



FREEWAT

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



 **ict4water.eu**

11th January 2018

Connected Smart Cities Conference 2018 – Bruxelles

Natural Resources: Digital Water and Beyond

Going digital in Water Resource Management: the H2020 FREEWAT project results

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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 digital capacity at agencies and governing authorities

Many countries are now producing water related data:

- in EU Countries case:

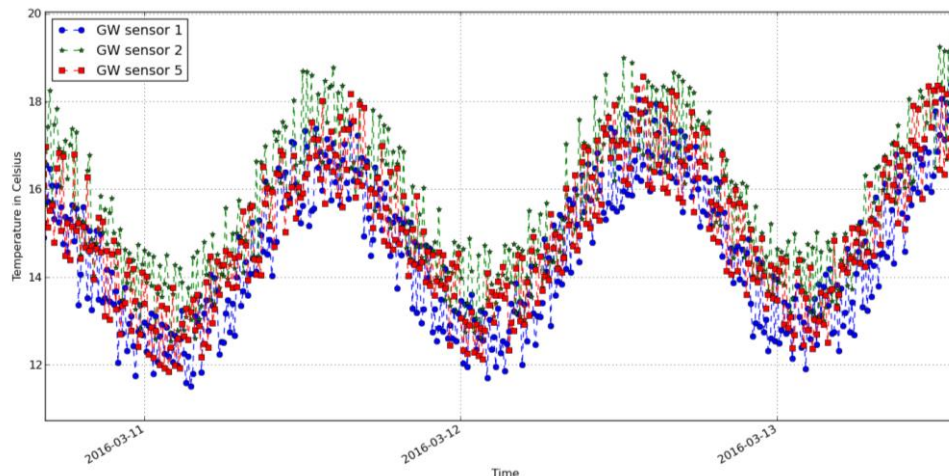
>>>>> *massive amount of data*

- in developing Countries

>>>>> *less data are available*

Actions	idsgw_1	date	time	level	temperature	ph	ces
Edit Delete	4968	2015-04-22	09:26:24	8.01714	9.68442	1	489.071
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Edit Delete	4972	2015-04-22	10:26:27	8.06777	9.70175	1	492.287
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Edit Delete	4976	2015-04-22	11:26:30	7.94677	9.63806	1	478.603
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Edit Delete	4980	2015-04-22	12:26:31	8.00855	9.718	1	477.45
Edit Delete	4981	2015-04-22	12:41:33	7.99031	9.69059	1	483.874

Information CONTENT of this data not fully exploited as today
ICT tools would allow





The H2020 FREEWAT project



FREEWAT (FREE and open source software tools for WATer resource management) is an ICT project for improving Water Resource Management (WRM)

