



## Project Results

# POLDER

## Data reusability in the smart city

The ITEA project POLDER (POLicy Data Exploitation & Re-use) envisions a new approach to data reusability by allowing city agencies to easily share knowledge in the form of aggregated data. This will help bring smart city services to smaller communities which lack the resources for existing solutions.

### Project origins

Smart city realisation is often hindered by domain isolation: the desire for different agencies to retain ownership of their data and the lack of free sharing due to security concerns. If a city wishes to generate KPIs on air pollution, for instance, traffic data must typically be acquired from both the traffic and environmental departments. The result is huge amounts of data in inaccessible silos and a need for better tools to overcome this.

POLDER offers a new perspective on data reusability in smart cities by providing a means to share knowledge rather than data. The primary innovation is a distributed framework for data exchange and data reuse with brokerage tools and an open data platform, allowing parties to retain control of their data while still providing valuable information to others. This is aided by holistic city monitoring dashboards and explainable AI to increase acceptance and trust by decision-makers and citizens. The project has demonstrated these achievements in four use-cases: Smart Tourism, City Expansion Planning & Urban Transformation, City Monitoring and Trust & Acceptance.

### Technology applied

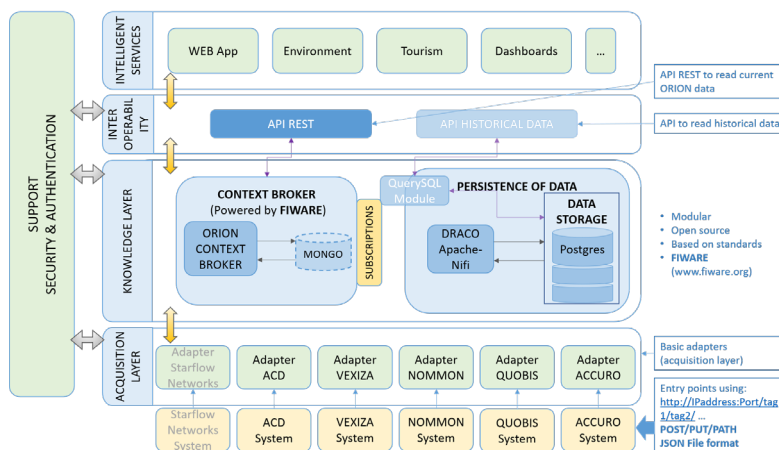
POLDER's IoT platform was developed using a reference architecture based on the FIWARE standard, enabling scalability, interoperability, integration capabilities and openness. In the acquisition layer, data is gathered from sensors and sent to the FIWARE

platform via a context broker and data adapters. Information is stored in the context broker, which utilises the database programme Mongo, database management system Postgres and historical data service Draco. In the acquisition layer and context broker, information is processed by the project's algorithms (such as data imaging for traffic information) and travels to the interoperability layer via REST API. This information can then be combined

open-source client Hyperledger Besu is used for tokenisation (the substitution of sensitive data elements for non-sensitive equivalents), providing sufficient security for inter-agency knowledge sharing. Using the project's KPI builder and dashboard builder, decision-makers can then make data requests and receive access to a collaborative environment for KPI and dashboard creation. These developments will be made available to the FIWARE community.

### Making the difference

As POLDER is the first of its kind, its technical achievements have mainly been the creation of entirely new outputs. For the general platform, the integration of



< POLDER's Open Urban Platform Architecture

and visualised using GIS tools, AI and web applications to provide intelligent services.

In addition, a security layer features an authentication process in which knowledge is placed in a containers net and smart contracts can be used to share this with other agencies under the control of the blockchain. POLDER has developed the decentralised data hubs Libra and Taurus to enable this. Additionally,

the layers with external systems has been demonstrated via load and functionality tests and the platform has been stabilised on the project server to optimise the containers net and interoperability. 10 dashboards have been developed for smart tourism, air quality, waste management and traffic management using visualisation tools for descriptive and predictive AI models. These tools facilitate the analysis and interpretation of collection information using graphs

and indicators. As POLDER focuses on decision support, explainable AI models will allow decision-makers to clearly understand the context and impact of their choices on citizens.

