

Data Spaces Symposium

Water Data Space

Roberto Di Bernardo,
Engineering &
Gerasimos Antzoulatos,
CERTH/ITI



Motivation

Water Sector



- + **Hydraulic Modeling** 1.0 to **2.0** using AI, IoT, big data ...
- **Fragmentation** of the key actors, tailor-made solutions
- **Lack of standardization** (industry-wide)
- Challenging **Data exchange & interoperability**
- **Reluctant** to adopt **open-source** solutions
- **Missing** global integrated **P/C security** context
- **Small** (economically) **market** size

WATERVERSE

Technology



- + Advances in IoT and Smart/Remote sensors
- + Big data – heterogeneous sources
- + Precision-based AI analytics
- + Advanced sensing and modelling technologies
- + Semantic representation/ reasoning & Smart Data Models
- + AI for BI processes

To develop a **Water Data Management Ecosystem (WDME)** for making data management practices and resources in the water sector ***accessible, affordable, secure, FAIR, and easy to use***

The Project at a Glance

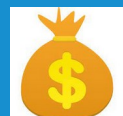
Water Data Management Ecosystem for Water Data Spaces



- **HORIZON-CL4-2021-DATA-01-03**—
Technologies for data management (AI, Data and Robotics Partnership)



- Start Date: **01 October 2022**
- End Date: **30 September 2025**



- Total cost: **€ 5 253 964,65**
- EU contribution: **€ 4 510 509,90**



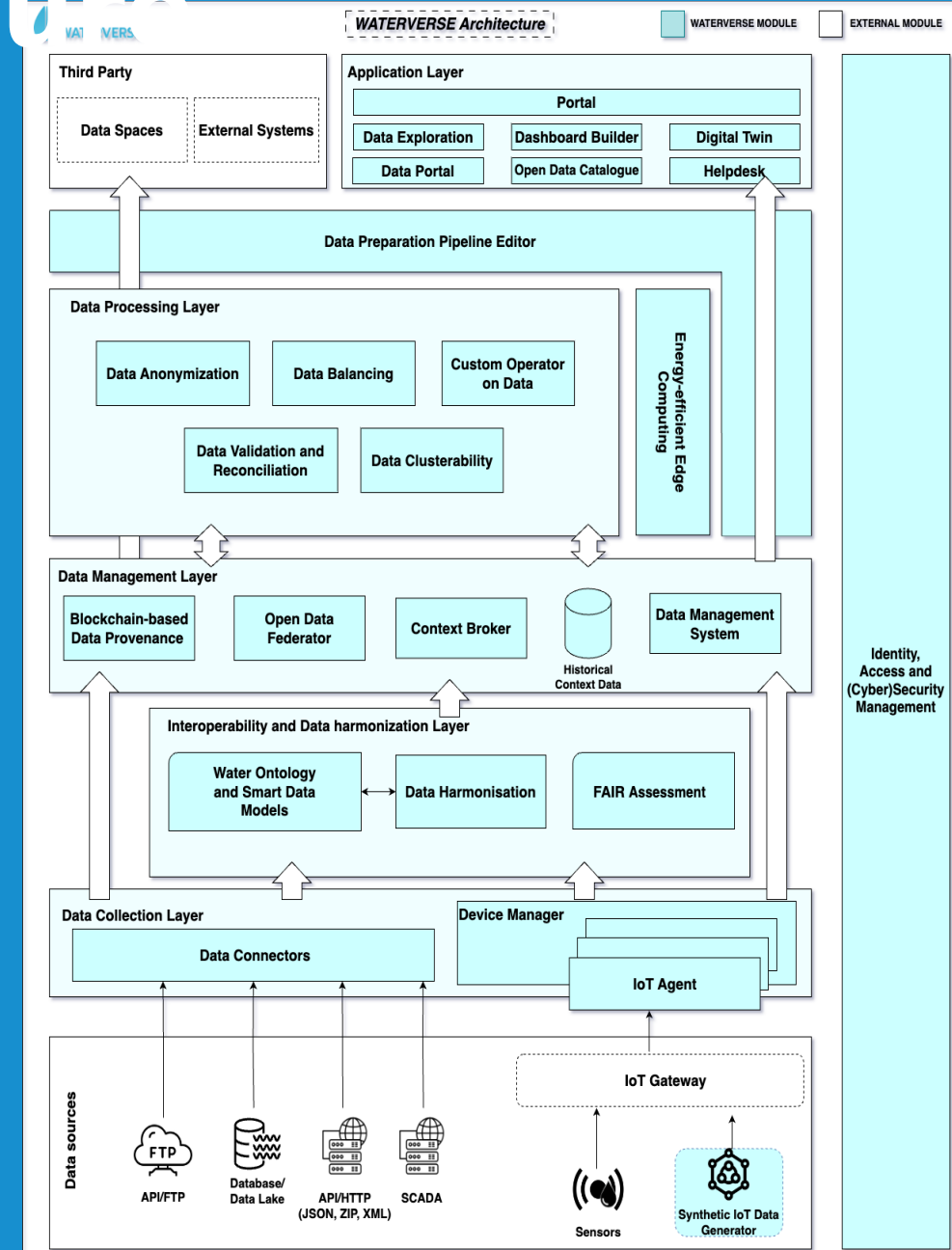
- **17 partners from 10 EU countries**
 - 6 RTOs
 - 7 SMEs
 - 1 large industry
 - 3 NPOs



WDME Logical Architecture

■ Multi-layer architecture to

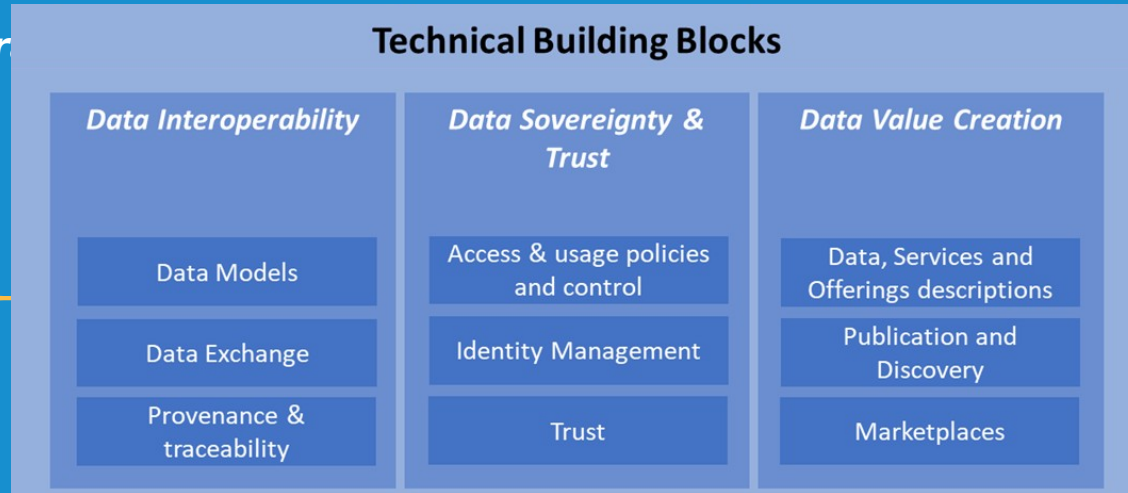
- consider the **entire data lifecycle** (collect, harmonise, fuse, manage, process)
- empower the **interoperability** and trustworthy **data sharing**
- assess **FAIRness** of data assets
- ensure **security** and **energy efficiency** in water utilities operations



