Emerging technologies in integrated water management

Exposure to new tools and opportunities

Dr. Georg Petersen
HYDROC GmbH

Content

- **Introduction and overview:** scope, objectives, and key concepts
- **Remote sensing in water management:** satellite monitoring of water resources
- **AI for water infrastructure:** digitalizing networks, smart sensors, IoT
- **AI-powered analytics:** decision support systems and data analytics
- **Mediterranean case studies**: regional examples and success stories
- **Conclusions:** key takeaways

-> E.g. leak detection, system optimization

Project context

The Union for the Mediterranean' s **Digital Transformation Initiative for the Water Sector** project aims to empower member states by driving digital innovation and capacity building in water management. Key objectives of the project include:

- **Digital readiness assessment:** Evaluate the current capabilities of UfM countries to identify strengths, gaps, and opportunities for improvement.
- **Capacity building and training:** Equip government officials, technical staff, and stakeholders with essential digital skills through tailored programs, including workshops, e-learning, and peer reviews.
- **Knowledge sharing:** Encourage a community of practice for digitalisation to foster collaboration, share best practices, and promote regional cooperation.
- **Strategic framework development:** Create an actionable roadmap and KPIs to guide digitalization efforts while ensuring alignment with UfM goals and national priorities.
- **Awareness and advocacy:** Highlight the importance of digital transformation to enhance efficiency, sustainability, and resilience in water management across the Mediterranean

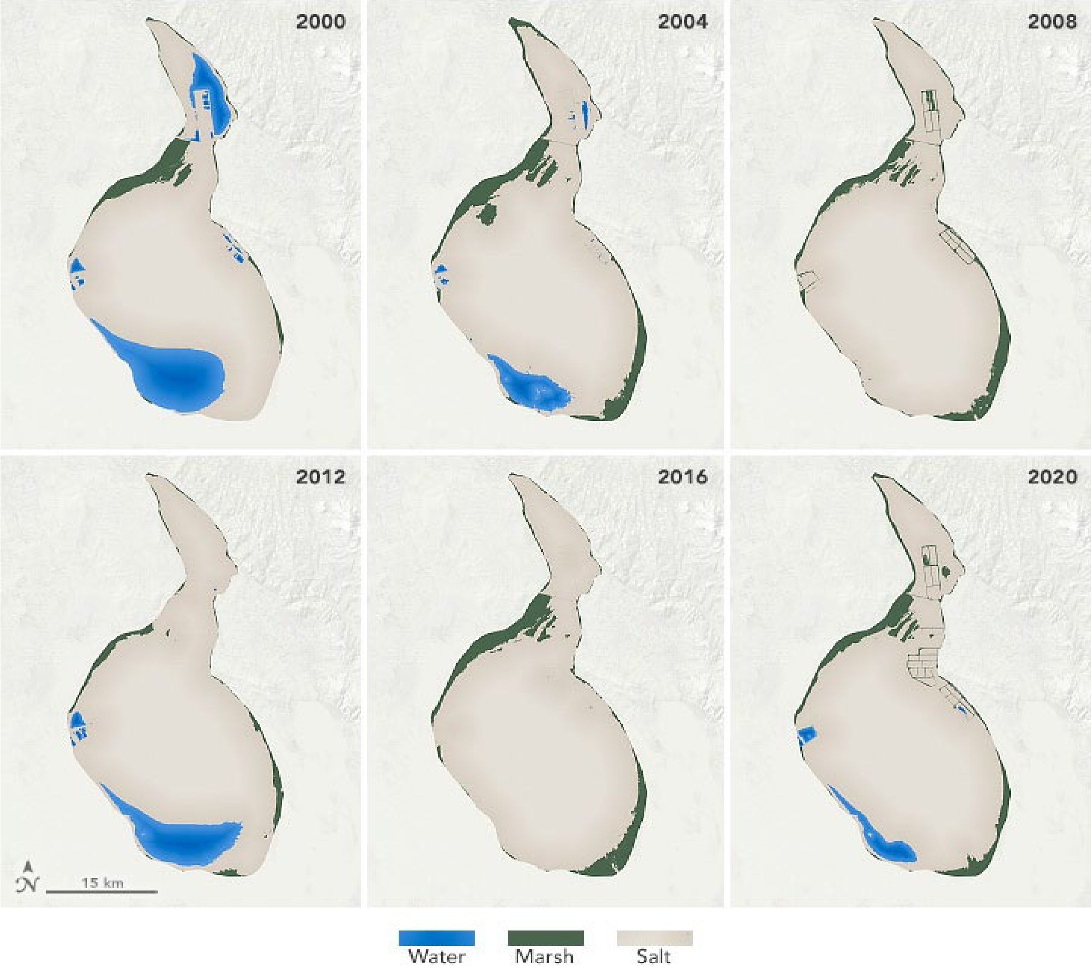
Water challenges in the Mediterranean

Scarce resources: Per capita, water availability is among the lowest globally in many Mediterranean countries

High demand and water stress: Rapid population growth, tourism (e.g. +1.8M tourists/year in Malta) strain limited. Agriculture uses up to 70-80% of water in some areas.

