



FREEWAT

Free and Open Source Software Tools for Water Resource Management
EU HORIZON 2020 Project



 **ict4water.eu**

Joining participatory approach and spatially-based modelling tools for groundwater resource management

Giovanna De Filippis, Iacopo Borsi, Laura Foglia, Massimiliano Cannata, Rotman Criollo, Enric Vázquez-Suné, Irena Kopač, Björn Panteleit, Pio Positano, Marco Saulo Nannucci, Manuel Sapiano, Daria Svidzinska, Mykhailo Grodzynskyi, Rudy Rossetto

EIP Water Online Market Place

Matchmaking for water Innovation

**MAR Solutions - Managed Aquifer
Recharge Strategies and Actions
(AG128)**



Water resource management and planning

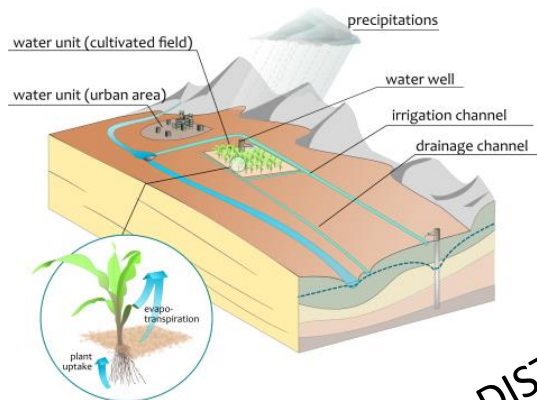
Although a lot of science is produced on Water Resource Management (WRM), especially in the ICT sector, **WRM is still today poorly addressed via scientific means**

REASONS

- underrated importance is given at political and decision-maker level
- low-capacity of the research environment to transfer the results to the real world
- missing capacities in using advanced digital tools at agencies and governing authorities

- ICT are complex tools, as high level of knowledge and computing skills are often required
- Often treated as “tricky games”
- Barriers to:
 - the uptake of existing and state-of—the-art technologies for water management
 - full data exploitation which at present often end up in...
 - ... data on paper or excel spreadsheet ...
 - ... so diminishing data values
- They have to be understood also by a non-technical audience
- Open ICT can then be a tool for shared WRM

What's FREEWAT



MODFLOW and Related
Programs (MT3DMS,
SEWAT, UCODE, etc.)

SPACE AND TIME DISTRIBUTED DATA

UPSCALING from
cell results

WATER
MANAGEMENT AND
PLANNING
MODULE

Rural water
management
module

Calibration
Sensitivity
Analysis
Parameter
estimation

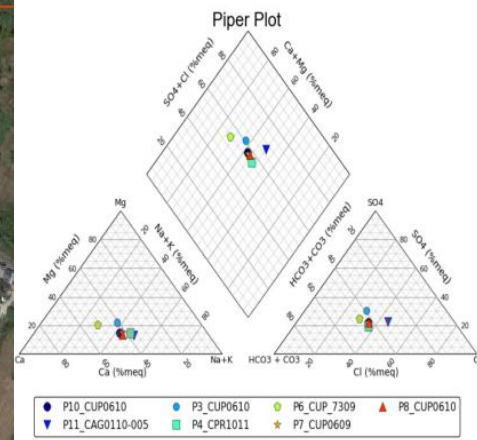
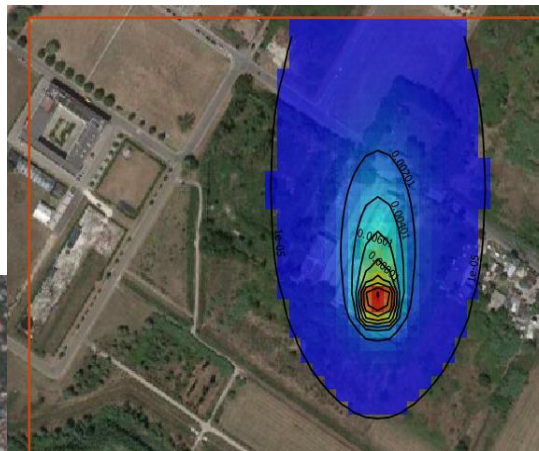
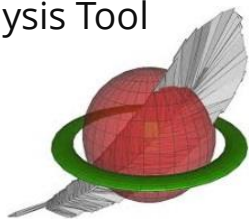
Water quality
issues
simulation and
analysis tools

