



Policy Brief N. 1/7

Needs and priorities for software capability in Water Resource Management



Key Policy Messages

- A survey for identifying needs and priorities in ICT for Water Resource Management was performed
- Priority areas and present ICT skills in public institutions and private companies are identified
- ✓ The H2020 FREEWAT approach supports these requests and increases capacity in the use of advanced ICT

WHAT H2020 FREEWAT is

FREEWAT is an HORIZON 2020 project financed by the EU Commission, aiming at promoting water resource management through innovative ICT tools and participatory approach.

Main result of the project is the free and open-source FREEWAT software: a QGIS integrated environment, where several simulation codes, based on the hydrological cycle, hydrochemical or economic-social processes, are integrated in a unique GIS project for conjunctive use of surface- & groundwater.

This Policy Brief is part of series of seven whose goal is to illustrate the FREEWAT approach and achievements.



The FREEWAT project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement n. 642224.



Identifying needs/priorities concerning ICT tools for Water Resource Management

A questionnaire was distributed to about 250 public and private stakeholders, receiving a complete response from 70 of them. On this basis, a set of relevant information was collected from various sectors dealing with Water Resource Management (WRM).



% of replying entities by type of institutions.

Legend:

res: research; rba: river basin authority; epa: environmental protection agency; wat: water utility; gov: ministry or similar; loca: local authorities involved in water management; geco: geoenvironmental company; oth: other.

7 groups of needs for ICT tools in WRM

Needs were classified in 7 groups:

- 1. Assessing conjunctive use of ground- and surface-water and the impact of agricultural activities
- 2. Sustainable management of groundwater
- 3. Analysis of impact of groundwater withdrawals
- 4. Understanding the impact of human infrastructures on sustainable water management
- 5. Preventing pollution of water wells, including heavy metals (mine waste sites) and old military, industrial activities
- 6. Simulating flows and water balances and analysing river/aquifer interactions
- 7. Managed Aquifer Recharge (MAR) design and operational management
- 8. Societal impact of sustainable water management

All these needs broadly relate to ICT tools for increasing knowledge on the natural availability of the water resource. They also point out the needs of ICT tools based on data that allow rigorous and robust analysis for managing the impact of human activities on the water resource. Needs particularly focus on groundwater resource management – a hidden resource.



% of replying stakeholder by main area of interest.

Legend:

wamt – technical water management; waq – water quality; wap – water policies; rem – contaminated site remediation; wall – all of the above; woth – other.



Number of replying entities by Country.





Priorities and EU Regulations

The survey allowed to identify the following priorities, namely the most relevant WRM issues to be addressed by using advanced ICT tools. They are:

- a) water management in rural areas (with special attention on nutrient management and related surface water and groundwater contamination);
- b) prevention of seawater intrusion (including the identification of the salinization front and countermeasures through optimization of pumping and artificial recharge of aquifers);
- c) identification of areas for artificial recharge (including recharge of treated wastewater);
- d) sustainable groundwater management and the implementation of European policies related to groundwater;
- e) analysis of contaminants fate and transport in order to prevent and/or remediate groundwater;
- f) smart water balance calculations distributed in space and time, with special attention to climate extremes (floods and droughts).

A useful information about these priorities is their link with EU Directives and Regulations dealing with WRM. To this extent, the most ranked regulations are the following:

- ✓ Water Framework Directive 2000/60/EC (and in particular Article 16 Strategies against pollution of water and Annex II 2. Groundwater 2.1 Initial characterization).
- ✓ Groundwater Directive 2006/118/EC.
- ✓ Nitrates Directive 91/676/EEC Code(s) of good agricultural practice, designation of vulnerable zones, Action Plans.

Status of skills in GIS and modelling

Which is the number of experts at your institution dealing with Geographic Information Systems and modelling tools for WRM?

This was the question posed to reflect the status of skills and expertise related to the use of ICT tools and their application in WRM.

While GIS tools can be considered as routinely used in technical units, more advanced tools are rarely used, thus diminishing the value of expensive data collection actions. In the FREEWAT project, this information led to targeted capacity building actions (especially for public bodies) to increase skills in using ICT tools. These actions will help addressing the challenge of ICT- and data-driven decision making in WRM in next years.

Number of experts in GIS at each institution.



Number of experts in hydrological modelling at each institution.





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The H2020 FREEWAT approach will support these requests and increase capacity in the use of advanced ICT

Stakeholders would appreciate multi-functional ICT tools able to manage spatial data incorporating modelling capabilities. The FREEWAT approach is then tailored to address the above mentioned WRM issues and to fulfil this requirement.

The following list summarizes the most ranked *desiderata* collected during the survey.

- Better estimation of actual water resources availability to improve WRM, e.g. locations of pumping wells, evaluation of the impact of alternative cropping systems, design of Managed Aquifer Recharge schemes, conjunctive use of ground- and surfacewater, irrigation planning.
- Simulate interactions between surface water and groundwater in terms of both water quantity and chemical quality.
- Simulation of seawater intrusion in coastal areas, including evaluation of the effects of Managed Aquifer Recharge schemes.
- Design of wellhead protection areas.



A sketch of tools included in FREEWAT.

- Modelling-based methodology for evaluating the efficiency of Action Programs related to Nitrates Directive implementation and CAP cross-compliance fulfilment.
- New user-friendly (intuitive) GIS-based modelling tools having the capability to input and process geological, hydrogeological, hydrochemical, hydrological, climate, land use and other related data for reliable modelling of land and water management.
- Tools for dealing with geothermal energy exploitation.

In this framework, stakeholders guess that the FREEWAT application can provide a valuable contribution towards the application of EU (and non-EU) policies, since it supports the following actions and achievements:

- increasing data value and making advanced tools (models) available to a wide public;
- 2. boosting capacity at various levels in the use of combined ICT tools;
- 3. supporting the application of WRM related policies;
- 4. supporting local dialogue among stakeholders thanks to a tool able to early identify conflicts in terms of water uses (drinking, agricultural, etc.).



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