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Editorial: Sustainable urban stormwater management under a changing climate

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Editorial on the Research Topic
Sustainable urban stormwater management under a changing climate

Changes in water balance due to land use practices and climate change not only lead to water shortage during the extended dry period, but also increase the flood risk during wet season. Sustainable urban stormwater management plays a very important role in water balance control and security (Chow et al., 2016).

With the increasing need to meet demands for innovative technologies and address climate change, stormwater engineers are facing a stiffer challenge to produce effective and sustainable drainage systems in urban areas (Lui et al., 2019). This requires incorporation of new technologies and innovations into the design of drainage facilities, as well as improved management practices (Ting et al., 2020); therefore, minimizing the risk associated with such changes constitutes an urgent priority to increase water security and enhance people's resilience in the future (Liu et al., 2021).

The Research Topic "*Sustainable urban stormwater management under a changing climate*" presents a collection of studies that delve into various critical aspects of hydrology and water resource management. This compilation of research articles as shown in Figure 1, reflects the latest research and innovative methodologies in the field, focusing on climate change impacts on river flow and temperature, new methodological approaches for characterizing water storage dynamics and parameterizing catchment models.

Kuok et al. (Paper 1) investigated the influence of climate change on Sarawak River flow, specifically concerning heavy rainfall and sea-level backflow. They employed the Infoworks River Simulation (RS) software to model flood inundation levels in low-lying regions along the Sarawak River. The simulations were conducted for the years 2050 and 2080. The results indicated that numerous low-lying areas along the Sarawak River were expected to experience inundation, with flood depths ranging from 1 to 4 meters by the year 2050. Moreover, by 2080, it is projected that flood depths will increase by an average of 1 meter, particularly in low-lying regions, compared to the 2050 scenario. Consequently, the study recommended that relevant authorities should take proactive measures to address the escalating flood challenges attributed to climate change, particularly in vulnerable low-lying areas.

Guilhen et al. (Paper 2) aimed to enhance the understanding of the hydrological processes within the Madeira Basin, encompassing its alluvial floodplains on both local and global scales. They employed a semi-distributed hydrological model called the Soil and Water Assessment Tool (SWAT) to simulate daily water discharge and water resources within various hydrological compartments. Their findings revealed that more than 60% of the alluvial validation points exhibited a correlation above 0.40 ± 0.02, irrespective of how the floodplains were delineated. This study contributed to a more comprehensive characterization of the spatio-temporal dynamics of water storage within the Madeira floodplains, addressing both local and global perspectives. Furthermore, it underscored the critical importance of accurately delineating floodplains before calculating biogeochemical fluxes and sediment yield.

Rajanayaka et al. (Paper 3) conducted a case study in New Zealand's Waikato and Canterbury regions, utilizing hourly observations of root zone soil water content and drainage to develop an upscaling method for parameterizing the TopNet catchment model's soil water balance module. This approach involves transferring multi-layer soil profile data from the S-map national soil database to the single-layer soil profile used in TopNet. Bayesian calibration identified hydraulic parameters, with eight correlated parameters used to develop upscaling functions for other locations. This methodology can be applied to similar areas and other catchment-scale hydrology models with available point-scale soil hydraulic data.

Finally, Qureshi et al. (Paper 4) examined climate variations in Pakistan's major agro-climatic zones, revealing a mean annual temperature increase of 0.1–1.4°C. Notably, cotton-wheat Sindh

