

SUBSOL Knowledge Environment Potential links with KINDRA

KINDRA Final Conference

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National Technical University of Athens

Brussels, 27th February 2018



SUBSOL has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 642228

The SUBSOL Knowledge Environment



SUBSOL Knowledge Environment

Bringing Coastal Subsurface Water Solutions to the Market

Marketplace

Knowledge Base

Toolbox

SUBSOL is an EU funded project to promote innovative, practical concepts for advanced freshwater management, with the common objective of protecting, enlarging and sustainably utilizing fresh groundwater resources in coastal areas.

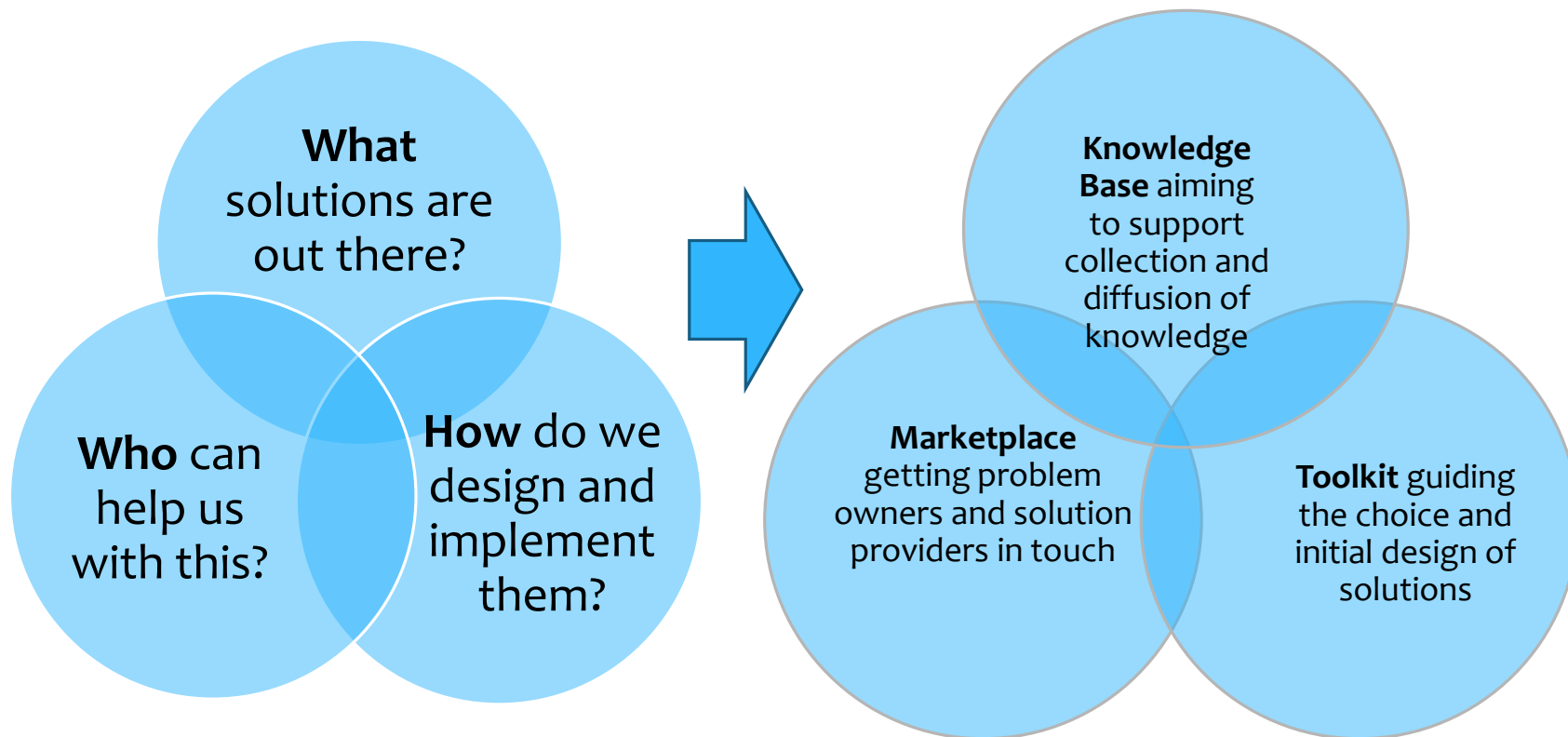
These subsurface water solutions (SWS) are built on experiences with Managed Aquifer Recharge and Aquifer Storage and Recovery, but their applicability is much wider due to innovations in water well design and configuration, allowing for advanced groundwater management, and maximum control over freshwater resources.

The SUBSOL Knowledge Environment is an online, flexible and adaptable platform to search for or share information about solutions to problems that frequently occur in freshwater resources and ecosystems of coastal areas, such as seasonal water shortage, saltwater intrusion, and degradation of wetlands. It consists of three parts: A Marketplace, a Knowledge Base and a Toolkit, all provided through a unified web-based environment.



The SUBSOL Knowledge Environment

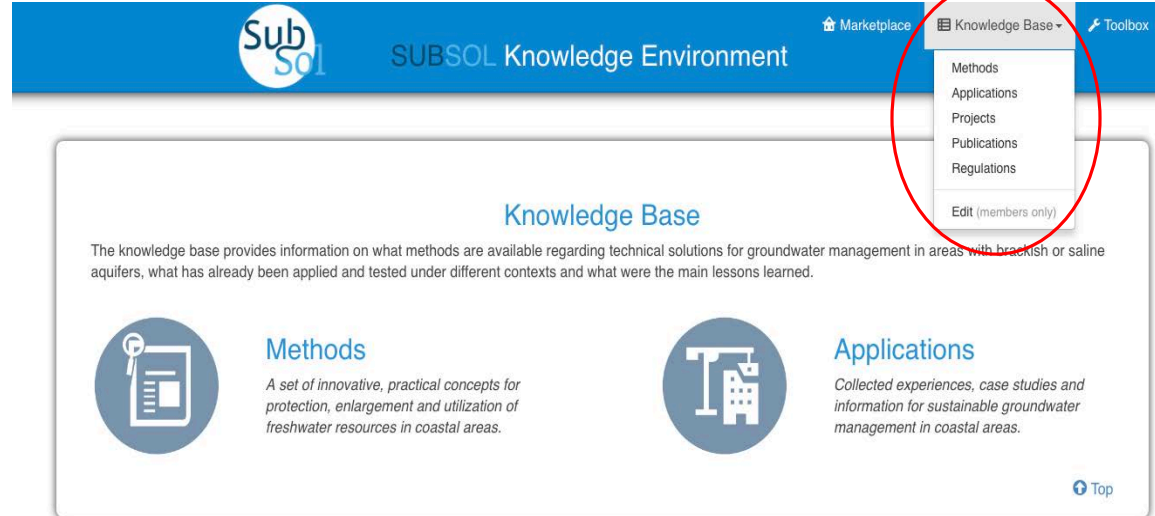
Three **building blocks** seamlessly embedded into a **common online platform**



SUBSOL Knowledge Base

The SUBSOL Knowledge Base (KB):

