ABU DHABI SUSTAINABILITY WEEK

European Commission

EU-Gulf Water Innovation Knowledge Exchange

Going digital in GroundWater 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)

WIRE
Water & Irrigated agriculture Resilient Europe
EIP Water Action Group
Pooling resources – Innovating water

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

INTERNATIONAL WATER SUMMIT
PART OF ABU DHABI SUSTAINABILITY WEEK
15-18 JANUARY 2018
ABU DHABI NATIONAL EXHIBITION CENTRE

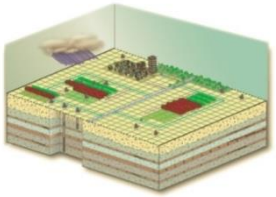
ict4water.eu

Hosted by Masdar A MUBADALA COMPANY
IRENA International Renewable Energy Agency
ZAYED FUTURE ENERGY PRIZE
WORLD FUTURE ENERGY SUMMIT
INTERNATIONAL WATER SUMMIT
ECO WASTE EXHIBITION
UAE Research Program for Rain Enhancement Science
WISER
The Student EXCLUSIVE
The Festival at Masdar City

WATER Nexus Research Group

@Institute of Life Sciences – Scuola Superiore Sant'Anna (Italy)

Devising innovative ways to sustainable water management developing theoretical and applied approaches bringing them to the real world



- *Development and application of innovative ICT tools for water management and governance*

- *The science and policy of water management in MED-areas*

- *Exploring green/blue infrastructures functions for the provision of water related agro-ecosystem services*

water is food water is jobs water is energy

A key factor in the development of job opportunities (SDG8)

- in its management (supply, wastewater treatment, etc.)
- in economic sectors that are heavily water-dependent such as agriculture, fishing, power, …

Good access to drinking water and sanitation (SDG6)

=

educated and healthy population

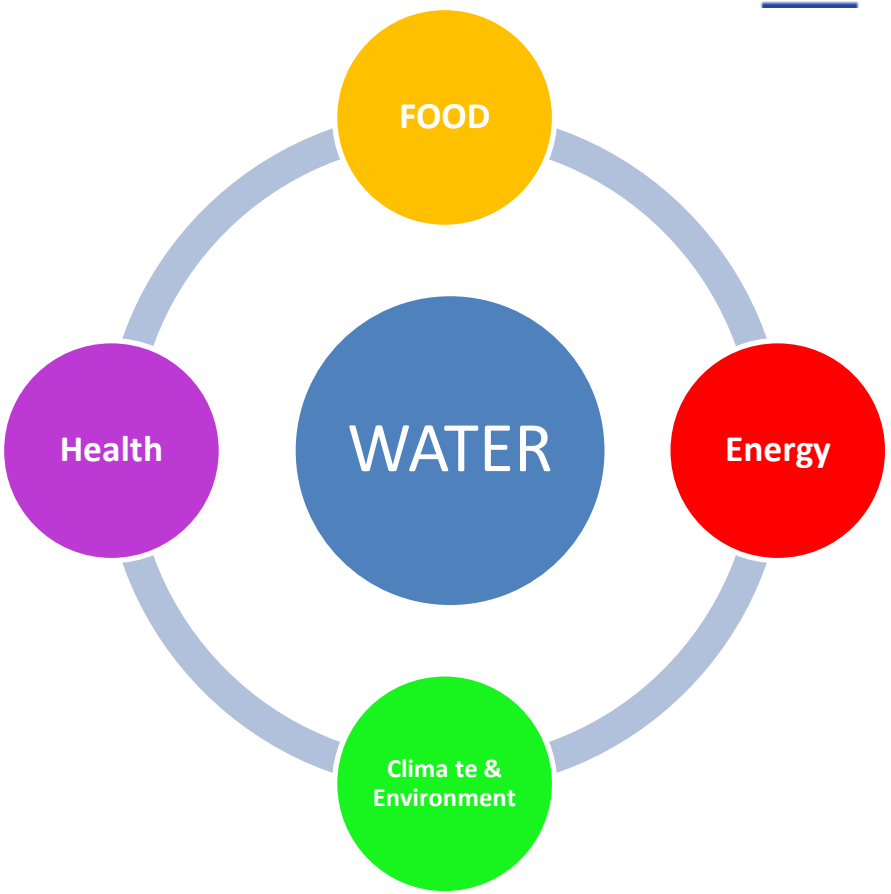
Water resource management

Roles and duties

Planning
Management

Tools

Regulations
Economic/financial tools
Technical tools



WATER WITHIN THE NEXUS

Water resource management

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

Water and data

Many countries are now producing water related data:

- in EU Countries case:

>>>>>> *massive amount of data*

- in developing Countries

>>>>> *less data are available*

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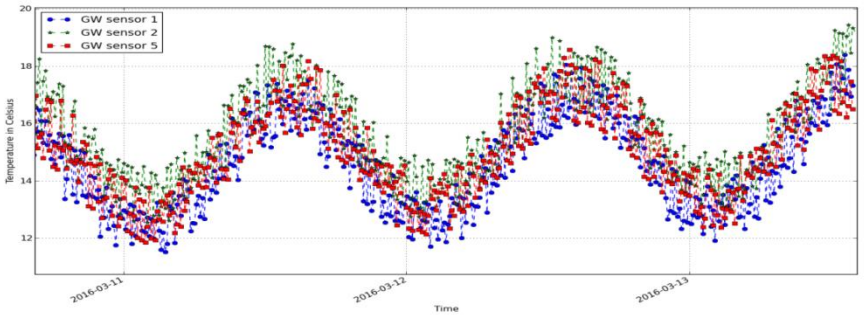


