



# LNEC LISBON CONFERENCE

## Floods, water scarcity and extreme events 2023

LNEC Congress Center | Lisbon | Portugal | 19-20 October 2023

### About LNEC Lisbon Conference 2023

Extreme hydro-meteorological events, such as inland flooding, coastal storms and severe water scarcity, have major social, economic and environmental impacts. These adverse impacts may be exacerbated by climate change. It is therefore important to better understand extreme events and water security challenges, and to take action to reduce increasing risks. In particular, there is a need to adopt strategies to increase the resilience of cities and critical infrastructure. The aim of the LNEC Lisbon Conference 2023 is to discuss how the research community, in collaboration with local authorities and citizens, can contribute with tools and solutions to address these water-related challenges.

### Highlights

The keynotes, round tables and institutional presentations were very rich. Most supporting presentations are available from the conference website ([Program](#))

#### Extreme events

Keynote by:  
**Miguel Miranda**

**round table**

#### Water scarcity

Keynotes by:  
**Clive Lipchin** (on-line)  
**Valentina Lazarova**

**round table**

#### Floods

Keynotes by:  
**André Fortunato**  
**José Pedro Matos**

**round table**

### Research challenges and strategies

#### Session 1

Joint Research Centre (JRC,  
European Commission)

**Jann Martinsohn**

University of Algarve, Faculty  
of Sciences and Technology  
(UAlg)

**Carla Rolo Antunes**

University of Lisbon, Faculty  
of Sciences (FCUL)

**Ricardo Trigo**

#### Session 2

Aqua Research Collaboration  
(ARC)

**Kristina Wencki**

Lisbon Municipality – Lisbon  
Living Laboratory

**Catarina Freitas**

National Laboratory for Civil  
Engineering (LNEC)

**Helena Alegre**

#### Session 3

Instituto Superior Técnico,  
University of Lisbon (IST/UL)

**Dídia Covas**

Swiss Federal Institute  
of Aquatic Science and  
Technology (EAWAG,  
Switzerland)

**Christian Stamm**

Zero Pollution and Green  
Cities, DG Environment,  
European Commission

**Lukas Repa**



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#### Following some highlights of the presentations and discussions:

- To cope with the evolving climate and the challenges we have ahead of us, we must profoundly change our lifestyle.
- We should conduct flood or other water-related extreme events drills, similar to fire or seismic drills.
- Risk is a part of life; difficult decisions should be made before they are needed; machine learning and real-time flow prediction are important assets for management and emergencies.
- Professionalism vs. personal interest is one of the most challenging issues in decision-making for low probability-high consequence risks.
- One water, one health.
- Water smartness.
- Water scarcity leads to added water quality issues in inland waters.
- Overcoming water scarcity requires demand management and water conservation (efficiency measures in urban, agricultural, and industrial areas) as well as the integrated and rational use of both conventional and alternative water sources, such as water reuse and seawater desalination.
- Measures to ensure the quality of (drinking and reclaimed) water from source to tap are needed.
- Fit-for-purpose treatment for safe, efficient, and cost-effective water reuse is needed and is feasible.
- Water reuse is a crosscutting solution for water scarcity across Europe, from the South (e.g., agriculture, urban non-potable uses) to the North (e.g., industrial).
- The more stringent discharge requirements coming with the revised Urban Wastewater Treatment Directive will make water reclamation for reuse more competitive.
- Reclaimed water storage is key for water reuse, and accurately modelled managed aquifer recharge may be part of the solution.
- Change the paradigm: water management involving all stakeholders is needed!
- Coastal regions, particularly estuaries, link oceans and seas to freshwater systems. In this context, for the European Union, it is important that scientific advice helps to further integrate and harmonize legislation underpinning freshwater and marine governance, namely the Water Framework Directive and the Marine Strategy Framework Directive.
- Many estuaries will experience dramatic changes associated with sea-level rise.
- To reduce coastal risks, consider a range of solutions: avoidance, relocation, soft and nature-based solutions, and improvement of traditional solutions. The first solution to consider is to avoid risk through appropriate territorial management.
- Floods are not only threats to humans but also are necessary for maintaining healthy aquatic ecosystems. Further development of long-term inter- and transdisciplinary collaborations with stakeholders to implement and test novel water management methods and strategies is needed.



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- We need to integrate the effects of climate change into flood estimation and raise public awareness of the role of river and river basin interventions in reducing (or not) flood exposure.
- Portuguese legislation on inundation plans (inland, estuaries, coastal areas) should be revised because it does not take all the main drivers into account.
- Integration of the most updated scientific knowledge into operational water management is needed. A significant share of major flood events is associated with atmospheric rivers.
- Reliable, accessible, and multisource data are strategic for policy and decision making.
- Further development of different sensing technologies (in-situ sensors, drones, satellites, video, etc.) and their integration into models for faster-than-real simulation and short-term prediction is needed.
- Satellite-based earth and ocean observation should be better integrated into our scientific advice support for and monitoring of national and EU legislation and policy decision-making.
- Digital twinning, for example, the Digital Twin Ocean (DTO), should be important components in our endeavour to tackle extreme water-related events and for water governance in general.

#### Recommendations:

- **Reduce the unsustainable use of water**, in particular groundwater, and ensure surface and groundwater quality protection.
- **Promote water efficiency** through innovative technological and non-technological solutions, including capacity building and certification.
- **Facilitate safe water reuse** and support research into treatment and renewable energy desalination technologies to address growing water scarcity.
- **Increase the use of nature-based solutions** and multiple-benefit solutions through appropriate partnerships with clear lines of responsibility.
- **Recognize the essential role of spatial planning** in increasing resilience to extreme coastal and inland flooding events in a changing climate.
- **Improve the resilience of hydraulic infrastructures** through adequate monitoring, review of return periods, system rethinking and upgrading of critical elements.
- **Develop flood forecasting and early warning systems**, based on reliable data and modelling tools, to strengthen preparedness and support effective disaster response.
- **Maintain up-to-date flood hazard and risk maps and management plans**, based on scientific evidence and modelling, prioritising areas at highest risk.
- **Relocate critical facilities** and, where necessary, make long-term plans to relocate communities exposed to unacceptable risks.
- **Develop water-oriented living labs** and engage citizens, local authorities, industry and research institutions in the design of innovative solutions.