WDME ROs & link to DS

Empower Data Sharing & Interoperability

- **NGSI-LD Context Broker**
- **Blockchain**-based data provenance tool
- **Water Ontology Catalogue**
- **Smart Data Models** for data harmonization
- **FIWARE Data Converters** (NGSI-LD)
- **IoT Device Manager**
- **IoT Agents** and system adapters
- **Data Connectors**

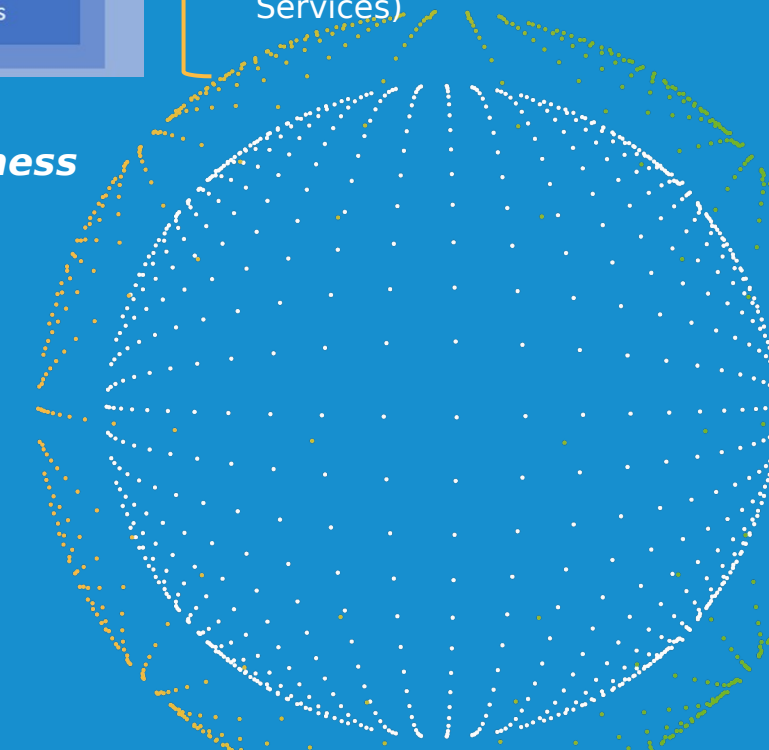


Establish a FAIRness Ecosystem

- Data catalogue for Open Data discovery
- Data exploration and navigation tool
- Tool for FAIRness assessment (16 FAIR Services)

Empower Data-Sharing Trustworthiness

- Identity Access Tool
- Cybersecurity solutions for Water Utilities



Pilot Use Cases



- **NL Pilot:** Prediction of water quality and its impact in the treatment steps



- **DE Pilot:** Digital Village Twin for flood protection and territorial management



- **CY Pilot:** Leveraging the potential of water digital twin and water analytics tools



- **UK Pilot:** Addressing the challenges of Combined Sewer Overflow performance



- **ES Pilot:** Management of the integral water cycle and open innovation



- **FI Pilot:** Smart water tools and risk management

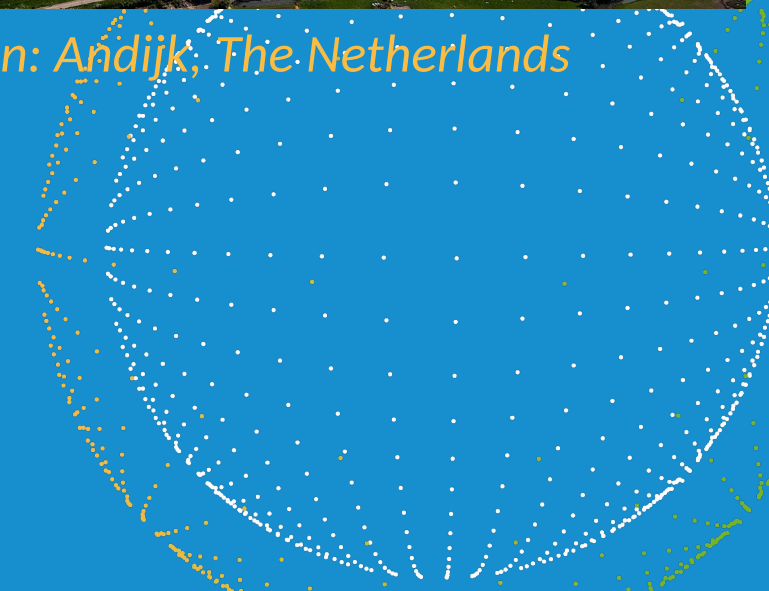


NL Pilot Use Cases

- **NL#UC1: Collection and harmonisation of heterogenous data**
 - NL#UC1.1: Collect & harmonize raw datasets into WDME.
 - NL#UC1.2: Synthetic data generation
- **NL#UC2: Sharing of the collected after its preparation**
 - NL#UC2.1: Newly acquired data to perform **model predictions** for Cl concentrations.
 - NL#UC2.2: **Data validation and reconciliation**
- **NL#UC3: Federation of external data to make available to Water Utility teams**
 - NL#UC3.1: **Data visualisation**
 - NL#UC3.2: External sharing of **Cl model predictions**



Location: Andijk, The Netherlands



Water Data Management Ecosystem

WATERVERSE

Water Data Management Ecosystem for Water Data Spaces

WATERVERSE is an EU-funded project aimed at developing a Water Data Management Ecosystem (WDME) for making data management practices and resources in the water sector accessible, affordable, secure, fair, and easy to use. The Water Data Management Ecosystem will improve usability of data and the interoperability of data-intensive processes, thus lower the entry barrier to data spaces, enhance the resilience of water utilities and boosting the perceived value of data and therefore the market opportunities behind it.

Have a problem with the platform or want to send us feedback?

[Open a ticket](#)

Check out our manuals to learn how to use WATERVERSE Data Management Ecosystem.


[User Guide](#)

Before opening a ticket, check whether the FAQ meets your needs.