Information CONTENT of this data not fully exploited as today ICT tools would allow

The H2020 FREEWAT project

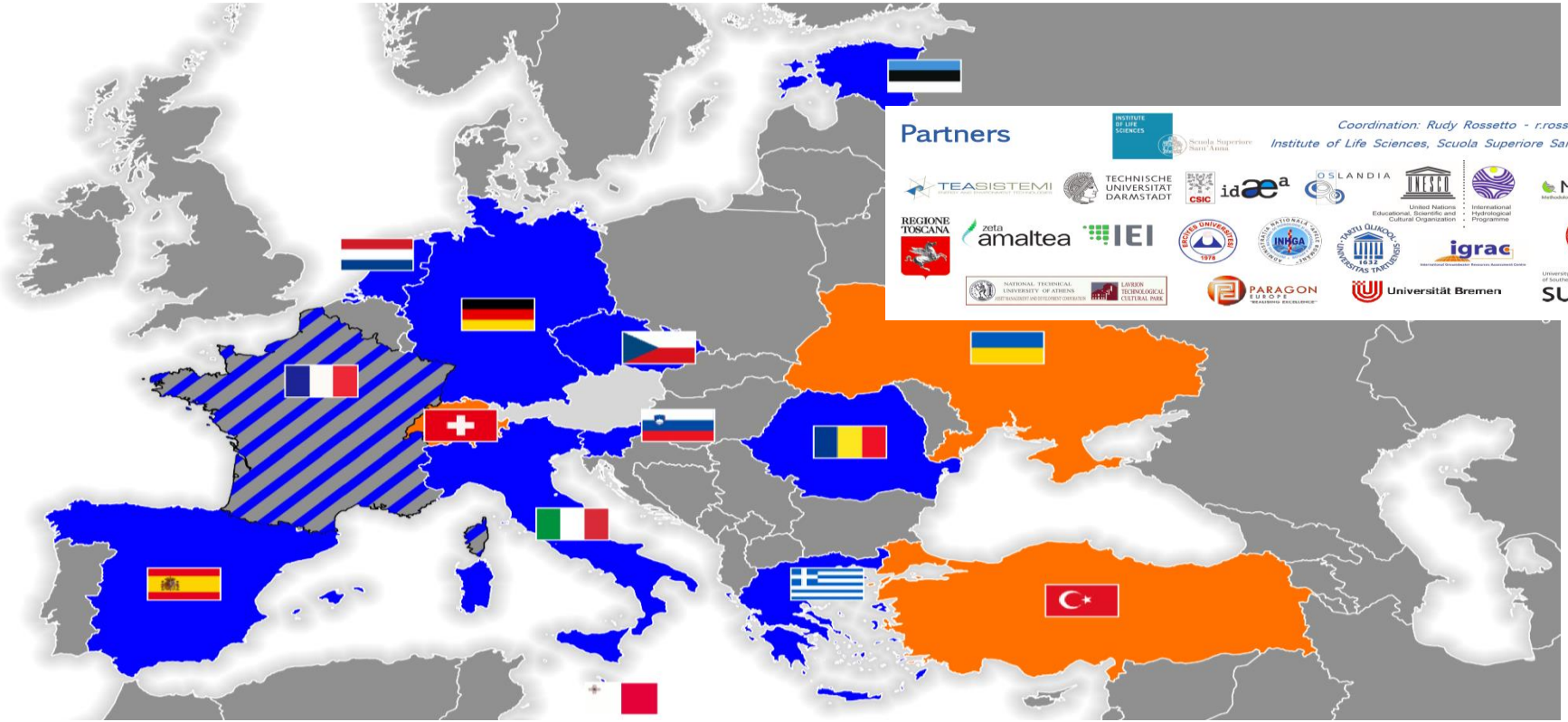
FREEWAT (FREE and open source software tools for WATer resource management) is the main result of a EU funded H2020 ICT project

Open source and **public domain**, **GIS-integrated modelling platform** for promoting WRM

FREEWAT may be used for:

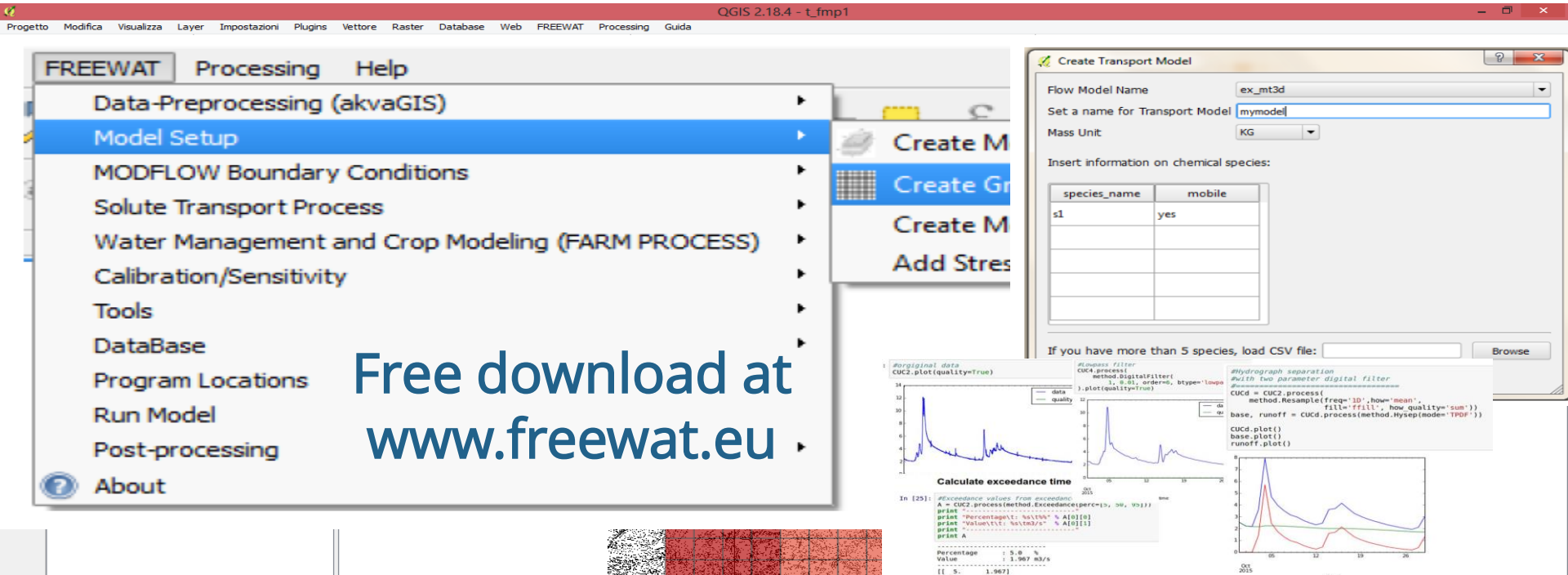
- **actively managing the groundwater resource**
- **managed aquifer recharge schemes**
- **aquifer remediation schemes and seawater intrusion management…**

