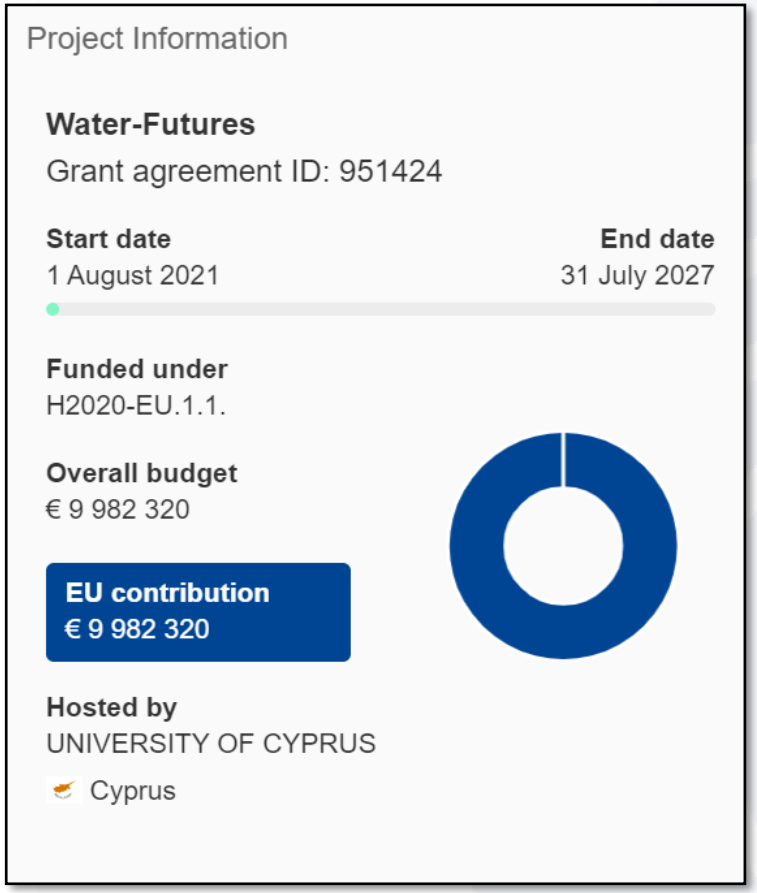
water futures

Smart Water Futures: designing the next generation of urban drinking water systems

Water-Futures has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Grant agreement No. 951424)

Project outline- ERC Synergy Grant

- Smart Water Futures: designing the next generation of urban drinking water systems
- Acronym: Water-Futures
- Beneficiaries:
  - University of Cyprus (Cyprus)
  - Bielefeld University (Germany)
  - Athens University of Economics and Business (Greece)
  - KWR Water Research Institute (Netherlands)
  - University of Exeter (UK)
- Total budget: € 9,982,320