Aging infrastructure: Many networks suffer >25% losses from leaks. Non-revenue water remains high, reducing efficiency.

Transboundary pressures: Several rivers and aquifers are shared across borders, complicating management under stress conditions.



Satellite image of Lake Tuz, Turkey – once one of the region's largest lakes – now almost dried up due to persistent drought

Why digital transformation?

- **Enhance efficiency:** Optimize operations (pressure management, pumping schedules) to save water and energy
- **Reduce water losses:** Smart leak detection and rapid response can cut losses dramatically (e.g. smart meters helped Israel cut leakage to ~7%)
- **Improve resource management:** Data-driven insights for water allocation, drought management and demand forecasting
- **Increase resilience:** Better monitoring and predictive analytics strengthen climate resilience against droughts and floods
- **Sustainable outcomes:** Supports equitable, sustainable water use and environmental protection (doing more with less)

What is digital transformation in water?

Definition: Strategic integration of digital technologies (sensors, data systems, AI, etc.) into water management to improve efficiency, sustainability, and resilience.

Components: Real-time monitoring, IoT devices, data platforms, analytics and decision support, automation, and smart infrastructure.

Not just IT upgrade: Involves rethinking processes and policies, a paradigm shift in how water services are delivered.

Cross-sectoral: Applies across water supply, sanitation, irrigation, flood management, and the WEFE Nexus (Water-Energy-Food-Ecosystems)

Goal: Transform utilities and resource agencies into data-driven organizations for proactive management.

Building capacity and skills

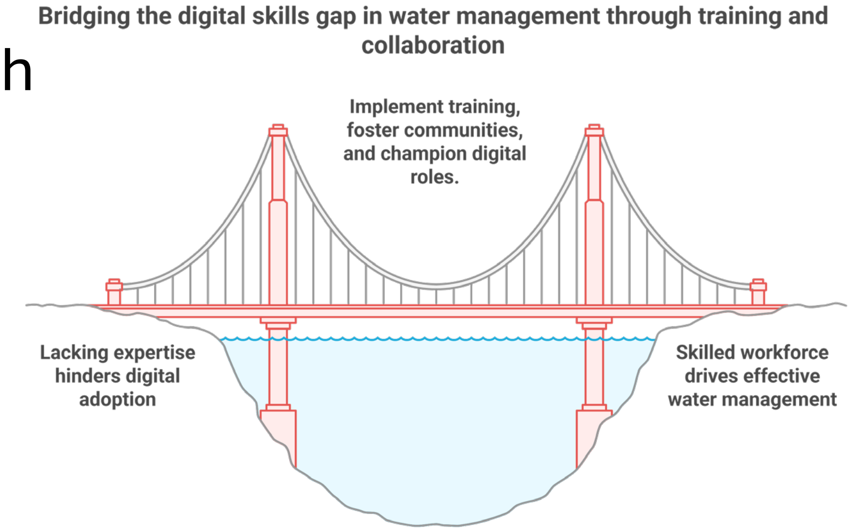
Skill gaps: Digital tools demand new skills – data analysis, AI modeling, IT maintenance (identified as a challenge in utilities)

Training programs: Implement capacity-building through workshops, certification courses, and knowledge exchange visits (leveraging UfM & international support)

Community of practice: Establish networks (e.g. UfM Digital Water Community) for professionals to share experiences and best practices

New roles: Hire or develop digital water officers, data scientists, GIS/remote sensing experts within water agencies

Leadership and culture: Foster a culture open to innovation – leadership must champion digital change and encourage staff to adapt and learn



Benefits of water digitalization

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Operational efficiency: Automation and analytics can increase efficiency by >20%, lowering costs of water delivery. e.g., digital twins optimize pump schedules to save energy and money

Reduced water loss: Smart networks can quickly pinpoint leaks – some cities saved tens of millions of m^3 of water (Israel saved 10M m^3 in 2024 via alerts)

Enhanced resource management: Better data leads to more equitable and sustainable allocation of water, supporting agriculture while preserving ecosystems

Climate resilience: Early warning systems (AI flood forecasts, drought monitoring) give time to act, mitigating disaster impacts

Transparency and customer engagement: Digital platforms inform the public of usage and involve them in conservation (e.g. customer apps with real-time consumption)

Key challenges and risks

High initial costs: Digital infrastructure (sensors, ICT, AMI meters) requires significant upfront investment – a barrier for budget-limited utilities

