

The Water SWITCH-ON, Spatial Information Platform (SIP)



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AGU fall meeting 2017, December 11-15, 2017, New Orleans, USA

SWITCH-ON is an EU FP7 Collaborative project (grant agreement No. 603587) under the Environment programme running from November 2013-October 2017

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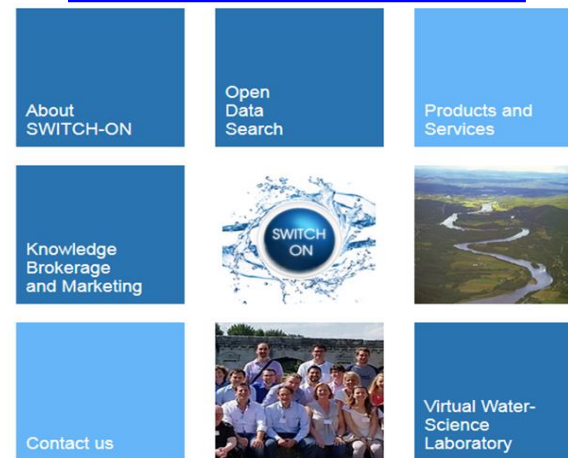
- **Project context**
- **Software requirements**
 - Design principles
 - Agile software development approach
 - Component and layer driven development
- **Software architecture**
 - Components and relationships
 - Components and functionalities
 - BYOD (Browse Your Open Dataset)
 - ODR (Open Data Registration) tool
 - REST interfaces and Catalogue
 - SIP Expert tool
 - Catalogue and data model
 - Protocol tool
- **Documentation and code**
- **Conclusions**

Project context

- SWITCH-ON is a project using **Open Data** as a vehicle for innovations, with the aim to use water resources in a sustainable way for a safe society and to advance hydrological sciences.
- We are building bridges between policy makers, water managers, information producers and scientists.
- EU research project running **Nov 2013 – Oct 2017** within the **FP7**.
- 15 collaborating **partners** (5 Universities, 2 Governmental institutes, 8 SMEs).



www.water-switch-on.eu



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Design principles

“As hydrological modeller, I would like to find different data types (like meteo and discharge), which are spatially correlated (in other words, in the same catchment), so I can directly see if all the data for my model is available.”

Remko Nijzink (TU Delft)

- Main search/discovery/access objectives and design principles:
 - **Spatial** search for water-related datasets (**Polygons** work better than simple bounding boxes).
 - **License-based** search and terms of use per dataset.
 - Combined **keywords** search both free-text, generic (**INSPIRE** topic categories) and domain specific (**X-CUAHSI** keywords, hydrologic ontology).
 - Access should be **directly** accessible (no registration) and **links** should be verified.
 - Catalogue of datasets should be **harvestable** by other big projects such as GEOSS.

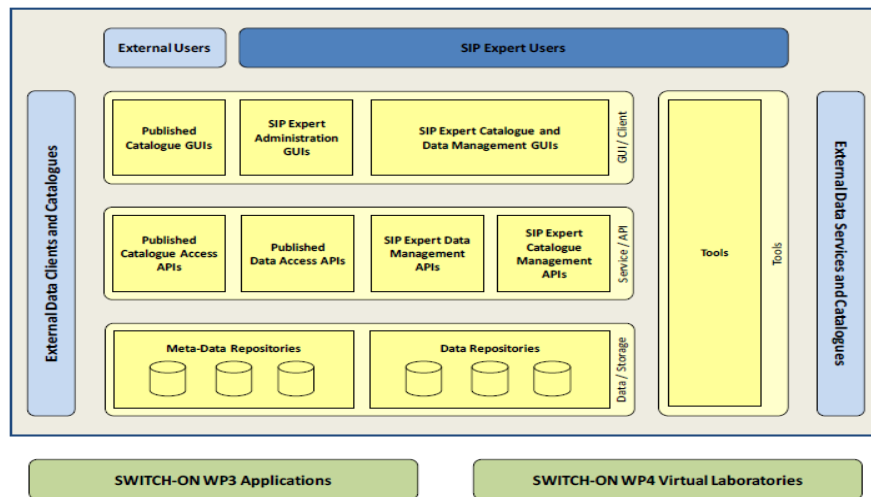
Agile Software development approach

- Correcting an initial IT development approach based on existing GIS tools within the consortium.
- **User story** driven development via GitHub issues (**iterative** process, refinement).
- **Use cases** written by scientists, technical solution led by IT professionals.
- Interactive sessions with both **developers** and **scientists** led to better Graphical User Interfaces.



