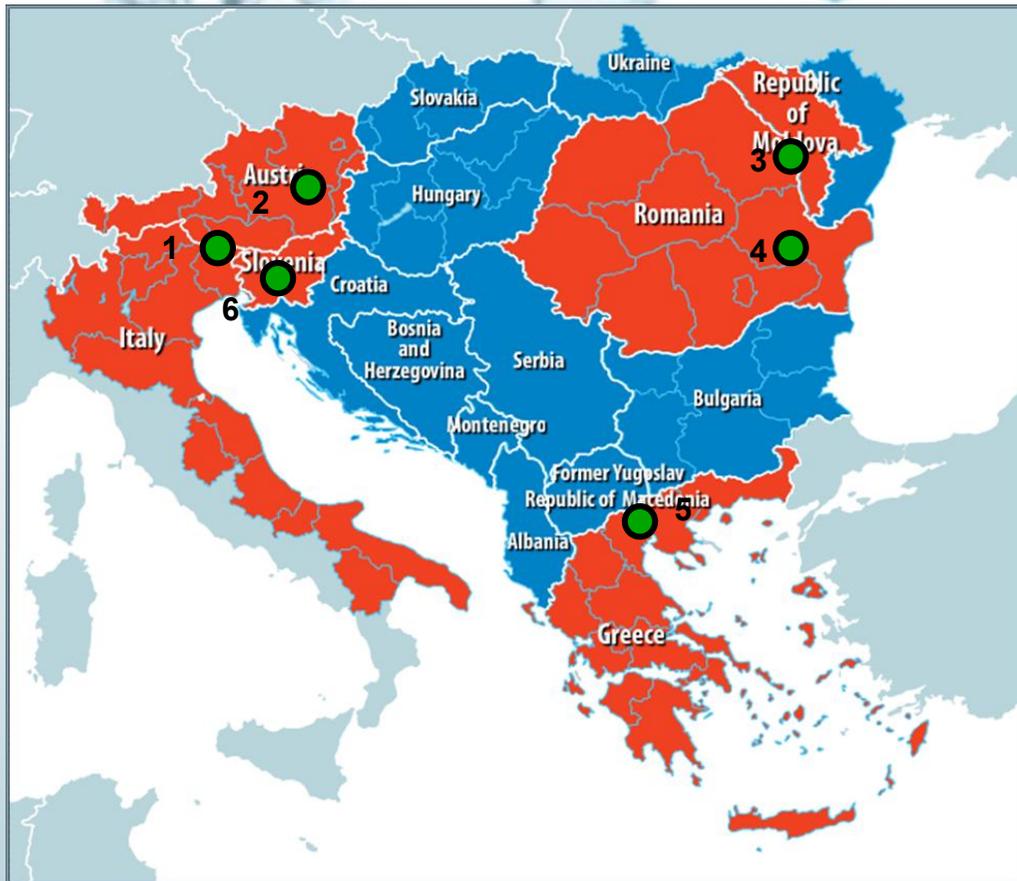


University "Politechnical" of  
Bucharest (Romania)

