

CHALLENGE TITLE	
A4: Intelligent Water Management: From Digitalization to Real-Time Decision Making	
MACRO-AREA	
Water	
PROBLEM/GAP	
Water management in complex operations faces the challenge of data fragmentation and high latency in decision-making. The lack of external laboratories and an integrated data architecture prevents agile response to variations in the water balance or deviations in resource quality, directly impacting overall efficiency and fresh water consumption.	
CHALLENGE DESCRIPTION	
The challenge aims at the development and implementation of digitalization and advanced analytics solutions to optimize water cycle management in complex operations. Sensorization, data integration, modeling, and real-time control technologies are sought to improve operational decision-making and reduce gaps between data capture and field action. Proposals must consider interoperable data architectures (cybersecurity), simulation tools, and continuous monitoring, as well as their validation in operational environments demonstrating improvements in water efficiency, planning, and resource control.	
GENERAL OBJECTIVE	
To develop digitalization, advanced analytics, and real-time monitoring solutions to optimize water cycle management and improve operational decision-making.	
SPECIFIC OBJECTIVES	
1.	Improve decision-making and water planning with reliable information based on advanced digitalization solutions.
2.	Increase water performance through monitoring and automation.
3.	Enable timely decision-making based on real-time data.
4.	Accelerate the selection and adoption of advanced sensing technologies.
EXPECTED RESULTS	
- Operational water data management platform with governance protocols, interoperability, and cybersecurity validated in at least one pilot operation. - Demonstrable reduction in operational decision-making latency and frequency of quality deviations, with documented metrics compared to baseline. - Catalog of sensorization, measurement, and analytics technologies evaluated and rated by maturity level (TRL→IRL) for future scaling. - Reduction in makeup water consumption, lower occurrence of out-of-specification events, and ability to anticipate critical operational events.	

5. Development of Digital Twins of the water cycle to simulate critical scenarios (scarcity, pumping failures, quality changes) for preventive planning.

SCOPE

Includes:

- Design and implementation of a pilot in an operation and/or local network, focusing on a process line and return point from a deposit.
- Validation of interoperability between OT/IT systems and industrial cybersecurity requirements.
- Integration of the solution into the site's or end-user's Operation Center, through agreements with ITL and technology providers.
- Design of intelligent dashboards with georeferenced visualization of the entire water cycle (catchment, process, tailings, return).
- Multi-site deployment roadmap based on pilot results.

Excludes:

- Replacement of existing SCADA or control systems.
- Civil works or modifications to physical water infrastructure.

KEY PERFORMANCE INDICATORS (KPIs)

1.	Latency in operational decision-making based on water data (minutes).
2.	Reduction in makeup water consumption (%).
3.	Frequency of out-of-specification quality events (number/month).
4.	Number of technologies evaluated and rated (TRL→IRL) in the catalog.
5.	Validation time per technology incorporated into the catalog (days).
6.	Recirculation efficiency in the use of recovered water thanks to operational optimization.
7.	Specific energy consumption of the water management system (kWh/m ³).

DESIRABLE CONTRIBUTION TO ITL CAPACITY BUILDING

- Standardized water data governance methodologies and protocols, transferable to different operations and ITL partners. (Yes)
- Possible sensor testbed and real-time measurement technologies installed at ITL, available for evaluation and qualification of supplier solutions. (Very High)
- Consolidated ITL coordinating role among operators, OT/IT providers, and regulators, with its own technology validation methodology (TRL→IRL). (Very High)
- OT interoperability and cybersecurity standards developed and available as a reference for the regional mining-water sector. (Yes)

INDUSTRY AFFECTED BY THE CHALLENGE

Mining Companies, Agricultural Companies, Municipalities, Industries in general.