Surface and
Groundwater
Flow Simulation

Observation
Analysis Tool



GIS AND
SPATIAL
DATABASE

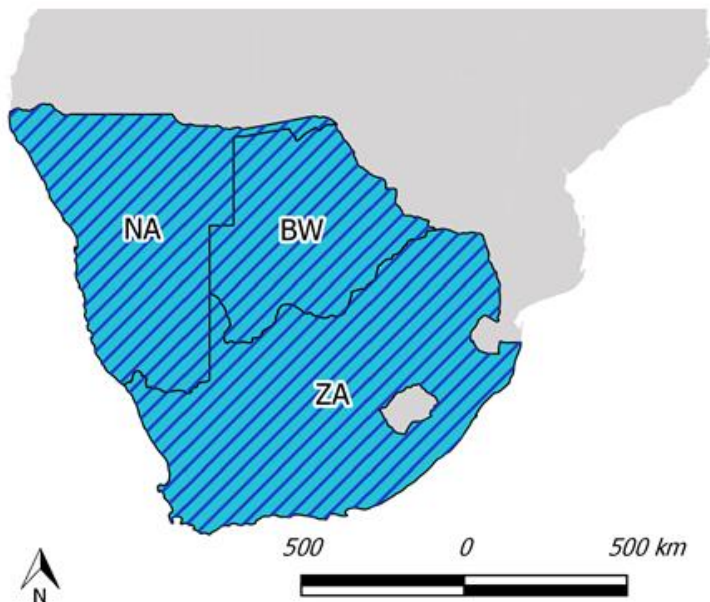
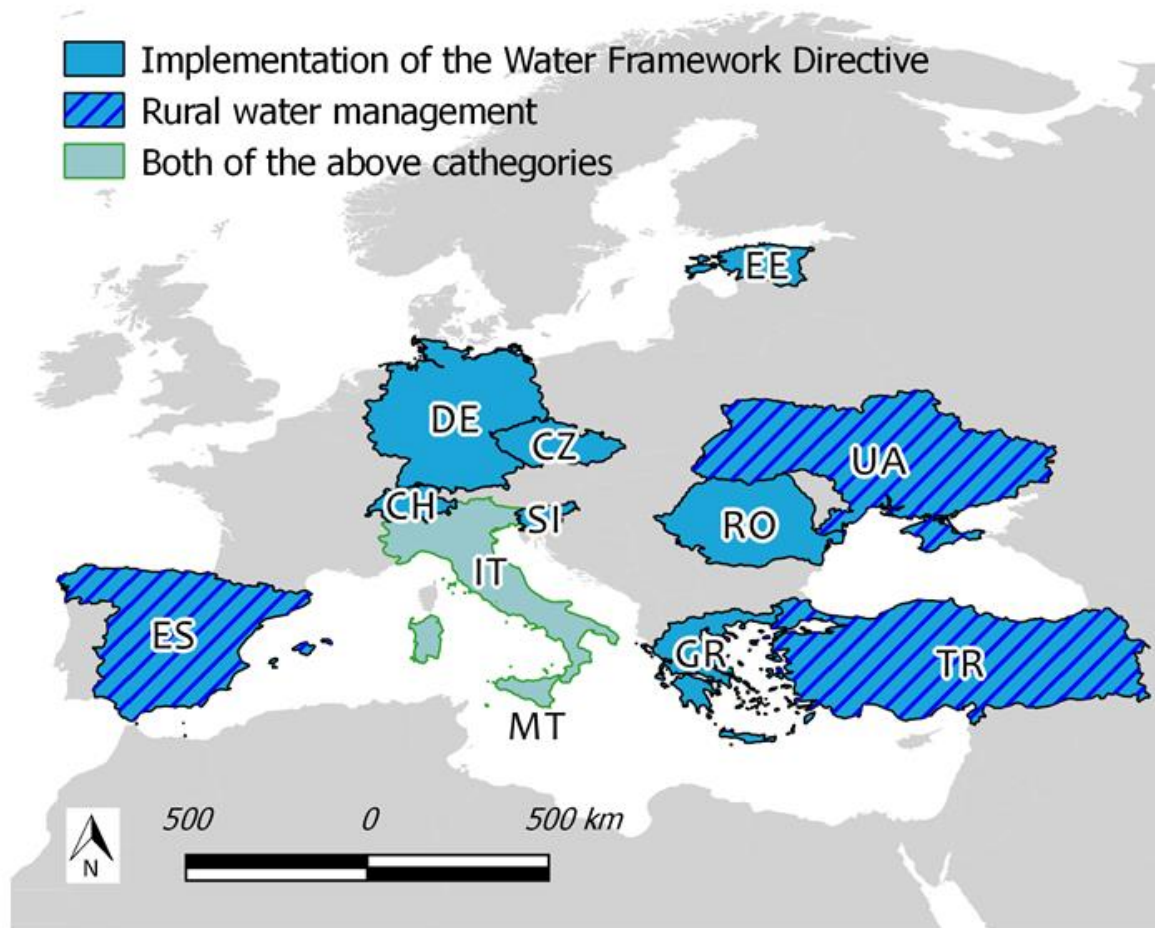