Capacity and skill gaps: Shortage of trained personnel to operate and maintain advanced systems. Need continuous training to keep up with tech

Data issues: Concerns about data privacy and cybersecurity – water usage data is sensitive. Also, data quality and availability can limit AI/ML effectiveness

Legacy systems integration: Difficulty connecting new digital solutions with old infrastructure and institutional processes. Risk of siloed systems if not carefully planned

Change management: Resistance to change within organizations; need for cultural shift. Without leadership buy-in and user acceptance, even the best tech can fail

-> Digitalization / AI can replace/reduce spending needs by “taking over” some of the tasks

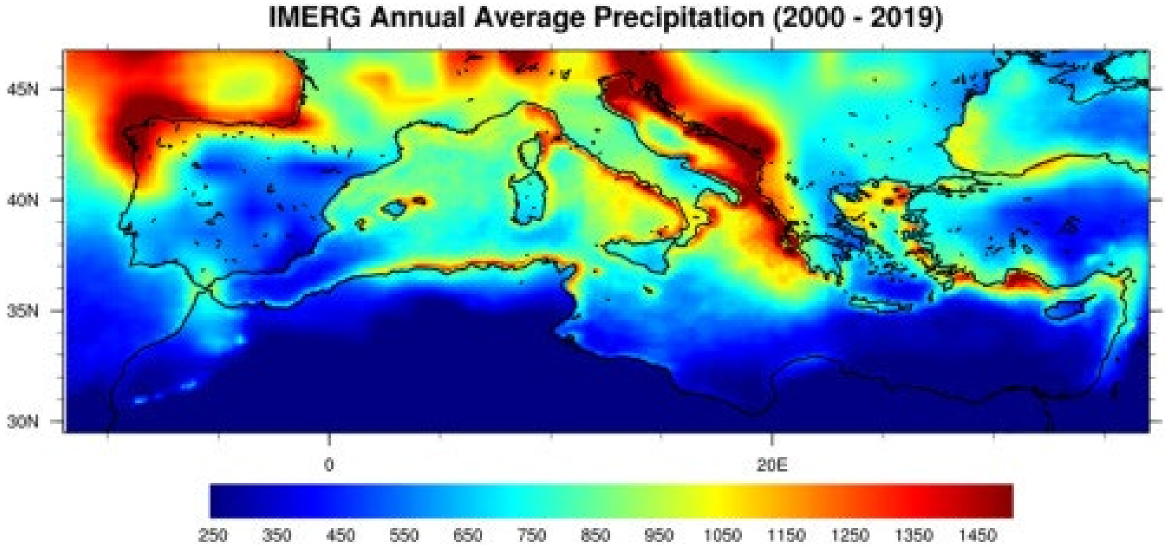
Remote sensing – eyes from the sky

What is remote sensing? Using satellites, drones, and aerial imagery to observe Earth's water features without on-site contact.

Value for water management: Provides synoptic, frequent coverage of large and remote areas, critical for basins that span countries or hard-to-reach zones.

Key technologies: Optical satellites (e.g. Sentinel-2, Landsat) for surface water extent and water quality; radar satellites (Sentinel-1) for soil moisture and flood mapping;

Data availability: Many datasets are now freely available, extending the range of countries that can benefit from satellite data.



Integrating with ground data: Sensing complements ground sensors and gauges, feeding into hydrological models and early warning systems.

Status and trends: Multi-decade satellite archives allow trend analysis of various parameters – identifying persistent declines or expansions linked to climate or human use

Monitoring surface water using satellites

River and lake extents: Satellites detect water bodies; monthly maps show lake surface area changes and river meandering. Helps spot drying lakes (e.g. Aral Sea, Lake Tuz) or newly formed.

Lake/reservoir storage: Radar altimeters measure water levels; when combined with area from optical images, can estimate reservoir volume.

Snowpack: Snow cover extent and snow-water equivalent from satellites inform how much meltwater to expect – key for Mediterranean headwaters in Alps

Coastal water: Remote sensing monitors coastal lagoons and reservoirs, important for balancing freshwater inflow and salinity (e.g. Nile Delta lakes).

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Drought monitoring and early warning

Vegetation health from space: Satellites measure greenness (NDVI); persistent browning signals drought stress on crops and rangelands. NASA's studies show much lower vegetation index in North Morocco during 2023–24 drought

Soil moisture and groundwater: Missions like SMOS and GRACE detect changes in soil moisture and even groundwater storage. GRACE data revealed major groundwater declines in the Middle East over 2002–2016

Dry reservoir detection: Comparing satellite images year-to-year highlights reservoirs and lakes at risk

Drought indices: Remote sensing feeds into composite drought indices (e.g. European Drought Observatory combines precipitation, soil moisture, snow). These tools trigger alerts for emerging drought hotspots

Satellite imagery comparison Feb 2023 vs Feb 2024 around Casablanca shows stark contrast (green fields vs parched brown) confirming the on-ground reports of the intensive drought

Flood monitoring and disaster response

Flood extent mapping: Synthetic Aperture Radar (SAR) imagery penetrates clouds to map flooded areas in near-real time. Useful for emergency response.