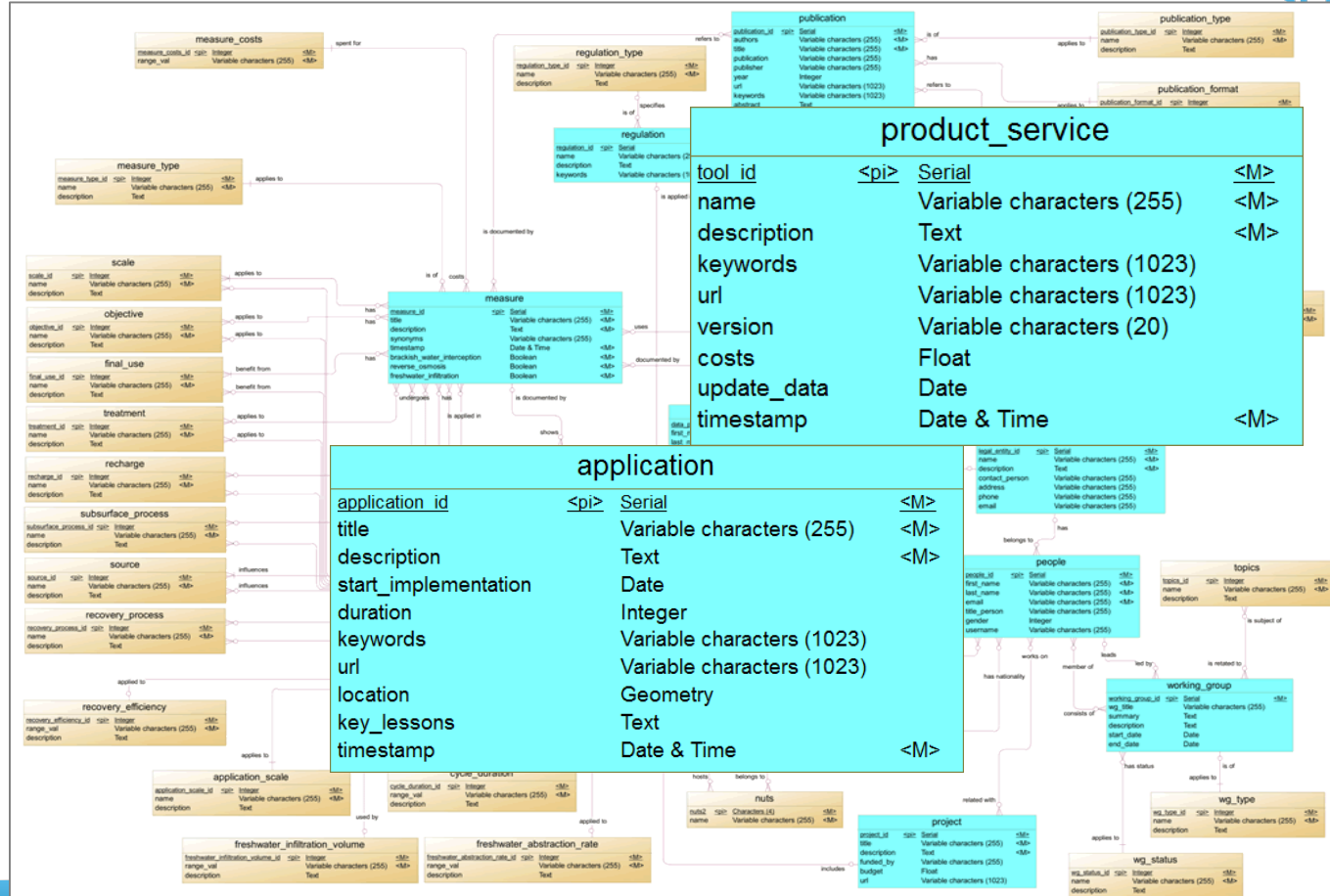
- is a flexible, extendable, web-based knowledge environment enabling the user to explore the knowledge collected within SUBSOL
- is currently up and running (<http://subsol-data.euprojects.net/>)
- The KB will be enhanced with data from other similar platforms (EIP Water, Kindra project, etc.)



Schema of SUBSOL Knowledge Base

Main categories

- Method
- Application
- Project
- Product-Service (Toolbox)
- Publication
- Regulation
- People
- Illustration
- Data provider
- Organisation



Lookup tables

Main tables



KB functionalities

(freely available, no login required)

- Listing of various data categories
- Tooltip for selected terms
- Detailed page of an item

Publications

Publications, references and other sources related to the protection, enlargement and utilization of freshwater resources in coastal areas

Show 10 entries

Search:

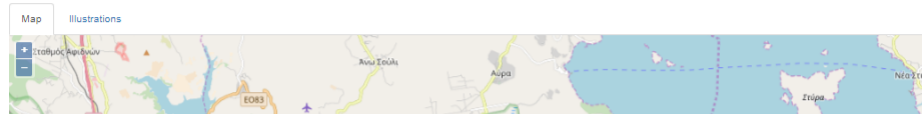
Title	Authors	Abstract	Publisher or Journal name	Year
A fresh keeper for Noord Burgum - The future for a saltinated well field?	Marcus J.H. van der Valk	This document is a MSc study project that was commissioned by Vitens to understand and predict the fresh/brackish and salt	M.Sc. Report	2011
Aquifer storage and recovery van gezuiverd effluent Nieuw Prinseland (Dinteloord)	Koen G. Zuurbier, Steven E.M. Ros	Voor het glastuinbouwgebied AFC Nieuw Prinseland (Dinteloord) is het van belang om de gruwatenuitvoering duurzaam vorm te geven. Naast het	Report	2017
Assessing impacts of climate change, sea level rise, and drainage canals on saltwater intrusion to coastal aquifer	P. Rasmussen, T. O. Sonnenborg, G. Gonciar, K. Hinsby	Groundwater abstraction from coastal aquifers is vulnerable to climate change and sea level rise because both may potentially impact saltwater	Hydrology and Earth System Sciences 17: 421-443	2013
Assessment reversed osmosis membrane cleaning under varying redox conditions of feedwater - Part 1: characterization and ASR performance	Haas	Coastal areas are generally densely populated and marked by high freshwater demands. Due to the proximity of the sea these	Report	2016
Beneath the surface of the future freshwater supply: groundwater as a drink	Peter J. Stuyfzand, Klaasjan J. Raaij	The production of fresh drinking water from brackish groundwater by reverse osmosis (BWRO) is becoming more attractive, even in temperate	Hydrogeology Journal 18(1): 117-130	2010
Business Case Freshkeeper, Town of Belleair	P. S. Ross, K.J. Raaij, D.S. Smith, W.J. Zaadnoordijk	Report available upon request	ARCADIS / KWR report 077716525	2014
Consequences and mitigation of saltwater intrusion induced by short-circuiting during aquifer storage and recovery in a coastal subsurface	Koen G. Zuurbier, Pieter J. Stuyfzand	Coastal aquifers and the deeper subsurface are increasingly exploited. The accompanying perforation of the subsurface for those purposes has increased	Hydrology and Earth System Sciences 21: 1173-1199	2017
D1.1 Validated regional scale groundwater model Noordburgum	A. Oosterhof	Scenario analyses with a regional scale SEAWAT groundwater model indicate that 2 million m3 of freshwater can be produced at	SUBSOL deliverable	2017
D2.1 Full implementation of SWS pilot test site in confined fractured chalk aquifer in Falster Island	K. Hinsby	GEUS has developed and fully implemented the planned SWS pilot test site at Marielyst, Falster during 2016. The first	SUBSOL deliverable	2017
D2.3 SWS pilot test site in Schinias	C. Makropoulos	The aim of the Schinias Pilot was to test SWS configurations coupled with novel pollution remediation techniques for the pumped	SUBSOL deliverable	2017

Showing 1 to 10 of 30 entries

Previous 1 2 3 Next

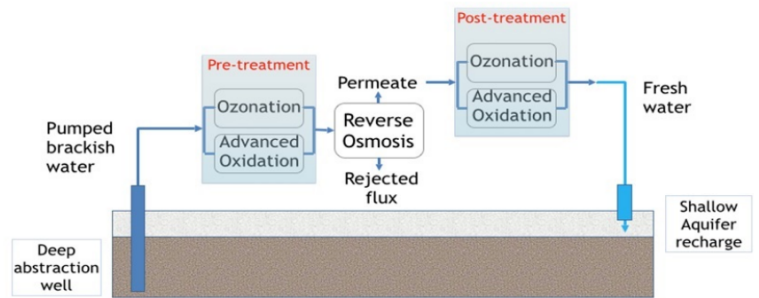
Tooltip

Application: ASR-Coastal and Freshmaker in Schinias (Greece)



Application: ASR-Coastal and Freshmaker in Schinias (Greece)

Map Illustrations



A combined groundwater well system has been installed, abstracting brackish water from the lower karst and re-injecting desalinated water in the upper aquifer
Source: www.subsol.org