FREEWAT v.1.0.2
Free download at www.freewat.eu

FREEWAT case studies within a participatory approach/1



- Implementation of the Water Framework Directive
- Rural water management
- Both of the above categories



Running Focus Groups on ICT in water management

Type of stakeholder	Name of stakeholder
Local /governemnt	Regione Toscana
River Basin authority	Autorità di Bacino del Fiume Serchio
River Basin authority	Autorità di Bacino del Fiume Arno
Environmental Protection Agency	Agenzia Regionale di Protezione Ambientale Toscana
Land managers	Consorzio di Bonifica Toscana Nord
Municipality	Comune di Vecchiano
Water utility	ASA spa
Water utility	GAIA spa
	Ingegnerie Toscane
	Servizio idrologico Regionale
Natural area/protected area	Parco Naturale Regionale Migliarino S. Rossore Massaciuccoli
Farmer association	Confagricoltura
Farmer association	CIA
Farmer association	Coldiretti
Industrial association/Commerce Chamber	Camera di Commercio di Pisa, Camera di Commercio di Lucca
Environmental protection association	WWF
Environmental protection association	LIPU
Environmental protection association	Legambiente
Research	University of Pisa

Piano di Gestione delle Acque - I Aggiornamento

Schede Indirizzi Vincolanti

Misure vincolanti per le quali è affidata agli enti competenti l'individuazione modalità attuative

N. 19

Monitoraggio dei fabbisogni e degli utilizzi irrigui nel bacino del lago di Massa

N. 20

Monitoraggio delle coltivazioni nel bacino del lago di Massaciuccoli

N. 25

Individuazione delle modalità operative volte ad incentivare un uso sostenibile risorsa idrica nel bacino del lago di Massaciuccoli.