Rainfall estimation: Satellites like NASA's GPM provide rainfall intensity data, helping identify areas with extreme precipitation that may flood.

Reservoir inflow forecasting: monitoring upstream snowmelt and rainfall by satellite improves reservoir management for flood control (e.g. in Alpine dams).

Urban floods and stormwater: high-resolution imaging can show water pooling in urban neighborhoods, guiding immediate response.

Climate change signals: Remote sensing records of extreme flood events help calibrate models and improve future flood risk maps in the Mediterranean region's changing climate.

Water quality monitoring from space

Union for the Mediterranean
Union pour la Méditerranée

Algal blooms: Satellite color sensors can detect chlorophyll and turbidity – early warning of algal bloom outbreaks in reservoirs or coastal areas (e.g. Nile Delta lakes).

Sediment plumes: After heavy rain, satellites track sediment-laden plumes in rivers and reservoirs, indicating erosion upstream or potential siltation issues.

Pollution tracking: Unusual color changes or thermal signals (from power plant coolant water) visible from satellites can flag pollution events or illegal discharges.

Limitations: Works best on large water bodies and surface indicators; cannot directly measure chemical contaminants – but supports targeting ground sampling.

Copernicus Sential-2 captures algal bloom in north Adriatic Sea

Remote sensing in agricultural water management

Sida

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

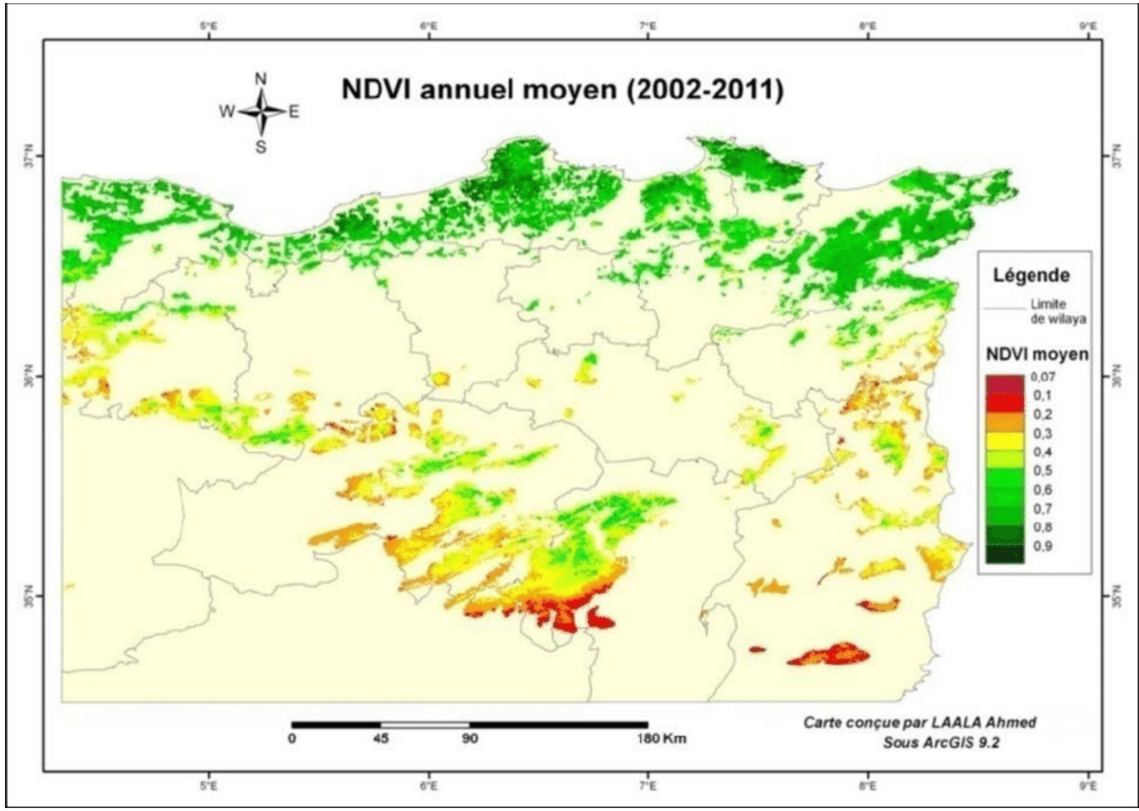
HYDROC

Synoptic monitoring: Satellites provide basin-wide, frequent views of croplands, capturing crop conditions and water use patterns over large areas.