Description

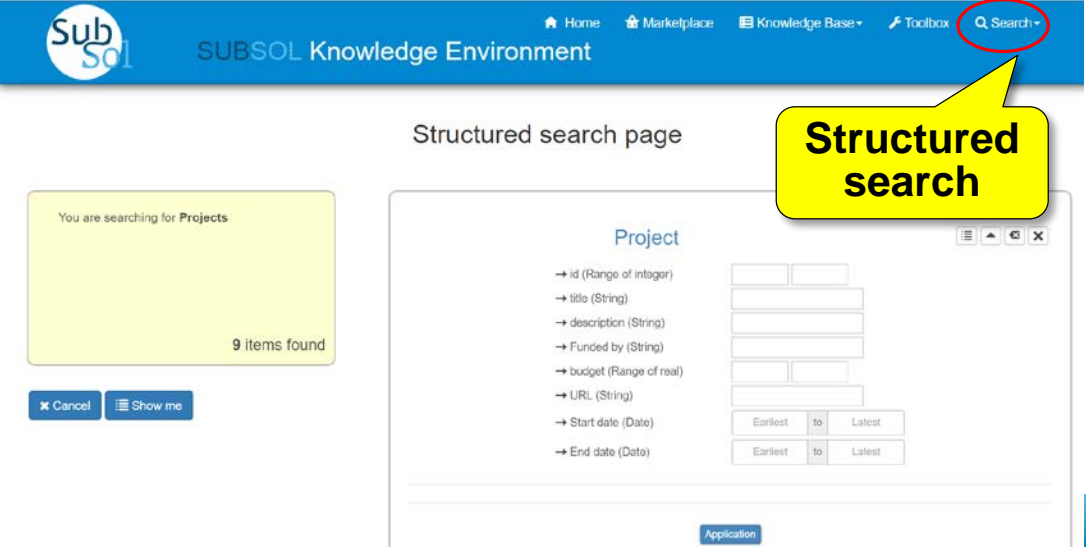
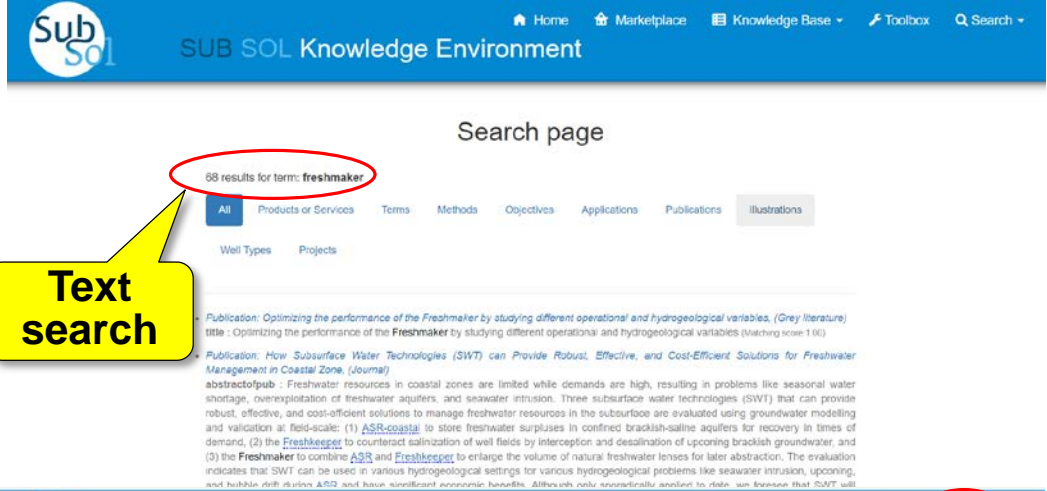
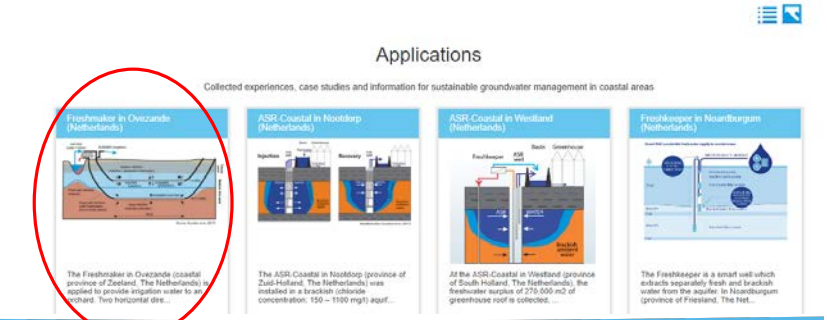
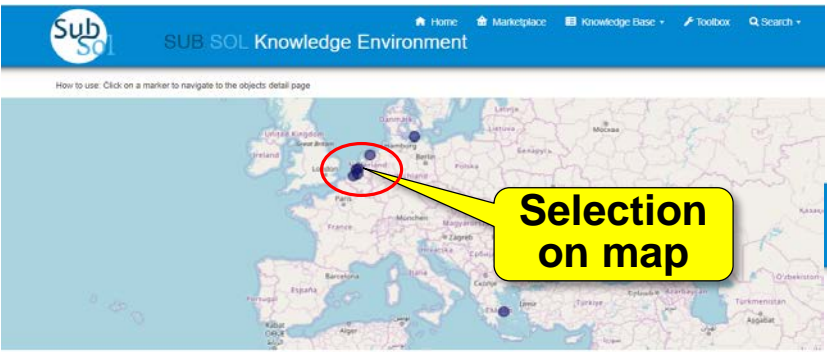
The Schinias pilot (in Greece) is a hybrid application of [ASR-Coastal](#) and [Freshmaker](#) technologies of the subsurface water solutions. The site of Schinias was selected as it is a coastal wetland with the characteristics of a distinct ecosystem linked to a typical coastal hydrogeological system of a Mediterranean region. At the same time, the area of Schinias has developed plenty of productive activities (agriculture, tourism), which results in multiple and persistent anthropogenic pressures for decades. In particular, the increased water demand, along with the impact of climate change, put pressure on their freshwater resources and ecosystems. Therefore, there is a seasonal water shortage of the over-exploited coastal aquifer, as well as saline intrusion, water, soil and wetland degradation, resulting in adverse effects on activities connected with agriculture and tourism as well as on the ecological processes of the ecosystems. This pilot exploits a rather usual context: the alluvial aquifer in use by both the wetland and agriculture, is sitting on top of a karstic aquifer, discharging relatively good quality water straight to the sea. Thus karstic water resource is been used, treated with novel pollution remediation techniques (Reverse Osmosis (RO) and Advanced Oxidation Methods (AOP)) and re-injected in the alluvial aquifer. Demonstrating how this currently unused resource, can be turned into a source for protection, regeneration and financial sustainability for the area as well as other similar ones throughout the Mediterranean.

Title	ASR-Coastal and Freshmaker in Schinias (Greece)
Start Of Implementation	2017-02-01
Duration (In Months)	18
Timestamp	2018-02-05 11:01:49-00:00