FREEWAT Consortium



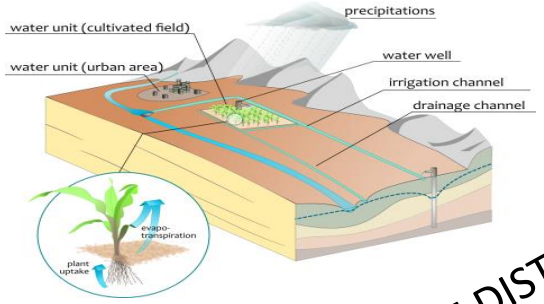
WHAT IS FREEWAT TODAY?

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



FREEWAT architecture

FREEWAT



SPACE AND TIME DISTRIBUTED DATA

USGS science for a changing world

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

UPSCALING from cell results

WATER MANAGEMENT AN PLANNING MODULE

FloPy3

Observation Analysis Tool

Surface and Groundwater Flow Simulation

Water quality simulation and analysis tools

Rural water management module

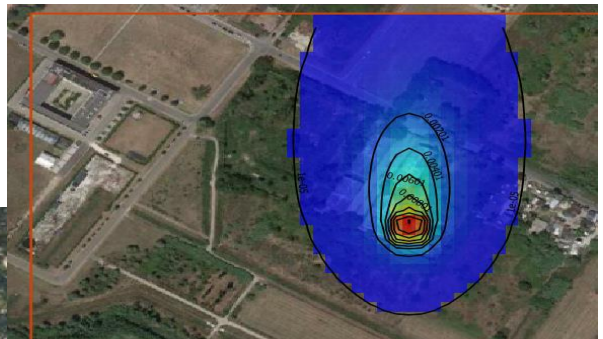
Calibration

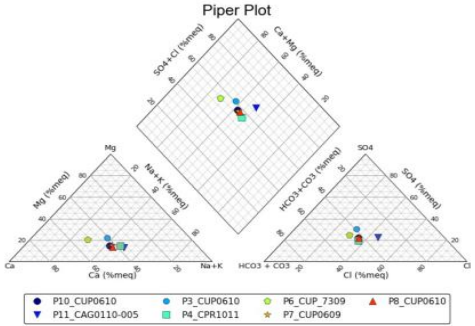
Sensitivity Analysis

Parameter estimation

python

GIS AND SPATIAL DATABASE



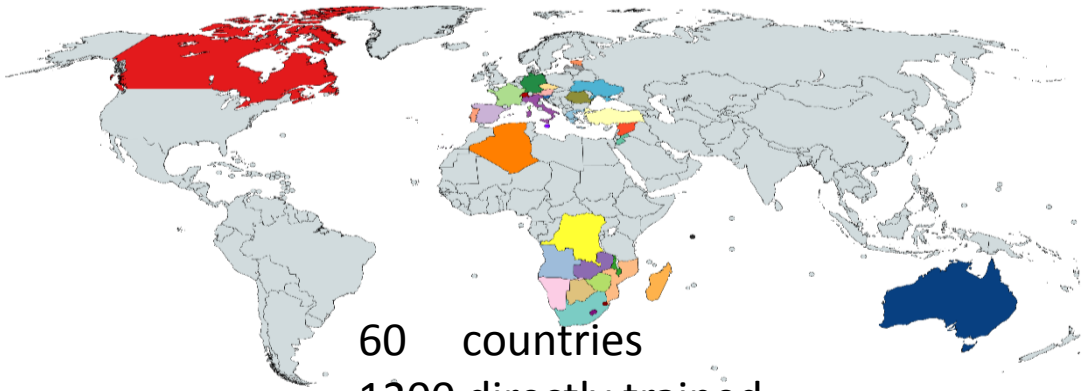


FREEWAT capacity building

Large stakeholders involvement (>>>500 stakes involved)

Growing web social and professional networks

(linkedin group >700 followers – twitter: >940 followers @h2020freewat)



60 countries
1200 directly trained
400 institutions

TUTORIALS AVAILABLE so far...

