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EDITORIAL
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Editorial: Resilience of Urban Water Infrastructures: Challenges and Opportunities

Jorge Leandro[1]*, *Guangtao Fu*[2] *and Philippe Gourbesville*[3]

[1]Chair of Hydromechanics and Hydraulic Engineering, Research Institute of Water and Environment, University of Siegen, Siegen, Germany, [2]Centre for Water Systems, University of Exeter, Exeter, United Kingdom, [3]Polytech Lab, Université Côte d'Azur, Polytech Nice Sophia, Sophia Antipolis, France

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Editorial on the Research Topic

Resilience of Urban Water Infrastructures: Challenges and Opportunities

The United Nations' Sustainable Development Goals (SDGs) on water and sustainable cities highlight the need for setting the improvement of management of urban water infrastructure a growing priority for all cities worldwide. Population growth, climate change, urbanisation and infrastructure maintenance are major challenges in the context of disaster management in both developed and developing countries. Maintaining good levels of service is therefore built on the resilience which enables a quick recovery from system failures caused by natural disasters (e.g., floods or storms) and other disruptive events (e.g., earthquakes) that affect water infrastructure systems. The recent examples observed in various urban environments especially in Asia and in Europe during the last flash flood events have demonstrated the need to reshape the design process and the operation of urban water systems for accommodating major disruptive events.

The concept of resilience is beginning to appear in public strategies for flood risk management in particular with the new European policy targeting the development of resilience plans at regional scale for 2030. While risk-based approaches provide a rational way to weight the costs of mitigation and adaptation measures, resilience takes into account deep uncertainties associated with natural hazards by focusing on the ability of an affected system to absorb extreme shocks, to restore good service levels in a short perspective and to plan improved services for the ultimate recovery phase. However, improving resilience is not trivial and combine large diversity of components. Resilience is associated with ambiguous concepts (e.g., multiple meanings for resilience), multidisciplinary origins (e.g., ecological vs. engineering) and different metrics (qualitative vs. quantitative). The lack of clarity and a unified definition poses challenges for operationalising resilience for the water systems, but also creates opportunities for research and development.

The purpose of this Research Topic is to examine the latest advances and developments in addressing the challenges in urban water infrastructure resilience, but also to discuss the opportunities they create. This issue features contributions on new flood forecasting methods, flood simulations and remote sensing, approaches to strengthening resilience, and related challenges and opportunities in four articles with contributions from 17 authors. Selected highlights from each paper are summarised below:

The paper Zheng et al. presents a novel way to determine the threshold of flood-leading precipitation via inverse simulation of a hydrological model combined with flood hazard assessment. The predicted flood results showed excellent agreement with the first two flood peaks, and good agreement for the third flood peak event within a season.

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Ahmed Kenawy,
Mansoura University, Egypt

***Correspondence:**
Jorge Leandro
jorge.leandro@uni-siegen.de

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The article Su et al. compared the accuracy and efficiency of coarser and finer grids for flood simulations in urban areas. While the use of coarse grid resolutions is probably sufficient for disaster management, high-resolution grids of 0.5 m may be required for assessing flood impacts on critical infrastructure.

The editors' choice article Igigabel et al. deals with coastal flood protection systems. The article contains a thorough bibliographic analysis not only of methods but also of operational tools for strengthening the resilience of systems, with very exciting results.

The paper Diaby and Roux-Dufort draws on several recent conceptual developments in urban resilience to analyse various relationships that interact in urban systems. By taking a fresh look at these relationships and core dispositions, the paper identifies innovative ways to capitalise on opportunities for increasing resilience.

Overall, this Research Topic highlights the challenges and opportunities in urban systems through a variety of case studies and techniques currently being used and/or developed to improve the resilience of water infrastructures. All the selected contributions help to consolidate resilience's concepts and operational approaches. We would like to highlight the exploratory methodological approach of the authors. Finally, we would like to thank the reviewers and all authors for their contributions to this Research Topic. We hope you enjoy reading.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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