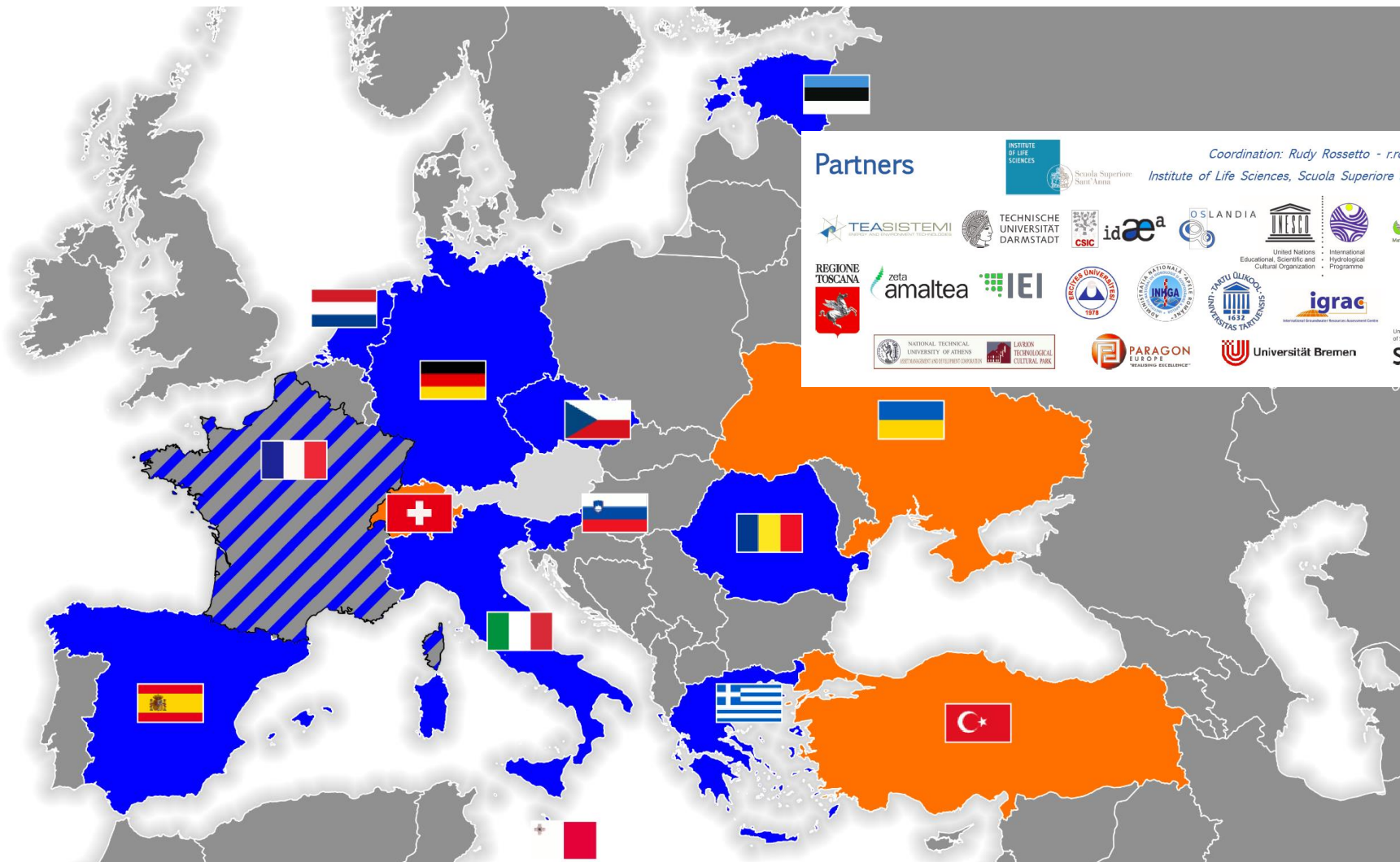
MAIN EXPECTED RESULT

Open source and public domain, GIS-integrated modelling platform for promoting WRM by simplifying and strengthening the application of WFD, GWD and other water related Directives

FREEWAT expected main impact →

help producing scientifically and technically sounding decision and policy making based on:

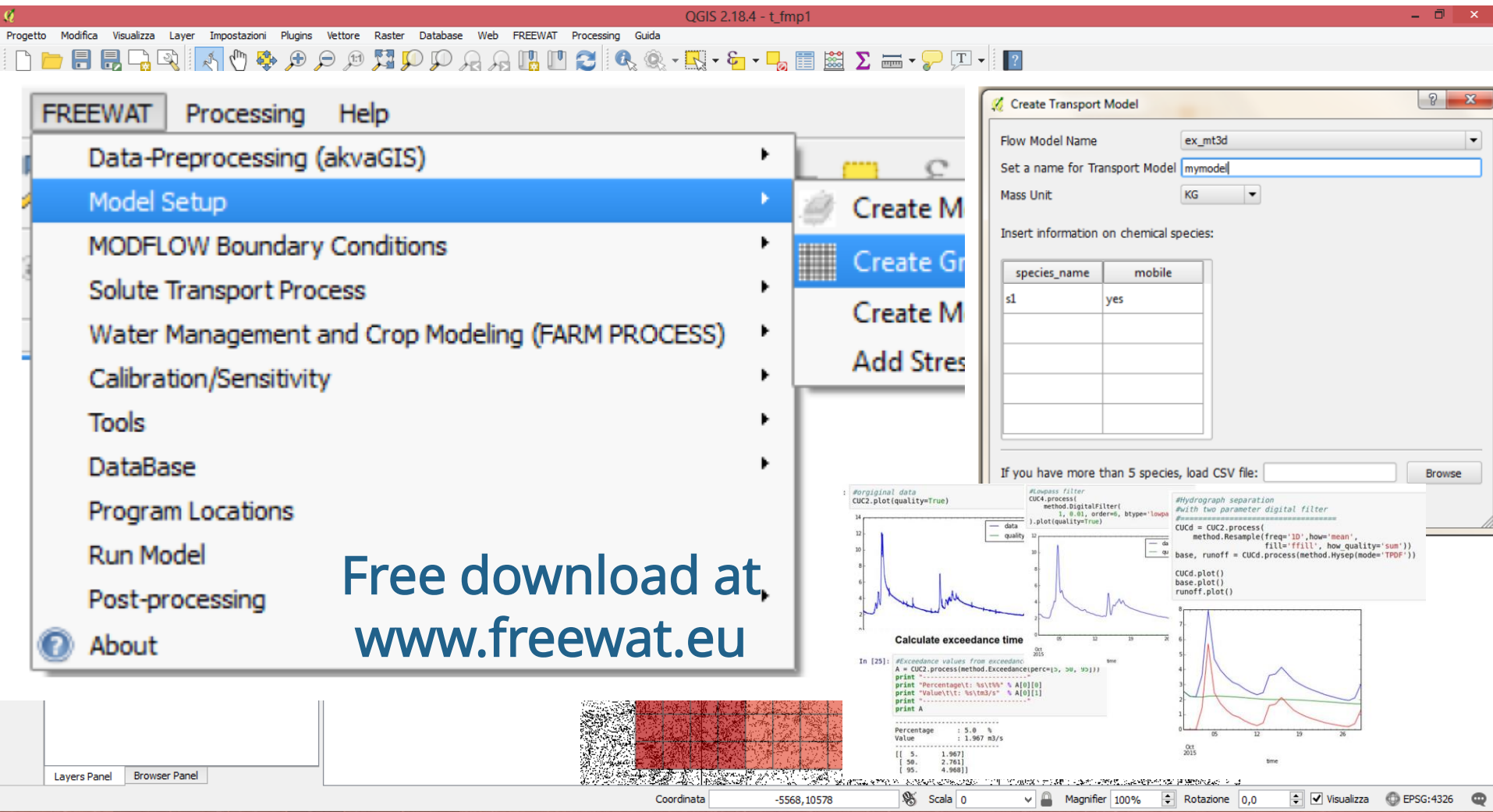
- data and innovative data analysis tools and
- including participatory approach