Groundwater modelling exercises (3 tutorials)

AkvaGIS tutorial (Hydrogeological and Hydrochemical Analysis Tools)

Calibration and parameter estimation

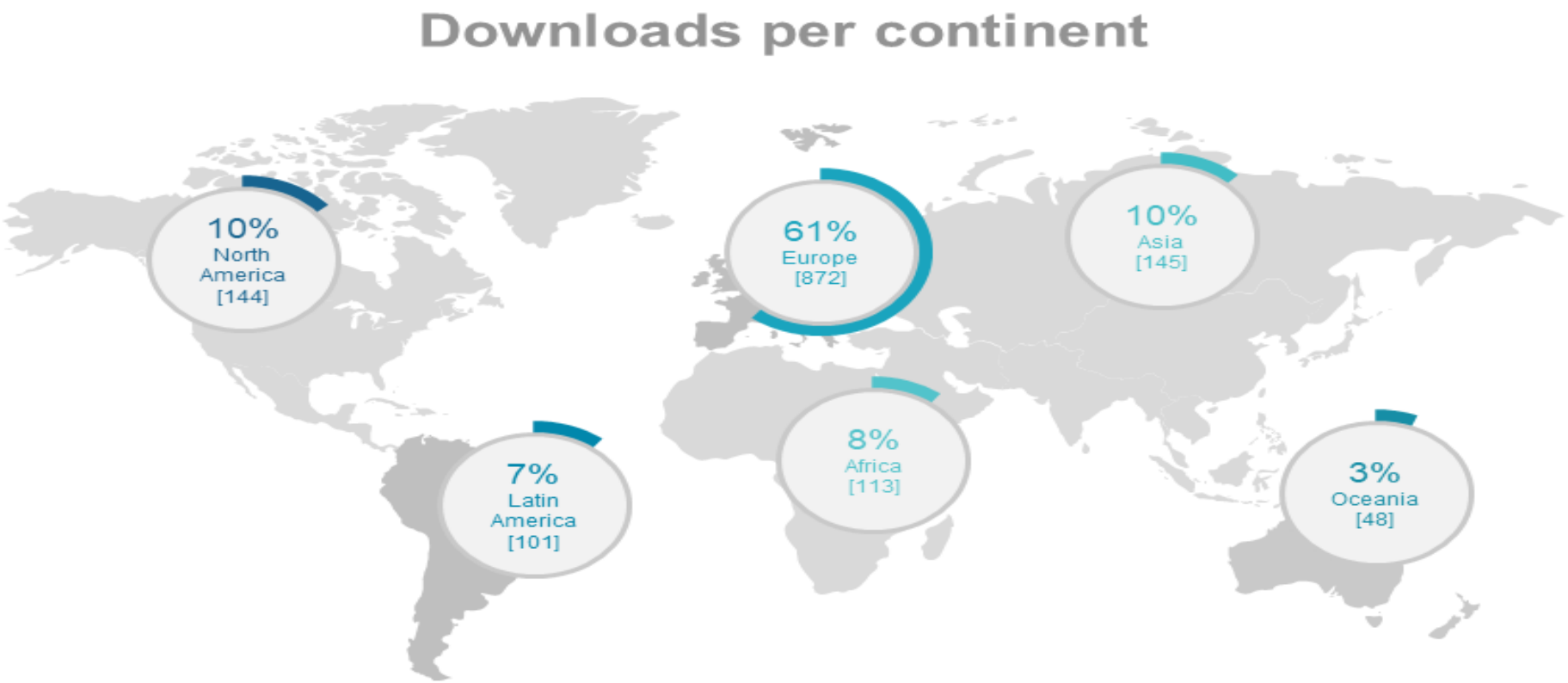
Unsaturated zone solute transport (2 tutorials)

Seawater intrusion

Water Resource Management in Rural Environment

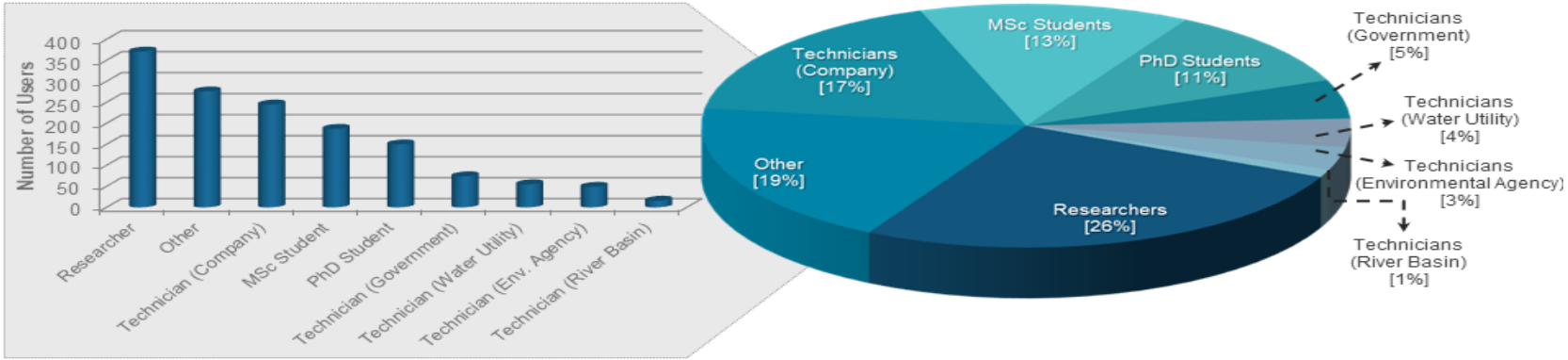
Observation Analysis Tools (OAT)

