T10 · A New Blue Technological Hope – Digital & AI

1. BACKGROUND

The digital revolution and artificial intelligence (AI) are profoundly reshaping water management. Connected sensors, digital twins, predictive algorithms and real-time data platforms offer unprecedented opportunities to reduce leaks, optimise distribution networks, anticipate droughts and floods, and improve water quality across the Mediterranean and beyond. Large, centralized data centres can help undertake decision in real time and can further contribute to risk management and climate modelling. Yet this technological promise faces a structural paradox: the digital sector itself is a rapidly growing consumer of freshwater.

A landmark 2026 report from the United Nations University Institute for Water, Environment and Health (UNU-INWEH) provides the most comprehensive quantification to date. In 2025, global data centres consumed an estimated 448 terawatt-hours (TWh) of electricity - equivalent to France's national consumption, ranking them the world's 11th largest electricity user if treated as a country. AI accounts for approximately one-fifth of that total. Projections are stark: by 2030, AI-related electricity demand is expected to reach 945 TWh, with an associated water footprint of 9.3 trillion litres - sufficient to cover the basic annual domestic water needs of over 1.3 billion people, primarily in Sub-Saharan Africa.

Data centres consume water both directly - mainly for evaporative cooling, which can account for 30–40% of a facility's total energy use - and indirectly via electricity generation. At global scale, AI-related water withdrawals are projected to reach 4.2–6.6 billion cubic metres per year by 2027 - equivalent to 4–6 times Denmark's annual consumption.

The goal should be to transform water usage in the AI and in the broad technology sector, aiming to be water neutral by 2050, aligning water goal with climate goal. At the same time, smart water management must accelerate. The deployment of Internet of Things (IoT) sensors, satellite Earth observation and open data platforms is transforming hydro-meteorological monitoring. A digital twin of the terrestrial water cycle, developed by the Italian National Research Council (CNR-IRPI) and validated in the Mediterranean Basin, fuses high-resolution satellite data with advanced modelling of soil moisture, precipitation, evaporation and river discharge — enabling flood and landslide forecasting and precision irrigation management accessible to non-expert decision-makers.

In Italy, a position paper launched in 2024 by the Community Italiana delle Acque — comprising Gruppo CAP, Italgas, MM and Acquedotto Pugliese — identified 14 digital use cases for the integrated water sector, underscoring digitisation and real-time network control as industry priorities.

Non-revenue water (NRW) — water produced but lost before reaching the consumer, through leakage, theft or metering inaccuracies — is one of the most acute and costly inefficiencies in water systems globally. According to IWA estimates, the world loses approximately 346 million cubic metres per day (125 billion m^3/year), representing a financial cost of roughly USD 39 billion annually.7 In the Mediterranean region, NRW rates in many utilities exceed 30–40%; in Italy, the national average stood at 36.3% in 2024, according to the Utilitalia Sustainability Report, with some southern Italian networks reaching 72%. AI-driven acoustic sensing and IoT-based leak detection systems are achieving substantial results. AI-based algorithms for predictive network maintenance have demonstrated leak detection accuracy exceeding 94% in peer-reviewed deployments.

The Shenzhen Smart Water Grid (China), which equipped over 80% of residential connections with AI-powered smart meters, reduced NRW to 6.2% — among the lowest rates globally. Gruppo CAP (Milan metropolitan area), Italy's leading green water utility and a case study reported in Materia Rinnovabile, has deployed advanced data analytics and AI to reduce incident resolution times by up to 30%, and is scaling digital twins of its network — targeting 30 replicas by end-2024 and full digitalisation by 2030.

Beyond conventional monitoring, a new generation of technologies is entering operational deployment: biosensors for real-time water quality detection, blockchain for traceability of reclaimed water supply chains, low-cost smart meters designed for small municipalities in low-income contexts, and AI-powered predictive models for contamination events. At Aquatech Amsterdam 2025, AI-enabled smart water networks and circular water management — including the removal of micropollutants and PFAS — were identified as defining trends, alongside the growing imperative for industries to become water neutral or water positive.

AI-assisted precision irrigation is particularly relevant for the Mediterranean agricultural sector, where the sector accounts for 70–80% of freshwater withdrawals. AI-based crop water stress forecasting has demonstrated water savings of up to 50% compared to traditional irrigation management in controlled studies. Citizen science platforms — integrating participatory data collection with professional monitoring networks — are generating denser spatial datasets for water quality, flood early warning and groundwater surveillance than institutional networks alone can deliver. The integration of citizen observations into Digital Twin Earth (DTE) hydrology systems, as reported in Frontiers in Science (2024), represents a frontier of open, interactive water governance in which non-experts including local authorities and civil society can run simulations and assess risk. This approach aligns with the Forum's cross-sectoral ambition and is directly replicable for Mediterranean cities facing combined drought and flood exposure.