Crop health indicators: Optical imagery (e.g. NDVI greenness) shows where vegetation is thriving or drought-stressed; persistent browning in imagery flags water stress in fields.

Evapotranspiration tracking: Thermal infrared data from missions like Landsat are used to estimate actual evapotranspiration, measuring how much water crops consumeesa.int. This helps quantify irrigation requirements.

Data-driven irrigation: Remote sensing guides “more crop per drop” – identifying where and when to irrigate, and detecting over-irrigation or crop stress early, enabling timely interventions



NDVI Algeria (2002-2011)

AI in water management - leak detection in water networks

The problem: Urban water distribution networks in the Med (and globally) lose a significant portion of water to leaks – often 15–30% on average. Traditional leak detection means sending acoustic listening teams pipe by pipe, which is slow and costly. Many leaks go unnoticed until a major break or high bill.

Satellite solution: A novel approach uses L-band radar satellites to detect underground leaks. Technology by companies like ASTERRA (originating from Israel) analyzes radar reflections to find soil moisture indicative of drinking water leaks. Patented algorithms filter out signals from groundwater or rain, pinpointing likely leak spots with GPS coordinates.

Efficiency boost: This method can survey an entire city's network in one satellite pass. Utilities receive a map of leak "hotspots." It drastically reduces labor. Studies show **3-5× more leaks** found per day with satellite guidance versus traditional methods.

Irrigation management and crop water use

Sida
Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط
HYDROC

Evapotranspiration (ET) mapping: Knowing how much water crops actually consume (ET) is key for efficient irrigation. Remote sensing (thermal/infrared data) combined with weather data can estimate ET over large fields. AI models like METRIC or FAO's WaPOR algorithms use satellite inputs to provide daily ET maps.

Optimizing scheduling: AI-driven irrigation systems take those remote sensing inputs (crop stress indicators, soil moisture from satellites) and automate irrigation timing. Essentially, water is applied when and where needed, not by rigid schedules.

Regional water planning and aquifer management

National water plans: Many Mediterranean countries are updating their water strategies. Remote sensing provides a reality-check to these plans by offering data on all components of the water balance. Water plan assumptions can be tested with satellite data: actual irrigation consumption, natural vegetation use, and recharge can be estimated via RS.

Aquifer overuse and land subsidence: Groundwater is notoriously hard to monitor – wells are sparse and sometimes clandestine. In Spain's Murcia region, authorities turned to Sentinel-1 radar and AI to monitor ground subsidence as an indicator of aquifer over-extraction. Over 2014–2020 (a drought period), the satellite-based InSAR detected the ground sinking in areas with heavy well pumping.

Transboundary water management: Remote sensing offers neutral, shared data for rivers and aquifers crossing borders. Everyone sees the same reservoir levels from satellite, fostering transparency.

Lower monitoring costs with remote sensing

Replacing expensive field infrastructure: satellite monitoring can replace the need for a dense network of instruments. To monitor an aquifer via classical methods, costly GNSS stations are needed (around €10–20k each plus maintenance). In contrast, using free Sentinel data and an analyst can cover the same area continuously.

Labor savings: manual leak detection or water quality sampling campaigns involve many person-hours. Satellite analyses are largely automated, allowing a small team to monitor vast areas.

Limited accessibility = higher cost: in hard-to-reach areas (mountain catchments, politically unstable regions), the only alternative to satellites might be helicopter surveys or not monitoring at all. Helicopter/aerial surveys are extremely costly (thousands of € per hour). Satellite data is essentially free or low-cost, making it the most economical option to gather data for inaccessible sites. This democratizes data.

Efficiency gains = financial gains

Reducing water loss = saving money: Non-revenue water (NRW) is basically money down the drain. By using AI+RS to cut leaks, utilities save on production costs (less water to pump/treat) and increase billed water. Example: SES Water (UK) aims to reduce water leakage by 24% by 2030 using satellite leak detection.

Energy savings: Every cubic meter of water not lost is energy not wasted on pumping it. Less energy use means lower operating costs and often financial incentives

Optimizing operations: AI-driven scheduling (for pumps, irrigation, etc.) leads to efficiency. If an AI uses remote data to optimize pumping schedules in a water network (pumping when electricity is cheaper or when renewable energy is abundant), that cuts energy bills. If irrigation AI reduces water use by 30% on a scheme, that's 30% less water to pump – a huge cost reduction for large irrigation districts (which often are major electricity consumers). Efficiency also extends asset life (e.g., fewer pipe bursts with smart pressure control means less money spent on repairs).