The state of the play/1



The state of the play/2

Role of FREEWAT Users



Download purposes

497
35%
Research purposes

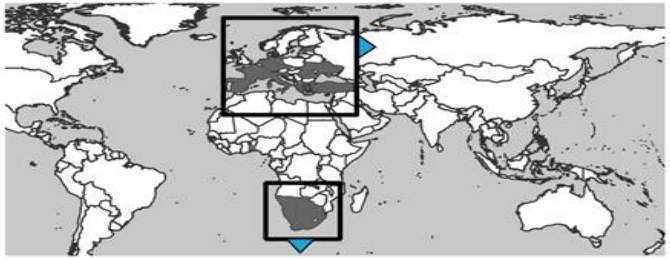
Only for getting training in modelling issues
417
29%

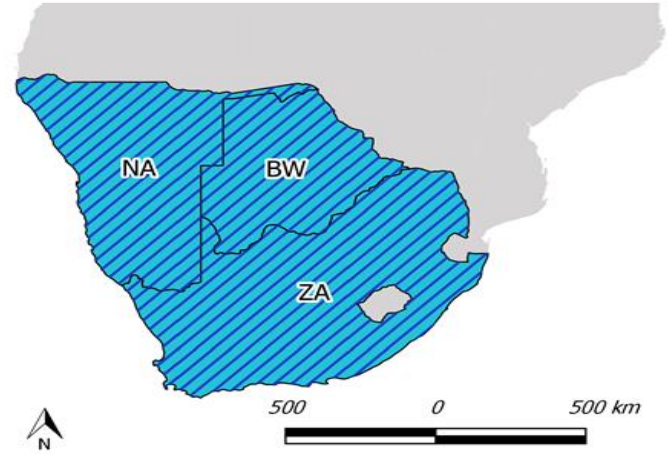
271
19%
Professional consultancy work

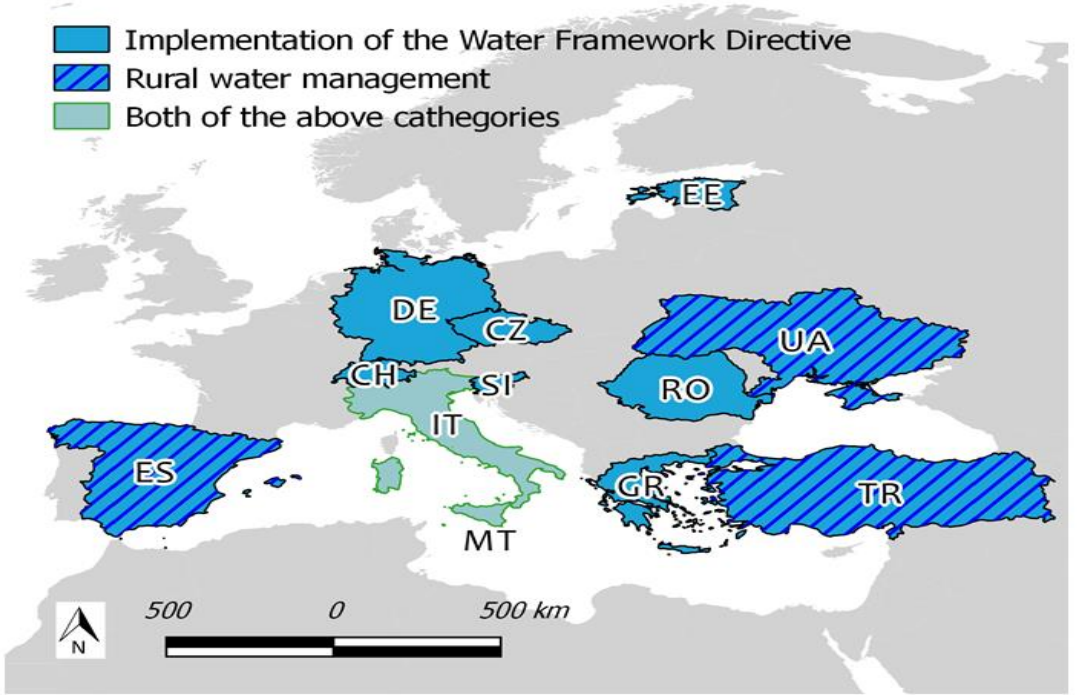
Application in public authority work
121
9%