https://cordis.europa.eu/project/id/951424

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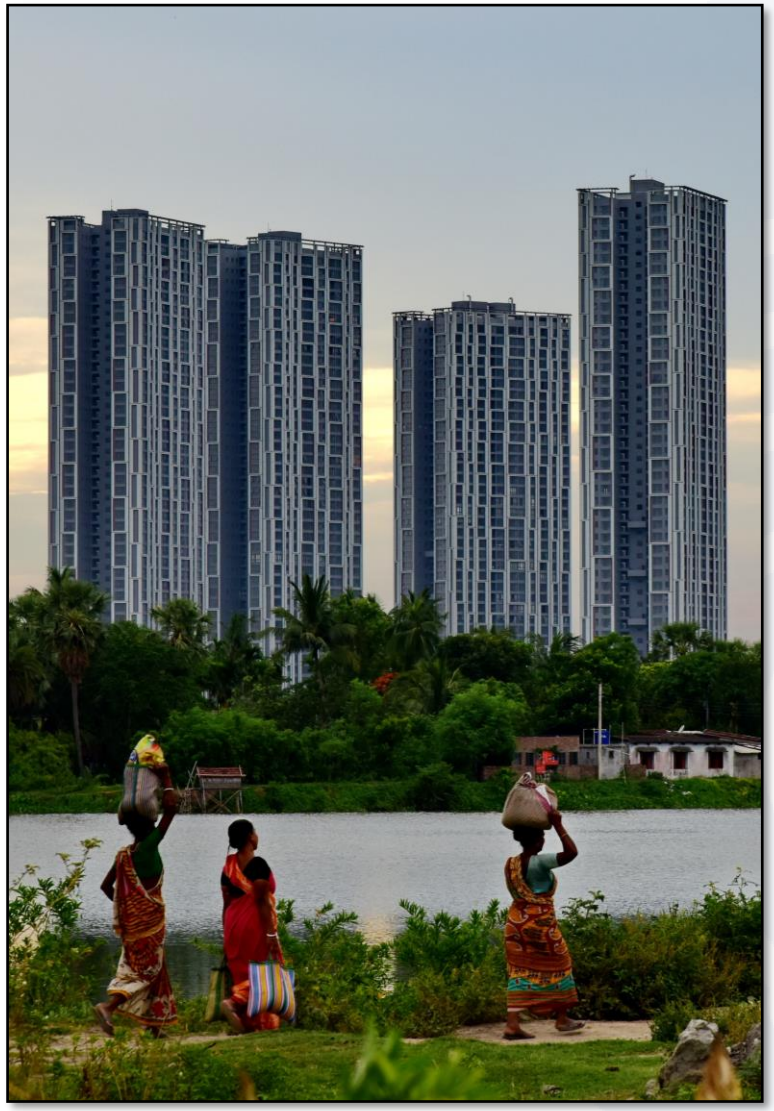
The future of water challenge

- 80% of the world's population is exposed to high levels of threat to water security due to anthropogenic climate change
- 70% of the world's population will live in urban areas by 2050
- Urbanization and climate change will cause increased water demand
- Urban water distribution systems: complex, large-scale, time-varying, long-lasting networks



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Scientific question

How should the world achieve the provisioning of high-quality water services in the future while facing severe climate, economic and population pressures, under deep uncertainty?

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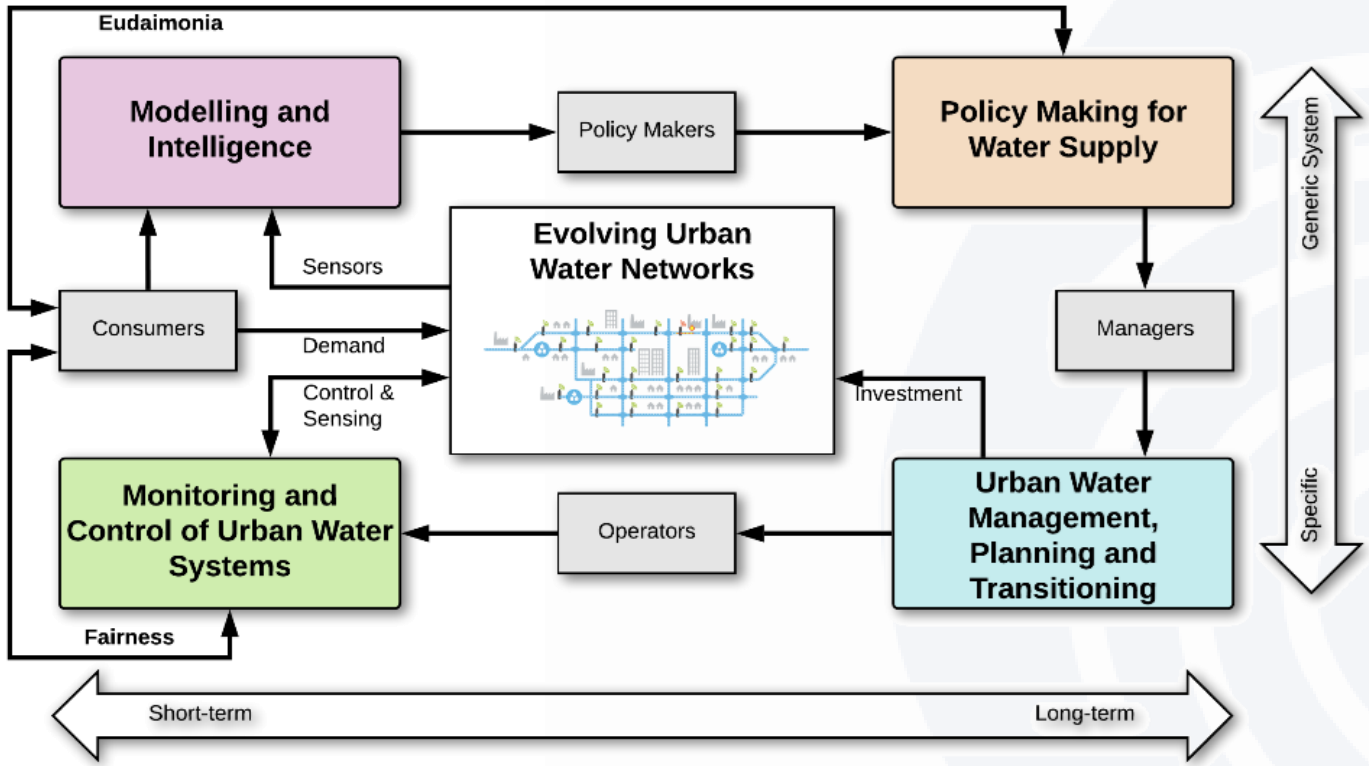
Concept