N. 36

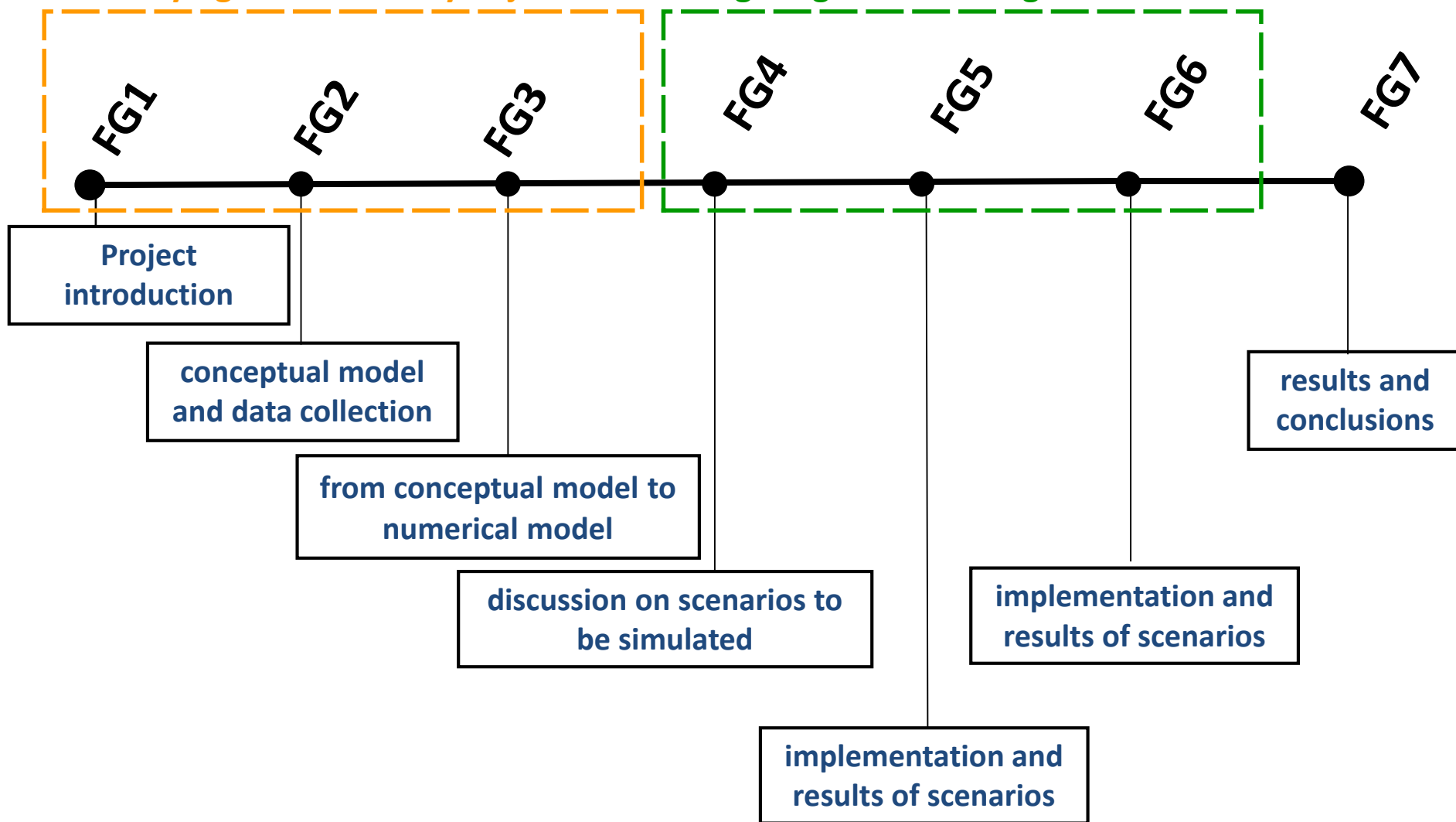
Approfondimenti del lago di Massaciuccoli



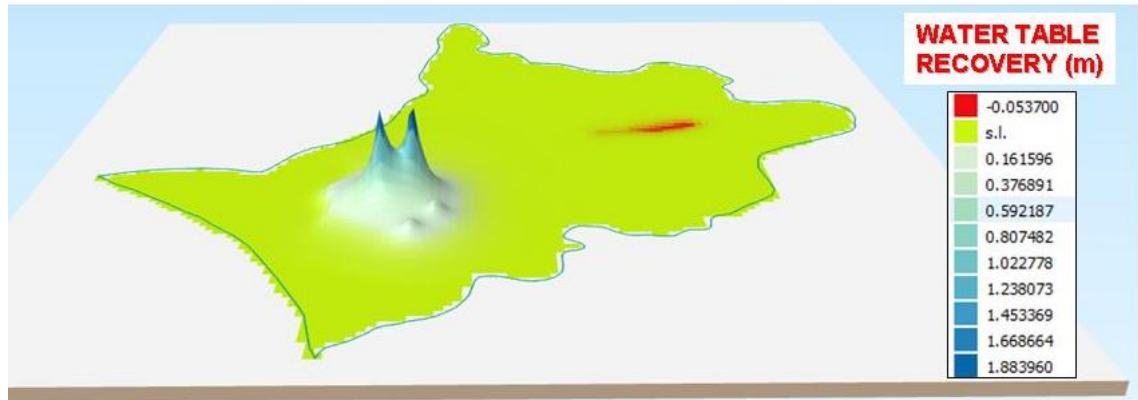
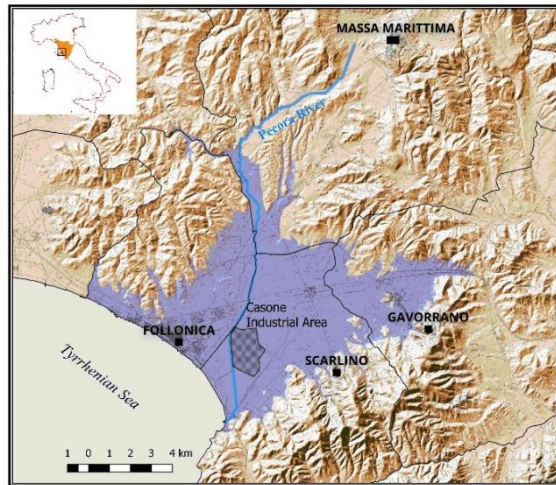
FREEWAT case studies within a participatory approach/2