Partners



A QGIS integrated modelling environment in its v.1.0 age along with User Manuals and tutorials



QGIS 2.18.4 - t_fmp1

Progetto Modifica Visualizza Layer Impostazioni Plugins Vettore Raster Database Web FREEWAT Processing Guida

FREEWAT Processing Help

- Data-Preprocessing (akvaGIS)
- Model Setup**
- MODFLOW Boundary Conditions
- Solute Transport Process
- Water Management and Crop Modeling (FARM PROCESS)
- Calibration/Sensitivity
- Tools
- DataBase
- Program Locations
- Run Model
- Post-processing
- About

Create Transport Model

Flow Model Name: ex_mt3d

Set a name for Transport Model: mymodel

Mass Unit: KG

Insert information on chemical species:

species_name	mobile
s1	yes

If you have more than 5 species, load CSV file: Browse

```

#original data
CUC2.plot(quality=True)

#pass filter
CUC4.process(
    method.DigitalFilter(
        1, 0.01, order=0, btype='lopass'
    ).plot(quality=True)

#hydrograph separation
with two parameter digital filter
#-----
CUCd = CUC2.process(
    method.Resample(freq='1D', how='mean',
        fill='ffill', how_quality='sum'))
base, runoff = CUCd.process(method.Hysep(mode='TPDF'))
CUCd.plot()
base.plot()
runoff.plot()
    
```

Calculate exceedance time

```

In [25]: #Exceedance values from exceedance
A = CUC2.process(method.Exceedance(per=3, 30, 10))
print "-----"
print "Percentage: %s%%" % A[0][0]
print "Value[%s]: %s\tn3/s" % A[0][1]
print "-----"
print A
    
```

Percentage : 5.0 %
Value : 1.967 m3/s

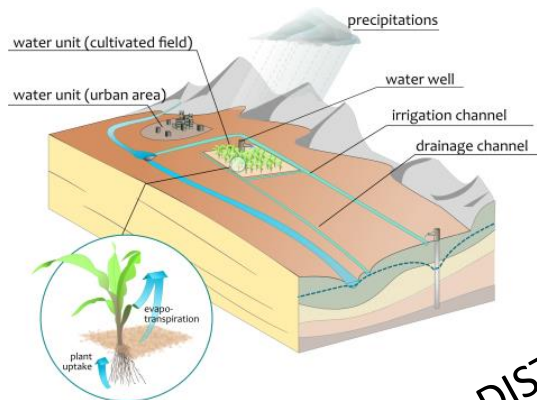
[[5. 1.967]
[50. 2.781]
[95. 4.968]]

Free download at www.freewat.eu

Layers Panel Browser Panel

Coordina -5568,10578 Scala 0 Magnifier 100% Rotazione 0,0 Visualizza EPSG:4326

FREEWAT architecture



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

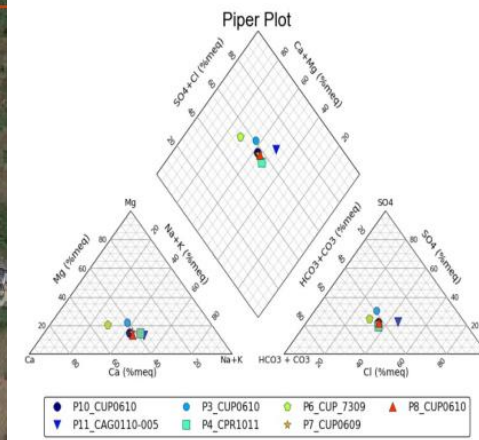
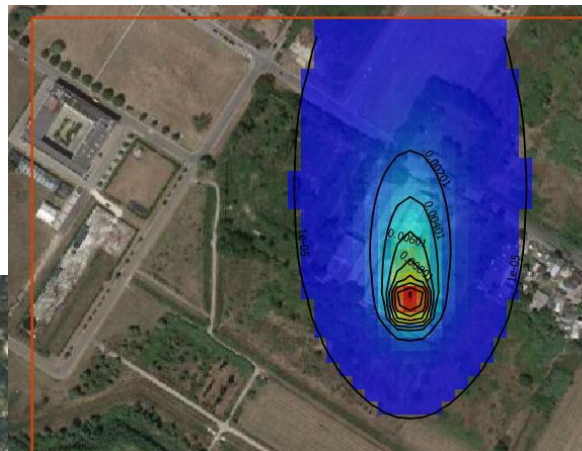
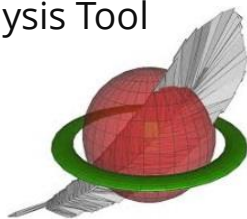
simulation and
analysis tools

