

Under the High Patronage of His Majesty King Mohammed VI



**XIX WORLD WATER CONGRESS**  
International Water Resources Association (IWRA)  
Marrakech, Morocco | 1-5 December 2025

Kingdom of Morocco



Ministry of  
Equipment and Water

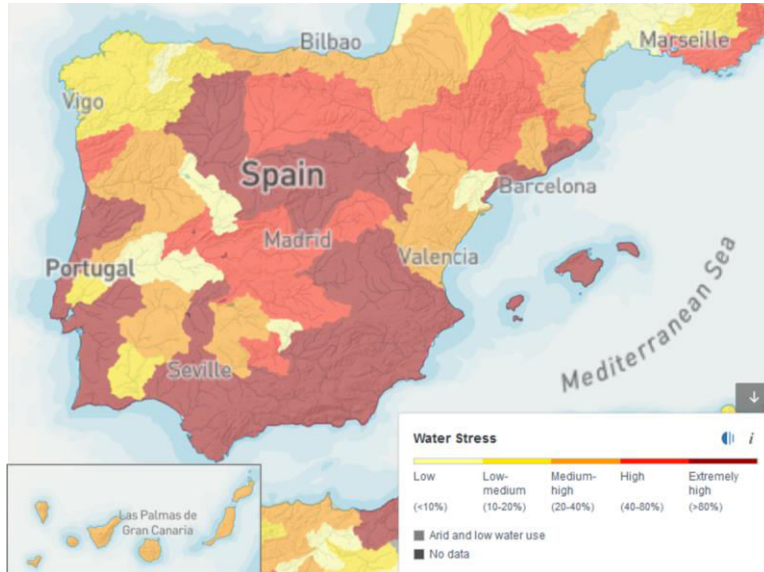
# Digitalization for water scarcity and climate resilience: Insights from Spain

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December 1<sup>st</sup>, 2025

# Setting the stage...



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Water stress in Spain

Source: GFZ,  
Germany)

- ✓ Rising temperature + reduced rainfall = prolonged drought seasons and deeper groundwater deficits.
- ✓ Water stress hotspots in **Andalusia, Murcia, SE Castile-La Mancha, SW Castile-Leon, and Catalonia.**



More efficient use of water resources

Use of alternative water sources

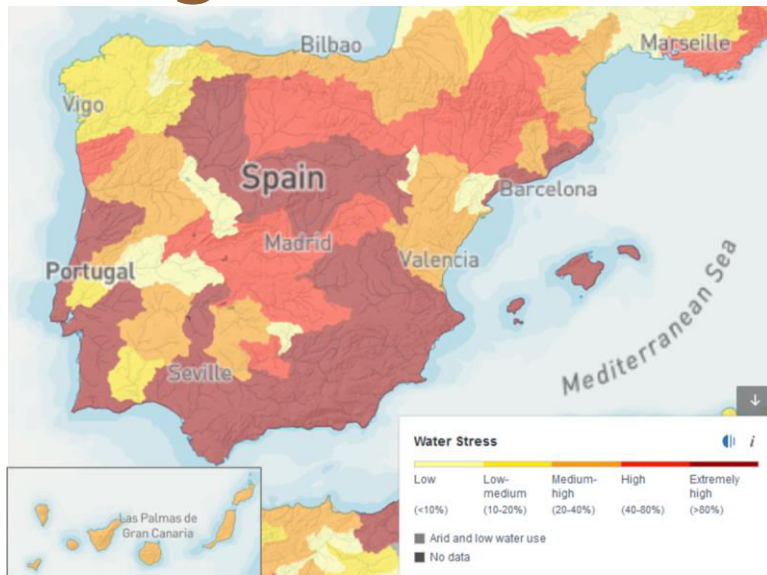
Smart water management (evidence-driven decision making, accountability, transparency, stakeholder involvement...)



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# Aims of our work



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- 1** To deepen understanding of how digital tools are reshaping water management and policy practices.
- 2** To provide insights into the main drivers and challenges of the digital transformation in water management, and to highlight key digital tools leading this shift.
- 3** To tease out transferable lessons that can support and accelerate digital transformation efforts.



