AQUA
Water Infrastructure, Ecosystems and Society

 AQUA — Water Infrastructure, Ecosystems and Society Vol 72 No 10, iii doi: 10.2166/aqua.2023.404

Editorial: Get prepared for unexpected disasters via advanced analytics and simulation techniques for urban hydraulic engineering and water infrastructure

INTRODUCTION

Nowadays, water infrastructure faces even more significant challenges during disasters. Disaster events of water infrastructure are often the result of the joint action of human activities and natural factors, and its mechanism is very complex. Therefore, deploying an effective monitoring and control system with intelligent equipment and technology integration is essential for disaster simulation analysis, especially in water conservancy projects and urban environmental systems. Using scientific and theoretical models, monitoring data, and computer technology in a synergistic manner becomes appealing and necessary. Preventing damage to water conservancy projects is the first priority for disaster prediction. As such, intelligent simulation techniques are increasingly important in disaster prevention analysis and mitigating water system challenges. This special issue aims to publish original research and review articles covering the latest developments in applying hazard analysis and simulation techniques for urban hydraulic engineering and water systems. The detailed contribution of each paper is highlighted in the following section.

A GLANCE AT THE CONTRIBUTIONS TO THE SPECIAL ISSUE

This special issue introduces several current hotspots on disaster analysis and simulation in urban hydraulic engineering and water infrastructure, including emerging real-time flood forecasting methods, advanced volume of fluid (VOF) model, computational fluid dynamics approach, system dynamic approach, pollution prediction model for water quality, and water infrastructure planning strategy. In addition, some new development trends in this field are summarized.

Abraham *et al.* (2022) applied a system dynamic approach to simulate a chain of four tanks in the Guduvanchery watershed, Tamil Nadu, India, and VENSIM was used for the system dynamic simulation to assess water availability for the sustainable management of water resources.

Cao *et al.* (2022) developed a three-dimensional computational fluid dynamics approach to elaborate the water-hammer pipe flow and detailed dynamic characteristics of a closing ball valve, in which the water compressibility and the viscous sublayer were considered. The developed approach better reproduced the pressure oscillations while helping to visualize the associated physical processes and further exploring the transient characteristics.

Li & Yu (2023) selected 25 villages in the north-central area of Shanxi Province in China for field study to get a comprehensive grasp of the population and land-use conditions. Based on the field study, a water infrastructure planning strategy based on an analysis and evaluation of the present situation was provided, which more effectively integrated the current rural development scenario while adjusting to the trend of population development and resource allocation in rural China.

Shen *et al.* (2022) developed a robust error estimation method for real-time flood forecasting in reservoirs, in which it repressed the gross errors by a robust loss function based on the real error distribution of measurements.

Sun & Fan (2022) proposed a combined water quality prediction model based on integrated ensemble empirical mode decomposition (EEMD) and cascade support vector machine (Cascade SVM). The proposed combined model showed a substantial superiority in many aspects of performance, such as training efficiency and prediction accuracy.

Wang *et al.* (2022) developed a VOF model to study the pressure surges and the water–air interface change law with two-sided inflow impacting entrapped air-pocket in deep stormwater storage tunnels. The proposed model could be extended to systems with multiple shafts or air-pockets.

Xu *et al.* (2022) studied the causes of water environment evolution in the tributary bay and investigated the driving force of eutrophication succession after the Three Gorges Reservoir entered regular operation. A three-dimensional hydrodynamic, water quality, and eutrophication mathematical model for the Meixi tributary bay was developed and calibrated with measured data about the hydrological regime, hydrodynamic factors, and water quality.

All the papers in this special issue provide helpful information for developing new disaster analysis and simulation technologies in urban hydraulic engineering and water infrastructure.

ACKNOWLEDGEMENTS

We appreciate the authors' high-quality papers, which have improved our scientific knowledge in disaster analysis and simulation in urban hydraulic engineering and water infrastructure. Furthermore, we would like to express our deepest thanks and gratitude to the reviewers and the IWA Publishing staff who contributed to the successful preparation of this exciting and meaningful special issue.

Guest Editors
Weiqiang Wang
Hohai University, China
E-mail: weiqiang.wang@hhu.edu.cn

Yang Yu
University of New South Wales, Australia
E-mail: yang.yu12@unsw.edu.au

Tianyu Xie
Southeast University, China
E-mail: tianyuxie@seu.edu.cn

Qi Wang
Guangdong University of Technology, China
E-mail: q.wang@gdut.edu.cn

REFERENCES

Abraham, M., Venugopal, K., Arunkumar, R. & Pramada, S. K. 2022 Simulation of chain of tanks to augment water supply: a case study from Tamil Nadu. *AQUA – Water Infrastructure, Ecosystems and Society* **71** (9), 975–991.

Cao, Y., Zhou, L., Ou, C., Fang, H. & Liu, D. 2022 3D CFD simulation and analysis of transient flow in a water pipeline. *AQUA – Water Infrastructure, Ecosystems and Society* **71** (6), 751–767.

Li, J. & Yu, R. 2023 A study on villages of the planning of water infrastructure planning: 25 villages in Shaanxi Province as an example. *Journal of Water Supply: Research and Technology-Aqua* **72** (1), 19–31.

Shen, D., Bao, W. & Ni, P. 2022 A robust real-time flood forecasting method based on error estimation for reservoirs. *AQUA – Water Infrastructure, Ecosystems and Society* **71** (4), 518–532.

Sun, Z. & Fan, Y. 2022 A combined water quality pollution prediction model based on the Spark big data platform. *AQUA – Water Infrastructure, Ecosystems and Society* **71** (9), 963–974.

Wang, Y., Yu, X., Qin, H., Cheng, N. & Yu, C. 2022 Analysis of pressure surges for water filling in deep stormwater storage tunnels with entrapped air-pocket using a VOF model. *AQUA – Water Infrastructure, Ecosystems and Society* **71** (9), 992–1001.

Xu, T., Ma, W., Cheng, Y., Qi, D., Sun, L. & Chang, F. 2022 How has the eutrophication evolved in the tributary bay of the Three Gorges Reservoir area. *AQUA – Water Infrastructure, Ecosystems and Society* **71** (8), 896–909.