Component and layer driven development

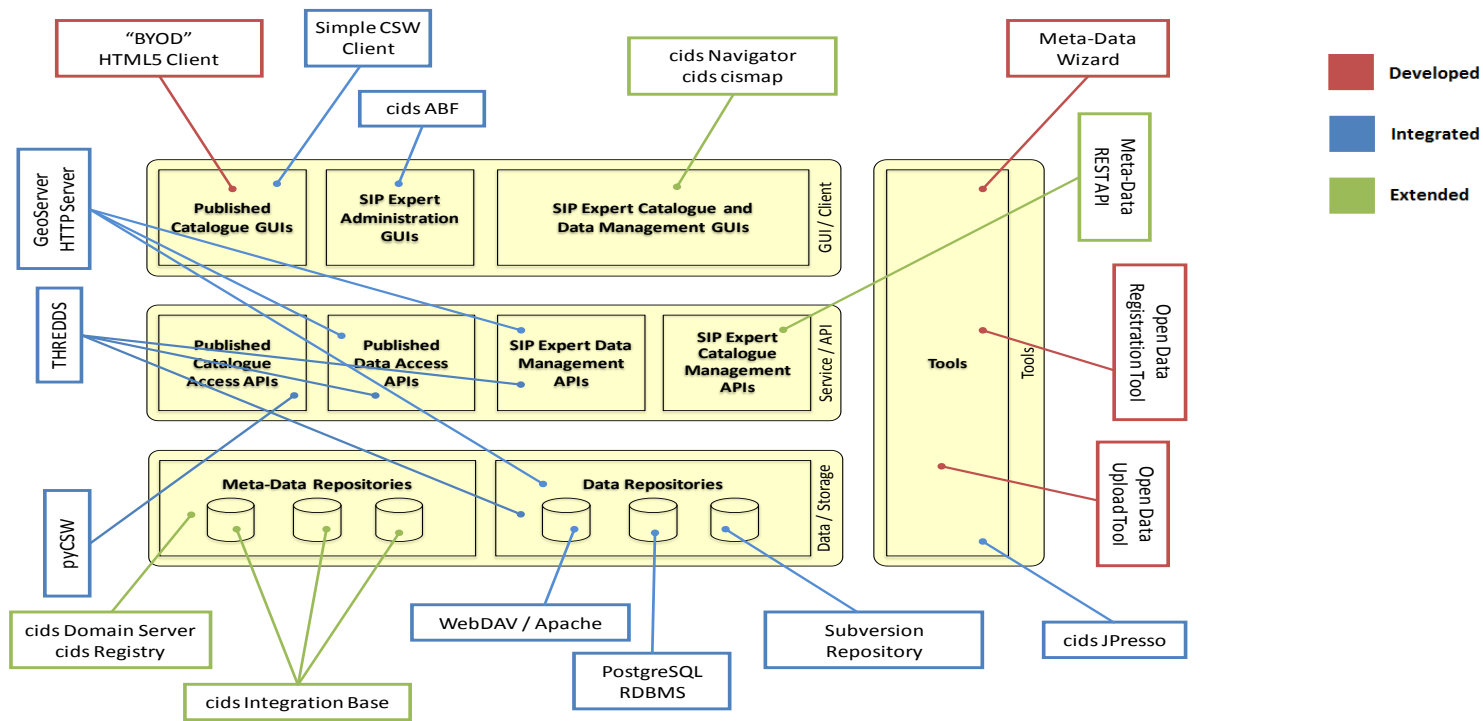
- Divide and conquer approach: Multiple software components communicating via **REST** services.
- Metadata **ISO standards + OGC protocols** used to serve external services and catalogues.
- Components divided in 3 layers (**Data/Storage**, **Service/API**, **GUI/Client**)



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Components and relationships