[FAQ](#)


WDME Data Management Tools

Data Portal




[Read More →](#)

Data Preparation Pipeline Editor




[Read More →](#)

Dashboard Builder




[Read More →](#)

Cybersecurity for Water Utilities




[Read More →](#)

Open Data Catalogue




[Read More →](#)

IoT Device Manager




[Read More →](#)

Data Exploration and Navigation Tool



[Read More →](#)


Digital Twin



[Read More →](#)


WDME Data Pre-Processor Tools

Synthetic IoT Data Generator




[Read More →](#)

Data Harmonization




[Read More →](#)

Data Validation and Reconciliation




[Read More →](#)

Data Balancing




[Read More →](#)

Data Anonymization



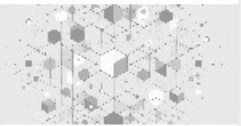
[Read More →](#)

Data Clusterability




[Read More →](#)

Blockchain-Based Data Provenance



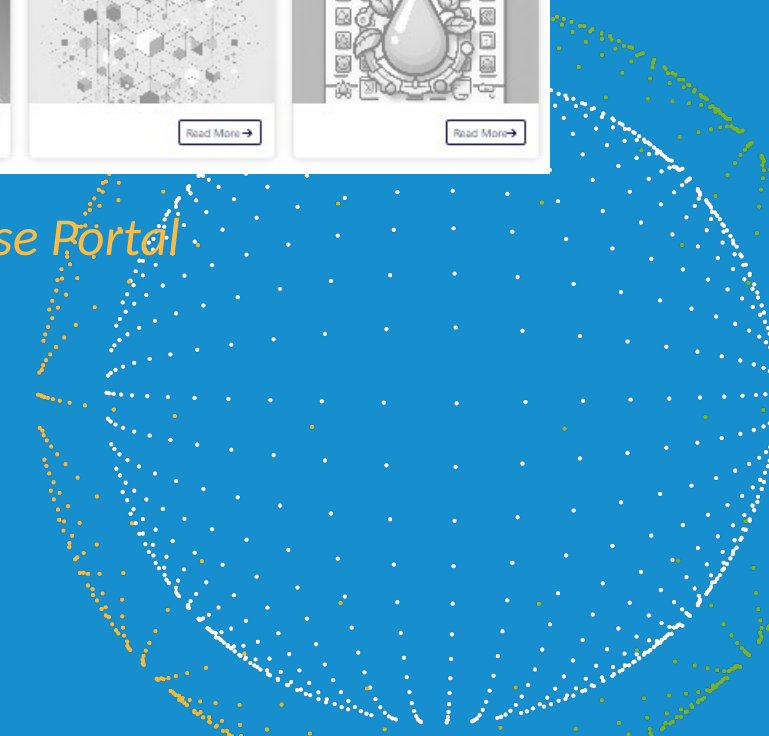
[Read More →](#)

Water Ontology Catalogue

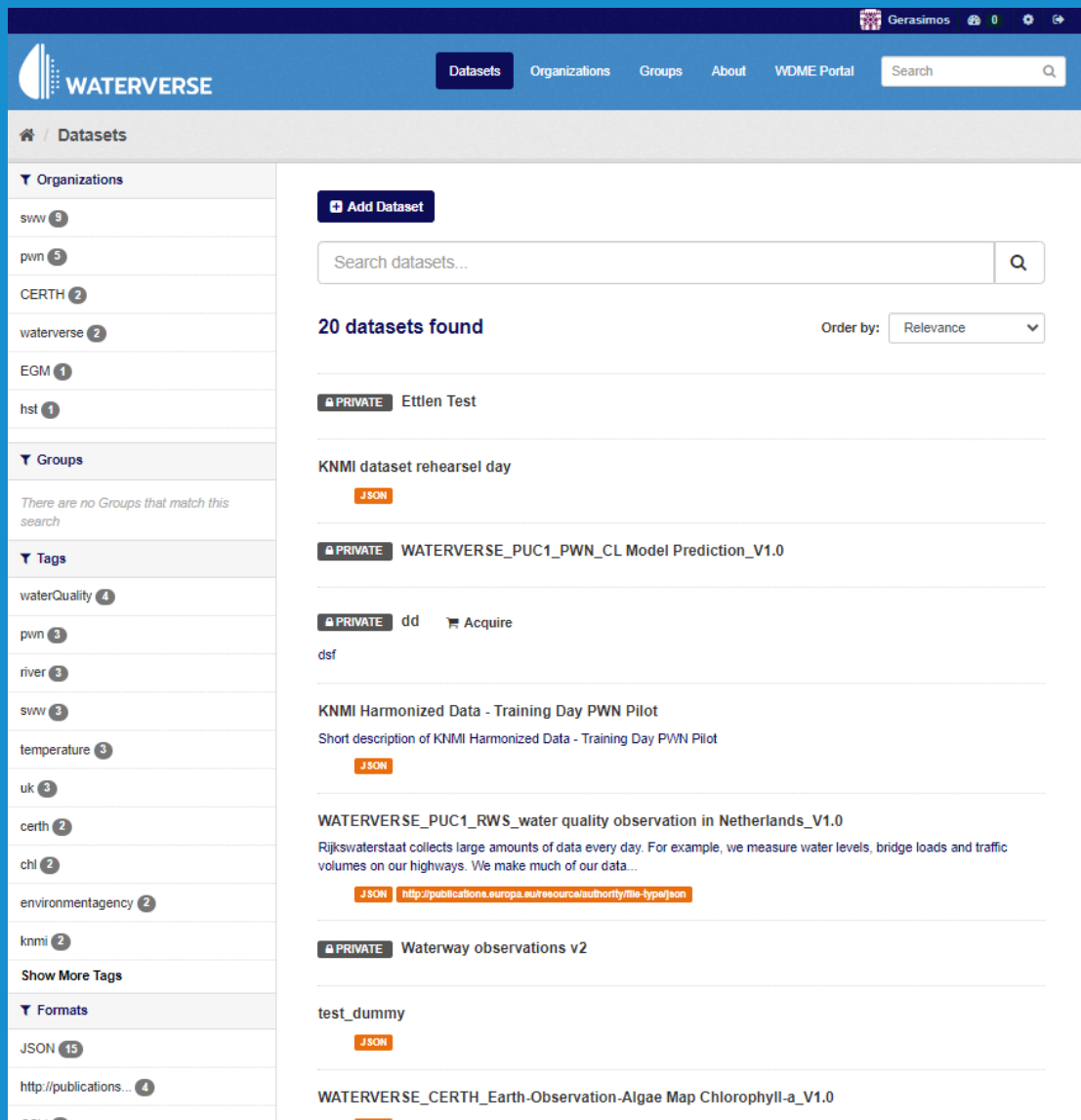


[Read More →](#)

