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EDITED AND REVIEWED BY  
Michael Nones,  
Polish Academy of Sciences, Poland

\*CORRESPONDENCE  
Ankit Agarwal  
✉ ankit.agarwal@hy.iitr.ac.in

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# Editorial: Emerging talents in water science

Ankit Agarwal<sup>1\*</sup>, Alban Kuriqi<sup>2</sup> and John Matthews<sup>3</sup>

<sup>1</sup>Department of Hydrology, Indian Institute of Technology, Roorkee, Uttarakhand, India, <sup>2</sup>CERIS, Instituto Superior Técnico, University of Lisbon, Lisbon, Portugal, <sup>3</sup>Trenchless Technology Center, Louisiana Tech University, Ruston, LA, United States

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## Editorial on the Research Topic Emerging talents in water science

All over the world, students are doing relevant research as part of their education. However, most of this work is not disseminated to a wider audience and remains buried in college archives. We recognize that this may be because many students find peer review daunting. This Research Topic was inspired primarily by these findings and a related effort to develop a Research Topic of Frontiers water research dedicated to highlighting the emerging talent of student researchers in water science. The Frontier in Water Research Topic entitled “*Emerging talents in water science*” includes six original papers on water quality, quantity, extremes, sanitation, and safety.

Zhang and Valeo investigated the scalability of PCSWMM’s low impact development (LID) modeling tools in an urban stormwater computer model. Evaluating different spatial and temporal scales, the study focuses on bioretention cells and uses a calibrated model for a semi-urban watershed in Vancouver Island, Canada. The results show that flow path length and slope are important factors during flood events. At the same time, the surface layer of the model plays a key role in peak runoff and volume reduction by bioretention cells. The storage layer parameters dominate the continuous rainfall inputs. The study shows how seasonal or excessive loads affect the static model parameters and suggests possible improvements for smaller storms and larger scales.

Porter et al. present a comprehensive flood risk assessment for commercial buildings and multifamily housing in the United States, using high-resolution data and a forward-looking approach. Unlike flood risk analyses focusing primarily on residential buildings, this study emphasizes the often-neglected commercial market. The methodology combines hazard information, depth loss functions, economic data, and future projections to estimate structural damage costs, lost days, and economic impacts associated with flood risks. The study predicts an 8% increase in buildings at risk over the next 30 years, with 25.4% higher structural damage costs, 29.1% longer downtime, and 26.5% greater economic impacts. These impacts exhibit spatial concentration, highlighting the need for a detailed understanding of flood risk in the commercial sector. The framework developed serves as a decision-making tool for investment, mitigation, and adaptation, benefiting commercial markets, governments, and individuals. The approach improves understanding of flood-related vulnerabilities and their economic impacts, filling a critical gap in flood risk assessment.

Santy et al. studied the impact of climate change on water quality in the polluted section of the Ganga River near Kanpur, a highly industrialized area. They assess the risk of eutrophication and fish kills for the mid-and late twenty-first-century considering various water quality parameters such as dissolved oxygen, biochemical oxygen demand, ammonia, nitrate, total nitrogen, phosphorus, and fecal coliform. Using downscaled climate projections and a coupled hydrology and water quality model, the study predicts a potential water quality degradation of more than 50% from climate change alone in the mid-twenty-first century, with a slight improvement toward the end of the century. The risk of eutrophication, fish kills, and dissolved oxygen reduction increases due to frequent low-flow events and reduced water flow. However, the risk of nitrate and microbial pollution decreases due to increased rates of denitrification and pathogen degradation. The results provide insights for policymakers to improve water quality management and highlight the effects of climate change on polluted river reaches.

Ak and Benson examine the effectiveness of integrated river basin management in achieving water security by comparing two case studies: the Konya Closed Watershed in Turkey and the Kern County Subbasin in California. In the context of global challenges such as climate change, population growth, and pollution affecting water resources, the study uses a modified Institutional Analysis and Development (IAD) framework and a water security index to analyze the governance, community, and biophysical factors influencing water security outcomes. The results show that water security success is closely linked to the governance context. This underscores the importance of multi-stakeholder participation and inter-institutional coherence in integrated river basin management. The paper also addresses lessons that can be learned from these cases and suggests potential models for policy design, such as the California Sustainable Groundwater Management Act (SGMA). However, the authors acknowledge that further research is needed to extend the findings to different national contexts and to examine the broader implications of integrated river basin management for water security and achievement of the Sustainable Development Goals UN.

The study by Grisaffi et al. addresses the challenges utilities in sub-Saharan Africa face in establishing safe manual and semi-mechanized latrine pit emptying, transportation, and disposal services citywide. The study focuses on the crucial period between initial pilots and service expansion. The authors use the Citywide Inclusive Sanitation (CWIS) framework to analyze the perspectives of implementing agencies in Livingstone, Zambia, and Malindi, Kenya. They use a modified Institutional Analysis and Development (IAD) framework that includes a review of secondary data and key informant interviews to uncover key challenges related to cost, manual pit emptier employment, barriers to employability, and other factors affecting water security outcomes. The study documents the unique challenges associated with establishing these services, including issues of loathing and the complex role of public utilities as commercial and social entities. The study provides valuable insights into the early implementation of citywide sanitation services, particularly the political feasibility

of private sector provision, the implications for utilities' ability to extend sanitation services to low-income areas, and the need for regulatory structures that support incremental change and investment. The findings affect similar socioeconomic contexts and may help regional water and sanitation regulators' policy and decision-making.

The study by Betgeri et al. presents a model for assessing defects in wastewater pipes for pipe maintenance using Natural Language Processing (NLP). The traditional method of manually assessing pipe repair records' structural condition is time-consuming and error-prone. The authors address this problem by developing an automated NLP framework on a small, curated dataset of annotated images, video data, and text. The study uses NLP techniques to break down the text to identify grammatical units. In the subsequent analysis, these units are used to determine the frequency of pipe defects and classify them into defect ratings for maintenance. The proposed model achieved high accuracy (95.0%), recognition (94.9%), specificity (95%), precision (95.9%), and F1 score (95.7%). This approach demonstrates the potential of using NLP-based models in large-scale pipe repair documents to accurately and efficiently detect pipeline failures and thus improve pipeline quality.

Finally, findings reported in the Research Topic highlight the quality and diversity of student researchers in water science. This Research Topic will shed light on the young emerging researchers within the field of water science and will allow the community to follow their glittering careers. All published six studies contributed significantly to our existing knowledge and will appeal to the broader society of water scientists regarding water quality, quantity, extremes, sanitation, and security.

## Author contributions

AA: Conceptualization, Writing—original draft, Writing—review and editing. AK: Conceptualization, Writing—original draft, Writing—review and editing. JM: Conceptualization, Writing—original draft, Writing—review and editing.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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