Components and functionalities

Functionality	Switch-ON component	Technologies / Software packages
Search/View/Download	SIP HTML5 easy GUI (BYOD)	Html5/JS/AJAX, pyCSW, ncWMS
Interoperate/Discover	REST API / Simple CSW client	Swagger / pyCSW
Store	SIP Metadata Relational DB	PostgreSQL / PostGIS / SVN
Upload/Describe and generate DOI	Upload data and metadata tool	Flask/Python, THREDDS, GeoServer, Zenodo DOI REST API.
Edit / Delete / Maintain	SIP Expert GUI (Desktop)	Java Web Start (JavaWS)
Participate/Review	Protocol tool	Django/Python
Navigate	Project main website	WordPress CMS

BYOD (Browse your open dataset) – Map view

Free text search

Search Results

Free text search

Spatial Preview

Resources (6)

- Coastal water body shapes, ...
- MODIS Water Mask
- Surface water body
- Transitional water body shapes
- Waterbase - UWWTD: ...
- Waterbase - UWWTD: ...

BYOD (Browse your open dataset) – List view

Selected keywords

Keyword groups

The screenshot displays the SWITCH-ON web application interface. At the top, there is a search bar containing the text 'inlandWaters'. Below the search bar, a dropdown menu for 'INSPIRE TOPIC Categories' is open, listing various categories such as 'none', 'biota', 'climatology', 'Meteorology', 'Atmc', 'elevation', 'environment', 'farming', 'geoscientificInformation', 'imageryBaseMapsEarthCov', 'inlandWaters', 'oceans', and 'society'. The 'inlandWaters' category is highlighted in blue. The main content area shows a list of dataset entries with columns for 'Description' and 'Keywords'. The 'Keywords' column contains tags like 'Delineation, catchment', 'Water body, river', 'assessment', 'bathing', 'Chemical', 'dataset', 'earth science', etc. The left sidebar contains three sections: 'Data origin' with a list of sources like 'EEA - Bathing Water Quality', 'EEA - Nutrients', 'EEA - Waterbase', 'EIONET - ECRINS', 'GRDC - Global Runoff', 'JRC - CCM2', and 'SWITCH-ON - Open Data'; 'License' with options like 'citation needed', 'Conditions unknown', 'Creative Commons (CC BY)', 'Creative Commons (CC BY-NC-SA)', 'Creative Commons (CC BY-SA)', 'for research only', and 'no limitations'; and 'Access Functions' with options like 'download', 'information', 'link to order data', 'search', and 'service'. The right sidebar is titled 'Keywords' and shows a list of keyword groups for each dataset entry.

Data origin

License

Access

ODR (Open Data Registration) tool - Upload



Data Upload Tool

[Upload Guide](#)
[Registration Guide](#)
[Virtual Water Science Lab](#)


Upload the dataset files. Drag & drop files from your desktop to this webpage or click on "Add files...". The maximum upload size (per file) is 3 GB.

Upload files for dataset Paulina Polder DEM

If you like to upload **shapfiles**, please zip (with a .zip extension) the shapfile before uploading. The tool will automatically create web services (WMS and WFS) for mapping and accessing the shapfile, as well as enabling a spatial search of the dataset. A dataset can contain only one zipped shapfile.

For **netCDF** (.nc) files, the tool will offer OPeNDAP web services for access. You can upload multiple netCDF files.

[+ Add file\(s\)...](#) [Zip selection](#) Select all

paulina_polder_dem_simplified_water_polygons.cpg	0.01 KB	<input type="checkbox"/>
paulina_polder_dem_simplified_water_polygons.dbf	75.06 KB	<input type="checkbox"/>
paulina_polder_dem_simplified_water_polygons.prj	0.85 KB	<input type="checkbox"/>
simplified_water_polygons.shp	29.74 MB	<input type="checkbox"/> Cancel

[Feedback](#)
[Next](#)

DATA UPLOAD

DATA SET DESCRIPTION

GEOGRAPHIC LOCATION

LICENSE AND CONDITIONS

SUMMARY



Open-Data Registration Tool

[UPLOAD GUIDE](#)
[REGISTRATION GUIDE](#)
[Virtual Water Science Lab](#)


Please provide a brief narrative summary of the content of the dataset. Use between 100 and 500 words.

