

UNESCO-IHP ECOMED Academy Network

Stakeholders Consultation Meeting on the Further Development of the ECOMED
Academy Network Proposal

Strategic Program Development, Implementation Planning & Feasibility Assessment

December 16 and 17, 2025, at UNESCO HQ, 7 Place de Fontenoy, Paris, 75007

**Session 4 Engaging the Network Planning of Capacity Building Support Programs
and their Implementation practice**

Presentation by Dr. Marcello SERRAO – 16 DEC 2025

From Research to Innovation in Action

Bridging Academia, Research & Industry in Digital Water Systems

My background

- Academic research & PhD: AI/ML-based process simulation and Digital Twins
 - Research Associate: **W-SMART – LEESU (ENPC – Paris)**
 - Industry experience:
 - International as a consultant Urban Water Management and the Integration of Advanced Digital Tools
 - **PhD-thesis with SIAAP** – regional wastewater utility (~10 million PE) in Paris (Fr) under the supervision of ENCP
 - Engineering consultant – design of water treatment systems and data-driven tools
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My observations in the industry regarding digitalization:

- Strong uptake of digital solutions over the last 10 years for reasons of:
 - Big Data & process models for control and optimization
 - Predictive maintenance & decision-support tools for management
 - Reduction of consumption of Energy and Chemical reagents, as well as promote Resource Recovery from wastewater
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Key challenges to overcome

- Trust and confidence building among technical staff remain critical
 - Operators think from a **physical engineering perspective**
 - AI and Machine Learning models are still often perceived as *black-box* solutions
 - Data confidentiality and sharing constraints
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Training as a key enabler

- AI-based Digital Twins can function as **safe training environments for operators**
 - Scenario-based learning (failures, crises, trade-offs)
 - Education of both **operators and management** is essential leading into a culture adaption
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My key message

- Integrate **academia, research, and industry** from the start
 - Co-design research with operators and managers
 - Embed Digital Twins into **training, education, and R&D**
 - **Research becomes innovation in action**
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My take-home message

Capacity building should not follow innovation — it should be built into it.