Provide the theoretical and practical basis for enabling stakeholders, policy makers, managers and operators:

- Make socially-acceptable and fair decisions (for the consumers)
- Balance real-time and short-term decisions as well as long-term infrastructure transitioning and planning
- Focus on evolving urban water distribution systems under multiple possible futures and deep uncertainties



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Impact

- *The project will result in a theoretical and practical basis for a generic framework, together with applied research tools, that could support decisions for the provisioning of future water services to more than two-thirds of the world's population that is expected to inhabit our cities by 2050.*
- Nurture scientific talent; training of researchers in new methods for water distribution systems
- Wider societal impact: building awareness; influencing policymakers; engaging the public.

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Thank you!

What is the ERC Synergy Grant?

- Funded by the EU's Horizon Europe Framework Programme
- European Research Council (ERC) Frontier Research Grants aim to empower researchers and foster their creativity
- ERC Synergy Grants enable up to 4 Principal Investigators and their teams, to jointly address ambitious research problems that could not be addressed by each team alone.
- Enable substantial advances at the frontiers of research
- Transformative research with potential to become benchmark on a global scale

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Principal Investigators

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Prof. Marios Polycarpou
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Project objectives

- To develop theory and application of **robust and flexible** decision support strategies to cope with **deep uncertainty** associated with urban water systems that evolve over time.
- To develop new **real-time distributed monitoring and evolving control methodologies** for water systems in order to support the ability to learn from experience acquired from other parts of the system, and to interact with uncertain human decisions, considering both short-term and long-term planning goals.
- To develop **Explainable Machine Learning** models in non-stationary environments for complex structured and networked data to seamlessly support human decision making for smart water systems by data-driven technologies.

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Project objectives

- To develop a methodology that integrates **economic, social, ethical and environmental** considerations, with direct relevance to UN Agenda 2030 into an interdisciplinary decision-support framework that will allow agent-based **societal welfare maximization** in the short, medium and long-run, under deep uncertainty.
- To design and implement an **open-source toolbox** that integrates the scientific outputs produced, and the **demonstration of the different methodologies** developed by the research team, in three urban water systems in the Netherlands, Cyprus and Mexico.

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A new theoretical framework

Need a holistic, intelligent decision-making framework for managing water infrastructures in the cities of the future:

(i) adapt to evolving urban water networks, new sensing technologies and consumer behaviours;

(ii) integrate real-time monitoring and control with long-term planning and policy making;

(iii) assimilate water quality issues with water supply problems; and

(iv) incorporate economic, social, ethical and environmental considerations.

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