Adapting
to climate change
by quantifying
optimal allocation
of water resources
T socio-economic
interlinkages

ACQUAOUNT

www.acquaount.eu

This project is part of the PRIMA programme
supported by the European Union

PRIMA IN THE MEDITERRANEAN AREA

Funded by
the European Union

THE ACQUAOUNT CONSORTIUM

eurecat · uniss · abinsula · cmcc · Global Water Partnership Mediterranean · Nature 4.0 SRL

THE PROJECT

GOAL

The ACQUAOUNT project aims to improve Integrated Water Resources Management and sustainable irrigation, through the deployment of innovative tools and smart water services and solutions for public and private use, contributing to climate resilience.

TOOLS

ACQUAOUNT will develop a suite of innovative tools covering monitoring and control (IoT), interoperability and standardization (WoT), efficient operation and recommendations for water and production efficiency (weather and complex dynamic modelling tools, combined with data analytics and a Decision Support Tool) and smart visualization and data exploration (KPIs-based visualization).

PRODUCTS

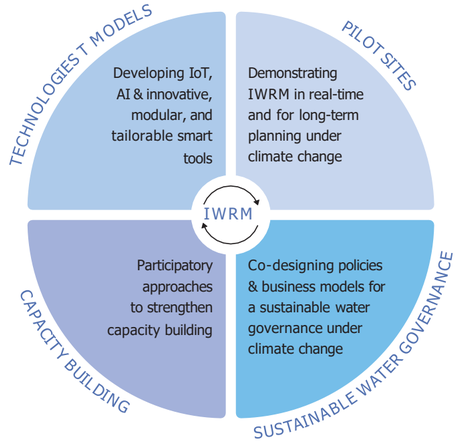
3 main products will be developed:

- A farm-level tool providing near-real time information about optimal irrigation amount and timing for each crop and field, including information on water quality.
- A basin-level water accounting tool featuring projections of water availability and allowing integrated water management decisions.
- A Decision Support Tool for long-term planning, which allows to consider the effects of climate change on water resources availability.

IMPACT

ACQUAOUNT will answer the urgent need for more efficient use of scarce water resources in the Mediterranean area, under the vision of smart, sustainable and inclusive growth, able to strengthen cohesion and benefits between sectors competing for water. The combination of Acquaount tools will permit to simulate complex interactions and feedbacks across time, taking into account multiple related environmental and socio-economic dimensions, leading to policy recommendations and climate change adaptation strategies on a macro scale, as well as advice for optimal decisions on a micro (individual) farm level.