KB functionalities

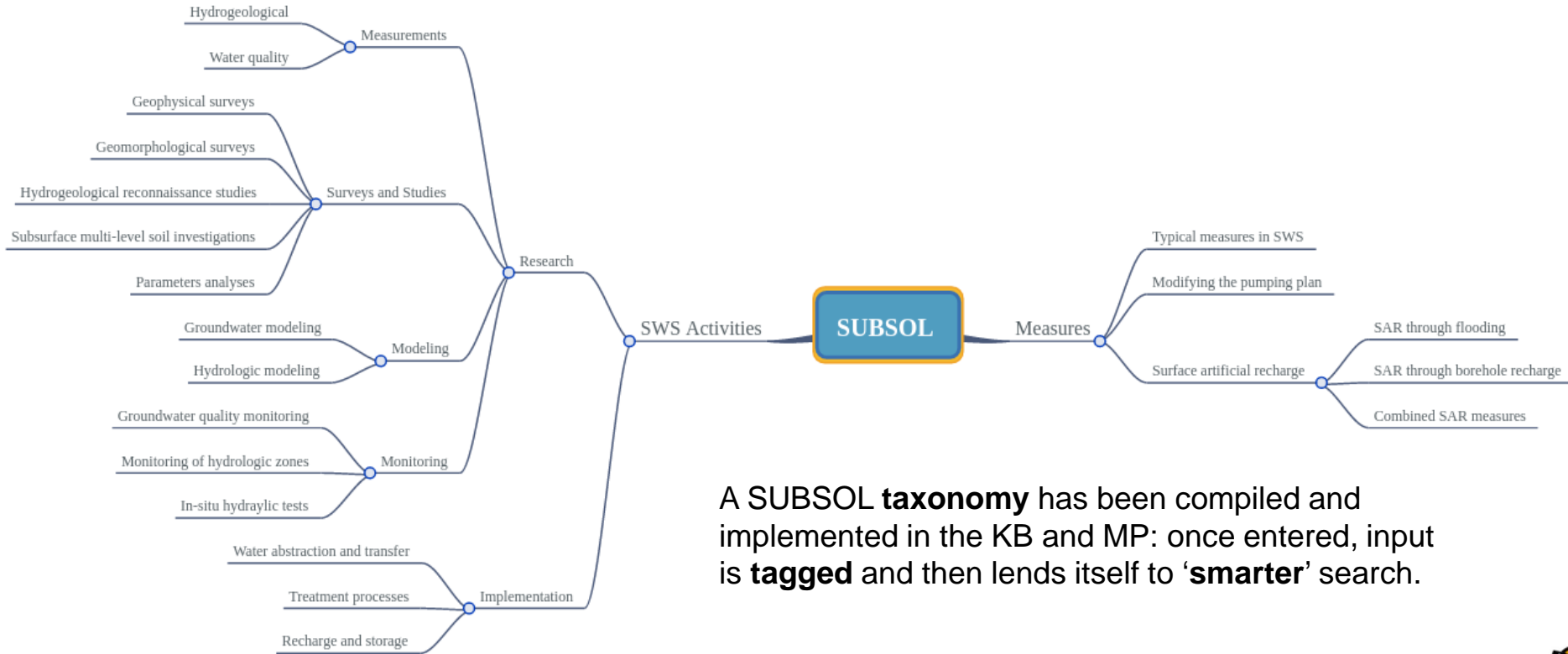
(freely available, no login required)

- full text and advanced search
- exploring applications in maps



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SUBSOL Taxonomy



A SUBSOL **taxonomy** has been compiled and implemented in the KB and MP: once entered, input is **tagged** and then lends itself to '**smarter**' search.



SUBSOL Marketplace

Additional functionalities are offered for **registered** users:

Supported roles:

- **Simple user:** able to view content and participate in set of services.
- **Organization representative/ Data manager:** able to manage content for his organization.
- **Platform administrator:** able to manage all the content in the platform.

CREATE A NEW ACCOUNT

Anastasios

Zafeiropoulos

azafeiropoulos

Email

Ministry of Education

Add a short description for your organisation

Government Organisation

CREATE ACCOUNT *



SUBSOL Marketplace

Functionalities for registered Marketplace members

- Customize your personal homepage
- Identify popular products and services
- Get updates on market solutions and new tools
- Promote your products & projects
- Get and provide feedback
- See your favorite items
- Filtering options
- Bookmark rate and express interest

The image displays two screenshots of the SUBSOL Marketplace interface, illustrating functionalities for registered members.

Top Screenshot: My Marketplace

- Header:** SUBSOL logo, navigation links (Home, My Marketplace, Knowledge Base, Toolbox, Search, User Management, My Account, Logout (subsol)).
- Left Sidebar:** MY MARKETPLACE menu with links to Products & Services, Projects, Methods, Applications, Inbox (0), and Knowledge Base.
- Main Content:** My Marketplace header with a welcome message. Below it, a "Popular Choices" section displays products like "SWS Location Identification Tool" (5.0/5) and "SUBSOL Automated Control Unit" (4.0/5). A "Market Place Updates" section shows updates like "Freshmaker quick tool" and "Freshkeeper-Chalk".
- Callout:** "Customize your personal homepage" points to the "My Marketplace" header.

Bottom Screenshot: Projects

- Header:** SUBSOL logo, navigation links (Home, My Marketplace, Knowledge Base, Toolbox, Search, User Management, My Account, Logout (subsol)).
- Left Sidebar:** MY MARKETPLACE menu with links to Products & Services, Projects, Methods, Applications, Inbox (0), and Knowledge Base.
- Main Content:** Projects section with a "Project List" header. Below it, a grid of project cards is displayed, including "GO-FRESH: Geohydrological...", "DESSIN - Demonstrate...", "Knowledge for Climate", "MAR SOL - Managed Aquifer Recharge Solutions", "FREEWAT - FREE and open...", "BaltICCA - Climate Change...", "WATERCOASTS - Evaluating...", "Keep it Fresh! Installation of a...", and "SUBSOL - bringing coastal...". Each card includes a title, description, and a star rating.
- Callout:** "Identify popular products and services" points to the "Popular Choices" section in the top screenshot.
- Callout:** "Promote your products & projects" points to the "Projects" section in the bottom screenshot.



SUBSOL has received funding from the European Union research and innovation programme under grant agreement

SUBSOL Marketplace

Functionalities for registered Marketplace members

- Customize your personal homepage
- Identify popular products and services
- Get updates on market solutions and new tools
- Promote your products & projects
- Get and provide feedback
- See your favorite items
- Filtering options
- Bookmark, rate and express interest

The screenshot displays the SUBSOL Marketplace interface. The top navigation bar includes links for Home, My Marketplace, Knowledge Base, Toolbox, Search, User Management, My Account, and Logout (subsol). The main content area is divided into sections: 'MY MARKETPLACE' with a sidebar for Products & Services, Projects, Methods, Applications, and an Inbox (0); 'My Marketplace' with a welcome message and a 'Popular Choices' section listing products like 'SWS Location Identification Tool' and 'SUBSOL Automated Control Unit' with their ratings; and 'Market Place Updates' showing recent updates for 'Freshmaker quick tool' and 'Freshkeeper-Chalk'. A red callout box labeled 'Filtering options' points to the 'Search' button in the top navigation bar. Another red callout box labeled 'Get and provide feedback' points to the 'Inbox (0)' link in the sidebar. Below the main content, a 'PRODUCTS' section shows a 'Product view' for the 'SWS Location Identification Tool'. This view includes a map, a description, and a rating system. A red callout box labeled 'Bookmark, rate and express interest' points to the rating system, which shows a five-star rating. The product details also include a 'Description', 'Costs', 'Version: 1.0', 'URL: http://users.itia.ntua.gr/mozos/SWS_Toolkit/', and 'Keywords: SWS, Freshmaker, Freshkeeper, ASR'. A 'View More' button is located at the bottom right of the product details section.

SubSol

Home My Marketplace Knowledge Base Toolbox Search User Management My Account Logout (subsol)

MY MARKETPLACE

Products & Services

Projects

Methods

Applications

Inbox (0)

Knowledge Base

My Marketplace

Hi subsol, welcome to the SUBSOL Marketplace.

Popular Choices

Products

SWS Location Identification Tool 5.0/5

SUBSOL Automated Control Unit 4.0/5

Projects

GO-FRESH: Geohydrological Opportunities FRESH water supply 4.0/5

DESSIN - Demonstrate Ecosystem Services Enabling Innovation in the Water Sector 3.5/5

Measures

Market Place Updates

Products

Freshmaker quick tool

Freshkeeper-Chalk

Applications

Freshkeeper in Venice, Florida (USA)

SubSol

Home My Marketplace Knowledge Base Toolbox Search User Management My Account Logout (subsol)

MY MARKETPLACE

Products & Services

Projects

Methods

Applications

Inbox (0)

Knowledge Base

PRODUCTS

Products

Product view

Description

The SWS Location Identification Tool is a spatial assessment tool that helps to scan an area to identify locations that can be suitable for applying a subsurface water solution (this can be any one of Freshmaker, Freshkeeper or ASR). The screening tool performs spatial operations on layers that describe the topographical and hydrological conditions of the study area. These operations are parameterized allowing the user to define the values of the parameters involved (e.g. maximum distance from power supply).