identifying the case study objectives

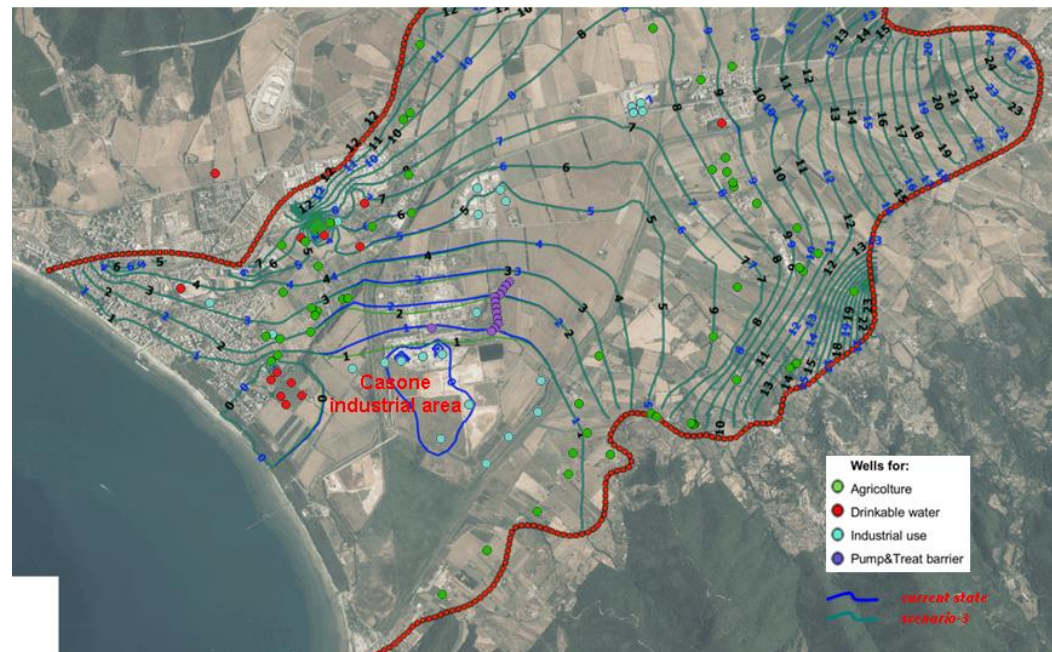
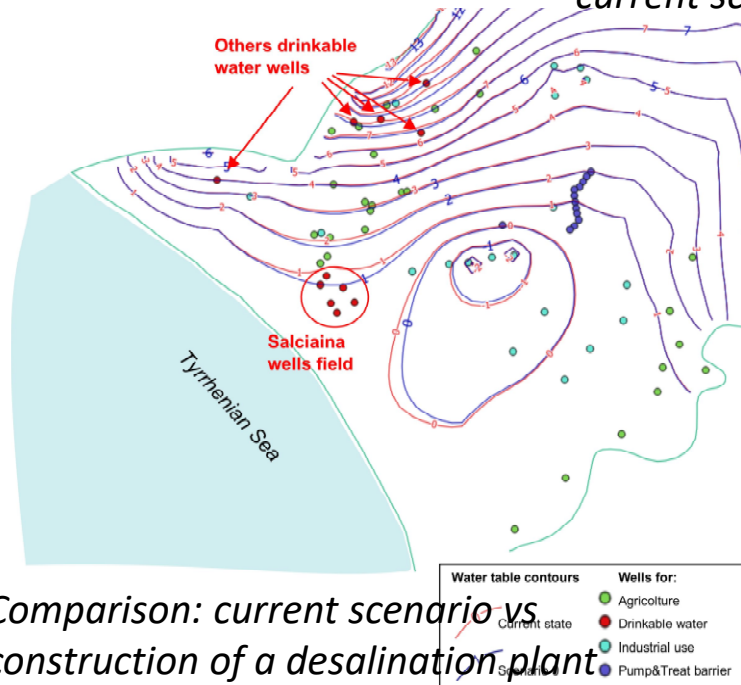
targeting water management issues