Dataset Description

Name [Get Digital Object Identifier](#)

Link to Data

Description

Keywords [Land cover](#) [Land management](#) [soil depth](#) [Geology](#)

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DATA SET DESCRIPTION

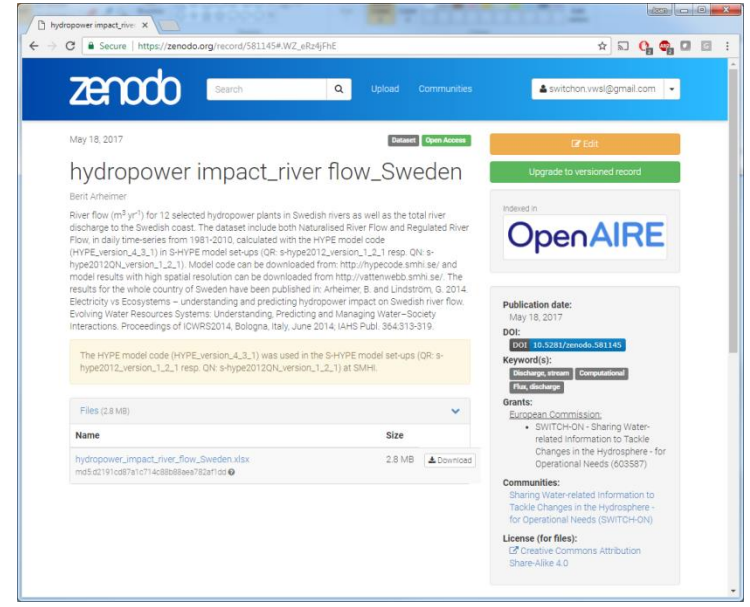
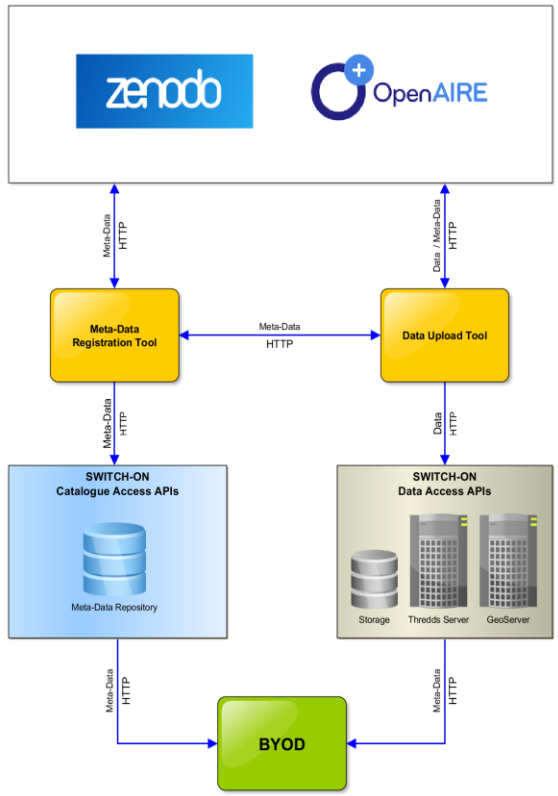
GEOGRAPHIC LOCATION

LICENSE AND CONDITIONS

SUMMARY

DOI (Digital Object Identifier)

The **OpenAIRE** project, in the vanguard of the open access and open data movements in Europe was commissioned by the EC to support their nascent Open Data policy by providing a catch-all repository for EC funded research.



ODR (Open Data Registration) tool - Describe

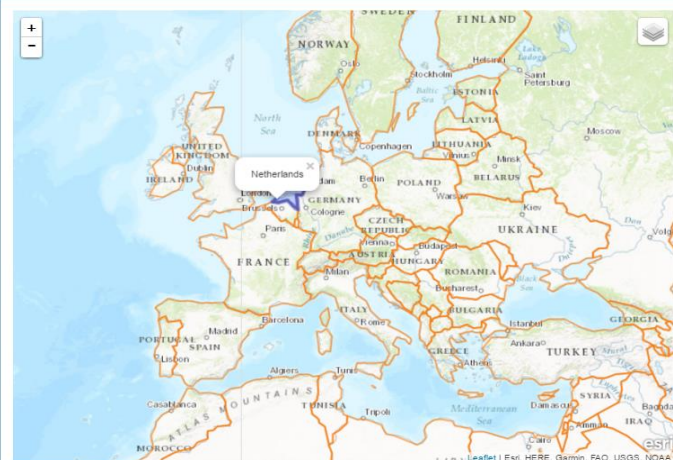


Open-Data Registration Tool

[UPLOAD GUIDE](#)
[REGISTRATION GUIDE](#)
[Virtual Water Science Lab](#)