Costs:

Version: 1.0

URL: http://users.itia.ntua.gr/mozos/SWS_Toolkit/

Keywords: SWS, Freshmaker, Freshkeeper, ASR

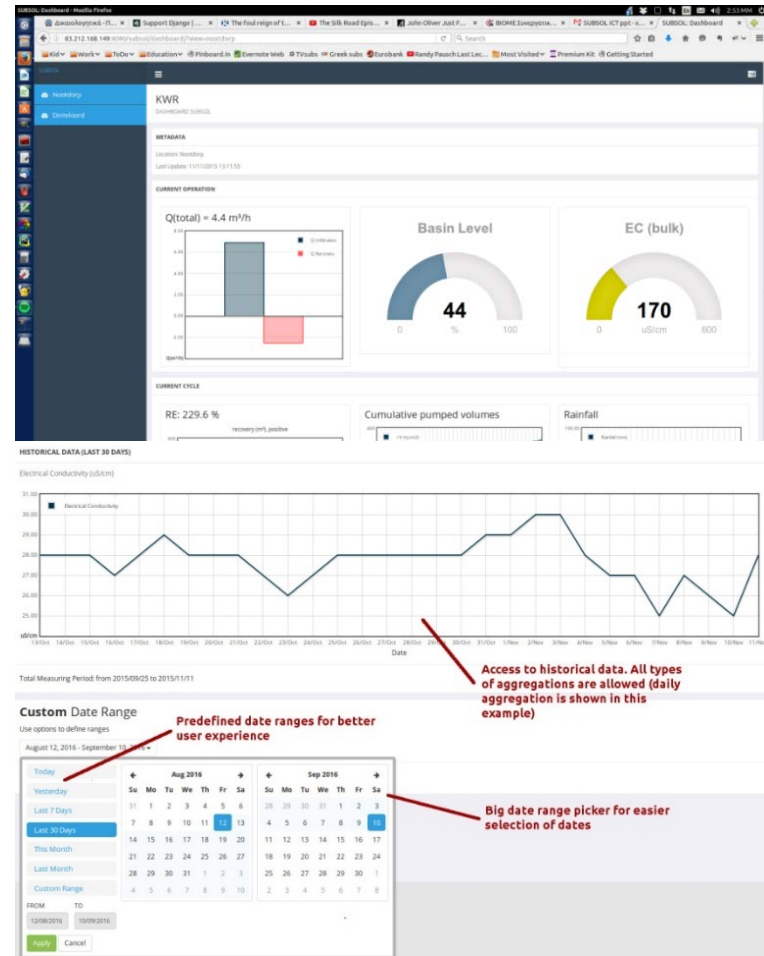
View More



SUBSOL has received funding from the research and innovation programme under

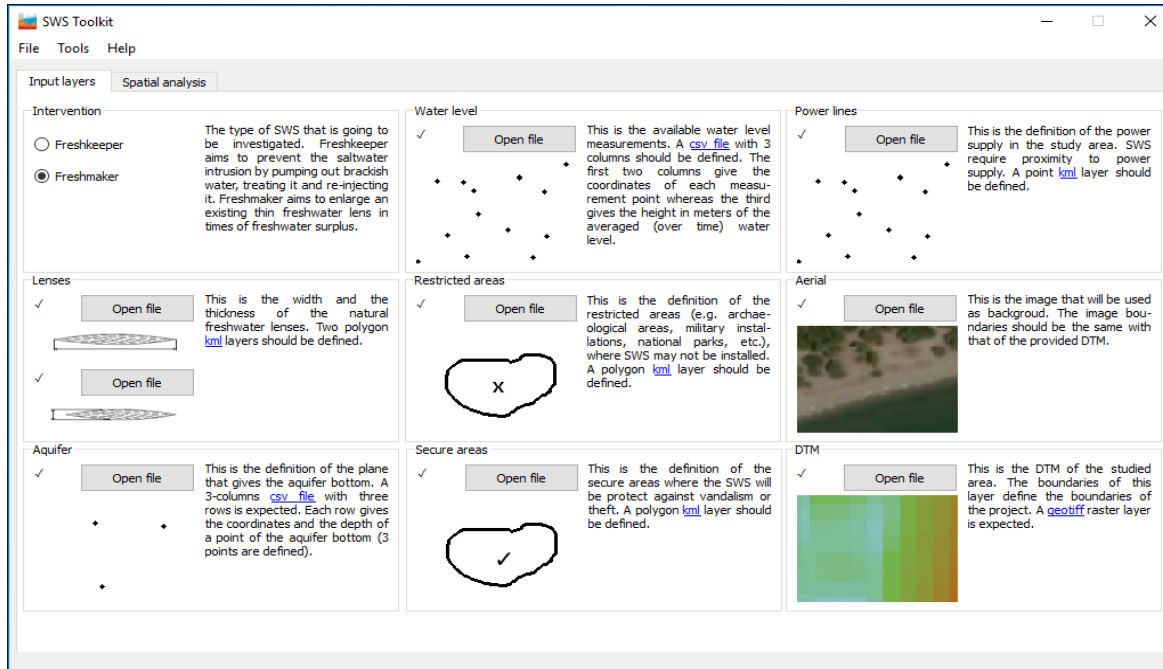
SUBSOL Toolbox

1. Development of **decision tree tools** (step by step guidelines)
 - know **what** to build
2. **GIS location identification** tools: spatial multicriteria assessment
 - know **where** to build it
3. Collection of available **open source/free models** has been performed to support the development of a hydro-technical SWS decision support toolkit.
 - know **how** to build it
4. Development of a generic transferable **Data Monitoring System** for remote SWS deployment monitoring.
 - know how it's going on **after** you build it



SUBSOL Toolbox: SWS Location Identification Tool (1/2)

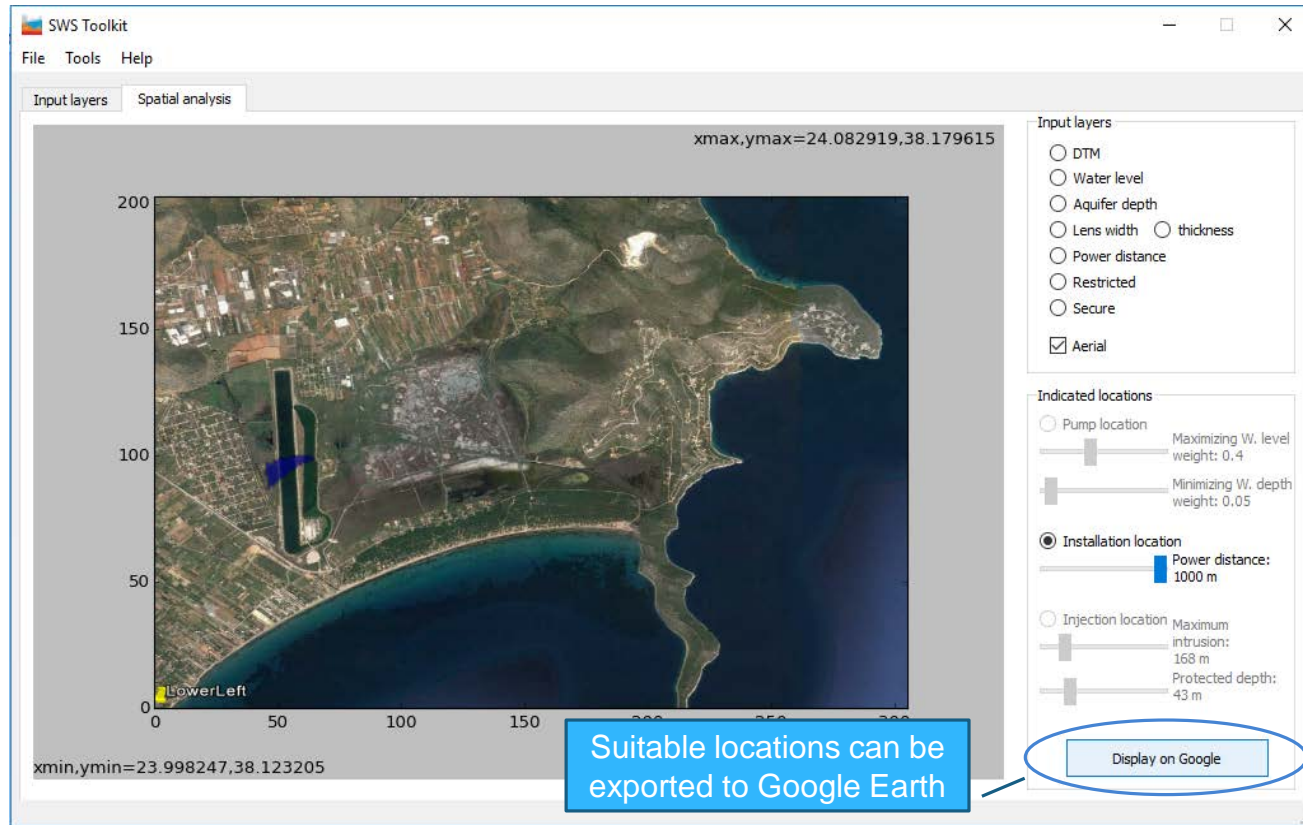
A **screening tool** that scans an area to **identify locations** that can be suitable for applying subsurface water solutions, performing **spatial operations** on layers that describe the topographical and hydrogeological conditions of the study area.