115
8%
Teaching purposes

FREEWAT case studies

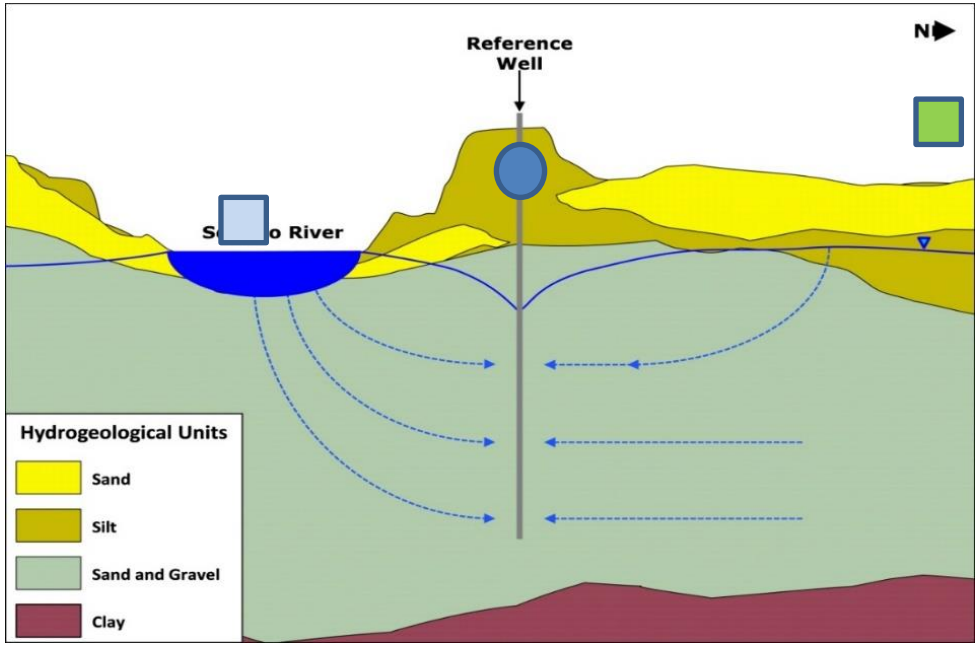


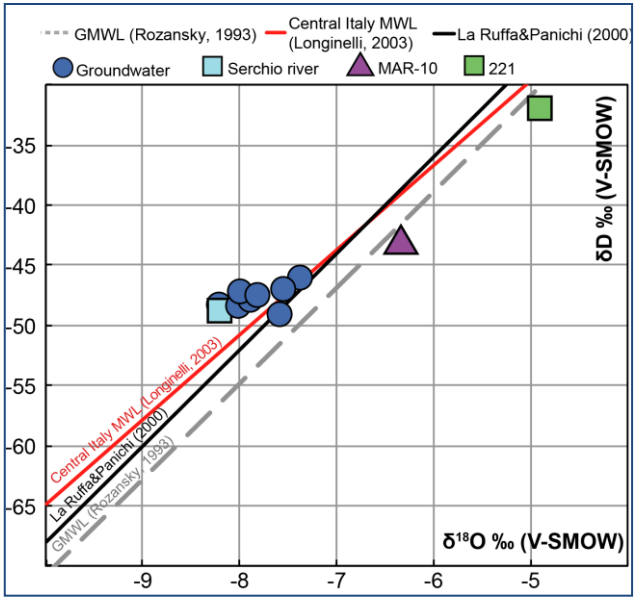




Analysing water supply issues

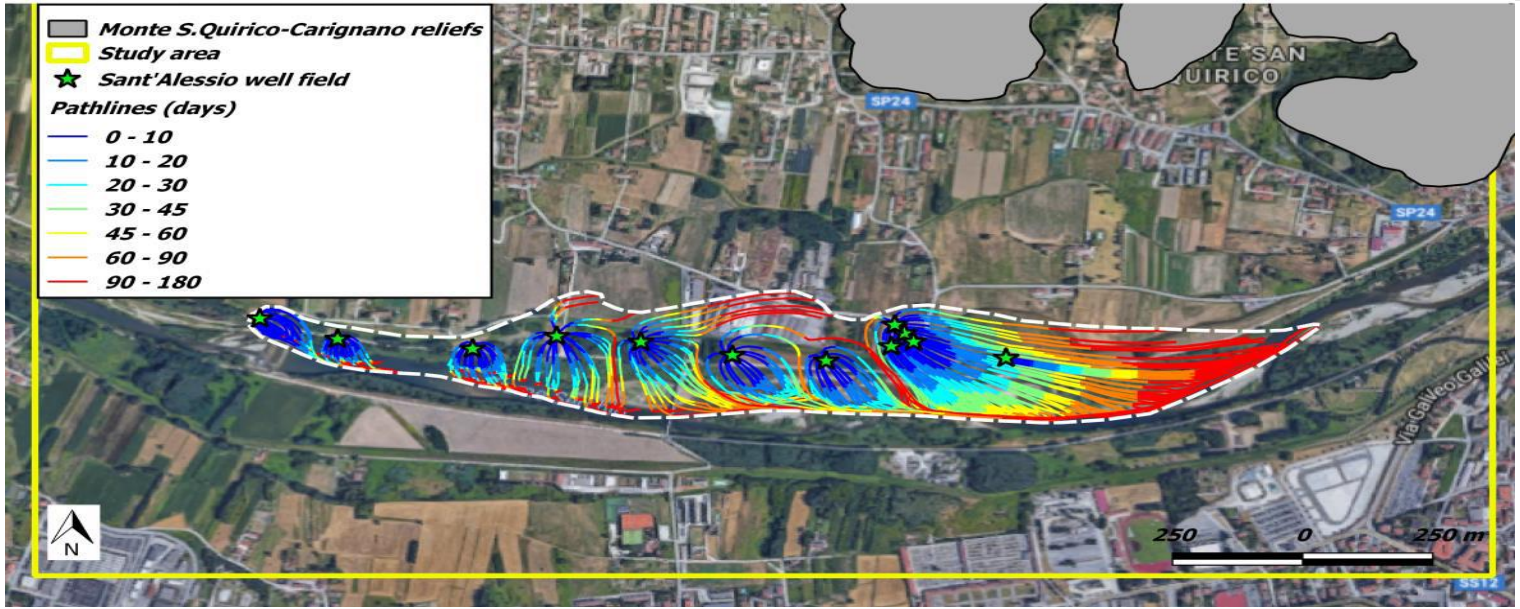
INDUCED RIVERBANK FILTRATION SCHEME





Analysing water supply issues

Definition of well-head protection areas using time of travel



Groundwater storage analysis @MAR plant

After 200 days
0.05 m³/s recharge
(about 900k m3)

Construction cost:
less than 500k €

REWAT
sustainable water management in the lower Cornia Valley

Life

www.liferewat.eu

RENDERING VASCA DI SEDIMENTAZIONE E INFILTRAZIONE

MAR SOL MANAGED AQUIFER RECHARGE SOLUTIONS

Demonstrating Managed A
to Water Scar
An EU F

Market Place
r innovation

Expected head increase @MAR plant

After 200 days
0.05 m³/s recharge
(about 900k m3)