Surface and
Groundwater
Flow Simulation

Observation
Analysis Tool



GIS AND
SPATIAL
DATABASE

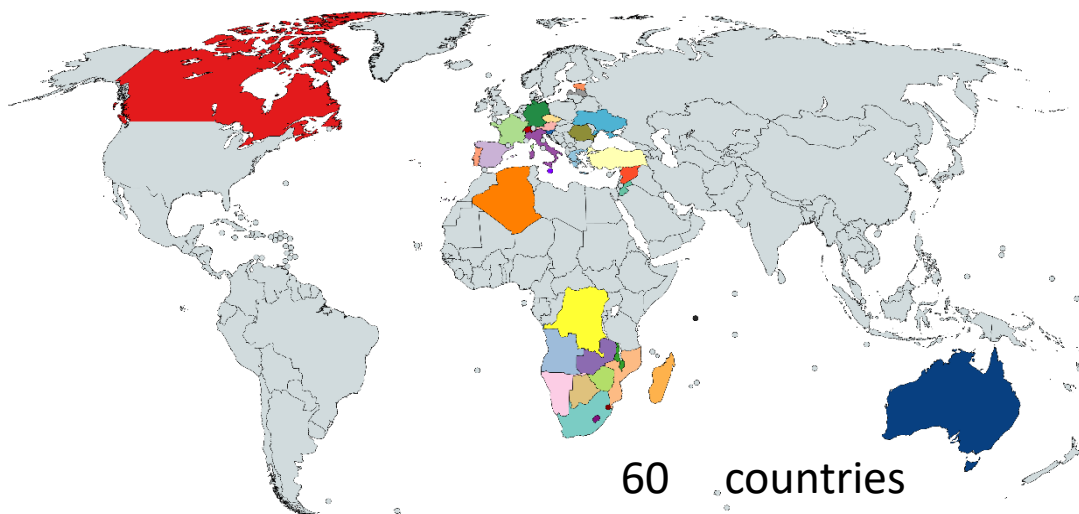


Large stakeholders involvement (>>>500 stakes involved)

Growing web social and professional networks

(linkedin group >700 followers – twitter: >865 followers @h2020freewat)

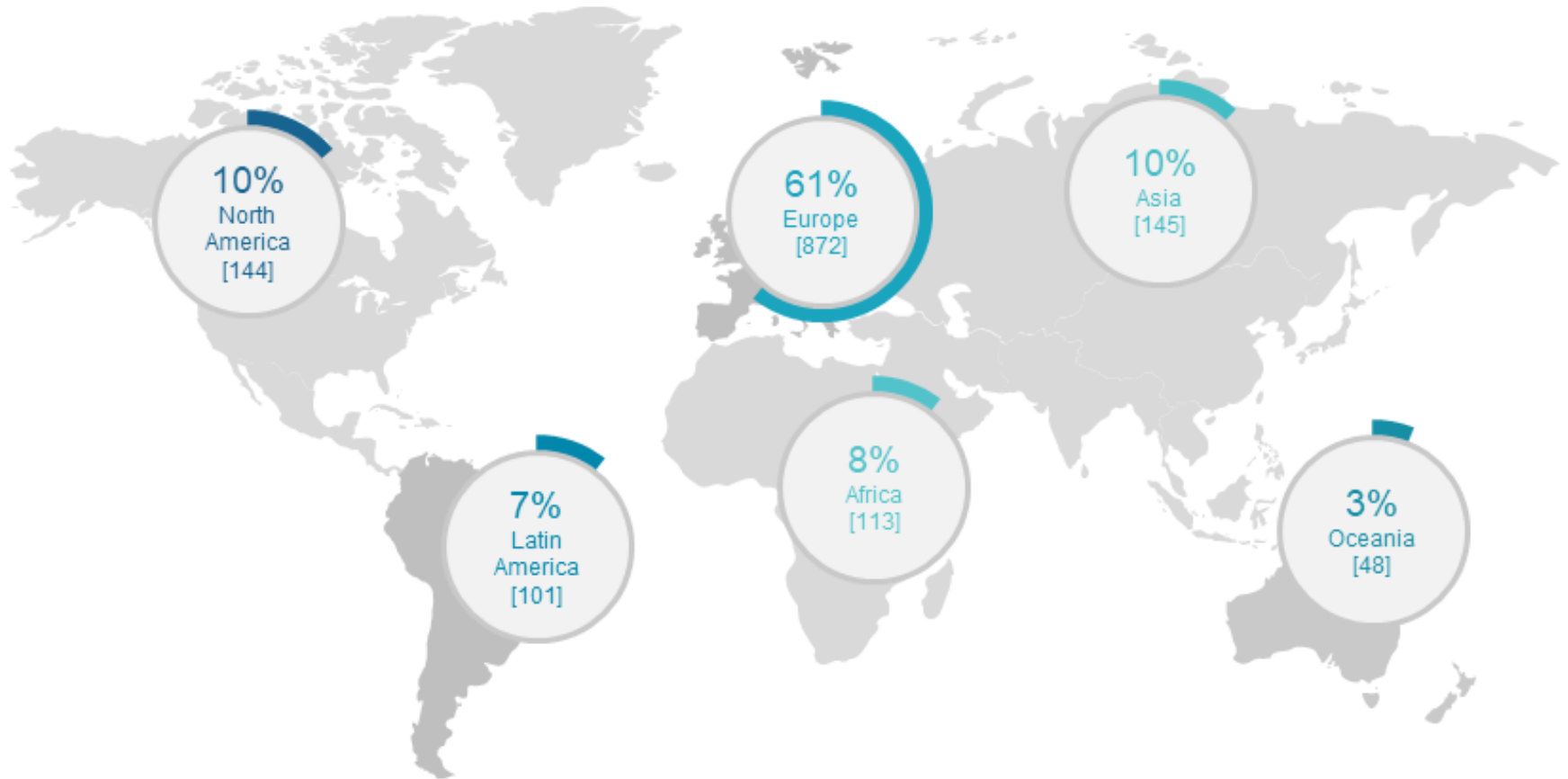
More than 3000 downloads so far (from 15th april 2017)