Define SWS type and corresponding spatial information available.



SUBSOL Toolbox: SWS Location Identification Tool (2/2) ^{Sub}Sol



The tool then indicates suitable locations for siting the SWS technology.

url: http://users.itia.ntua.gr/rozos/SWS_Toolkit/



SUBSOL Toolbox: Data Monitoring System (1/3)

A versatile and portable web application that aims to **gather** various types of data from various locations, **store** them in the database and **visualize** them for the user to view.

Fusion A Customisable Dashboard for the SUBSOL Project

Navigation: Home, Dashboard, Builder, Widgets, Settings, Help

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK
1	29/3/2017	5:11:7	364832	1	26	1	13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	66965	25	4719	29	100	58888	25	4744	54	100
2	29/3/2017	5:21:7	364832	1	26	1	13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	66965	25	4719	29	100	58888	25	4744	54	100	
3	29/3/2017	5:31:7	364832	1	26	1	13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	66965	25	4719	29	100	58888	25	4744	54	100	
4	29/3/2017	5:41:7	364832	1	26	1	13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	66965	25	4719	29	100	58888	25	4744	54	100	
5	29/3/2017	5:51:7	364832	1	26	1	13	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	66965	25	4719	29	100	58888	25	4744	54	100	

Create a new Atomic Variable

Date & time from file: March 29, 2017, 5:11 a.m.

Please, check if the date and time are depicted correctly from the 1st line of data, if not [click here to change these settings](#).

Your Atomic Variables: TS_TEST

Create a new Expression

Name of Your Expression: Total Recovery

Formula of Your Expression: $[[\text{Recovery}_{1.1_10}] / [[\text{Recovery}_{1.2_10}]] * ([[\text{Injection}_{10}]] + 10)$

Type the formula to be used in order to calculate the result. Use your Atomic Variables wrapped in "[[" and "]]". For example if you want to subtract your Variable1 from Variable2, just type `[[Variable2]] - [[Variable1]]`. You can use the list on the right to add your variable.

Unit of Measurement: m3

Description (optional):

Submit

Your Atomic Variables:

- Injection_10
Most Recent Value from Column C
- Recovery_1.1_10
Most Recent Value from Column AD
- Recovery_1.2_10
Most Recent Value from Column AI
- Recovery_1.3_10
Most Recent Value from Column AN
- Recovery_1.4_10
Most Recent Value from Column AS

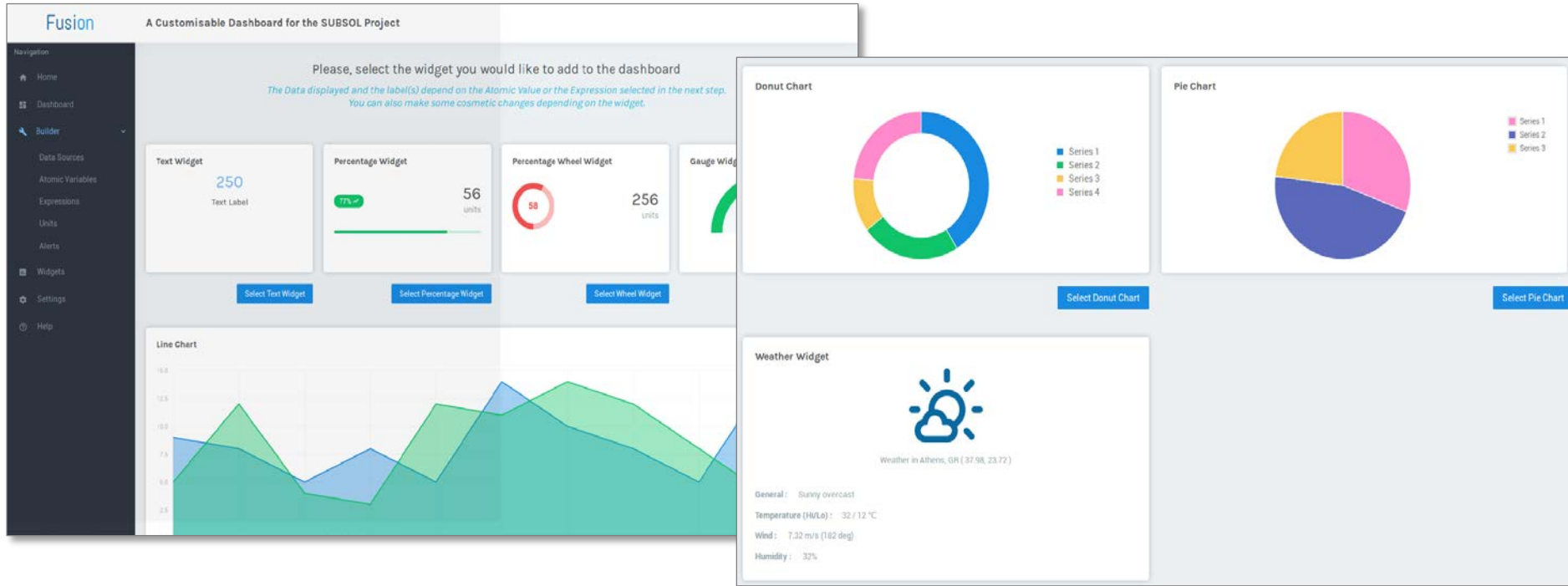
Variables

Create a variable that shows the most recent value of a certain column, or the minimum value of the same column. **Combine** variables and create a more complex form of data and **display** the result into the dashboard

Expressions

(almost) **any formula** is accepted combining variables into complex forms of expression

SUBSOL Toolbox: Data Monitoring System (2/3)

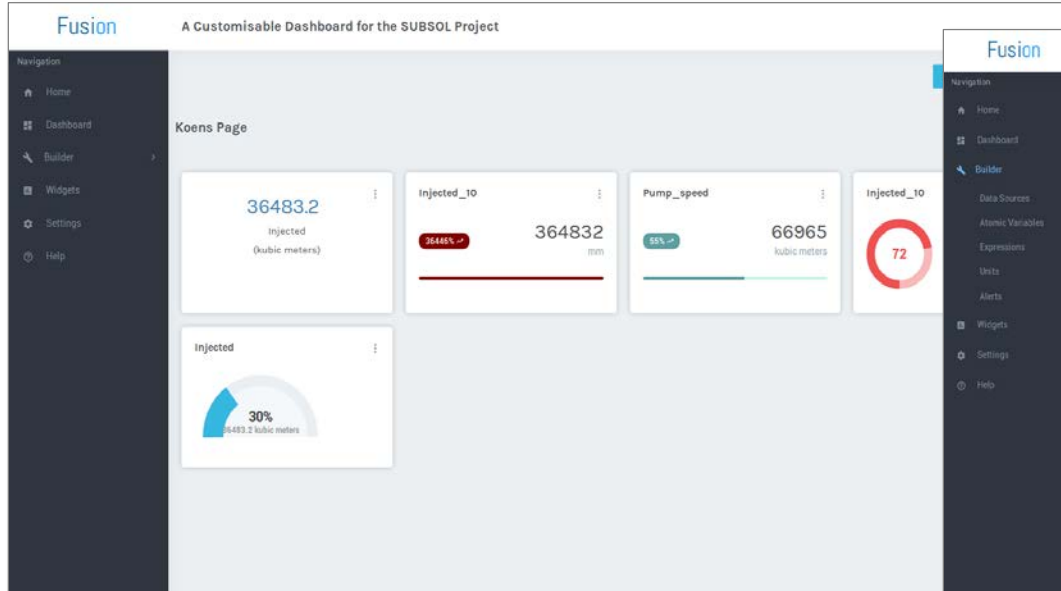


A wide selection of widgets is supported.
From simple text widgets and gauges, to pie charts and multiple line or bar charts.