Prof. Razvan Magureanu

## Pilot case studies

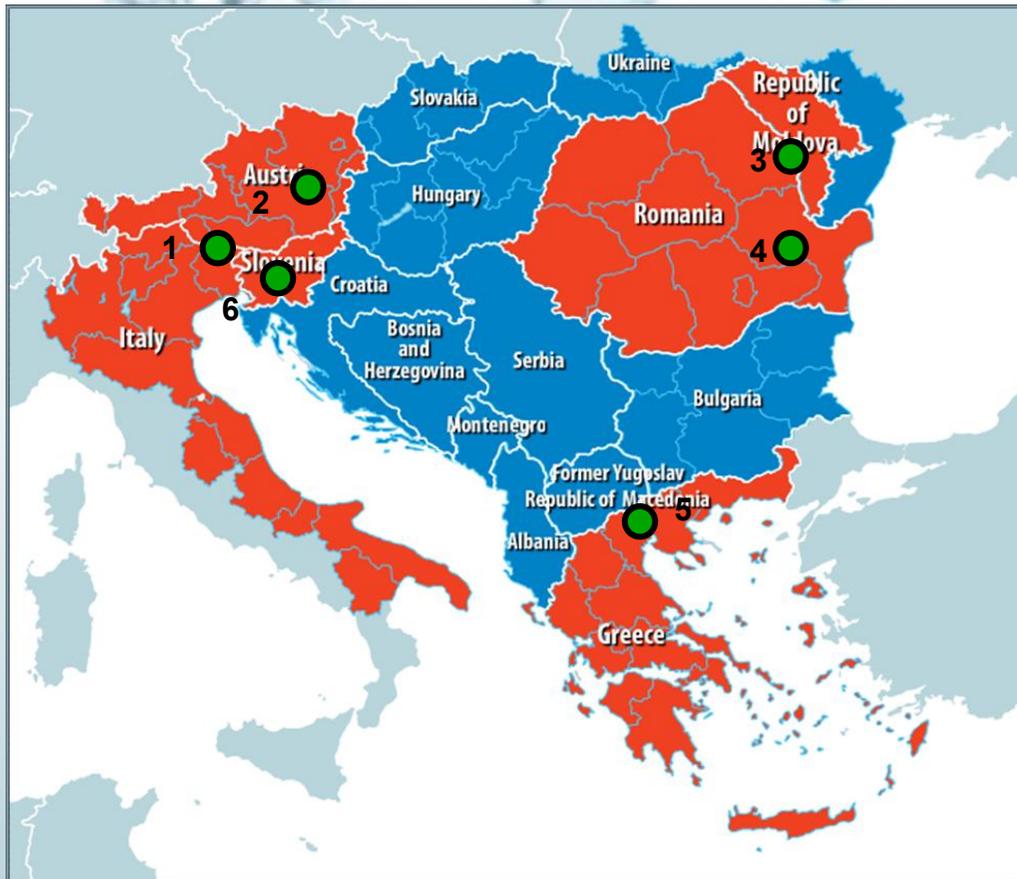
# SEE HydroPower



- **Piave Basin (Italy)**
- **Mur Basin (Austria)**
- **Prut Basin (Moldavia-Romania)**
- **Ialomita Basin (Romania)**
- **Strymonas Basin (Greece)**
- **Drava Basin (Slovenia)**

## Conclusions

# SEE HydroPower



- Non technological barriers
- R&D strong help to harmonize
- Involvement of all parts
- Transparency
- Regulatory framework
- SHP remaining potential
- New role of HP in storage

# Website

# www.seehydropower.eu

**Download reports**

Project Partners **Download Deliverables** Meetings & Seminars Events Contacts Links

**SEE HYDROPOWER - Project, targeted to improve water resource management for a growing renewable energy production**

The three years **SEE HYDROPOWER** project started on June 2009, financed by the South-East Transnational Cooperation Programme (EU), aims to a sustainable exploitation of water concerning hydropower production in SEE countries, looking up to renewable energy sources development, preserving environmental quality and preventing flood risk.

**SEE HYDROPOWER** defines specific needs and test methodologies & tools, in order to help public bodies to take decisions about planning and management of water and hydropower concessions, considering all multi-purposes uses, taking into account the environmental sustainability of natural resources and flooding risks.

Competition between water users (for drinking, irrigation, industrial processes, power generation, etc.) is becoming a serious problem, and there is a strong need of a more accurate planning and management optimization of the resources. **SEE HYDROPOWER** aims to be the solution!

**Reserved Area**

**News**

- 28/02/2012 test test test
- 23/02/2012 prova
- 01/01/2012 Seminar addressed to stakeholders of hydropower target groups in Slovenia

**Download tools**

- SMART Mini-idro
- VAPIDRO-ASTE

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- SMART Mini-idro
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Ricerca Sistema Energetico

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**Sesamo**  
**SEE-HYDROPOWER**

# Tools download

**VAPIDRO-ASTE**  
Assessment of the hydropower potential in watercourses  
RSE - Ricerca sul Sistema Energetico

**SMART Mini-Idro**  
Software for the technical-economic feasibility analysis of small hydropower plants in forest water courses

**EFI**

**HALTFLOOD**  
Hydrology-hydraulics and meteo prediction in reservoirs for FLOOD attenuation and delay  
RSE  
Version: June 2010

**MORIMOR**  
Mountain River Morphology Model  
Modello numerico idraulico-morfologico per fiumi a forte pendenza e sedimento multigranulare