Construction cost:
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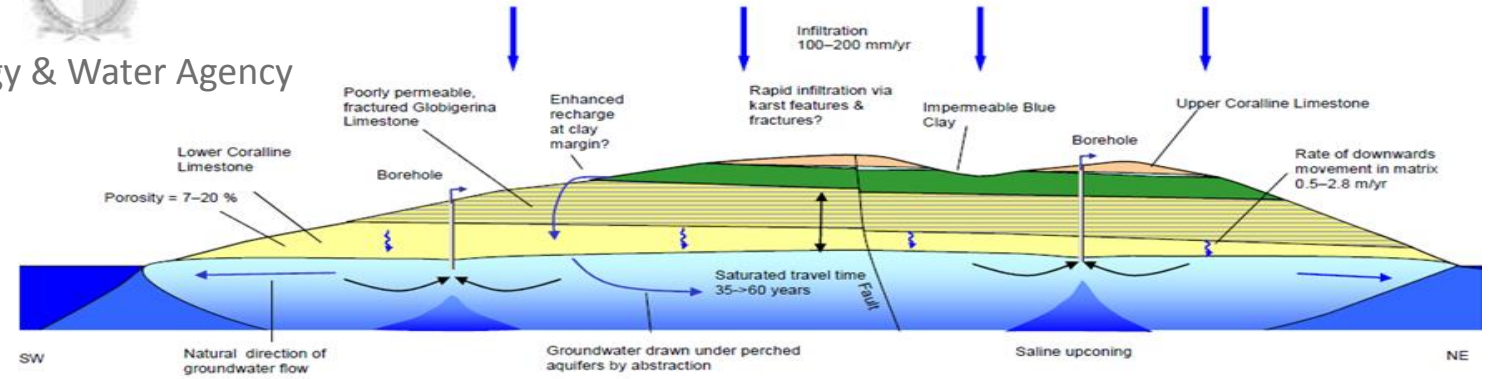
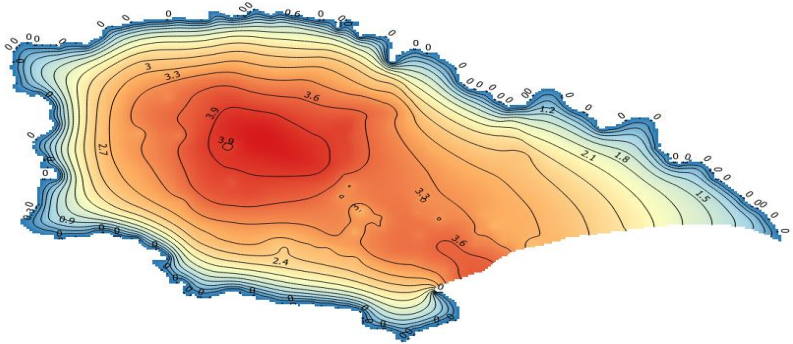
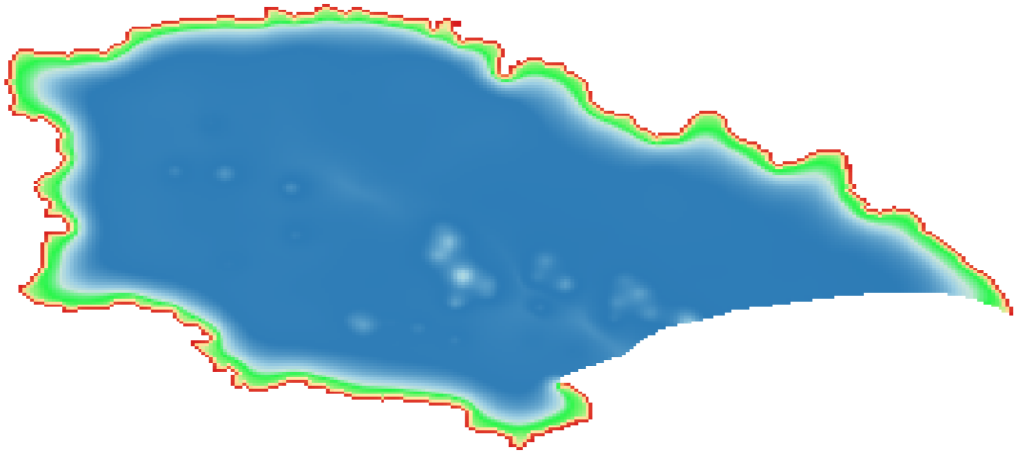
GOZO mean sea level aquifer