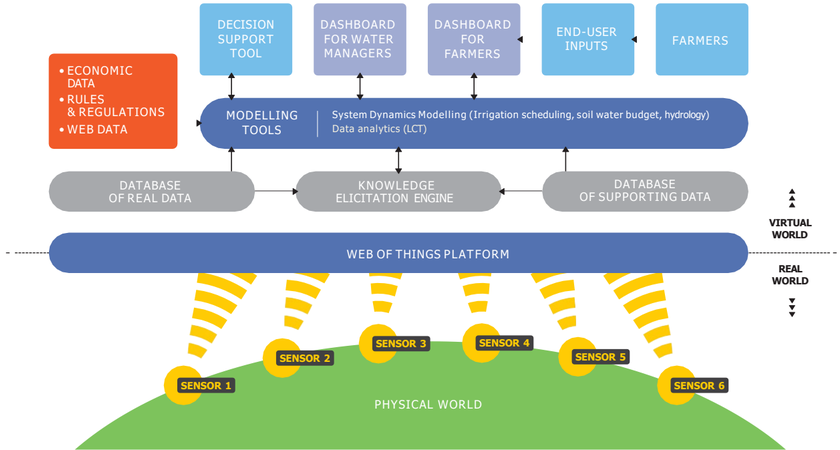
CONCEPT
T
METHODOLOGY



WEB OF THINGS PLATFORM

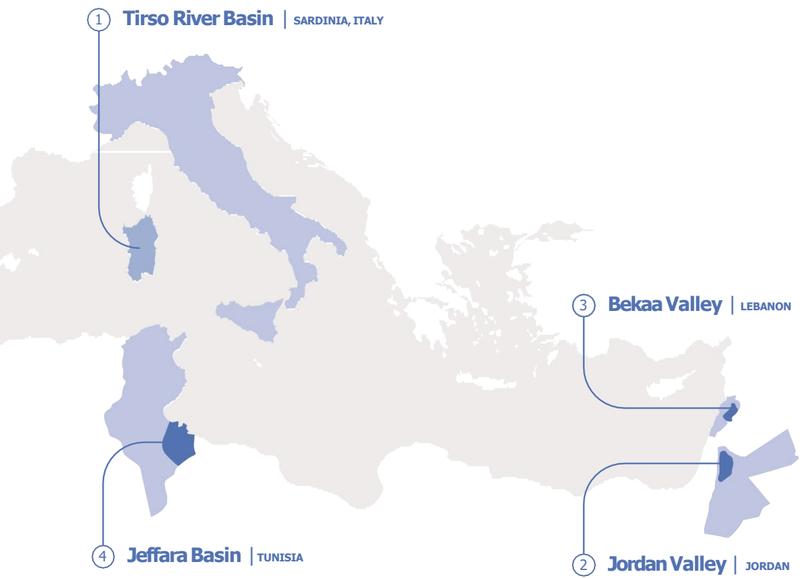
ACQUAOUNT will deploy a semantic WoT platform in different pilot sites to provide accessible and accurate information to support optimization of irrigation practices for farmers and basin level water allocation for water managers. The WoT platform will accept both real-time data from the biophysical systems, acquired from an IoT sensor network (using standard communication protocols such as AMQP, CoAP, LoRaWAN), and batch data inserted by end users.

Architecture of the WoT platform providing two real-time services through a dashboard and a Decision Support Tool



4 PILOT SITES ACROSS THE MEDITERRANEAN

4 pilot sites were selected to demonstrate the ACQUAOUNT approach. They cover a wide range of social and environmental gradients and are characterized by specific challenges to IWRM approaches. The pilot sites will see the deployment of ACQUAOUNT tools, as well as capacity building activities, through the implementation of local stakeholder alliances in the form of Living Labs.



1 Tirso River Basin | SARDINIA, ITALY

CHALLENGE

Tirso River basin is a highly productive agricultural area, with intensive animal husbandry, feed crops and rice production. It is characterized by a Mediterranean climate of high temperatures and dry conditions during summer, with water scarcity as one of the main challenges, together with floods and sea level rise. Omodeo lake, the largest Sardinian reservoir and artificial lake in the area, provides drinking water for a large share of the Sardinian population and for agricultural, coastal and tourist activities. The basin also includes a coastal area characterized by a complex system of wetlands and biodiversity hotspots. The main cultivated crops are cereals, legumes and vegetables, as well as specialized crops of vines, citrus fruits and olive trees.

ACQUAOUNT APPLICATION

The ACQUAOUNT project will install water-related monitoring equipment at five farming locations in the lower part of the Tirso River Basin, as well as in a pond and some wells. Connections with additional monitoring points managed by Regional Agencies will be established for basin-level monitoring. The University of Sassari, local pilot lead in Sardinia, is in charge for the monitoring activities and will support the development of the ACQUAOUNT digital platform in collaboration with the consortium partners.

2 Jordan Valley | JORDAN

CHALLENGE

The Central Jordan Valley is one of the main irrigated semi-arid regions of Jordan. The main water resources are freshwater from precipitation, mixed with treated water from the Khirbet Al-Samra treatment plant inside the King Talal Dam. The dam's water is mainly used for irrigation. As a result of the annual fluctuation of rainfall, there is an imbalance in the mixing ratio which affects the quality and quantity of water inside the dam.