# Methodology



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Interviews –  
Water manag.  
authorities



Literature  
review



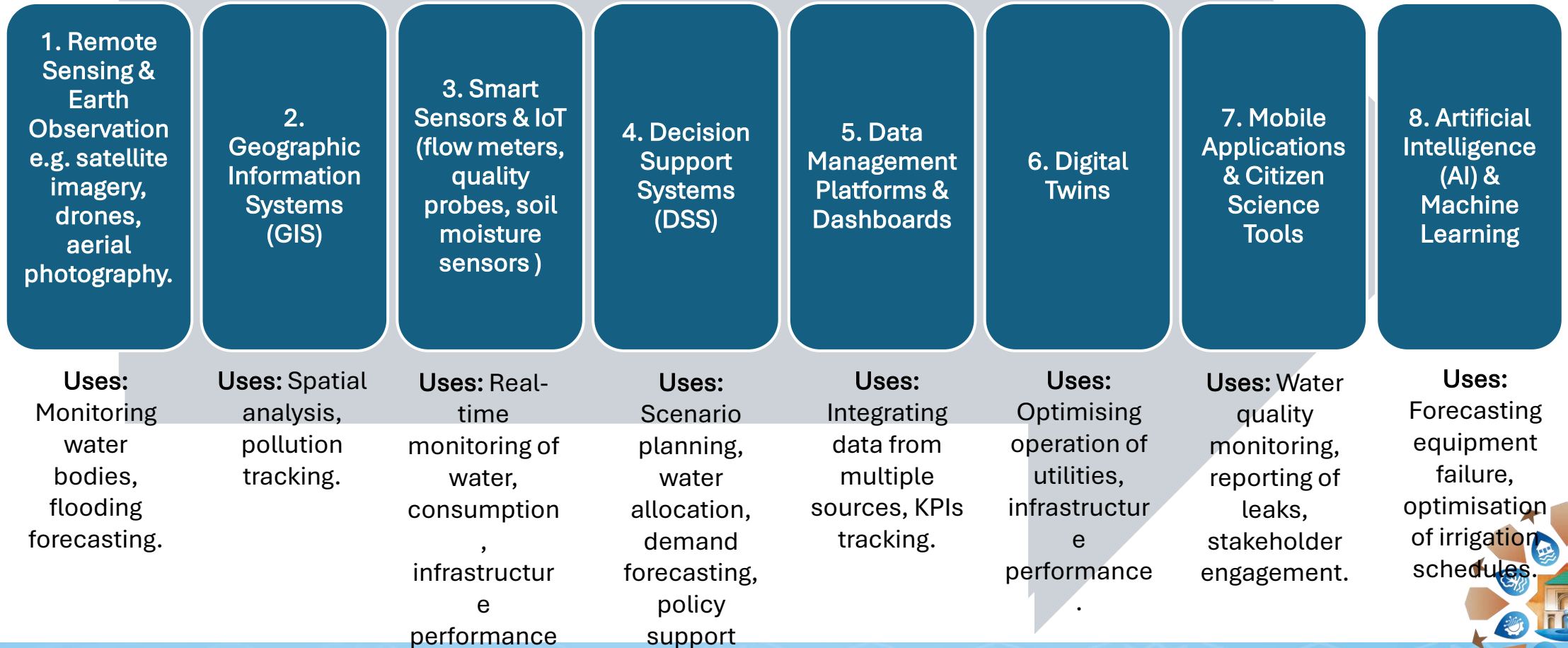
- High investment in digitalisation through the “**Water-Cycle Digitalisation Strategic Projects for Economy Recovery and Transformation**” (WCD-SPERT): 4 billion Euros (2022-2026)
- High vulnerability to climate change and water scarcity.
- Diversity of water challenges across the country, enabling a more profound analysis of the applications of digital tools in different settings.



# Digital tools & Main uses



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MONITORING & DATA  
COLLECTION

PREDICTIVE ANALYTICS &  
DECISION SUPPORT

Main applications of  
digital tools in water  
management

RESOURCE OPTIMISATION

STAKEHOLDER ENGAGEMENT  
& GOVERNANCE



# Monitoring & Data Collection



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- **Real-time Monitoring:** Smart sensors, IoT devices, and SCADA systems enable continuous monitoring of water quantity and quality across basins and urban networks.
- **Enhanced Decision-Making:** Automated Hydrologic Information Systems (e.g., SAH) help River Basin Authorities improve forecasting for droughts, floods, and water allocation.
- **Operational Efficiency:** GIS tools and IoT applications, such as in the Canary Islands, allow real-time adjustments in desalination and water distribution, reducing losses. Cities like Madrid and Barcelona have reduced water-leakage losses by up to 20% through smart meters and network sensors integrated with upgraded SCADA systems.
- **Pollution Tracking:** Digital monitoring ensures early detection of contaminants in rivers, reservoirs, and groundwater, supporting compliance and pollution source identification.