60 countries
1200 directly trained
400 institutions

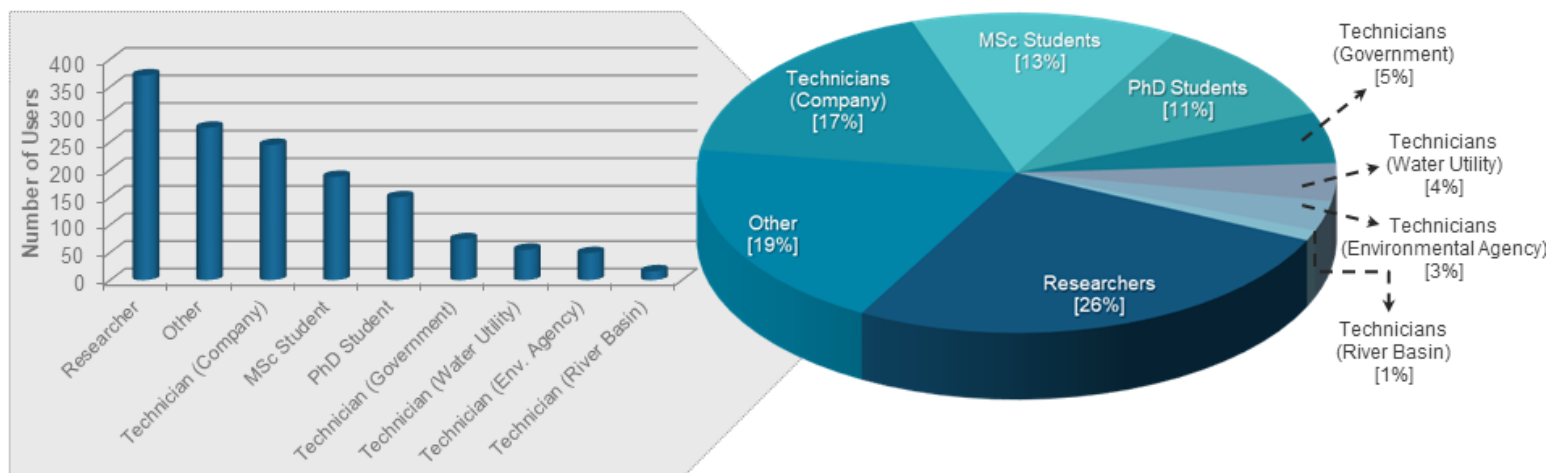


Downloads per continent

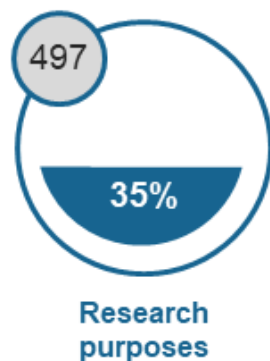


The state of the play/2

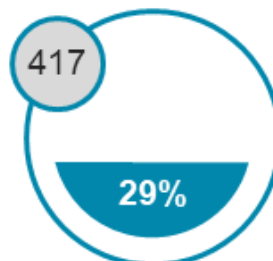
Role of FREEWAT Users



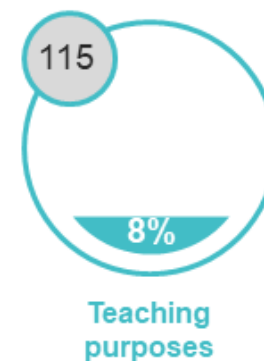
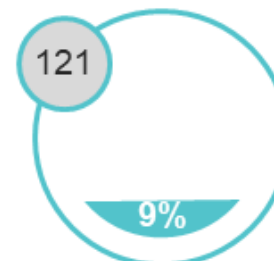
Download purposes



