FIWARE
Global
Summit

Smart Data Models

Leading
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transformation

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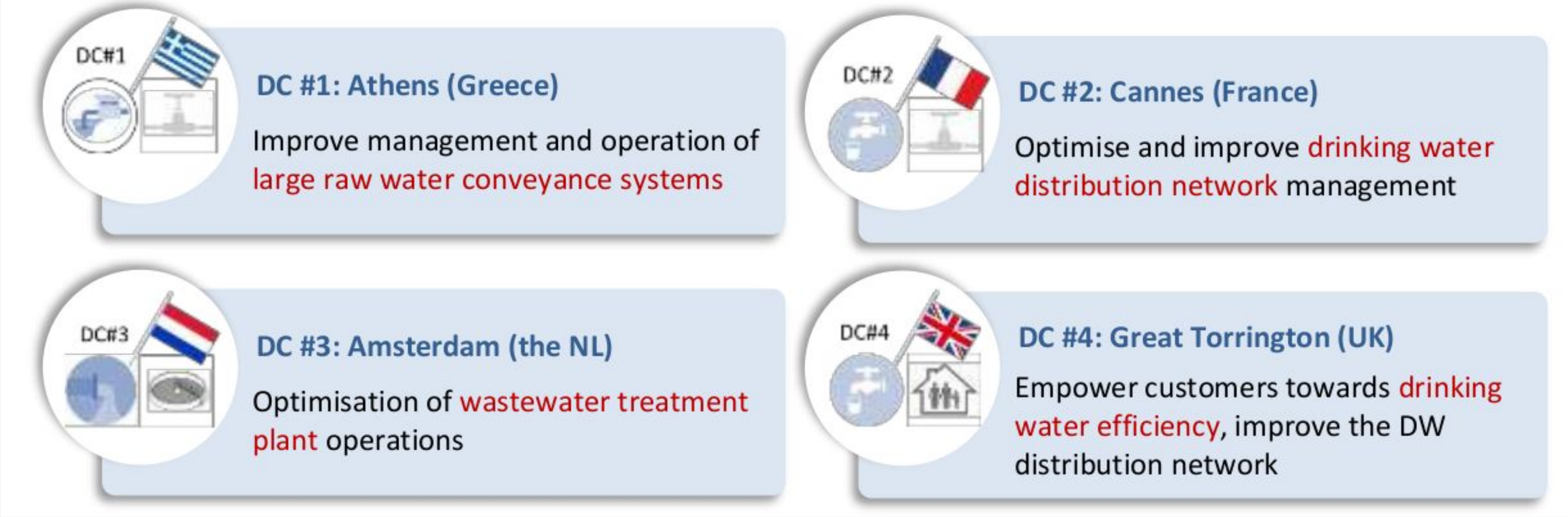
Smart Data Models

Water Data Models.

Gran Canaria, Spain
14-15 September, 2022
#FIWARESummit

FIWARE
Open APIs for Open Minds

Use case (s)



Four pilots using FIWARE platform

Reusing SAREF4Water ontology

Results

- Machine learning models for dealing with outliers
- F4W Reference Architecture has been updated with the BigData and AI tools integrated or developed.
- Components developed in the scope of this task are expected to soon enter the FIWARE Generic Enablers incubator following the schedule time and requirements of the FIWARE TSC.
- A deep neural network model to forecast the level of turbidity at the downstream parts of the conveyance system
- A predictive model based on a semi-supervised approach for water demand forecast.
- Hybrid approach for a real-time and continuous water availability forecast based on a combination of data-driven & hydrological models
- A predictive model based on a supervised classification algorithm for water leaks detection implemented through Python technology and offering Big Data capabilities such as horizontal scalability and high-performance.
- A hydraulic model based on a model-driven approach that relies on the EPANET model of the water distribution for leak detection.
- A geographical coverage model is built on top of a machine learning model to identify preferred search areas for the leak localization
- An of course up to 52 data models 35 related with water and the mapping of SAREF4Water ontology

Results

Prove that SDM were relevant at Water management (exceeded SAREF4Watr * 5)

Collaboration with other water projects to share data models (Naiades, DWC pathocert, Aqua3S, Lotus, etc) and ICT4Water cluster

Integration with tools (EPANET)

Data Models

Data Models

- Open channel (9DM)
- Machine Learning (3DM)
- EPANET (11 DM)
- Water consumption (1DM extended)
- Waste Water (6DM)

Others

- Social Media (6DM)
- Risks (10 DM)
- Satellite imagery (6DM)
- Alert (1 DM)

Services

- Customize a context with external IRI
- Merge several SDM contexts sources
- Draft a data model from a json keyvalues
- Draft a data model from a csv payload
- Generate examples based on a data model

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Thanks!

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Results

A clustering model for water consumers' behaviour classification based on a hybrid data-driven approach.

The NANOsensor behaviour was submitted to laboratory testing. In this stage, the testing concluded that the sensor was neither suited for the use in a beaker nor in a flow system to determine the concentration of several parameters.

A remediation plan was prepared to identify and understand the possible source of misfunction, and improve the formation and characterization of the active material.

Development of a software component to integrate the NANOsensor in a FIWARE environment.

The nano::stations were introduced in the Demo Case #2 to replace the data gathering process planned for the NANOsensor.

The introduction of the Eurecat printed sensor allowed blocked activities to be disbursed. The sensor was used to perform correct laboratory testing and develop low-level processes to treat the raw data.

AI-based algorithms were studied and developed to improve the data extracted by the printed sensor.

New sensors installed in the conveyance system.

Deployment of a new web platform for analysis, processing and monitoring of data from the sensors in the conveyance system

Deployment of new smart applications in an operational "live" context

Full deployment of the FIWARE-enabled architecture, that allows the seamless integration of EYDAP's legacy system, new analytics and platform with FIWARE technology

An operational and reliable communication chain to collect and transmit measurements from the four multiparameter probes (nano::stations) to the SCADA (TOPKAPI) to AQUADVANCED® Water Networks

Four nano::stations monitored and operational in the drinking water distribution network

Results

Water leaks detection:

o A predictive model based on a supervised classification approach

o A predictive model based on a supervised classification algorithm for water leaks detection implemented through Python technology and offering Big Data capabilities such as horizontal scalability and high-performance.

o A hydraulic model based on a model-driven approach that relies on the EPANET model of the water distribution for leak detection.

o A geographical coverage model is built on top of a machine learning model to identify preferred search areas for the leak localization.

o A leak mitigation tool based on Artificial Intelligence algorithms. Detection of water contamination events:

o A predictive model for drinking water quality events detection through an unsupervised approach.

A prediction-based approach combining Univariate Signal Evaluation and Forecasting-based Detector methodologies for water quality data.

Development and testing of the AI-based Data Validation and Reconciliation (DVR) smart application.

Iterative improvement of the data-driven digital twin model to forecast key WWTP processes.

Development of a deep reinforcement learning based control model with an optimisation goal of reducing greenhouse gas emissions and maintaining effluent quality standards.

Mobile app and website that the customers may access to understand their own water consumptions over selected period.