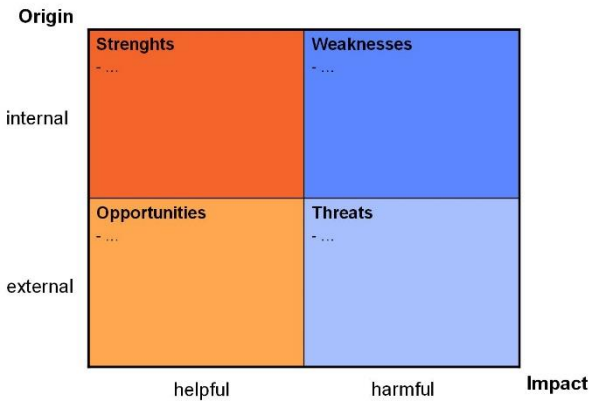


Over-exploitation of the Follonica-Scarlinto aquifer (Italy)



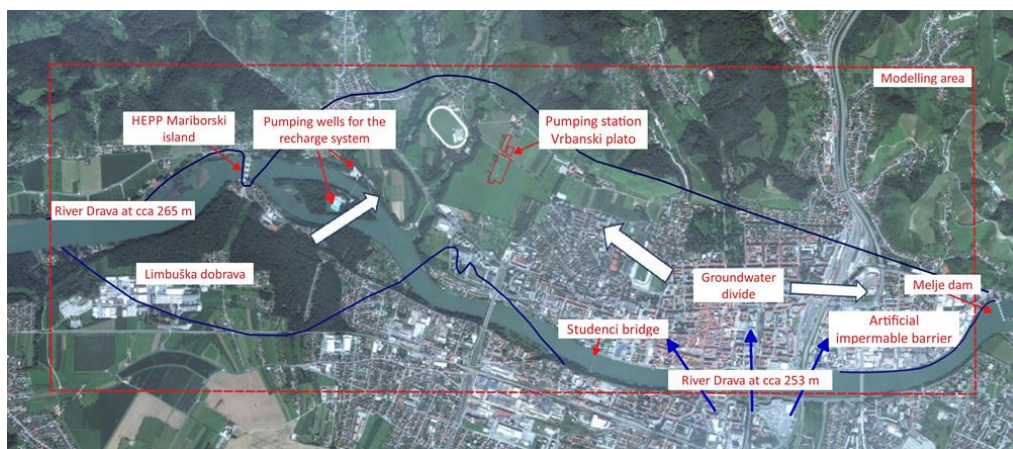
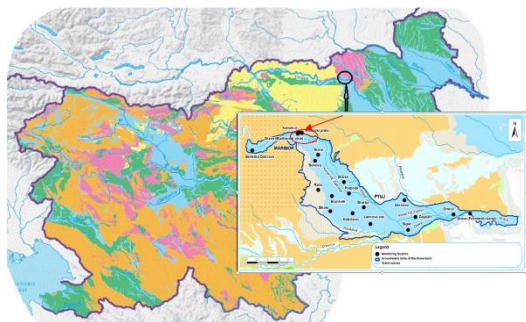
Top – Water table recovery for the second scenario; Bottom - Comparison: current scenario vs re-use of Gavorrano mine drainage water