Avoided crisis and externality costs

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Preventing disasters: The cost of water-related disasters (drought relief, flood damage, emergency water supply) can be enormous. Remote sensing and AI enable earlier interventions that can mitigate or avert disasters, saving those costs.

Environmental benefits → financial benefits: By protecting ecosystems (e.g., preventing a lake from drying, avoiding over-extraction that harms wetlands), there are long-term financial benefits like sustaining fisheries, tourism, or avoiding fines/penalties for not meeting environmental directives.

Policy and compliance: Having credible data can save money in legal and regulatory contexts. Countries or utilities that can prove (with satellite evidence) they are managing water responsibly might avoid lawsuits or penalties. In transboundary contexts, satellite data can resolve disputes cheaply rather than costly international arbitration.

Funding and affordability

Leverage free data: Some satellite data (Sentinel, Landsat, etc.) is freely available. This drastically lowers the entry barrier. Agencies need primarily to invest in human capacity and computing, not in data acquisition.

Shared services: Not every utility needs its own custom AI from scratch. They can subscribe to or share platforms. For example, the Copernicus Land Monitoring service provides drought and water maps for Europe at no cost. Regional projects (like Arab Satellite Water Monitoring) provide tools that countries can use without heavy investment. Pooling resources (e.g., a few countries jointly funding a center of excellence for remote sensing) can make it affordable.

Public-Private Partnerships (PPP): Innovative financing can spread costs. A water utility might partner with a tech firm: the firm provides RS/AI services up front, and the utility pays from the proven savings (performance-based contracts).

Data accuracy and groundtruthing

Need for calibration: Remote sensing provides indirect measurements. Groundtruthing data is needed to calibrate and validate the satellite-derived values. For example, a satellite may estimate chlorophyll in a reservoir, but without some water sample lab tests, the absolute values might be off. Similarly, converting a satellite soil moisture index to actual volumetric moisture requires local calibration.

AI model reliability: AI/ML models can sometimes produce false results if trained on limited or unrepresentative data. Traditional water managers may be skeptical of the AI output, especially if it contradicts field observations. In water quality, for instance, an AI might misclassify a turbid river sediment plume as an algal bloom if not properly trained – leading to false alarms. Validation with traditional methods remains essential.

Complement, not replace: The consensus is that remote sensing should supplement, not completely replace, in-situ measurements. Gauges, manual inspections, and citizen observations are still valuable for parameters satellites can't capture or for cross-checking. Over-reliance on remote data without local insight could be risky (e.g., misinterpreting a signal). Thus, maintaining a hybrid system is a challenge but necessary for accuracy.

Technical and infrastructure challenges

Sida

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

HYDROC

Big data handling: Satellites produce huge volumes of data. Managing daily images, storing them, and processing them (often in near-real-time) requires IT infrastructure and expertise.

Skilled personnel: Operating AI and remote sensing systems demands specialized skills – data scientists, GIS analysts, remote sensing experts. Many utilities and water ministries report skill gaps in these areas. Training existing staff and attracting new talent is a challenge. There's also the ongoing need to keep skills updated as tech evolves.

Integration with legacy systems: Water agencies might have old SCADA systems, databases, or even paper records. Integrating new RS/AI data flows into these existing systems can be technically complex. There's risk of creating data silos if the new tools aren't well integrated.

Connectivity: Some advanced tools assume constant internet/cloud connectivity which rural field offices may lack. Ensuring robust communication networks such that satellite data and model outputs reach the on-ground decision-makers timely is another infrastructure consideration.

Resistance to change and organizational hurdles

Cultural resistance: Water sector staff may be used to traditional methods honed over decades. Introducing AI and satellite analysis can be met with skepticism. There can be a sentiment of "we've always done it this way." Getting buy-in, especially from older engineers or decision-makers, can be tough. Leadership support and change champions are needed to drive adoption.

Process and policy misalignment: Regulations or standard operating procedures might not yet recognize data from remote sensing. For example, if water allocation rules legally require ground measurements, managers might hesitate to act on satellite data alone. Updating policies to incorporate these new data sources can lag behind technology.

Inter-agency coordination: Often, remote sensing and AI initiatives sit at the nexus of different departments (IT, hydrology, agriculture, environment). Silos can impede progress – e.g., the remote sensing unit in a space agency might produce great flood maps, but if the civil protection agency isn't looped in, those maps won't be used. Coordination mechanisms and data sharing agreements need to be in place so the right people get the right information in time.

Maintenance and sustainability: Maintaining a digital system is not a one-off activity. It requires continuous attention, updating algorithms, renewing software licenses, etc. Some projects faltered after pilot phase because once donor support ended, there wasn't clear institutional ownership or budget for ongoing operation.