Only for getting training in modelling issues



Application in public authority work



FREEWAT case studies within a participatory approach

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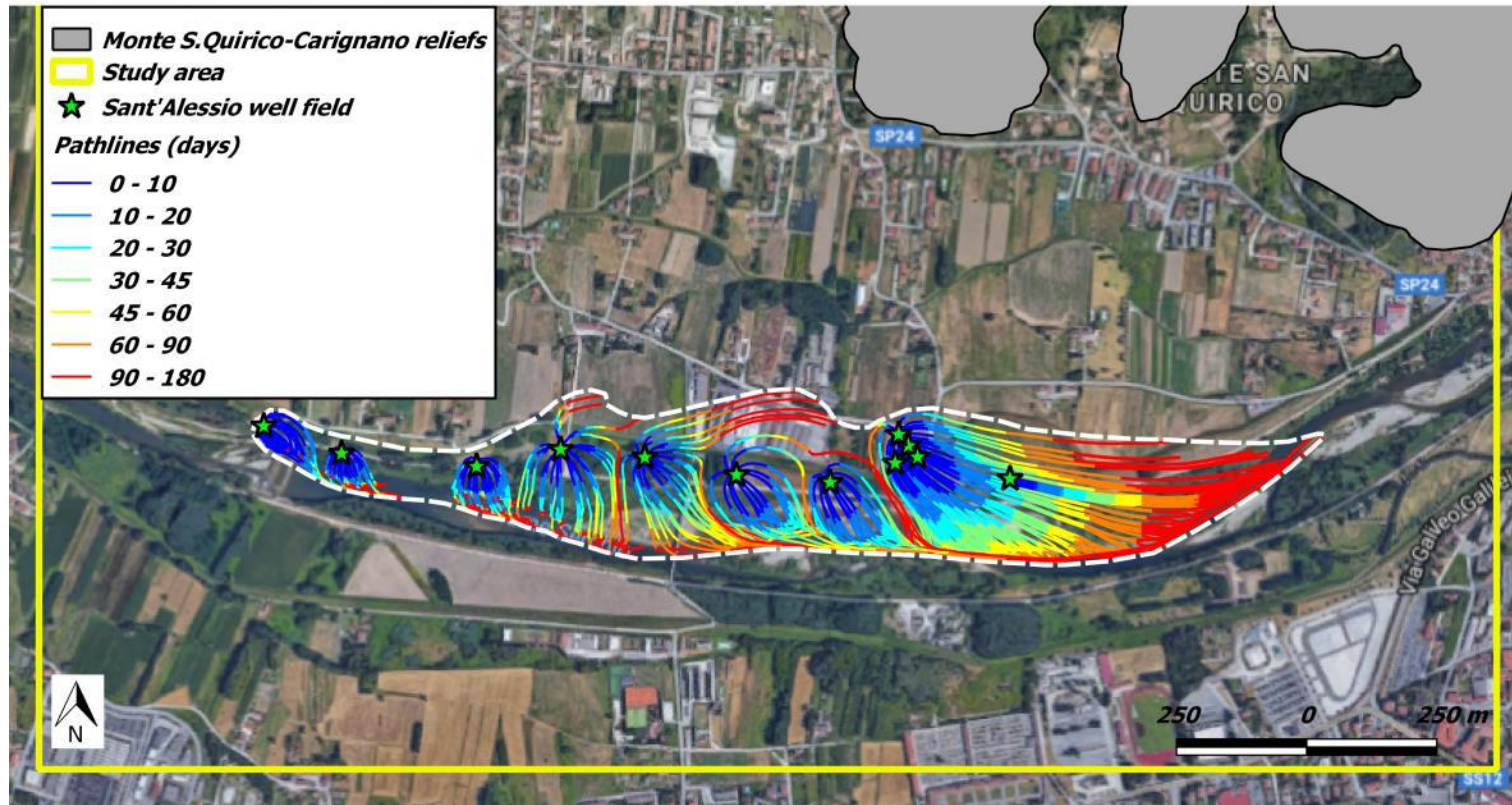
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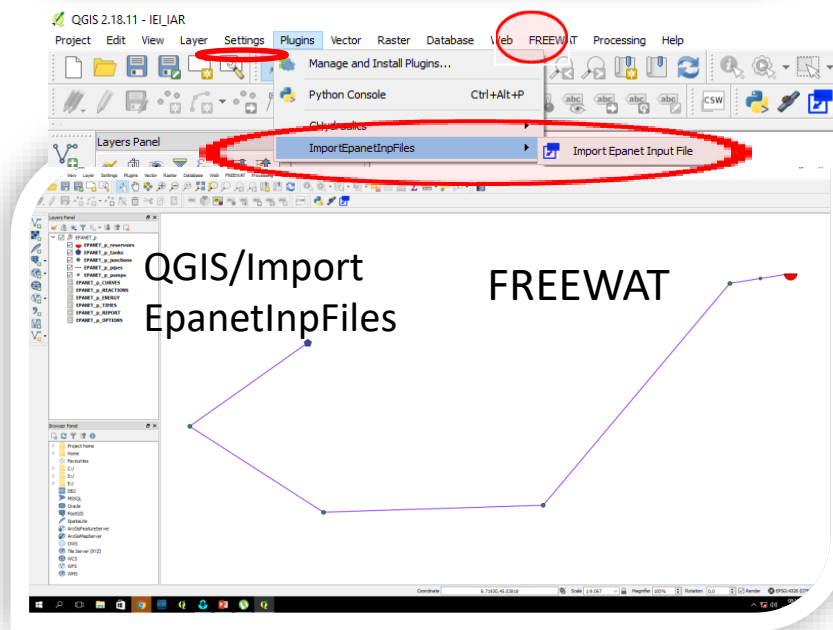
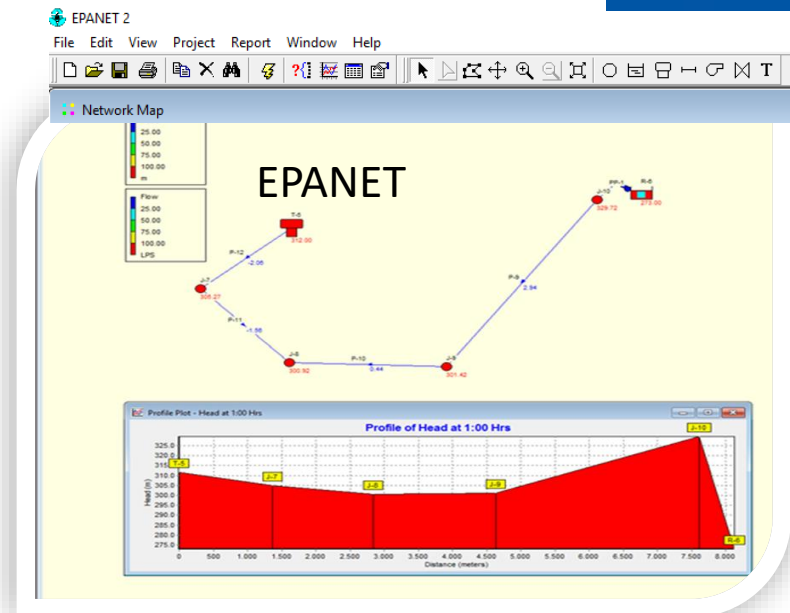
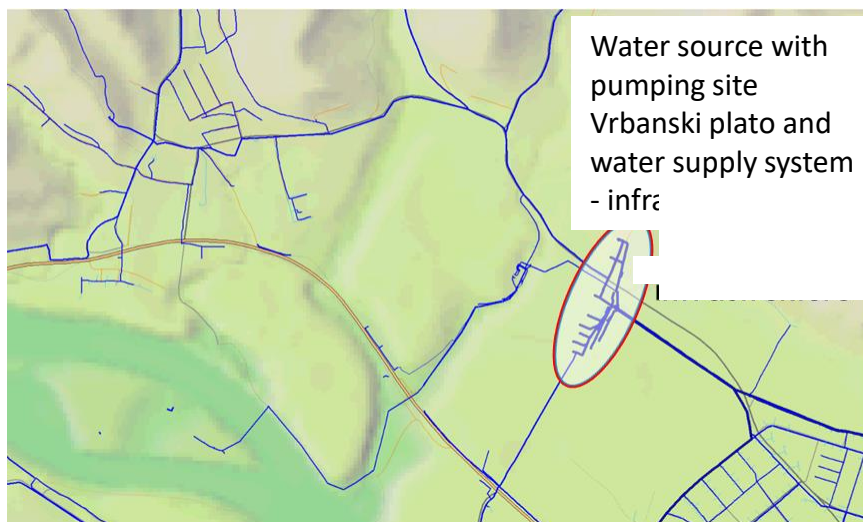
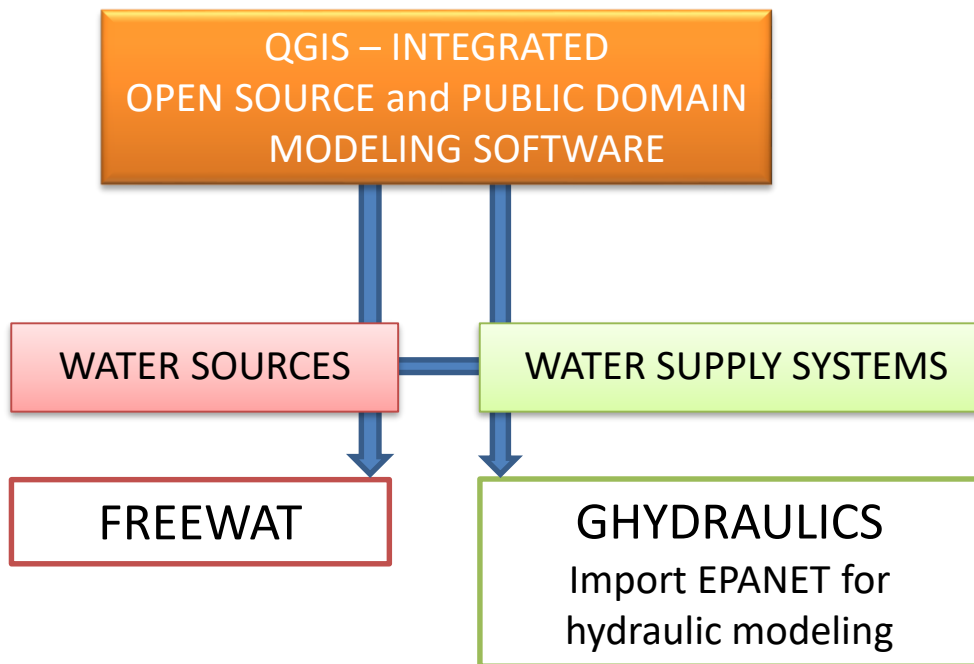