Select one or more countries that represent the spatial extent of the dataset.

Geographic Location



Geolocation options

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Open-Data Registration Tool

[UPLOAD GUIDE](#)
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Provide information on the sources used to create datasets. Links and citations can be included.

License and Conditions

Access Conditions

License Statement

Contact Person

Institution

Citation / DOI

Data Lineage

License conditions

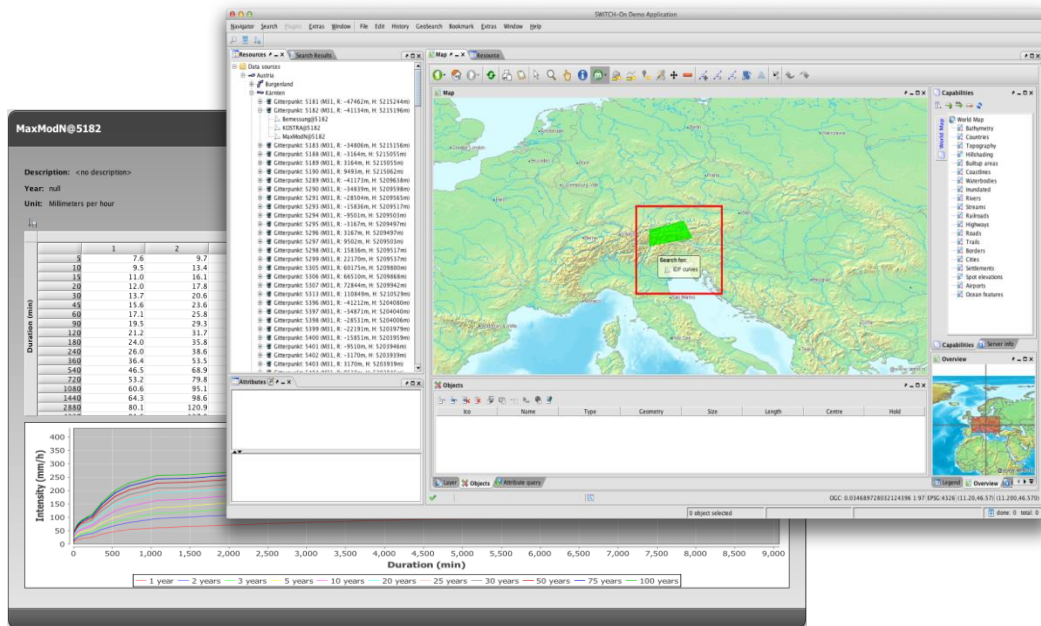
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SIP Expert tool

- Data management tool used by **project administrators** users only.
- **Extended** metadata editing capabilities (ex: **delete** datasets).
- Desktop tool with **GIS** capabilities and data visualization and **validation**.



Meta-Data Wizard

Steps

1. Configuration
2. Basic Resource Properties
3. Topic Category and Keywords
4. Contact Information
5. **Geographic Information**
6. Temporal Information
7. License Information
8. Additional Meta-Data
9. Basic Information
10. Contact Information
11. Import Meta-Data Document
12. Edit Meta-Data Document
13. Resource Representation
14. Basic Information
15. Additional Information
16. Data Import
17. Data Access Properties
18. Resource Relationship
19. Basic Information
20. Import Meta-Data Document
21. Edit Meta-Data Document

Geographic Information 5 of 21

Completion Guide

Please specify the spatial extent of the resource.

