

WISDom – Water Intelligence System Data

Summary

In Portugal, municipalities are responsible for providing water supply and sanitation services, either under direct management or indirectly through concessions. A sustainable management of these services needs the collection and the continuous updating of a broad set of data (e.g., pressure, flow, consumption) which need to be treated for generating valuable and usable information not only for the daily control, operation and management of the systems, but also for supporting the current and future planning and management of the urban water infrastructures. Depending on the degree of maturity of the water utility, these data can be collected manually by an operator in situ, stored in files or even on paper, or collected systematically and continuously, in real time, through telemetry systems. Collected data correspond to time series of pressure, water or volume records, tank levels, energy consumption and water quality parameters (e.g., chlorine, pH). Other type of available data includes infrastructure and consumer characteristics and meteorological data. The analysis of these data and their transformation into useful information for water utilities (WU) requires advanced tools.

WISDom project aims at the development of algorithms and models that allow to extract knowledge from the data, supporting the WU in the decision-making and, thus, improving the management of its systems by reducing water losses and ensuring the provision of drinking water in quantity and quality. The project is carried out by a multidisciplinary team with different technical competences in water supply engineering, data sciences, artificial intelligence and mathematics. The project has five main tasks, namely (1) exploratory data analysis; (2) predictive analysis; (3) spatial leak location; (4) advanced recognition of anomalous behaviour; and (5) prototype development and recommendation establishment for public WU. The front-end of the developed platform is presented in Figure 1.

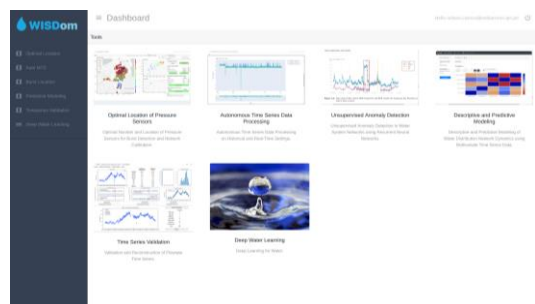


Figure 1. WISDom prototype: different available tools.

All algorithms and models developed are incorporated in the prototype allowing (1) to treat time series data and categorize/typify consumers, (2) to predict water consumption and quality parameters, (3) to detect and locate leaks, (4) to recognize anomalous events (e.g., illicit consumption, burst and meter deterioration). This tool allows to reduce water losses, which has a positive impact on environment, improving the use of water resources and reducing associated consumed energy. It will also allow to have systems more resilient to climate changes, given the developed better and smarter predictive models, that allow the WU to prepare contingency plans in time to face then increasingly more frequent extreme events, such as droughts.

The data to be analysed in this project are mostly time series (Figure 2) and will be provided by three public water utilities of different sizes and features. The Municipality of Barreiro (CMB) manages its urban water distribution systems in a traditional way with automatic meter reading (AMR) in district metering area (DMA) and manual metering at its clients. The Beja EMAS is a public company owned by the Municipality of Beja managing an urban system and small rural systems, using AMR in some domestic clients with different technologies. Infraquinta is a public company, owned in 51% by Municipality of Loulé (Algarve) and in 49% by Quinta do Lago company. Infraquinta manages the water supply system of Quinta do Lago, a luxury tourist destination. Infraquinta represents both a water utility of a touristic zone, dealing with high seasonality in water consumption, and the "water utility of the future" since it has hourly AMR in all its consumers.

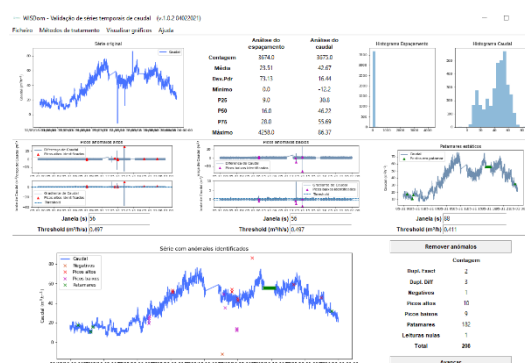


Figure 2. Tool for the treatment of discharge and pressure time-series.

The project outcomes have the potential to be replicated to other 256 water utilities existing in Portugal, mainly managed by the public administration (i.e., municipalities).



Project Reference

DSAIPA/DS/0089/2018

Leading Institution

IPS – Instituto Politécnico de Setúbal (Portugal)

Partners

IST-ID – Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (Portugal), INESC-ID – Instituto de Engenharia de Sistemas e Computadores: Investigação e Desenvolvimento em Lisboa (Portugal), Município do Barreiro (Portugal), Infraquinta (Portugal), EMAS Beja – Empresa Municipal de Água e Saneamento de Beja (Portugal)

CERIS Principal Investigator

Dídia Covas
(didia.covas@tecnico.ulisboa.pt)

CERIS Research Team

Laura Monteiro, Marta Cabral, Miguel Capelo, Guilherme Macara, Alexandre Pinheiro, Sofia Picciochi, Rafael Benatti

Funding

FCT – Fundação para a Ciência e a Tecnologia

Period

2019-2022

Total

288 450.00€

CERIS

45 508.00€

Project Website

wisdom.ips.pt