Waterverse Portal

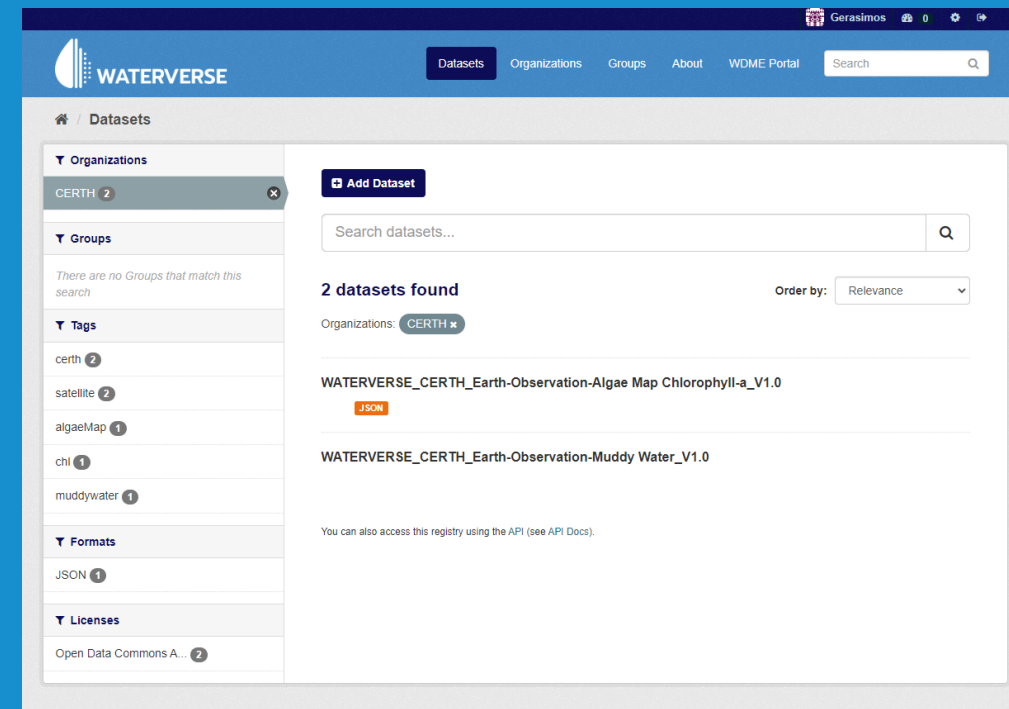


CKAN Data Portal

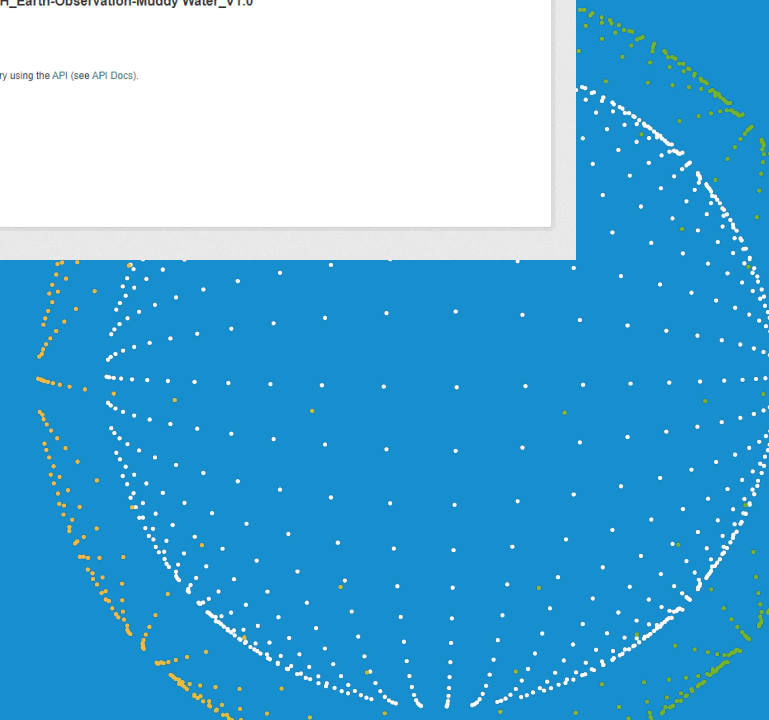


The screenshot shows the CKAN Data Portal interface. The top navigation bar includes 'WATERVERSE', 'Datasets', 'Organizations', 'Groups', 'About', 'WDME Portal', and a search bar. The main content area is titled 'Datasets' and features a sidebar with filters for Organizations, Groups, and Tags. The main panel shows a search for 'Ettlen Test' with 20 datasets found, ordered by Relevance. The results list includes datasets like 'KNMI dataset rehearsal day', 'WATERVERSE_PUC1_PWN_CL Model Prediction_V1.0', and 'KNMI Harmonized Data - Training Day PWN Pilot'.

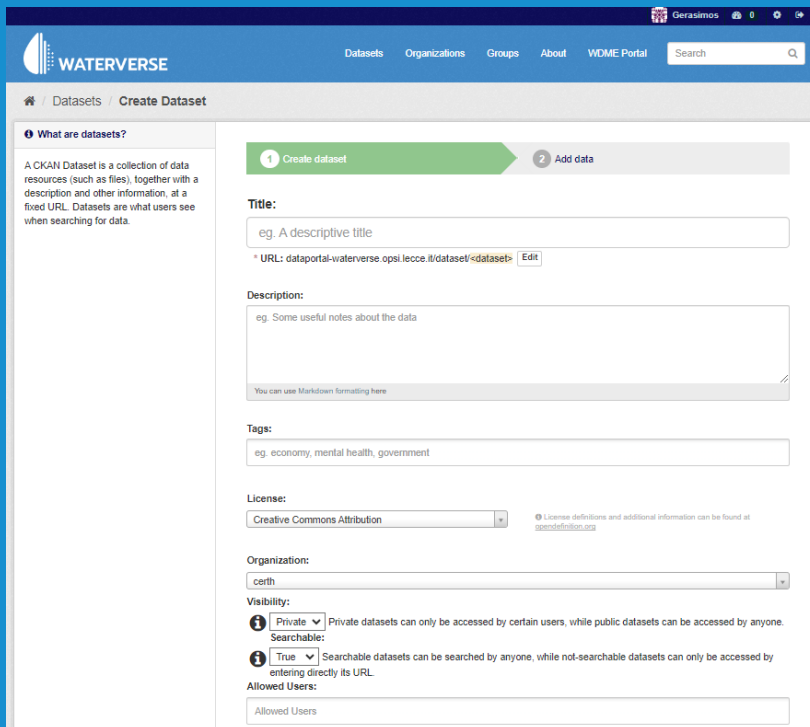
WaterVerse Portal



The screenshot shows the WaterVerse Portal interface. The top navigation bar includes 'WATERVERSE', 'Datasets', 'Organizations', 'Groups', 'About', 'WDME Portal', and a search bar. The main content area is titled 'Datasets' and features a sidebar with filters for Organizations, Groups, Tags, and Formats. The main panel shows search results for 'Ettlen Test', displaying 2 datasets found, ordered by Relevance. The results list includes datasets like 'WATERVERSE_CERTH_Earth-Observation-Algae Map Chlorophyll-a_V1.0' and 'WATERVERSE_CERTH_Earth-Observation-Muddy Water_V1.0'.