# Predictive Analytics & Decision support



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- **Smart Irrigation & Agriculture:** Predictive tools adjust irrigation based on soil and weather data, with €2.4 billion invested by Spain to digitalise 700,000 hectares of agriculture by 2027.
- **Proactive Drought Management:** AI-powered platforms and satellite data help basins like Segura and Ebro anticipate droughts and adjust allocations ahead of crises.
- **Flood Forecasting:** Systems like HIDRO-MET in Catalonia and the EU's Copernicus service enable early warnings by integrating real-time hydrological and meteorological data.
- **Urban Water Optimization:** Predictive platforms (e.g., GoAigua in Valencia) dynamically manage water pressure based on demand and climate forecasts to reduce waste.
- **Water Quality Safeguards:** In Seville, tools like Aquasig simulate network scenarios to maintain chlorine levels and prevent water contamination.



# Stakeholders involvement & Governance



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- **Citizen Participation:** Mobile apps to engage users in water conservation by allowing leak reporting, consumption tracking, and receiving real-time updates.
- **Transparent Governance:** River basin authorities are deploying digital platforms to promote stakeholder dialogue and participatory river basin planning.
- **Cross-Sectoral Collaboration:** Digitalisation breaks down data silos, enabling collaboration between sectors and improving decision-making across management levels.
- **Public-Private Partnerships (PPPs):** Encouraged by WCD-SPERT, these partnerships help scale digital water solutions by uniting basin authorities, utilities, and tech providers.
- **Innovation Hubs:** Institutions like Cetaqua and the Digital Water Innovation Hub support co-creation of solutions by linking researchers and tech companies to drive digital transformation.



# Resource Optimisation



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- **Smart Irrigation:** AI-based tools (e.g., IDRICA, Digital Data Farm, AGROW) enhance irrigation scheduling and reduce water use in agriculture.
- **Basin-Level Forecasting:** Simulation tools like SIMPA and real-time management systems (e.g., Guadalquivir 4.0) help river basin authorities optimise reservoir operations and adapt to climatic variability.
- **Ecosystem Protection:** Dynamic reservoir management supports ecosystem conservation (e.g., Doñana Park) through better-balanced water releases.
- **Urban Water Networks:** Smart technologies like AI and blockchain (e.g., Aquadvanced, Aquasig) reduce non-revenue water and improve supply efficiency.
- **Water Reuse and Circularity:** Projects such as Circular Toolkit and AQUATIM promote water reuse and enhance circular water management in agriculture and industry.



# BUT... some challenges



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- Need for **investments** (implementation, maintenance, updates, staff training).
  - For local governments in Andalusia and organisations with limited budgets, these costs can be prohibitive.
  - Need for clear financial incentives or evidence of costs savings.
- Insufficient **data exchange and interoperability** due to inconsistent water management practices.
- **Reluctance** of personnel to change their “common” practices.
  - Concerns about the need to disrupt established practices, bypass community-driven management, and necessity to restructure teams.
- **Limited access** of citizens and water management authorities to digital tools, in particular in rural and marginalized communities.
- Digital **illiteracy**.
  - The use of digital tools often requires a certain level of technical knowledge.
  - The added value of digital tools is not apparent to end-users.
- **Inadequate policies**, regulations and incentives.





# Some recommendations

- Develop **cost-effective, user-friendly and simpler digital tools**.
  - To make digital tools more accessible to a wider range of stakeholders.
- Enable **communication with end-users** from the outset of the design process.
  - To ensure a full alignment between the functionalities of the tool and users' needs.
- **Improve digital literacy** through showcase activities and Living Labs.
  - To improve knowledge and “demonstrate” the value creation of digital tools (e.g. delivery of tangible and measurable benefits such as improved decision-making, cost savings, better public engagement).
- Establish clear guidelines on **data ownership and sovereignty**.
- Enable the development of supporting **regulations, policy frameworks and instruments**.
  - The Spanish WCD-SPERT programme is a good example.
- Set up **evaluation frameworks (KPIs)** to track the implementation and use of digital tools, justify investments and identify options for improvement.



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Thank you!

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