In smart cities, commercialisation is relatively slow due to the public procurement process, but promise is already being demonstrated. A commercial contract has been signed with the Turkish Ministry of Environment, Urbanisation and Climate Change to develop a bathing water information system. This will likely open many doors to further commercialisation in Turkey, where the smart city market is set to hit USD 1.75 billion in 2024. Partners are now working on incorporating POLDER into existing business models (such as ACD's integration of its products with industrial applications powered by FIWARE) and new ones (such as the Romanian consortium's creation of IoT tools for air quality monitoring to support public policies). Across Europe, the smart

city decision support system market is growing by over 30% per year and more than 3000 cities are expected to implement POLDER-like systems within the next decade, providing an opportunity for a large market share in a fast-emerging domain.

Mid-sized cities make up a third of the EU population but often lack financial resources to develop and implement smart city solutions. However, with POLDER's easily implementable approach to data reusability, knowledge sharing should be possible even for towns of just 20-40,000 people. This will have huge knock-on benefits for the quality of life for citizens as towns can more easily improve air quality, waste management and traffic conditions while stimulating the economy with improved tourism services. All in all, this will help to spread the growth of smart cities more evenly across the continent, ensuring that no community needs to be left out of the information society.

## Major project outcomes

### Dissemination

- > 1 publication in Tendinte Magazine and 10 presentations / demos at conferences / fairs / seminars: Greencities 2019, SCEWC 2019 & 2021, Cities of Tomorrow 2021, GoTech World 2021, HEALTHIO TV, Expo Industria 4.0 Burgos, FIWARE DLT4Gov Day, 6th International Conference on Computer Science and Engineering, Resilient Cities Symposium 2021 in Turkey

### Exploitation (so far)

#### New products:

- > Tourist zone characterisation platform: supports tourist planning and monitoring by providing visual information of the characterisation of the different zones of a city according to the type of visitors it receives and the activities they perform
- > Cross-domain data analytics tool: combines data from different sources and domains, generate dashboards according to the information selected and KPIs for decision support
- > IoT platform for energy, air quality and water quality monitoring: processes sensor data for detecting anomalies, predicting AQI values and proposing optimal energy usage intervals

#### New services:

- > KPI calculator: provides calculation of different KPIs for different use cases by giving parameters as a service
- > RF training service: provides model training and predicting via http protocol without the necessity of a Machine Learning infrastructure using a Random Forest algorithm

#### New systems:

- > City survey & KPI monitoring module: allows the creation of KPIs based on surveys and configurable KPIs, monitoring changes in time and compare cities based on standard KPIs
- > Social media monitoring & analytics system: analyses tweets in search of keywords that relate to urban services and the place the tweet refers to, and analyses the sentiment of the message
- > Voice recognition & sentiment analysis system: identifies the language of a conversation, transcribes it and classifies the words according to their sentiment
- > Image recognition system: generates KPIs and alerts related to pedestrian and traffic flow and COVID-19 safety measures based on image recognition and classification algorithms

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#### Partners

##### *Finland*

- > Keypro Oy

##### *Romania*

- > Beia Consult International
- > Societatea de Inginerie Sisteme SIS

##### *Spain*

- > Accuro Technology S.L.
- > FCC
- > Nommon SOLUTIONS and Technologies S.L.
- > Quobis
- > Starflow S.L.
- > Vexiza
- > Wealize S.L.

##### *Turkey*

- > Acd Bilgi Islem Ltd. sti.
- > ARD Group
- > ForteArGe Informatics Engineering Consultancy Ltd. Co
- > Mantis Software

#### Project start

November 2018

#### Project end

June 2022

#### Project leader

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