Spatial Coverage

Other Properties

SRID: EPSG:4326

Location: France

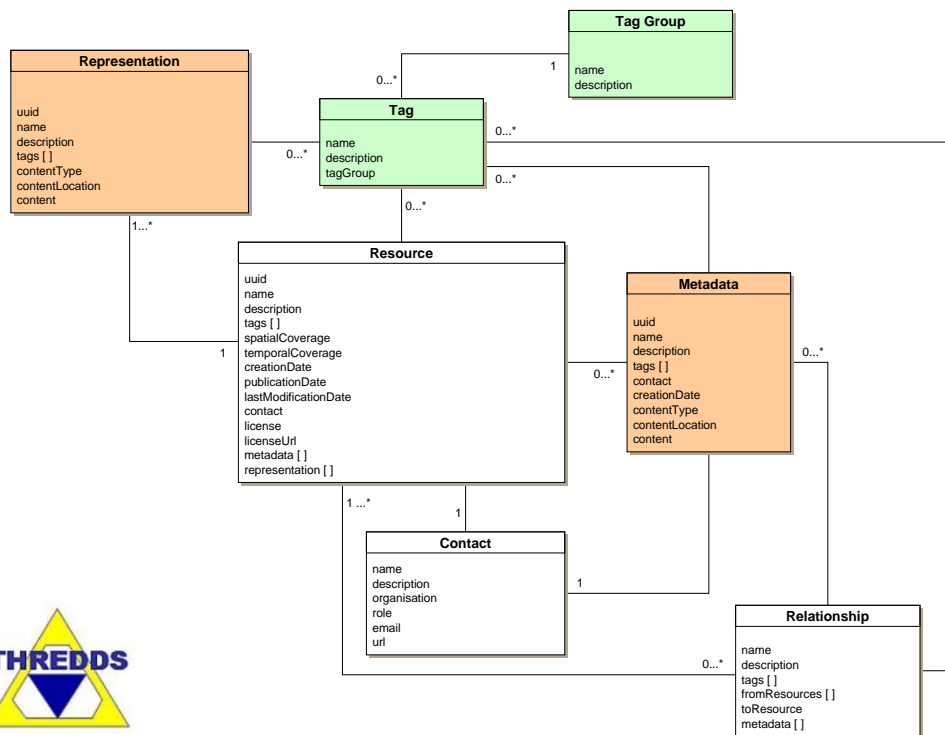
Add Location

Coordinates: 314877,41.65872897609122,8.822438851756473

Back Next Finish Cancel

Catalogue and data model

- **Data** stored in Geoserver, Thredds, depending on the data type.
- **Metadata** Information stored in a Relational Database (PostGIS).
- Information fields can be easily mapped to standards such as **ISO 19115**.
- Simple CSW client instance configured to enable easy access to the catalogue.

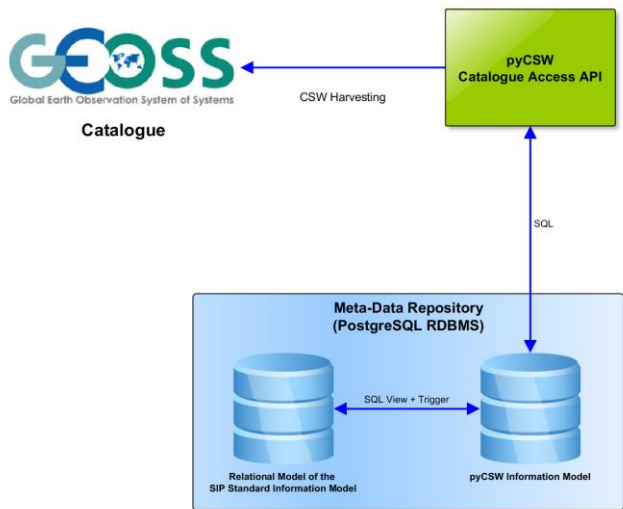


GeoServer



Catalogue and data model (GEOSS data provider)

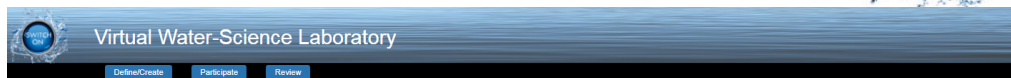
- Aim: To gain more **visibility/exposure** of the project datasets.
- **OGC/CSW** protocol and **ISO 19115** metadata facilitates the exchange.