The water footprint of digital infrastructure is not fixed — it is an engineering and governance choice. As UNU-INWEH (2026) explicitly states: "AI's environmental footprint is neither fixed nor inevitable." Leading operators are demonstrating that decoupling AI growth from water consumption is technically feasible. Microsoft, in FY2025, achieved water-positive status five years ahead of its 2030 commitment — replenishing more water than it withdrew globally — while reducing its average water use effectiveness (WUE) to 0.27 L/kWh against an industry average of 0.84 L/kWh.14 Its new zero-water-evaporation data centre design, launched in August 2024, uses closed-loop chip-level cooling and is projected to avoid more than 125 million litres per facility per year.15 AWS has pledged water-positive status by 2030 and is deploying direct-to-chip cooling across new AI data centres; Google operates a comparable water stewardship programme covering all its global facilities.

For the Mediterranean region, where new data centre deployments are accelerating in Spain, France, Italy, Morocco and Israel, this trajectory raises urgent questions of siting, governance and equity. The land footprints of training GPT-4 and GPT-5 alone are estimated at 0.9 and 1.5 km^2 respectively. The UNU-INWEH report underscores that communities hosting data centre infrastructure and its e-waste must be among the beneficiaries of AI — not merely its environmental creditors. In Italy, Materia Rinnovabile reported in late 2025 on the difficult balance between AI's ecological transformation potential and its growing resource footprint, noting that the same technologies driving water consumption can — if deployed with rigour — enable precision irrigation, network optimisation and demand forecasting that reduce consumption across all sectors.

2. KEY CHALLENGES AND OBJECTIVES

Challenge 1 · Fragmented hydric data and monitoring systems
Many Mediterranean territories still lack integrated, real-time and interoperable systems for tracking water availability, quality, losses, drought exposure and flood risk, limiting timely decisions and coordinated action.

Challenge 2 · High levels of non-revenue water
Water losses remain one of the costliest weaknesses in regional water services, with many utilities in the Mediterranean still operating with leakage and inefficiency levels that undermine both financial sustainability and resource security.

Challenge 3 · Uneven access to digital capacity
Advanced monitoring, AI tools and smart infrastructure are not equally accessible across utilities, municipalities and rural territories, creating a risk of widening the gap between more and less prepared water systems.

Challenge 4 · Weak integration between innovation and governance
Technological deployment often moves faster than regulatory adaptation, public oversight, ethical safeguards and basin-level planning.

Challenge 5 · Insufficient participation and transparency
Citizen science, open data and participatory platforms remain underused, even though they can improve local monitoring, trust and accountability.

Challenge 6 · The water footprint of digital infrastructure
Data centres and AI-related facilities may increase pressure on local water systems unless they are designed and regulated around low-water cooling, non-potable sourcing and replenishment commitments.

3. GUIDING QUESTIONS

This session will explore how digital technologies and artificial intelligence can improve water efficiency, climate resilience and governance across the Mediterranean, while also addressing the growing water footprint of digital infrastructure itself. It aims to move beyond generic "tech optimism" and focus on the applications with the highest practical value for Mediterranean territories, utilities, industries and communities.

- Which digital and AI applications should be prioritised first in the Mediterranean because they deliver the highest impact on water efficiency, service quality and resilience?
- How can utilities and municipalities use AI and real-time monitoring to reduce non-revenue water and improve network performance without deepening territorial inequalities?
- What governance frameworks are needed to ensure that data-driven water management remains transparent, accountable and aligned with public-interest goals?
- How can citizen science and participatory monitoring complement institutional data systems and help build trust in water decision-making?
- Should water-neutral or water-positive standards become a condition for data centre development and AI-related industrial growth in water-stressed Mediterranean regions?
- What forms of cooperation are needed between regulators, digital operators and water actors to ensure that innovation reduces pressure on water systems rather than adding new risks?

4. EXPECTED OUTCOMES

This session aims to demonstrate by example that the digital and AI transformation of water management is technically feasible, economically sound and ecologically urgent. Expected outcomes include:

- Define a framework to establish a EIT-based EuroMediterranean atlas for flagship case studies.
- Quantifiable technological trajectories for NRW reduction (target: 20–30% fewer losses through AI-enabled detection and network management, with documented Mediterranean case studies).
- A clear roadmap for data centres and AI companies operating in the Mediterranean to achieve water-positive status — including WUE benchmarks, non-potable water sourcing, and replenishment investments.
- A joint declaration or call to action for public authorities, digital companies and water utilities to co-design standards for the co-location of data centres and water-neutral industrial zones.