

Abstract

About 58% of surface waters in Europe have not yet achieved good chemical and ecological status. In line with the European Green Deal and the zero-pollution ambition, improved monitoring of emerging pollutants and more harmonised monitoring and reporting approaches are urgently required. Systematic assessment of contaminants allows stakeholders to identify pollution sources, assess ecosystem health and implement targeted remediation strategies. Maintaining water quality is also a fundamental principle of the circular economy, supporting sustainable resource management and the regeneration of natural systems.

AQUAWISE aims to address these challenges and enhance the resilience and sustainability of freshwater resources through a holistic, innovative and scalable approach for monitoring, detection, analysis and management of pollutants in freshwater bodies such as rivers, lakes and reservoirs. The project integrates advanced technologies including unmanned vehicle platforms, remote sensing, artificial intelligence and geospatial analysis to improve the monitoring and understanding of pollution dynamics in aquatic environments.

A key component of AQUAWISE is the monitoring and detection of surface water pollutants using multi-modal uncrewed vehicles operating in aerial, surface and underwater environments. These platforms are equipped with advanced sensors and innovative sampling systems capable of collecting environmental and water quality data across large spatial areas and at multiple depths. Their deployment allows improved coverage of aquatic environments and supports the rapid identification and tracking of pollution events.

The project also integrates Earth observation data, meteorological information and in-situ measurements to analyse pollutant behaviour and dispersion patterns. Artificial intelligence and machine learning techniques will support the identification, monitoring and classification of pollutants, (e.g., heavy metals, nutrients, and plastics). Predictive models will be developed to map pollutant pathways and generate high-resolution spatio-temporal information on water quality conditions. These tools will support authorities and water managers in making data-driven decisions for pollution control and water resource protection.

In addition to monitoring and analysis, AQUAWISE investigates circular economy opportunities related to water pollution management. The project evaluates the feasibility of recovering valuable resources from polluted waters and examines the economic and environmental benefits of integrating resource recovery within water management strategies. This perspective contributes to more sustainable water systems and supports the transition toward circular water use.

The AQUAWISE framework will be demonstrated and validated in three pilot sites selected for their diversity in environmental conditions and water management challenges, including a natural lake, a reservoir and a transboundary river system. These pilot cases will enable the testing of the developed technologies under real operational conditions and will demonstrate their scalability and transferability to other regions

Stakeholder involvement is a key component of the project. Water management organisations, public authorities, industry representatives and local communities will participate in consultations, workshops and knowledge exchange activities. Their engagement will ensure that the developed solutions respond to real operational needs and can support improved water governance.

Through its interdisciplinary approach, AQUAWISE contributes to the development of advanced tools and methodologies for monitoring and managing water pollution. The project supports European policies related to water quality, environmental protection and circular economy while promoting sustainable and resilient water management practices for the future.



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- SILESIA UNIVERSITY OF TECHNOLOGY - POLAND
- TECHNICAL UNIVERSITY OF MUNICH - GERMANY
- DEVELOPMENT ORGANIZATION OF CRETE S.A. - GREECE

► Funding organisations

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3 years

► Contact

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water pollution monitoring, circular water economy, unmanned vehicles, earth observation, AI, remote sensing, resource recovery, hydrological modelling, sustainable water management

KEYWORDS