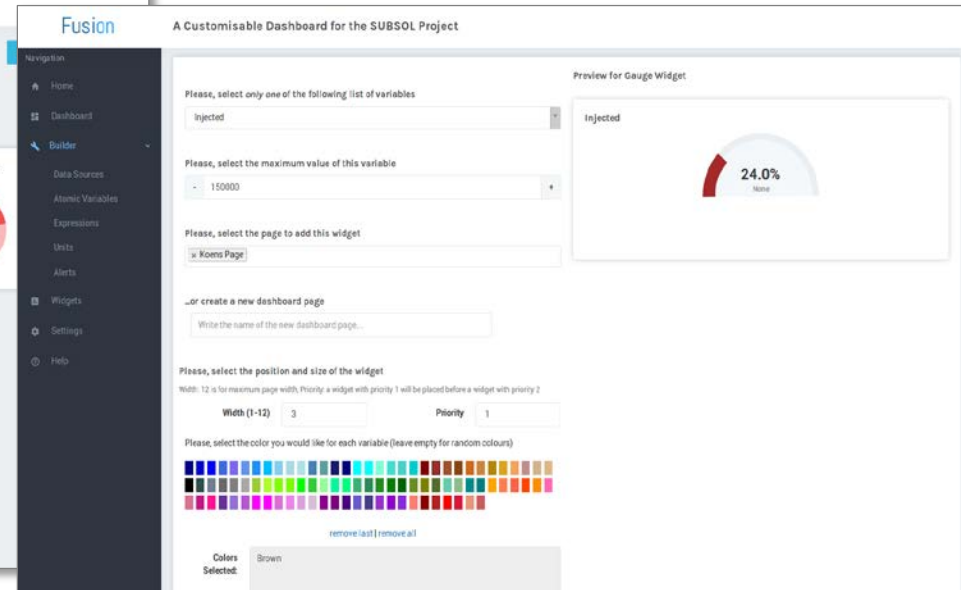
SUBSOL Toolbox: Data Monitoring System (3/3)

Multiple Dashboards



- Users can **create** multiple dashboards to insert their widgets
- Widgets can be in **multiple pages** at the same time

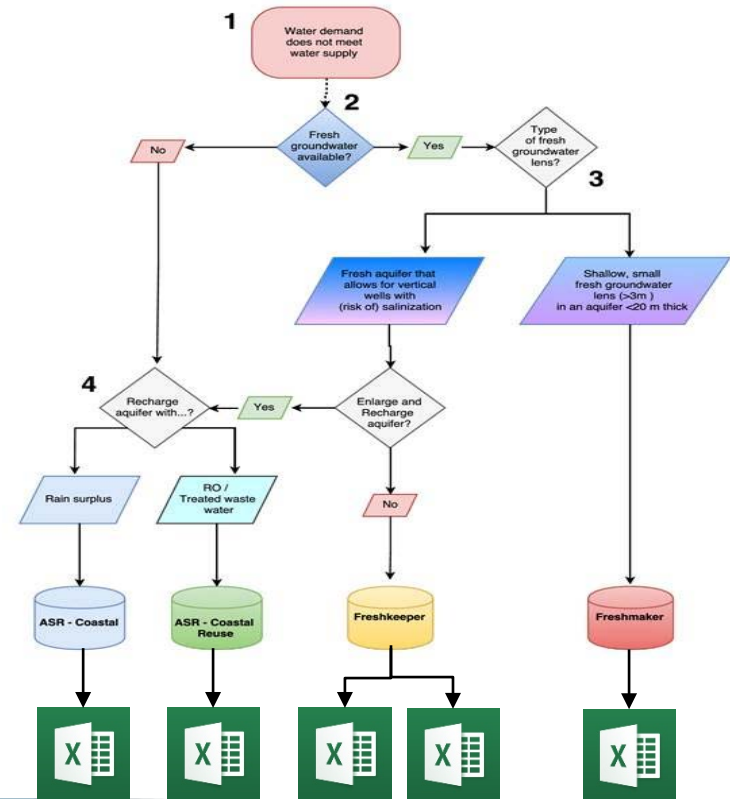
Fully Customizable Widgets



- Users can **customise** their widgets using several different options
- Users may **preview** the widgets before adding them to the dashboard

SUBSOL Toolbox: Generic Toolbox for applying SWS Methods (under development)

- Online Web Application will guide the user to:
 - Step 1:** define the problem and select interactively the appropriate SWS
 - Step 2:** select a Tool for applying the SWS Method
 - Step 3:** configure and run the Tool online
 - Step 4:** review the results in a comprehensive way using graphical elements
- Tools are implemented in MS-Excel enabling their development by non-IT experts
- Tool management routines will make the Toolbox expandable and easy to use
- The Toolbox will minimize the development time of new Tools and facilitate their evaluation



Last but not least - not all tools are software...

- Technological Participatory Assessments with stakeholders
- Development of business cases
- Market analysis of target regions
- Strategy for commercialization and market penetration
- Studies for assessing the impact of the solutions to the environment



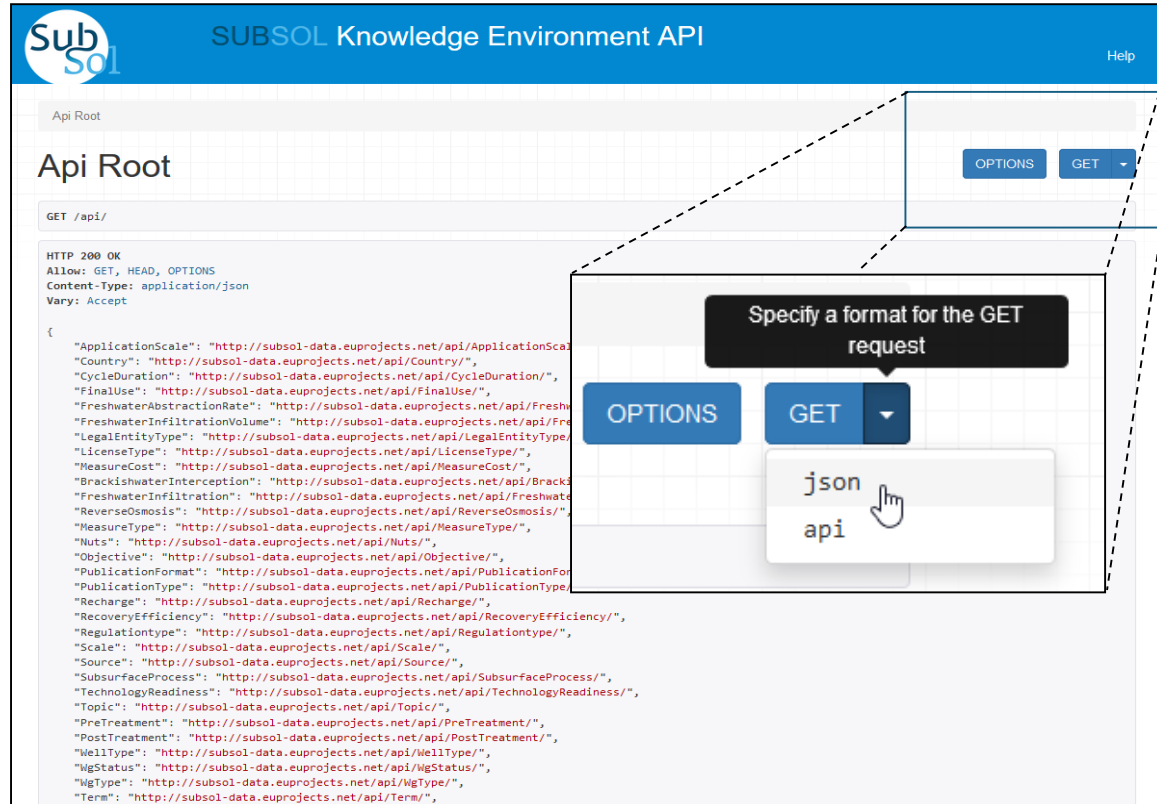
Linking with other platforms: SUBSOL KE API