The Energy & Water Agency

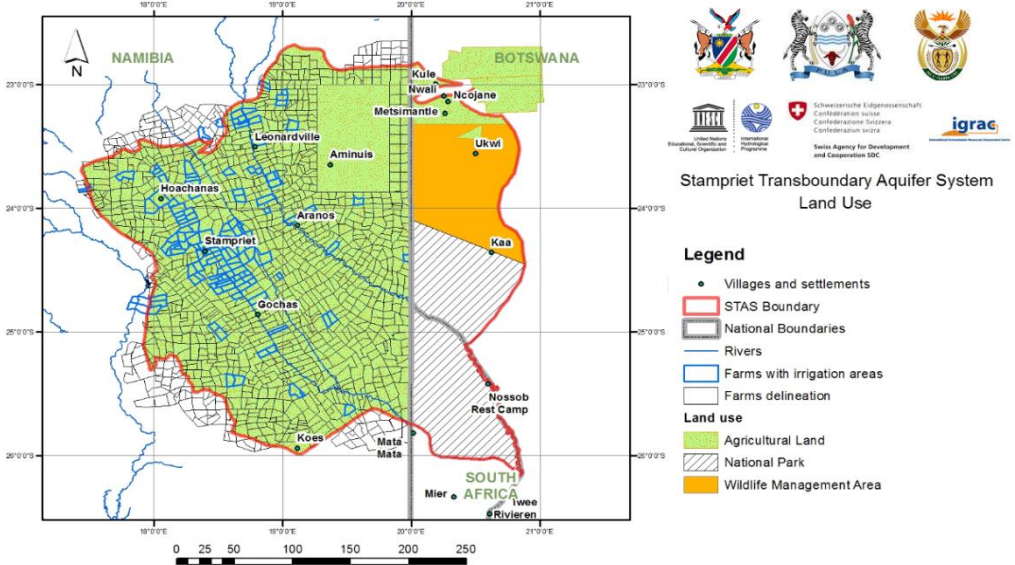






USING FREEWAT FOR WATER GOVERNANCE ON TRANSBOUNDARY WATER RESOURCE

- The STAS is a large farming area with approximately 1200 farms (mostly in Namibia)
- Groundwater use: 52% irrigation, 32% stock watering, 16% domestic use
- No mining and industrial activities
- Annual groundwater abstraction: 20Mm^3 (around 70% in the Stampriet area)



GROUNDWATER MANAGEMENT INSTITUTE

QGIS – INTEGRATED OPEN SOURCE and PUBLIC DOMAIN MODELING SOFTWARE

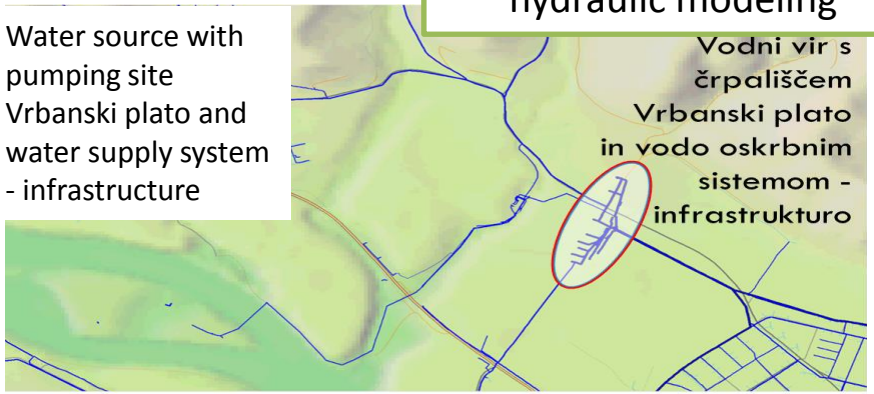
WATER SOURCES

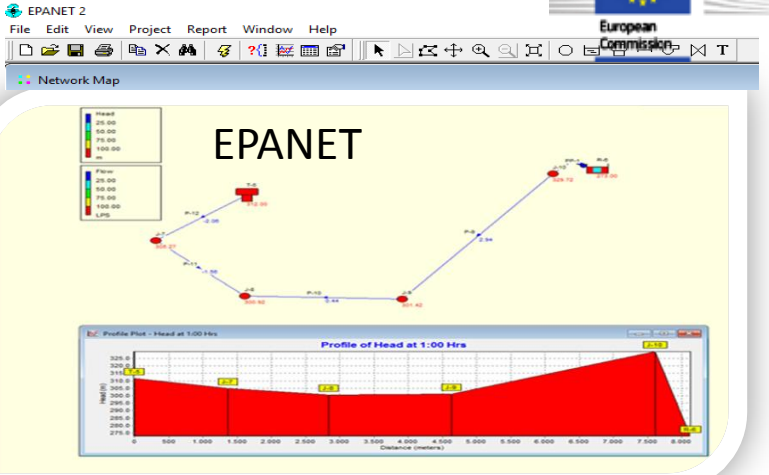
WATER SUPPLY SYSTEMS

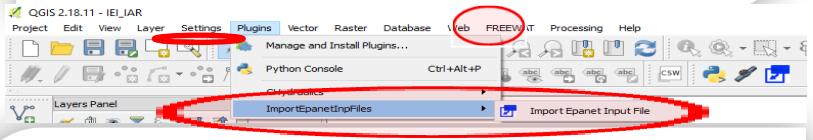
FREEWAT

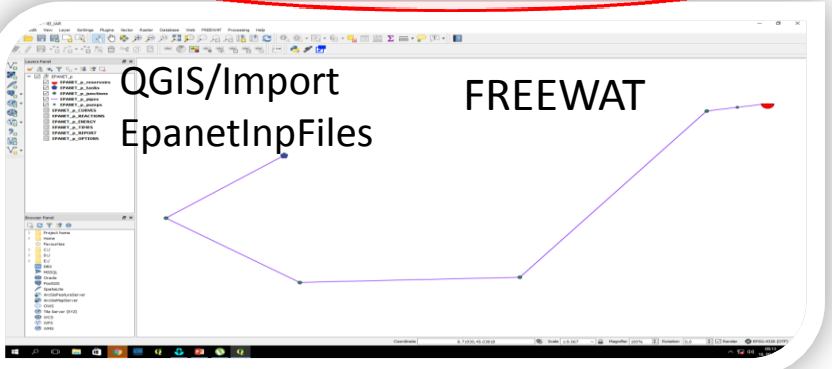
GHYDRAULICS
Import EPANET for hydraulic modeling

Water source with pumping site Vrbanski plato and water supply system - infrastructure









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 perfoming planning analysis
- No cost for licences (money can be moved to development of client tailored applications>>>> new companies and jobs)

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Thanks!

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