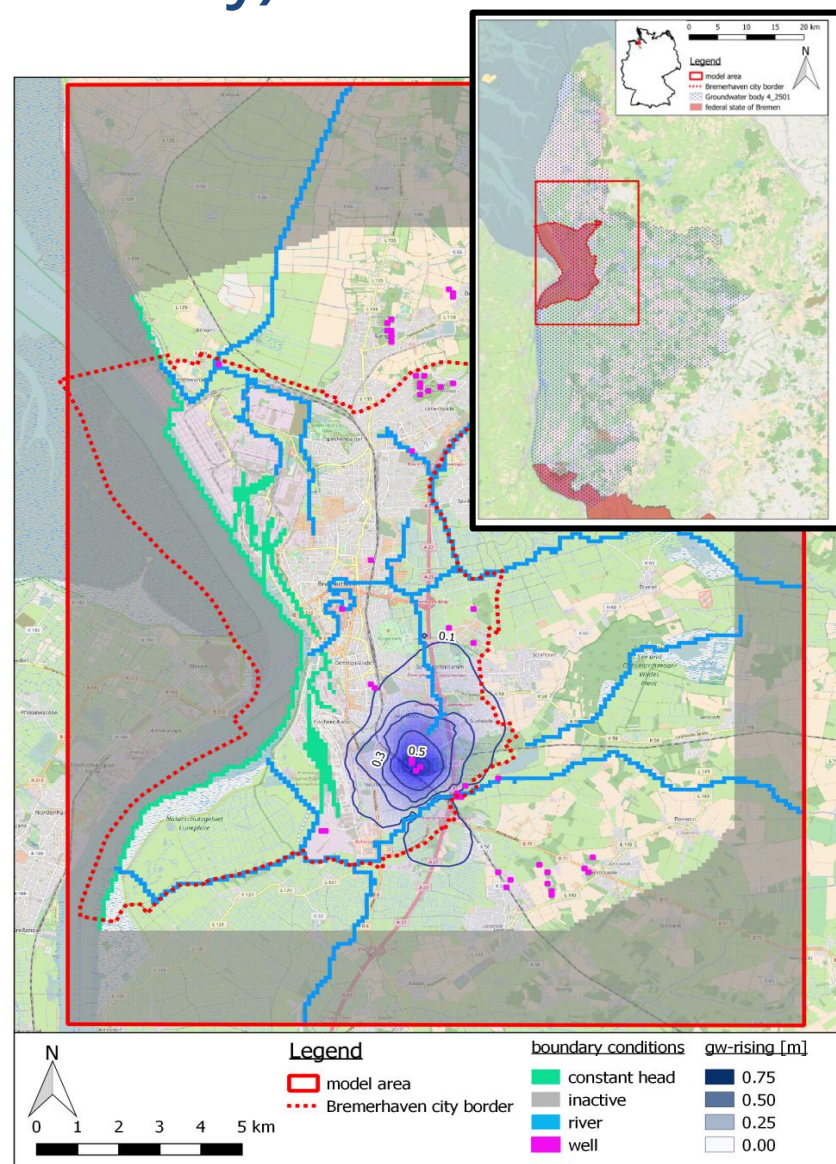
- The 2nd scenario is a starting point to increase opportunities for productive activities in a very responsible manner for the society and the environment
- FREEWAT is a useful tool to improve the knowledge of a study area or a problem and to organize and share data
- The participatory approach was useful to grow up the importance of water resource management and planning

Management of a MAR plant at Vrbansky plato (Slovenia) and impacts of climate change at Bremerhaven (Germany)

