Space Assisted Water Quality Forecasting Platform for Optimized Decision Making in Water Supply Services

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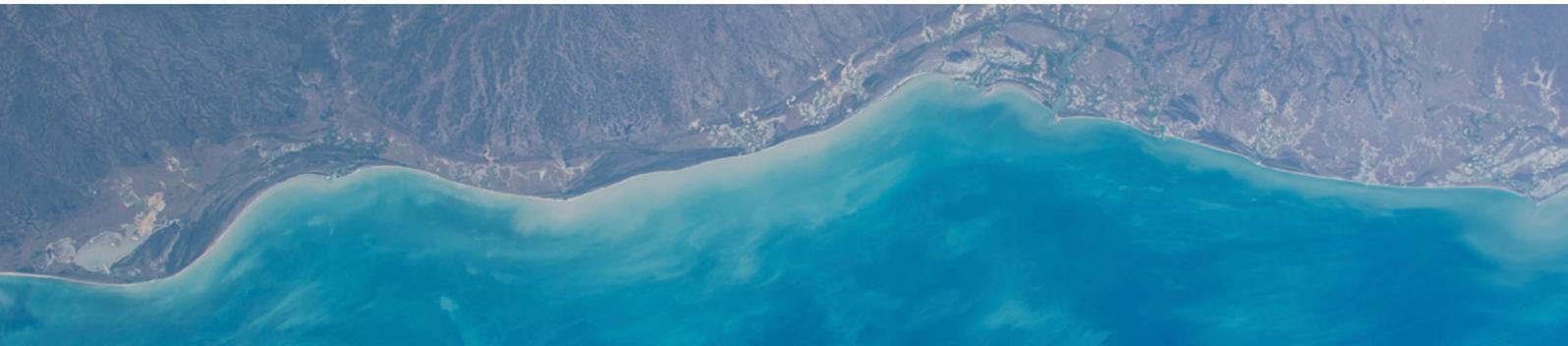
In Europe, as in other parts of the world, freshwater resources are limited and face increasing pressures, including from climate change, which could have severe consequences for water quality.

Satellite remote sensing techniques are widely used for the systematic study of the Earth's surface. They have many applications in science, including assessing and quantifying changes in water quality.

SPACE-O is catalysing innovation with an operational service platform designed to increase interoperability among earth observations and modelled services. This will provide improved real-time, short to medium term water quantity and quality forecasting in reservoirs, which can promote and support technology innovation that ensures the sustainability of our water resources.

The Earth Observation sector is being recognised as a leader in the development, deployment and integration of science and technology into policy and decision-making. By providing better information on water quality and quantity, SPACE-O aims to improve water supply, address environmental challenges and support EU policy implementation through a range of new products and services.

Project Goals:

Promote technology innovation by increasing the use and access of satellite data by water utilities.
Cutting-edge technologies will be combined into an innovative, value-added service line, such as providing satellite data to alert users to water incidents to improve responses.

Optimised utility operations by providing forecasted information to treatment plant operators on water quantity and quality.
Allows water managers to make faster decisions at the operational level when there are short to medium term changes in the source water.

Better understanding of specific environmental challenges using a combination of satellite, in situ, modelled data and citizens' observations.
Increases the understanding of patterns and dynamics of algae blooms, sediment transport and deposition in reservoirs, allowing utilities to proactively manage upstream risks.

Support policy implementation by contributing to protecting water resources intended for human consumption.
Expands water quality information in catchment areas beyond the regular monitoring program and proposing a method for assessing risk upstream.

SPACE-O integrates state-of-the-art satellite technology and in-situ monitoring with advanced hydrological, water quality models and ICT tools, into a powerful decision support system. This generates real-time, short- to medium-term forecasting of water flows and quality data in reservoirs, used to optimise water treatment plant operations and establish a complete service line from science to the water business sector.

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Case studies:

The products and services will be applied in case studies at two utilities in their water treatment plants (WTP) and reservoirs- OAK (Crete, Greece) and ENAS (Sardinia, Italy)

Aposelemis Dam and WTP, Heraklion, Crete (Greece)

Aposelemis Dam is a 62 m high dam creating an artificial reservoir with 27 hm^3 volume and 2 km^2 surface area. The reservoir supplies drinking water to 300.000 people in Heraklion and Agios Nikolaos, as well as surrounding communities. Water is treated at the Aposelemis WTP (110.000 m^3/d maximum capacity), which includes pre-ozonation, pH correction, coagulation - flocculation sedimentation, sand filtration, chlorination and clean water storage.

Mulargia Dam and WTP, Cagliari, Sardinia (Italy)

Mulargia Dam is a 99 m high dam with a volume of 347 hm^3 and surface area of 12.5 km^2. The Mulargia reservoir provides drinking water to 700.000 people in the Cagliari metropolitan area, and 20 surrounding villages. Water is treated at Simbirizzi WTP (216.000 m^3/day maximum capacity), which includes microstraining, pre-ozonation and pre-chlorination, flocculation, dual sand-filtration, post-ozonation, activated carbon-filtration and disinfection.

Scientific case studies:

Key functionalities such as integration of Earth Observation data into hydrological models will be tested in two scientific studies

Umeälven river (Sweden)

The Umeälven river system (15000 km^2) is highly influenced by snowmelt runoff. Two main branches, one non-regulated and one impacted by regulation at hydropower reservoirs and power plants, run in parallel from west to east. Forecasts of runoff volumes, together with in-situ and Earth Observation products (snow information, water levels, runoff, discharge), are key inputs to the decision models of the hydropower companies when planning daily production based on the energy market.

Lake Garda (Italy)

Lake Garda has an area of 370 km2, 50 km^3 volume, and a maximum depth of 346 m. The lake is an essential water supply for agriculture, industry, energy, fishing and drinking. It is an important resource for recreation and tourism due to its landscape, mild climate and water quality. The catchment of Lake Garda is instead relatively small in relation to the lake area (6:1) and mainly composed by sedimentary rocks. In-situ and Earth Observation products (snow information, water level, discharge, evapotranspiration) will be assimilated using different algorithms into hydrological modelling.

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