Create a Dataset & Check FAIRness



1 Create dataset → **2 Add data**

Title:

* URL: dataportal-wataverse.opsi.lecce.it/dataset/<dataset> Edit

Description:

You can use Markdown formatting here

Tags:

License:
 License definitions and additional information can be found at [opendefinition.org](#)

Organization:

Visibility:
 Private Private datasets can only be accessed by certain users, while public datasets can be accessed by anyone.
 Searchable:
 True Searchable datasets can be searched by anyone, while not-searchable datasets can only be accessed by entering directly its URL.

Allowed Users:

Acquire URL:

Source:

Version:

Author:

Author Email:

Maintainer:

Maintainer Email:

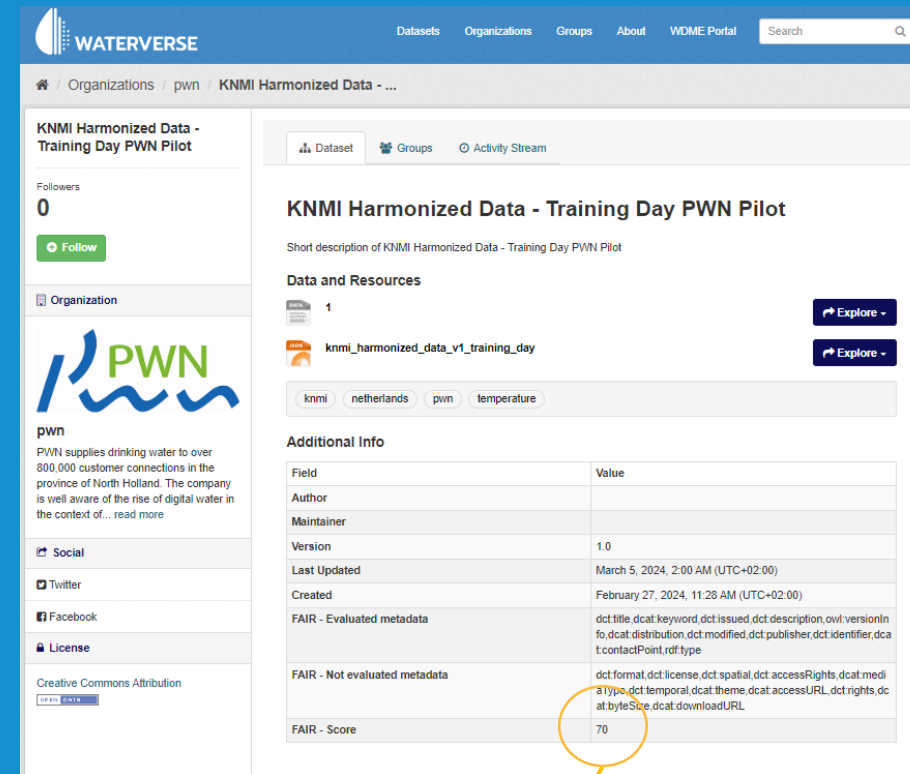
Custom Field:

Custom Field:

Custom Field:


The data license you select above only applies to the contents of any resource that you add to this dataset. By submitting this form, you agree to release the metadata values that you enter into the form under the Open Database License.

* Required field **Next: Add Data**



KNMI Harmonized Data - Training Day PWN Pilot

Followers: **0**
[Follow](#)

Organization

pwn
 PWN supplies drinking water to over 800,000 customer connections in the province of North Holland. The company is well aware of the rise of digital water in the context of... [read more](#)

Social
[Twitter](#)
[Facebook](#)
[License](#)

Creative Commons Attribution
[OPEN DATA](#)

KNMI Harmonized Data - Training Day PWN Pilot

Short description of KNMI Harmonized Data - Training Day PWN Pilot

Data and Resources
 1 [Explore](#)
 knmi_harmonized_data_v1_training_day [Explore](#)

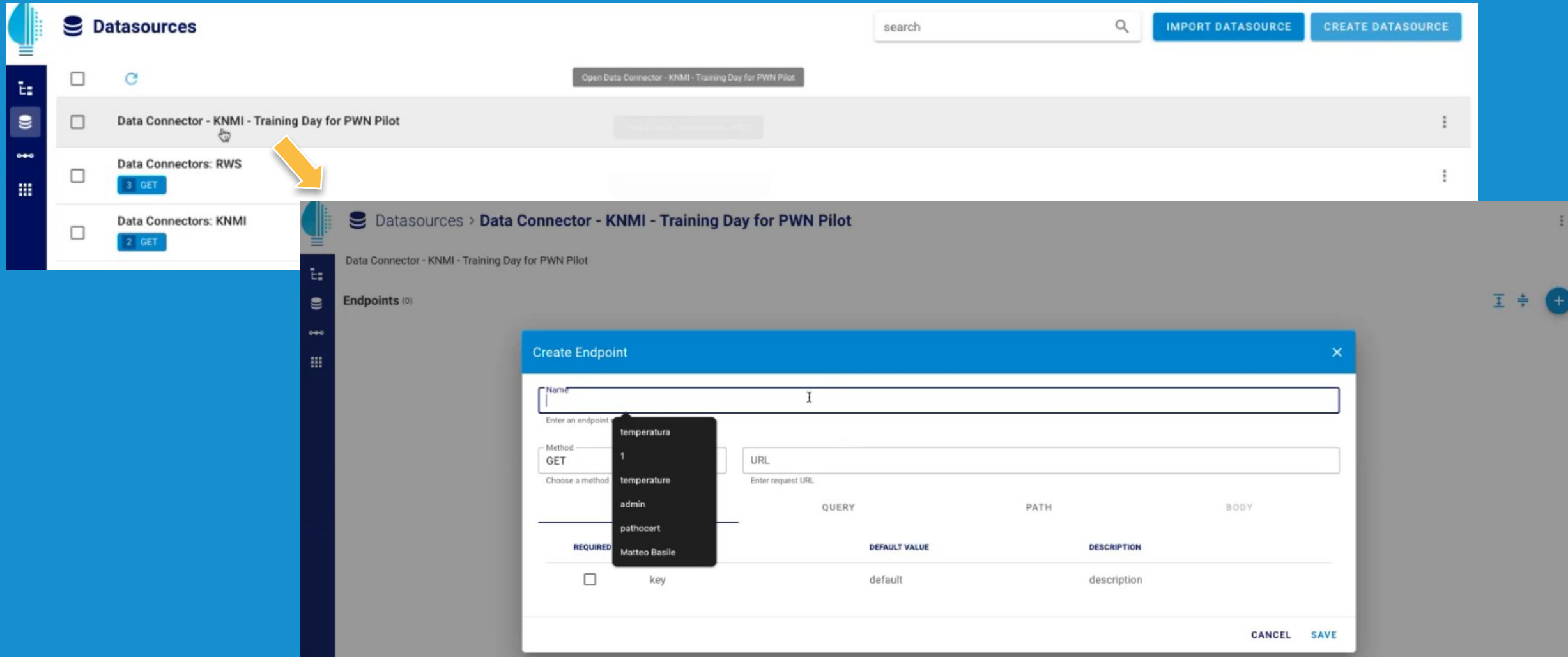
Additional Info

Field	Value
Author	
Maintainer	
Version	1.0
Last Updated	March 5, 2024, 2:00 AM (UTC+02:00)
Created	February 27, 2024, 11:28 AM (UTC+02:00)
FAIR - Evaluated metadata	dct:title, dcat:keyword, dct:issued, dct:description, owl:versionInfo, dcat:distribution, dct:modified, dct:publisher, dct:identifier, dcat:contactPoint, rdf:type
FAIR - Not evaluated metadata	dct:format, dct:license, dct:spatial, dct:accessRights, dcat:mediaType, dct:temporal, dcat:theme, dcat:accessURL, dct:rights, dcat:byteSize, dcat:downloadURL
FAIR - Score	70