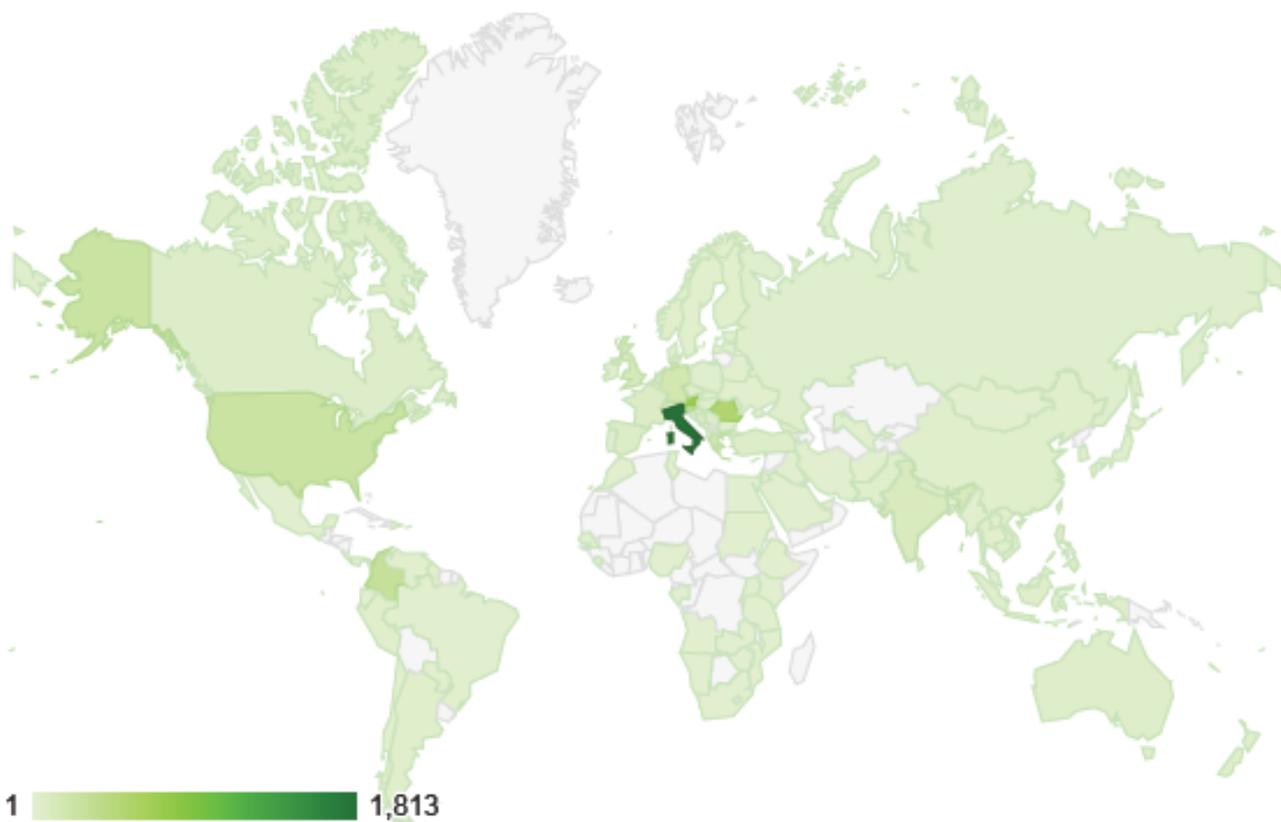


# SEE HydroPower

clear water clean energy

> 5,500 visits (117 countries)

> 150 tool downloads (43 countries)



Paese/zona	Visite
1. Italy	1.813
2. Austria	701
3. Romania	524
4. Colombia	287
5. Slovenia	281
6. United States	249
7. Germany	159
8. Greece	145
9. United Kingdom	114
10. India	91
11. Netherlands	61
12. France	45
13. Spain	43
14. Hungary	39
15. Bosnia and Herzegovina	33



**Be part of the harmonizing community !**

**Thanks !**

**[www.seehydropower.eu](http://www.seehydropower.eu)**

**[maximo.peviani@rse-web.it](mailto:maximo.peviani@rse-web.it)**