Purpose:

- provide additional quality content with regard to groundwater research
- upgrading systems in terms of dissemination and traffic

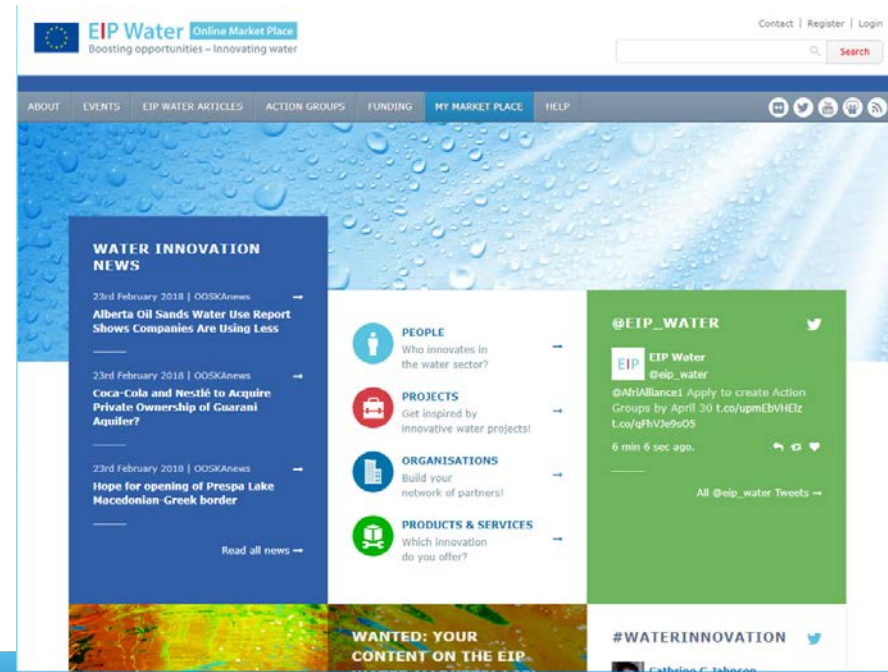
Steps:

- Web browsable API guides the user through the SUBSOL KE
- GET, HEAD, OPTIONS requests allowed
- Unrestricted access to all information
- Results provided in JSON format



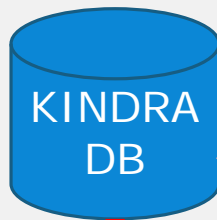
Linking EIP Water with SUBSOL

- **EIP Water** has recently developed its own generic **marketplace**
- We identified the need to make the SUBSOL Marketplace **compatible** with the EIP Water Marketplace from the beginning.
- A procedure for **synchronizing** the databases has been outlined and agreed.
- SUBSOL database **structure has been adjusted** to be compatible with EIP Water
- The purpose is to achieve a **synergy** among the two market places and establish a link that can be considered a '**pilot**' for connecting **(other) projects MP with the EIP water market place.**



Linking KINDRA with SUBSOL

Initiatives for establishing links between the two KEs, to provide to additional quality content in groundwater research and increase platforms dissemination and publicity



KINDRA KNOWLEDGE FOR HYDROGEOLOGY RESEARCH

Aggregated results matching search criteria: 1-101803 (page 5/181) | Select: all, 2008 | Actions on selected

DEMONSTRATION ACTIVITIES FOR THE REDUCTION OF WATER LOSSES AND PRESERVATION OF WATER QUALITY IN OVER-DIMENSIONED WATER DISTRIBUTION NETWORK IN KAEKERE TOWN, ESTONIA

Abstract
The main objective of the project was to prepare a comprehensive and integrated plan for the reduction of water loss from over-sized and degraded water distribution network in Kaekeere town, whilst providing water supply, integrated water resources management, quality, qualitative monitoring network, water distribution network, water shortage, sewerage system, water pollution, water saving, waste water treatment.

Keywords
w191239

Schema
Extent 21.43736 57.52263 28.19409 59.66472

Related
[X] Metadata

GROUND WATER AND SURFACE WATER SUPPLEMENT BY COLLECTING RUN OFF AND SURPLUS DRAINAGE WATER AND TREATING SEWER OVERFLOWS IN A HELIPOLYTE FILTER

Abstract
The project sought to demonstrate sustainable integral water management by three entities: the Community of Wierseveld, the Rijn and IJssel Water board and the Province of Gelderland. This was to be... Runoff, integral water management, drainage water, sewer, communal water system, surplus water, helipolyte filter.

Keywords
w191239

Schema
Extent 3.37087 52.76388 7.21097 53.46583

Related
[X] Metadata

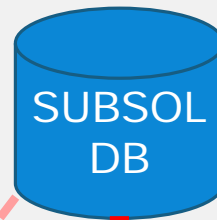
WATER IN A CHANGING WORLD: THE UNITED NATIONS WORLD WATER DEVELOPMENT REPORT 3

Abstract
The WDD03 builds on the work of previous studies, including the two previous WDDs, "Water for People, Water for Life" (WDD01), presented at the 3rd World Water Forum in Japan in 2003, and "Water: A... Groundwater resources, Water supply, Management, Sustainable, Sustainable water use, Legislation

Keywords
w191239

Schema
Extent -11.5 35.3 43.2 81.4

Related
[X] Metadata



SUB SOL Knowledge Environment

Publications

Publications, references and other sources related to the protection, enlargement and utilization of freshwater resources in coastal areas

Show 18 entries

Title	Authors	Abstract	Publisher or Journal name	Year
A fresh perspective for coastal aquifers: The future for a saltwater well field?	Marcus J.H. van der Valk	This document is a MSc study project that was commissioned by Vitem to understand and predict the freshwater and salt...	M.Sc. Report	2011
Aquifer storage and recovery van gezand zand effluent Nieuw Prijsland (Dinteloord)	Koen G. Zuister, Steven E.M. Ros	Voor het duurzaam opgevoerd A/C Nieuw Prijsland (Dinteloord) is het van belang om de gebruiksovereenkomst duurzaam vorm te geven. Naast het...	Report	2017
Assessing impacts of climate change, sea level rise, and drainage canals on saltwater intrusion to coastal aquifer	P. Karmann, T. O. Sonnentag, G. Gonczar, K. Hensby	Groundwater abstraction from coastal aquifers is vulnerable to climate change and sea level rise because both may potentially impact saltwater...	Hydrology and Earth System Sciences 17, 421-443	2013
Assessment reversed osmosis membrane clogging by varying initial conditions of freshwater - Part 1: Site characterization and ASL performance	Koen G. Zuister, Kjetil Haas	Coastal areas are generally densely populated and marked by high freshwater demands. Due to the proximity of the sea these...	Report	2016
Benefits and hurdles of using brackish groundwater as a drinking water source in the Netherlands	Pieter J. Stuyfzand, Klaasjan J. Raaij	The production of fresh drinking water from brackish groundwater by reverse osmosis (RO) is becoming more attractive, even in temperate...	Hydrogeology Journal 16(1): 111-130	2010
Business Case Freshwater Town of Delfzijl	P. S. Rijk, H. J. Raaij, D. S. Smith, W. J. Zandbergen	Report available upon request	ARCADIS / IOWI report 677716025	2014
Consequences and mitigation of saltwater intrusion induced by short-circuiting during aquifer storage and recovery in a coastal subsurface	Koen G. Zuister, Pieter J. Stuyfzand	Coastal aquifers and the deeper subsurface are increasingly exploited. The accompanying deterioration of the subsurface for those purposes has increased...	Hydrology and Earth System Sciences 21, 1173-1186	2017
D1.1 Validated regional scale groundwater model Noordbrabant	A. Oosterhof	Scenario analyses with a regional scale SEAWAT groundwater model indicate that 2 million m³ of freshwater can be produced at...	SUBSOL deliverable	2017
D1.1 Full implementation of D1.1 pilot test site in confined fractured chalk aquifer on Friesland island	K. Hensby	GEUS has developed and fully implemented the planned D1.1 pilot test site at Marenveld. Favour during 2016, the first...	SUBSOL deliverable	2017

Thank you for your attention!

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