Data limitations and technical gaps

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

HYDROC

Resolution limits: Not all satellites have high enough resolution for every task. Free imagery like Landsat (30m) or Sentinel-2 (10m) might miss very small water features or fine details (e.g., small leaks or very narrow canals). Commercial high-res images (sub-meter) exist but are costly and not continually available.

Cloud cover and temporal gaps: Optical sensors can't see through clouds, which is a problem in rainy season or for quick response needs. While radar helps for flood mapping, many water quality and vegetation measures need clear skies.

What satellites can't measure: Some critical parameters are beyond current remote sensing. Water quality parameters like bacteria, heavy metals, etc., are invisible to satellites – you still need physical sampling for those. AI might infer some hints indirectly (e.g., correlating turbidity to likelihood of bacterial presence), but it's not a direct measurement.

Data overload vs. use: Ironically, an abundance of data can be a challenge – analysis paralysis. Without clear objectives, one can drown in maps and graphs. Agencies need to develop the capacity to translate data into decisions, otherwise the investment in data yields no benefit.

Cybersecurity: greater protection for infrastructure

Sida

Union for the Mediterranean
Union pour la Méditerranée

HYDROC

The Cyberthreat Predictions for 2025 report, published by Fortinet, has revealed that AI-designed attacks, focused on the cloud and including real-life threats, are a trend in the upcoming year.

The areas most affected by cyberattacks in 2025 are likely to be operational technology (OT) and critical systems in sectors that depend on data continuity. This includes the water sector.

Greater protection for infrastructure industrial monitoring and control systems, such as those used in treatment plants and distribution networks, require constant updates to prevent unauthorized access and manipulation or deletion of sensitive data.

Build capacity and digital skills

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Invest in people: The most important recommendation is to train and hire for the new skill sets. Water agencies should establish roles like GIS/Remote Sensing Specialist or Data Analyst in their teams. Partner with universities to create courses on water informatics. Encourage young professionals to take on these roles and provide continuous learning (workshops, certifications).

Executive champions: Ensure leadership understands digital tools' value. Organize short trainings for managers and decision-makers so they trust and promote these methods. When the "boss" advocates using satellite data in meetings, it legitimizes it for the whole organization. This top-down support is crucial to overcoming inertia.

Community of Practice: Create or join networks where water professionals share experiences on AI/RS. Nationally, regular meet-ups or online forums can help practitioners troubleshoot and learn from each other (e.g., one utility's GIS team teaching another's). This peer support sustains capacity beyond initial training.

Start small, demonstrate quick wins

Rather than a big-bang overhaul, begin with a focused pilot that addresses a pressing issue. For example, pick one drought-prone watershed to implement satellite monitoring, or one city district to apply AI leak detection. Keep the scope manageable and define clear metrics (e.g., water saved, accuracy improvement).

Use pilot results to create a roadmap for scaling. Perhaps the pilot revealed need for more training or a different sensor – adjust the plan accordingly. Then roll out to additional areas incrementally, incorporating lessons learned. Secure funding for scale-up by using the pilot's success story in proposals.

Measure and celebrate success

Within a short timeframe (6–12 months), aim to show tangible results. If the pilot finds leaks that save X cubic meters or predicts a drought impact that, say, averts crop losses, document that. Show ROI early. These quick wins build internal and political support to expand digital tools.

Integration with existing systems

Data integration: Ensure that remote sensing/AI outputs feed into the regular decision-making channels. If operators use a SCADA dashboard daily, integrate key satellite indicators into that dashboard (e.g., add a panel for reservoir levels from altimetry or soil moisture maps). This avoids the "two-system" problem and makes new data impossible to ignore.

Standard procedures: Update or create SOPs such that, for example, "drought committee will review satellite drought index maps at each meeting" or "leak repair teams receive monthly satellite leak reports and must investigate all high-probability points." By institutionalizing the use of the data, it becomes part of the workflow rather than a novelty.

Combine ground and RS data: Use AI to fuse data – e.g., hydrological models that take both rain gauge data and satellite rainfall, or water balance that uses both flow measurements and satellite ET. The integrated approach yields more robust decisions.

Sida
Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط
HYDROC

Embrace continuous improvement

Iterate and evolve: Treat the implementation of RS+AI not as a one-time project but as an evolving program. Continuously refine models with new data. As more ground truth is collected, feed it back into the AI to improve accuracy. For example, an AI that predicts water quality should be re-trained whenever new lab results are available to keep it calibrated.

Stay updated on tech: The field is rapidly advancing. New satellites (higher resolution, new sensors) and new algorithms (e.g., better deep learning models) are emerging. Organizations should allocate time for tech watch – attending conferences, engaging with the tech community, perhaps running small trials of new tech. Being an early adopter (once proven) can yield big benefits.