ACQUAOUNT APPLICATION

Controlled irrigation scheduling will be implemented in 6 pilot farm, in a designated area of 0.5 hectares in each farm, based on real-time soil moisture sensors to be installed at the crop root zone. These sites will be used as living labs to train farmers and extension agents on how to manage irrigation water on the farm level using the Internet of Things and remote sensing technologies. On the basin level, water quality sensors will be installed at Abu Al-Zeghan station at the Jordan Valley Authority water distribution unit in Deir Alla region. Water level sensors will also be installed for measuring the water quantity in the King Talal Dam to help the water managers take the right water allocation decisions for the farmers' fields, based on the available water in the dam.

3 Bekaa Valley | LEBANON

CHALLENGE

The Bekaa Valley represents Lebanon's most important farming region with a climate that shows a typical Mediterranean pattern, of higher temperature and dry conditions during summer, and precipitation mainly distributed during fall and winter. Drought events have become more frequent in the last decade. Agriculture covers about 150,000 ha with about 80% of it irrigated, using about 70% of Lebanon's freshwater resources. Tree crops cover about 60,000 ha. The remaining cropping systems are vegetables and rainfed cereals. Irrigation mostly uses groundwater which has been drastically depleted in the past few decades, while also showing alarmingly increasing rates of nitrate contamination.

ACQUAOUNT APPLICATION

ACQUAOUNT will monitor water quantity and quality on the upstream and downstream levels at the Upper Litani River Basin (ULRB), under the local pilot lead of Lebanese Agriculture Research institute (LARI). The project will install water-related monitoring equipment at five farming locations of the ULRB. LARI will aid in field investigation and ground-setup. The ACQUAOUNT digital platform will be under the accountability of LARI to sustain and collaborate with relevant organizations and institutions. Capacity building is to be performed throughout the project implementation by LARI staff.

4 Jeffara Basin | TUNISIA

CHALLENGE

The Jeffara basin, in the province of Medenine, is representative of the arid southeastern region of Tunisia, and is among the main socio-agro-ecological zones of the country where land degradation and water management challenges are acute.

The Jeffara basin is strategically important for water management, since the Triassic aquifer, on which it is based, is considered one of the most important aquifers in Medenine, used for domestic water demand (80%) and agricultural activities (20%). It is one of the most productive agricultural areas in the Jeffara plain and of consequently high agricultural and socio-economic importance. The area is experiencing a widespread increase of irrigated systems, which are exerting a huge pressure on scarce deep-water resources. The cropping system is based on irrigation from deep and shallow private wells. Main crops are vegetable, forage and cereal crops and are mainly practiced as inter-cropping system with fruit trees, such as olive and peach-trees, oranges, grapevines and almonds. Irrigation water management remains very empirical, not taking into account the real needs or long-term risks of soil salinization. The decision makers are in need of an operational system to optimise the use of scarce available water resources, while satisfying demands from the rapid development of all sectors in the region.

ACQUAOUNT APPLICATION

ACQUAOUNT will be applied and demonstrated in Jeffara basin under the local pilot lead of Institut des Rmgions Arides (IRA), Ministry of Agriculture, Hydraulic Resources and Fisheries. Six farms have been selected, located in the main area for vegetable crops, mostly practiced as inter-cropping system with fruit trees, such as olive and peach-trees, oranges, and grapevines. Potato and orange crops are a priority for the pilot site, with 4 pilot farms cultivating potatoes and 2 pilot farms oranges. Variables monitored, through sensors that will be installed in one field per each farm, will include soil moisture, plant water consumption, and consumed water per irrigation event, to provide a service for optimal irrigation and scheduling for potatoes and oranges.

At basin level, there is no real-time monitoring of groundwater levels and quality, or of groundwater stored water volume. To this end, ACQUAOUNT will employ digital water counters in six interventions sites to monitor water withdrawals from the aquifer through drilling, as well as water stocked in Tejra reservoir and allocated for domestic uses. The monitoring system for water level and quality will be set up in 3 selected wells located in Hjar, Megarine and Koutine. A climate monitoring station will be installed to monitor the main meteorological variables (air temperature, relative humidity, radiation, and precipitation).