The screenshot displays the GEOSS Portal interface for the Water Switch-ON EU project. Key elements include:

- Navigation:** Home, About, Search, and user profile (Hi, Joan).
- Page Title:** Data providers | switch
- Project Title:** Water Switch-ON EU project
- Description:** SWITCH-ON is a project using Open Data as a vehicle for innovations, with the aim to use water resources in a sustainable way for a safe society and to advance hydrological sciences. We are building bridges between policy makers, water managers, information producers and scientists. All project assets are available at the web Portal, including dedicated Search tools for water-related open data. There is an open Virtual Product Market with 14 running software producing information for efficient water management and policy. We have initiated a Virtual Water-Science Laboratory for scientists to collaborate on computational experiments, and we arrange for Knowledge Brokerage to facilitate a dialogue on development and marketing of information products.
- Registration date:** 2017-05-15
- URL:** <http://www.water-switch-...>
- Affiliation:** The GEO Affiliation: Non GEO
- Data Policy:** The Data Policy: GEO Data CORE
- Geographical coverage:** The geographical coverage: Global
- Sustainable Development Goals:** A grid of 17 icons representing the UN Sustainable Development Goals.
- Societal Benefit Areas:** A row of icons representing various societal benefit areas.
- Footer:** Visible 1 · 1 of 1, Send Feedback, Terms & Conditions.

Protocol Tool



- Store **ideas** and meta-data for new scientific research.
- Define analysis **steps** and required data.
- Track reporting **status** and other to-do's.
- Create '**repeatable recipes**' for research in PDF.

Protocol: Flood change


Request edit rights

Experiment information

Full experiment name: FLOOD CHANGES IN EUROPE
Experiment title: The idea is to explore the relative role of climate and geographical characteristics to identify changes in floods, and to develop methods and tools for evaluating the triggering factors of flood events across a wide range of scales and environmental conditions in Europe.
Hypothesis: Are there clusters (in time and space) of similar flood characteristics in Europe?
Research objective: The aim of the experiment is to explore and evaluate how floods and their changes cluster in time and space across Europe
Date last update: 2017-09-21

Partners

Name	E-mail	Organisation	lead
Juraj Parajka	parajka@hydro.tuwien.ac.at	TU Vienna	
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	via@gmail.com	TU Bratislava	



Flood change

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Partners

Name	E-mail	Organisation
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Kristina Benner	kristina.benner@gmail.com	TU Bratislava

... from GRDC (Global Runoff Data Centre) in Koblenz (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15). All available daily data from Europe (WMO region 6) are available from GRDC.

... to explore the relative role of climate and geographical characteristics to identify changes in floods, and to develop methods and tools for evaluating the triggering factors of flood events across a wide range of scales and environmental conditions in Europe.

... the aim of the experiment is to explore and evaluate how floods and their changes cluster in time and space across Europe

... via@gmail.com

A) Data & Method Preparation

Task 1: Collect daily runoff data from GRDC (Global Runoff Data Centre) in Koblenz (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15). All available daily data from Europe (WMO region 6) are available from GRDC.

Link: <http://www.hydro-grdc.org/>

Task leader: Juraj Parajka

Deadline: 2015-09-30

Task 2: Write a script to evaluate seasonality and its concentration from daily runoff data (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15).

Description: Write a script to evaluate seasonality (average date of event and its concentration over long time period) from GRDC data.

Link: <https://gitlab.com/parajka/130407063-130407063-248546117>

Task leader: Alberto Viglione

Deadline: 2015-11-30

Task 3: Write a script for identification of flood events from daily runoff time series (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15).

Description: Write a script to process individual time series of daily runoff (GRDC dataset). Output is a file with identified (i) date of the start and end of the flood event (ii) date of the peak (iii) flood peak magnitude (iv) volume of the flood event

Link: <https://gitlab.com/parajka/130407063-130407063-408446491>

Task leader: Alberto Viglione

Deadline: 2015-10-30

Task 4: Create time boundaries for the GRDC dataset (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15).

Description: Create time boundaries for the GRDC dataset from CCSE Flow and Catchment Database, version 2.1 (CCSD2).