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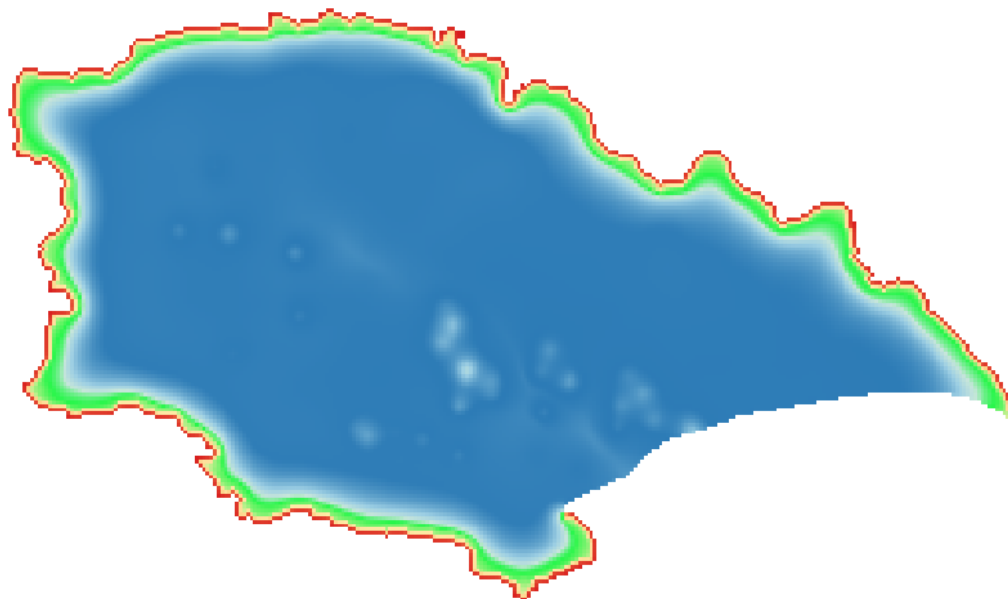
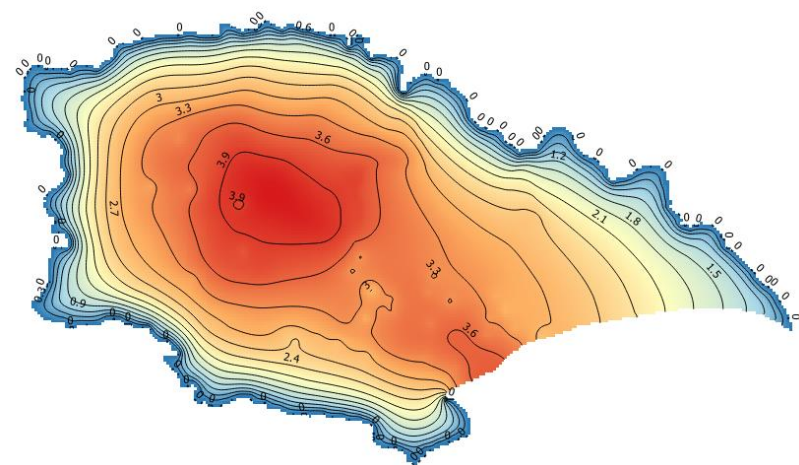
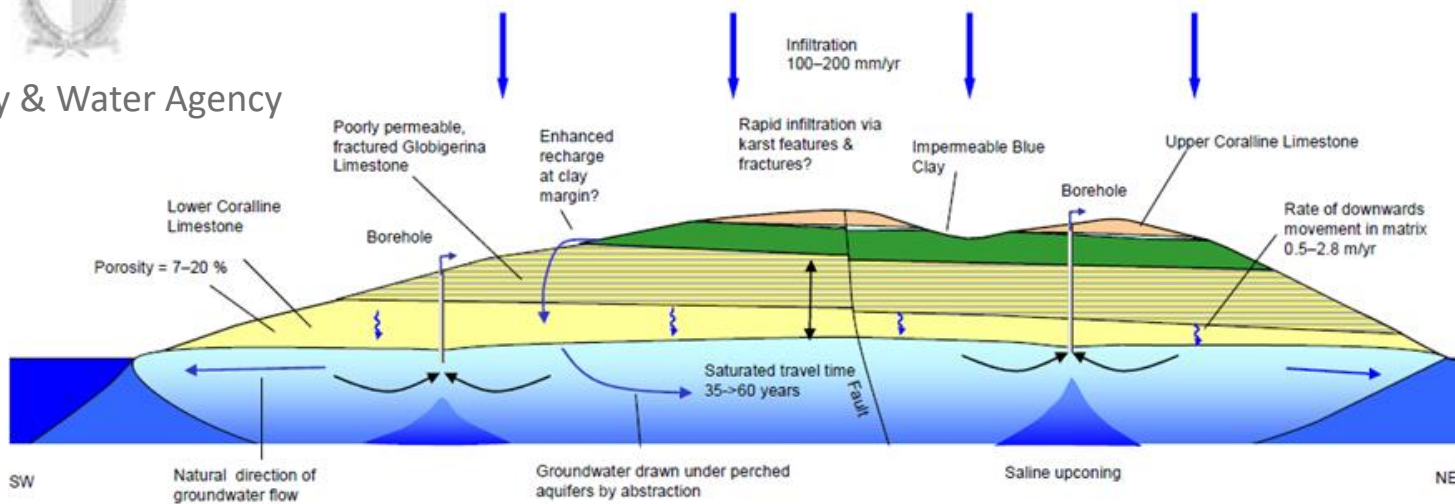
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GOZO mean sea level aquifer

The Energy & Water Agency



Conclusions



- Unite the power of GIS geo-processing and post-processing tools in spatial data analysis to that of simulation software
- Public authorities have the chance to build high informative and dynamically growing SHARED representation of hydrologic systems where performing planning analysis
- No cost for licences (money can be moved to development of client tailored applications>>>> new companies and jobs>>>SDG8)





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Thanks!



EIP Water Online Market Place
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