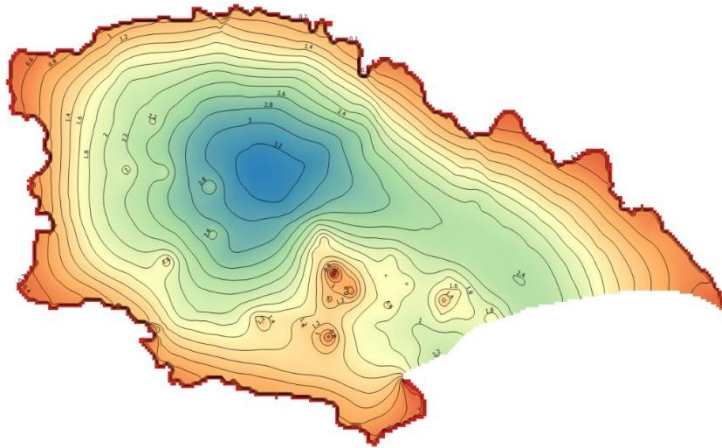


Induced Riverbank Filtration plant at Vrbansky plato

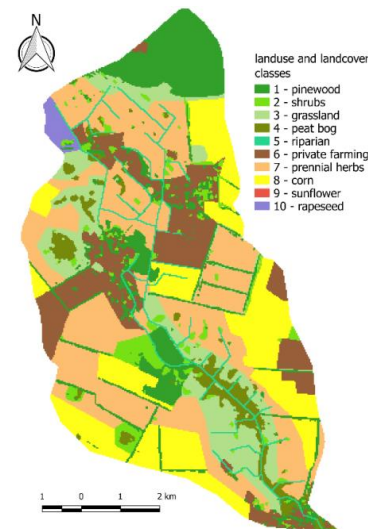
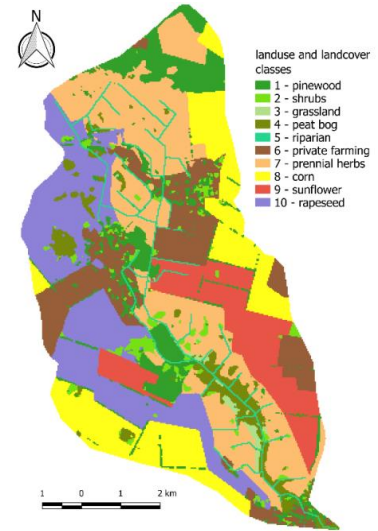
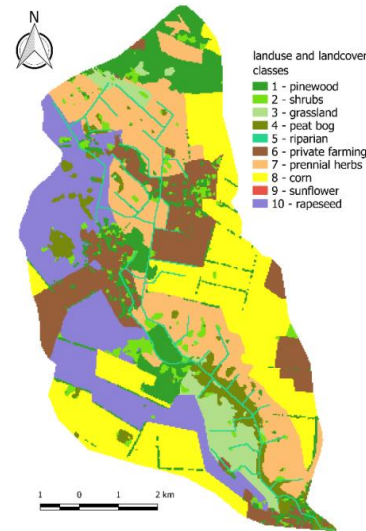
Water level increase after shifting the waterworks of “Bremerhaven Wulsdorf” →



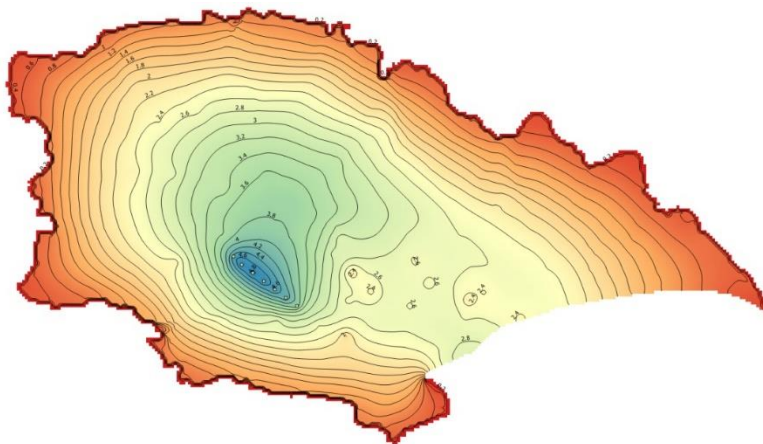
Management of the mean sea level aquifer of the Gozo island (Malta) and optimizing water use at the Bakumivka river basin (Ukraine)



Simulated hydraulic head at the Gozo island under current conditions



Landcover configurations for three scenarios simulated within the Bakumivka area



Simulated hydraulic head at the Gozo island after setting in place a MAR plant

Conclusions/1

- Combining technical work and stakeholder involvement in River Basin Management Plan is fundamental for WRM
- OPEN and FREE ICT tools may offer relevant opportunities in running this combined activities (i.e., from the point of view that models can be easily shared)
- Public authorities have the chance to build high informative and dynamically growing SHARED representation of hydrologic systems where performing planning analysis



Conclusions/2

- Demonstration of FREEWAT capabilities to a range of water-related problems to address requirements of EU Directives and National regulations for water resource management
- Positive and successful methodology based on the participatory approach
- Increased understanding in water management issues, creating a common space to generate a shared knowledge on the value of water





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Thanks!



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Matchmaking for water Innovation

**MAR Solutions - Managed Aquifer
Recharge Strategies and Actions
(AG128)**



WIRE
Water & Irrigated agriculture Resilient Europe
EIP Water Action Group
Pooling resources - innovating water