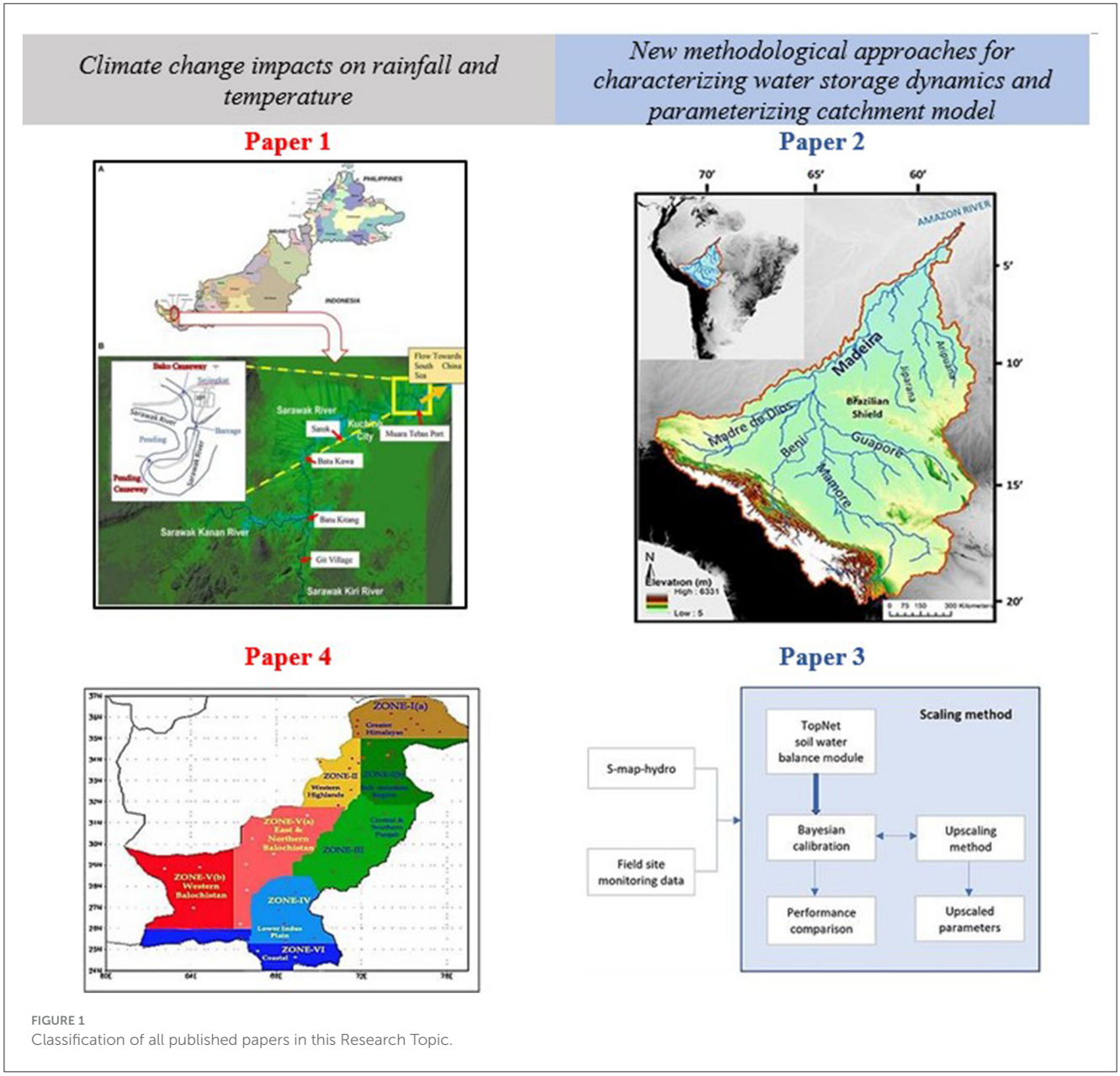

FIGURE 1
Classification of all published papers in this Research Topic.

experienced 0.1–1.2°C warming, and rice-other Sindh saw 0.8–1.4°C rise, while cotton-wheat Punjab had 0.6–0.9°C warming, and rainfed Punjab exhibited 0.2–0.6°C increase. Spring had the most significant warming. Precipitation trends showed annual rises of 30–60 mm in Sindh and 100–300 mm in Punjab, with monsoon precipitation increasing by 50–200 mm. The study emphasizes potential agricultural challenges and opportunities, such as increased irrigation needs and flood risks, necessitating climate adaptation and mitigation strategies.

Although this Research Topic includes only four studies, each offering distinct perspectives and analyses, they collectively make a significant contribution in light of the challenges and opportunities outlined earlier. The first study (Paper 1) examined climate change impacts on flood risks along an urban river, while the fourth study (Paper 4) focused on temperature and precipitation changes in major agro-climatic zones in Pakistan. Both studies underscored the need for climate adaptation and mitigation strategies to address future flooding and drought challenges. The second study (Paper 2) introduced new methodological approaches for understanding spatio-temporal water storage dynamics. In contrast, the third study (Paper 3) presented a method for parameterizing the soil water balance module of the TopNet catchment model. These studies offered promising approaches for enhancing sustainable water management in the face of climate change impacts.

Author contributions

FT: Conceptualization, Project administration, Resources, Visualization, Writing – original draft, Writing – review & editing, Data curation, Methodology. MC: Conceptualization, Writing – review & editing. CC: Writing – review & editing.

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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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