The dataset is enriched with new metadata giving a FAIR score

Data Preparation Pipeline Editor

1



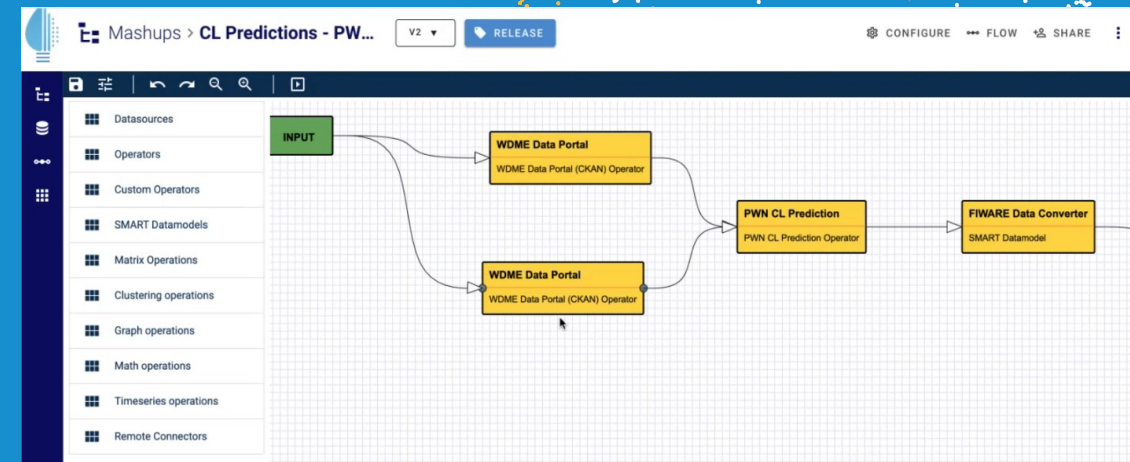
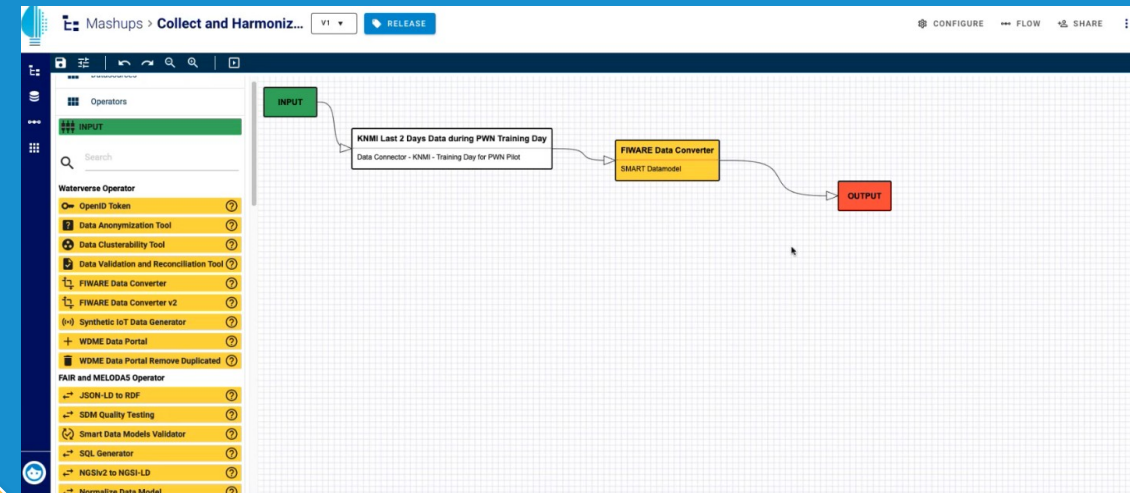
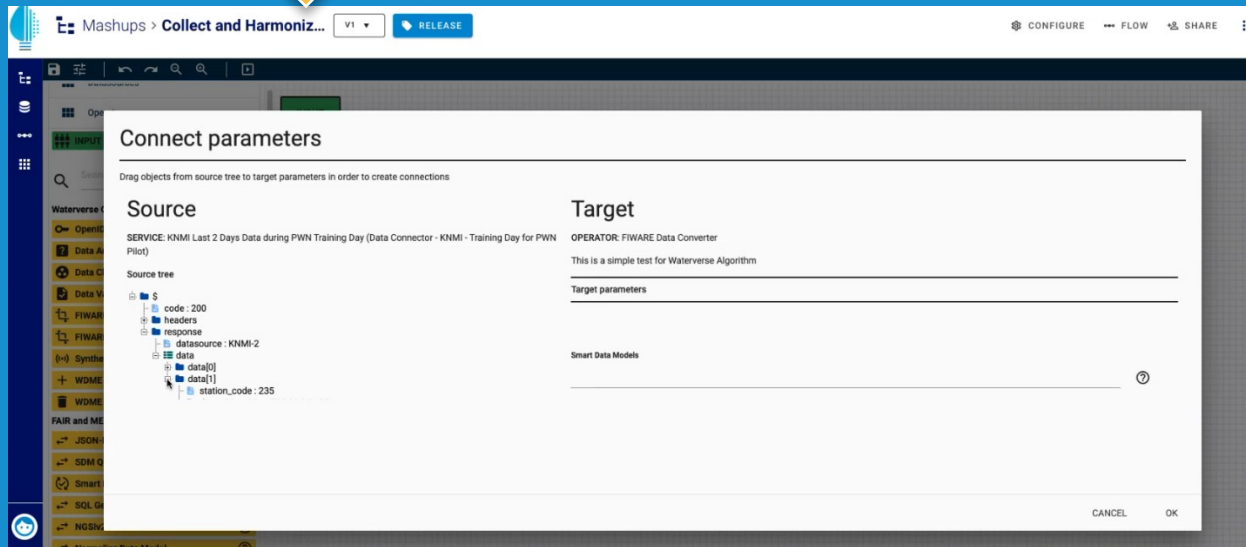
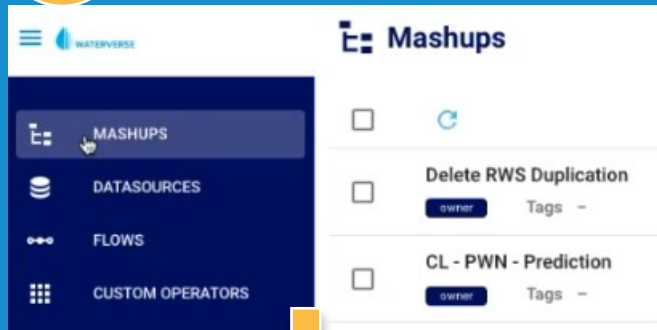
The screenshot displays the 'Datasources' management interface. On the left, a sidebar lists several data connectors: 'Data Connector - KNMI - Training Day for PWN Pilot', 'Data Connectors: RWS', and 'Data Connectors: KNMI'. An orange arrow points to the 'Data Connectors: RWS' entry. The main area shows the details for the selected 'Data Connector - KNMI - Training Day for PWN Pilot', including a breadcrumb trail and a list of endpoints (currently empty). A 'Create Endpoint' dialog box is open in the foreground, featuring a 'Name' field, a 'Method' dropdown set to 'GET', and a 'URL' field. Below these fields is a table for defining endpoint parameters:

REQUIRED	KEY	DEFAULT VALUE	DESCRIPTION
<input type="checkbox"/>	key	default	description

A dropdown menu is visible over the 'Method' field, listing options: '1', 'temperatura', 'temperature', 'admin', 'pathocert', and 'Matteo Basile'. The dialog box also includes 'CANCEL' and 'SAVE' buttons at the bottom right.

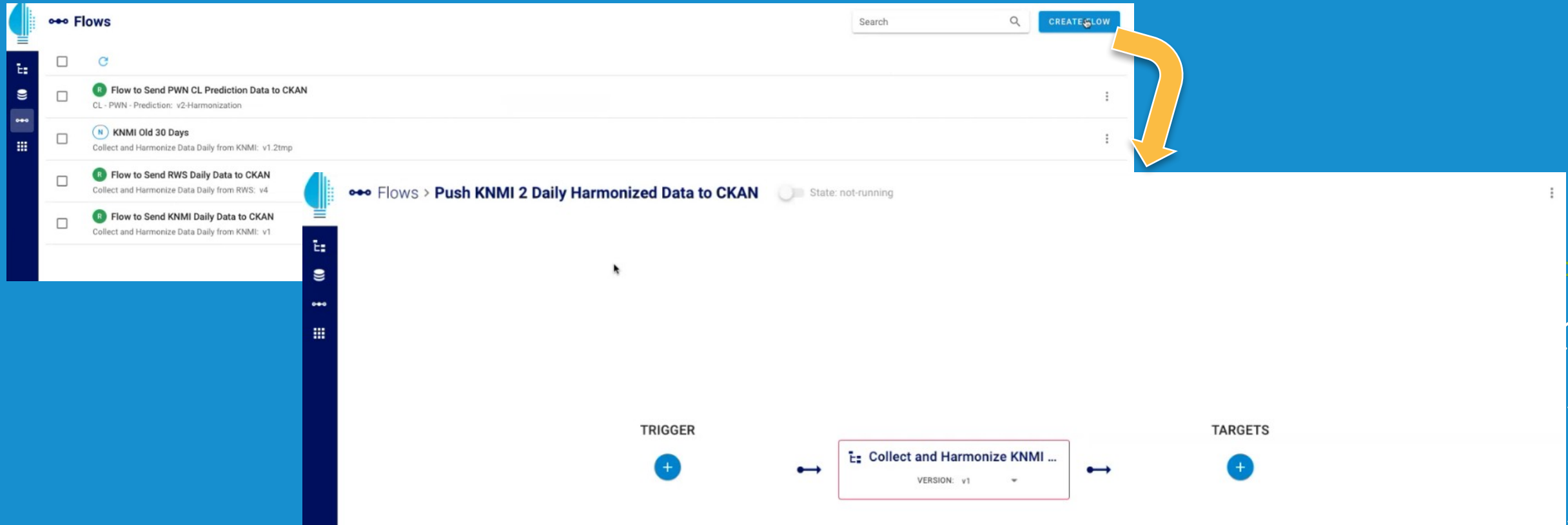
Data Preparation Pipeline Editor

2



Data Preparation Pipeline Editor

3



The screenshot displays the 'Flows' management interface. On the left, a sidebar lists several flows, including 'Flow to Send PWN CL Prediction Data to CKAN', 'KNMI Old 30 Days', 'Flow to Send RWS Daily Data to CKAN', and 'Flow to Send KNMI Daily Data to CKAN'. The main area shows a detailed view of the flow 'Flows > Push KNMI 2 Daily Harmonized Data to CKAN', which is currently 'State: not-running'. Below this, a pipeline diagram is visible, consisting of a 'TRIGGER' section with a plus icon, followed by a task box labeled 'Collect and Harmonize KNMI ...' with 'VERSION: v1' and a dropdown arrow, and finally a 'TARGETS' section with a plus icon. A large orange arrow points from the 'CREATE FLOW' button in the top right of the flow list to the detailed view of the selected flow.