Link: <http://www.ccm.cemr.res.in/ftp/links.php?text=ccsd2-2.1>

Task leader: Juraj Parajka

Deadline: 2016-01-01

Task 5: Write a script for extracting changes in flood magnitude and frequency (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15).

Description: Write a script to extract changes in flood magnitude and frequency (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15) from the Catalogue of Identified Flood Peaks from GRDC dataset.

Link: <http://gitlab.com/parajka/130407063-130407063-408446491>

Task leader: Walter Mangini

Deadline: 2016-10-31

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Documentation (video tutorials)



SWITCH-ON ForecastBroker Version 2
8 visualizaciones • Hace 2 meses



SWITCH ON SafeTrip
30 visualizaciones • Hace 1 año



SWITCH ON RiverInfo.eu
88 visualizaciones • Hace 1 año



SWITCH ON NUTPRINT
55 visualizaciones • Hace 1 año



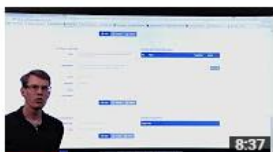
SWITCH ON ForecastBroker
77 visualizaciones • Hace 1 año



SWITCH ON BYOD Tool
234 visualizaciones • Hace 1 año



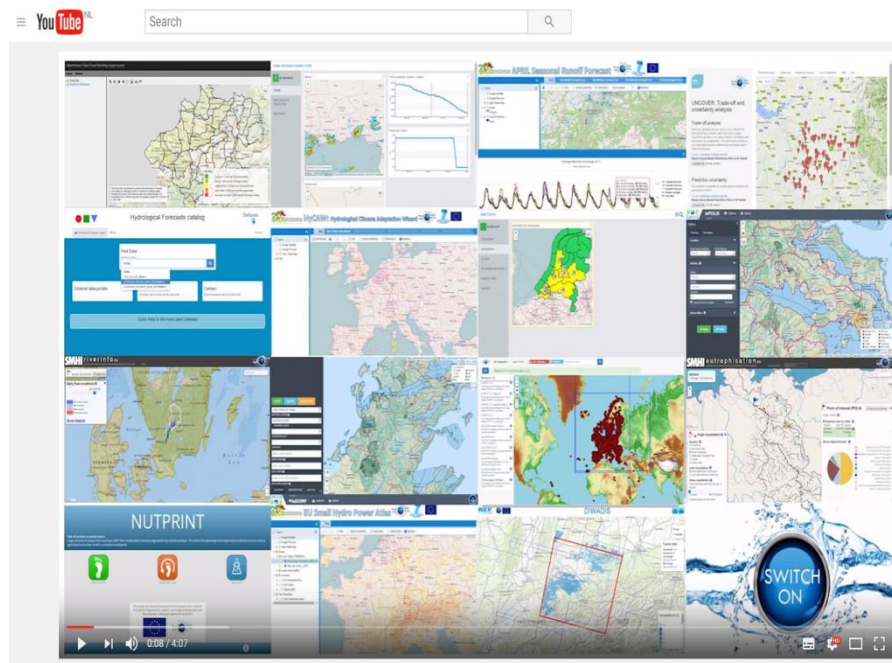
SWITCH-ON FFRM
18 visualizaciones • Hace 1 mes



SWITCH-ON Protocol Tool
10 visualizaciones • Hace 2 meses



SWITCH-ON Open Data Registration and Upload Tool
23 visualizaciones • Hace 2 meses



https://www.youtube.com/channel/UCNbBe7iIT_HRekm3yFzui2g

Open Source code (GitHub)

<https://github.com/switchonproject>

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Conclusions

- SWITCH-ON architecture is divided in several **OGC compliant** components instead of a single entity.
- The **agile development** approach was very successful.
- SWITCH-ON uses both **CUAHSI keywords** (extended) and **INSPIRE topic** categories to tag uploaded open data.
- **Zenodo API** allows users to make their data/work citeable (DOIs).
- Thanks to the usage of **OGC/CSW** protocol the datasets are **harvestable** by bigger catalogues such as the GEOSS system of systems.
- Code is open-source and available through **GitHub**
- There is documentation and online howto videos on the **switch-ON Youtube** channel

Thank you!



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