Feedback mechanisms: Create formal feedback loops where those using the tools (field staff, decision-makers) report back on what worked or what was confusing. Maybe the satellite drought index triggered an alert that turned out false – investigate why and improve the system. Or if field teams found the leak priority ranking from AI was off, adjust the algorithm. Make sure users have a say in improving the tools, which also builds their ownership.

2025 AI trends for water

Dynamic treatment plant operations: AI will continue to revolutionize treatment plants through systems that adjust processes in real time, including reagent dosing and treatment train control.

Demand forecasting: Advanced AI algorithms will play a key role in accurately anticipating consumption peaks. By integrating resource management platforms, operators can accurately predict and respond to user behaviors and weather events.

Energy optimization: AI can optimize energy consumption in pumping stations and treatment plants through predictive models that adjust operations according to demand.

Early problem detection: As AI systems become more advanced, they'll be able to spot leaks, fraud, and operational issues earlier. This means lower maintenance costs and greater resilience for operators – and for consumers, it opens the door to real-time alerts about water challenges in their communities, helping everyone stay informed and conserve more effectively.

Wastewater treatment optimization: AI will continue to transform wastewater treatment. Digital twins will become more sophisticated, simulating complex scenarios to anticipate problems before they occur.

Case study - Spain –
The PERTE Water Digitalization Plan

Launched by Ministry for Ecological Transition in response to climate impacts

Objectives: Improve efficiency & sustainability of water use, reduce consumption and losses, adapt to climate change.

Investments: ~€3 billion (with €1.94B from EU and government budgets). The project will also create ~3,500 skilled jobs in water-tech.

Key components: IoT sensors networked across water infrastructure, smart metering (urban & irrigation), advanced data platforms, public-private collaboration for innovation

Environmental and social aspects: Aligns with EU Water Framework goals – protect water bodies, improve water services, and build resilience to droughts for society and economy.

Spain PERTE – implementation and lessons

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Phased approach: Initial phase creating national water data portal and funding pilot projects in key river basins. Next phases scale up sensor networks and integrate systems nationwide (breaking data silos).

Smart irrigation focus: Significant funds allocated to modernize irrigation districts with remote control and AI scheduling, since agriculture is using ~70% of water.

Public-Private model: Collaboration with tech firms (telecoms for IoT networks, startups for AI tools). Competitive calls for innovative solutions – accelerates adoption of best-in-class techufmsecretariat.org.

Challenges encountered: Data standardization across regions (different basin authorities used different systems – now unified platform needed), training local staff on new tools, ensuring maintenance of new devices.

Greece: Smart island water management on Naxos

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Location: Naxos island
Technology: IoT sensors, digital infrastructure, and smart water management systems
Implementation: Amazon Web Services (AWS) leading a consortium of 20 companies

The Naxos Smart Island project represents a comprehensive digital transformation initiative addressing water supply challenges on Greek islands. The project upgrades water management systems with IoT sensors and digital infrastructure to monitor and optimize water distribution. The system integrates real-time monitoring of water supply networks, smart management of limited freshwater resources, and optimization of water usage patterns for the island's 22,000 residents and 130,000 summer tourists.

Malta: AI-Powered Multi-Objective Water Resource Optimization

Technology: AI prediction algorithms with multi-objective optimization
Implementation: NOAH Global Solutions developed an AI-based decision support system

Malta faces critical water scarcity as a Mediterranean island nation relying on both groundwater extraction from limestone aquifers threatened by saltwater intrusion and energy-intensive reverse osmosis desalination plants. NOAH developed an AI-based multi-objective decision support system that optimally balances groundwater extraction with reverse osmosis production. The system considers three key objectives: minimizing energy consumption, maximizing aquifer protection, and maximizing final blended water quality under weather-related uncertainty

Key conclusions

Digital transformation = game changer: It's not optional for water-scarce regions, it's becoming integral to achieving efficiency, resilience, and equitable water management.

Strategic and capacity focus: Technology alone isn't enough – success requires clear strategy alignment (as per UfM Water Agenda) and investing in people (skills, culture). This combination yields sustained improvements.

Early wins and scale: Start with impactful projects (smart metering, SCADA upgrades) that quickly show results (water savings, cost recovery). Use those wins to justify scaling up across sectors (urban, agri, environment).

Regional cooperation: Mediterranean countries benefit from sharing knowledge and tools (through UfM platforms, PRIMA projects). Collective learning accelerates progress and avoids reinventing the wheel.

Sustainable financing: Upfront costs are high but returns are tangible (water saved, energy saved, damage avoided). Innovative financing can bridge the gap, especially if backed by strong political commitment.

Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Q&A

Thank You!

HYDROC GmbH
Kappelner St 18, 24975 Husby, Germany
Managing Director: Dr. Georg Petersen
www.hydroc.de