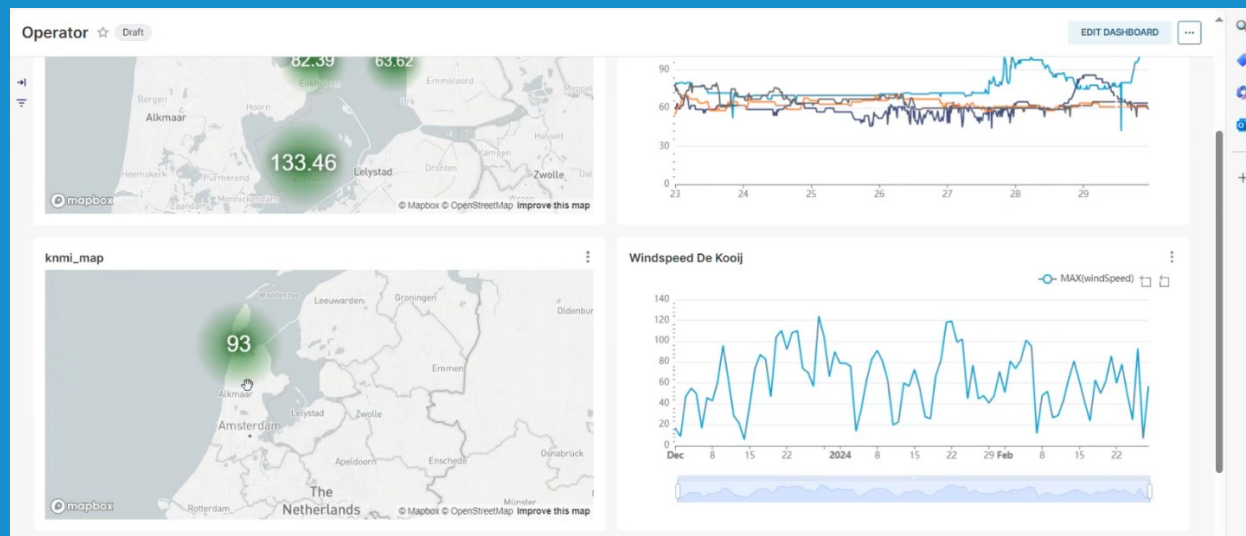
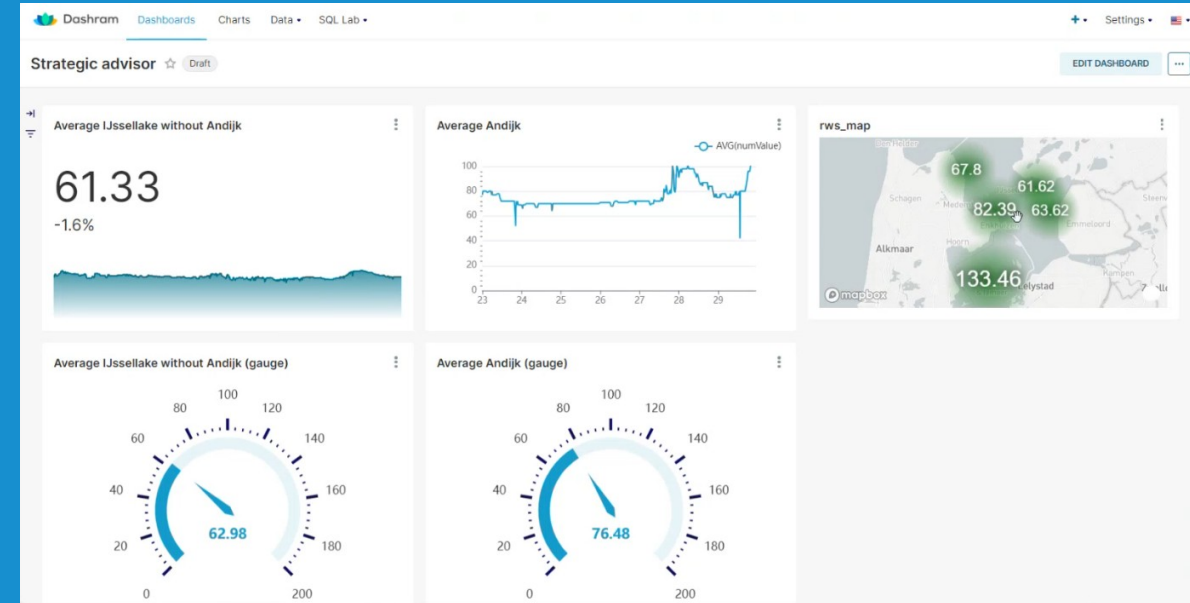
Data Visualisation - Dashram

Dashram Dashboards Charts Data • SQL Lab • Settings •

Data Databases Datasets Saved queries Query history BULK SELECT + DATASET

OWNER	DATABASE	SCHEMA	TYPE	CERTIFIED	SEARCH				
Select or type a value	Select or type a value	Select or type a value	Select or type a value	Select or type a value	Q. Type a value				
Name	Type	Database	Schema	Modified	Modified by	Owners	Actions		
pwn_chi_prediction_v1	Physical	PostgreSQL - PWN - Dashram	public	a minute ago	Superset Admin				
Synthetic_Data_Rehearsel	Physical	PostgreSQL - PWN - Dashram	public	a minute ago	Eric de Vos				
water_quality_observation_rws_v2.2	Physical	PostgreSQL - PWN - Dashram	public	an hour ago	Superset Admin				
mytabletest	Physical	PostgreSQL - PWN - Dashram	public	an hour ago	Superset Admin				
weather_observation_knmi_v1.0	Physical	PostgreSQL - PWN - Dashram	public	an hour ago	Superset Admin				
water_quality_observation_rws_v1.1	Physical	PostgreSQL - PWN - Dashram	public	an hour ago	Superset Admin				
pwn_chi_prediction_v1	Physical	PostgreSQL - PWN - Dashram	public	4 hours ago	Superset Admin				
water_quality_observation_rws_v0.2	Physical	PostgreSQL - PWN - Dashram	public	11 hours ago	Siddharth Seshan				
Testtable_KNMI	Physical	PostgreSQL - PWN - Dashram	public	17 days ago	Eric de Vos				ED
Testtable_rws_edv	Physical	PostgreSQL - PWN - Dashram	public	21 days ago	Eric de Vos				ED
weather_observation_knmi_v0.2	Physical	PostgreSQL - PWN - Dashram	public	22 days ago	Siddharth Seshan				

1-11 of 11



Dashram Dashboards Edit Report

Alerts & reports Alerts

REPORT NAME* CI trend and predictions Andijk OWNERS* Eric de Vos x DESCRIPTION CI trend and predictions IJsselmeer at Andijk Active

OWNER Select or type a value

Last run: 2024-02-29 13:05:18+01, 2024-03-01 00:50:20+01, 2024-03-01 09:13:19+01, 2024-02-29 14:55:18+01

Report schedule* Every day at 12:00

CRON Schedule 0 12 * * *

TIMEZONE GMT +01:00 (Central European Time)

Schedule settings LOG RETENTION* 90 days WORKING TIMEOUT* 3600 seconds

Message content* Dashboard Chart RWS Ignore cache when generating screenshot Notification method* Email EMAIL Recipients are separated by ";" or ","

CANCEL SAVE

Some steps ahead towards Water Data Spaces

The GREAT project aims to establish the Green Deal Data Space Foundation and its Community of Practice which builds on both the European Green Deal and the EU's Strategy for Data.

WATERVERSE has been in contact with GREAT project since one year.

We organized a common session during last Data Week 2023: **AI and Data Spaces for sustainable smart city – water and other key resources challenges**

- Measures towards the creation of a harmonised and federated ecosystem based on the data space, focusing on the water sector and related data-driven ecosystems.

A workshop series on Water Data Space:

■ **From GREAT and WATERVERSE experience to future Water Data Spaces** workshop will be held on **16th April, 9:00 – 12:00 CEST**

- Starting from **GREAT** requirements/specs, we will merge them with the **WATERVERSE** ones, thanks to the support of our key communities.
- Other (two) workshops will follow to consolidate the results and include them into official reports:



Thank You!

Roberto Di Bernardo,
roberto.dibernardo@eng.it
Technical Manager (ENG)



Gerasimos Antzoulatos,
gantzoulatos@iti.gr
Project Manager (CERTH/ITI)



Stefanos Vrochidis (CERTH)
Project coordinator (stefanos@iti.gr)

Ilias Gialampoukidis (CERTH)
Deputy project coordinator (heliassgj@iti.gr)

Roberto Di Bernardo (ENG)
Technical Manager (roberto.dibernardo@eng.it)