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EDITORIAL
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Editorial: Flood Management: Multi-Disciplinary Approaches for Data Observation, Analysis, Forecasting, and Management

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Editorial on the Research Topic

Flood Management: Multi-Disciplinary Approaches for Data Observation, Analysis, Forecasting, and Management

Floods are one of the most damaging natural hazards. In the last 12 years (since 2010), floods and storms have resulted in over 200,000 deaths worldwide and around $2 Trillion in direct damages, affecting around 2 Billion people and leaving over 10 Million people homeless (EM-DAT, 2022). The events that have led to these impacts are distributed across all regions of the world, but disproportionately affect more vulnerable populations. Regionally, in the last 30 years, floods have caused more than US $1,280 billion loss for the world economy, affected nearly 2 billion people around the world and killed about 214,000 people (Piadeh et al., 2022). Recent literature review of research papers published between 2010 and 2020 revealed that flood mortality is a real problem worldwide, regardless of the latitude, climate or level of development of the affected country (Petrucci, 2022).

Despite significant progress on various fronts related with flood prediction and management, flood damages continue unabated in various parts of the world. Many factors drive the devastation caused by floods, including, unwise development activities, growing urbanization, people occupying unsafe floodplains, the intensification of flood hazards resulting from climate and landuse-land cover changes, etc.

The objective of the present Research Topic was to compile recent developments in different aspects of flood management from across the world. To that end, three research papers covering three different topics have been included in the research collection. The three aspects are: climate change, water storage, and flood damage assessment. All these three topics are highly relevant to flood management, and in fact cover an interesting breadth of highly topical issues in the flood management domain. They are briefly synthesized in **Figure 1**.

The first paper investigates the economic impact of flooding in the agricultural sector (Giang and Vy). In Vietnam, a large segment of population depends on agriculture for their livelihood. The authors of the first paper have tried to estimate impact of climate change on agricultural production in a province of Vietnam. The projected extreme precipitation data was used to force a hydrologic model to compute resulting flood depths. This information along with crop data was used to estimate economic value of loss of rice crop. Due to climate change, the peak flood level is projected to rise by about 1 m and this will lead to increase in inundation area by 12.61% which will result in a 21% increase in the value of damage. Such a large potential increase in damage would adversely impact the

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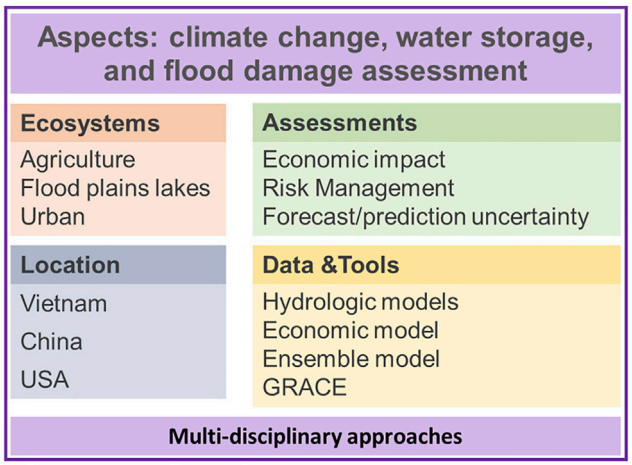

FIGURE 1 | Synthesis of papers.

income of farmers and food security for the country. It would be helpful if similar studies are carried out for the other places and information generated by such studies should be used to develop adaptation plans and mitigation measures.

The second paper focusses on the role of flood plain lakes in regulating floods (Song et al.). The storage capacity of lakes can be gainfully utilized to moderate floods and the stored water can be used to serve beneficial purposes. The research investigated the seasonal variation of hydrologic regime of lakes in the Yangtze-Huai plain, China and their utilization for flood risk management. The motivation of the study was the absence of a quantification of such data, and thus a detailed understanding of the role these lakes play in flood dynamics. A range of tools that used multi-source data including GRACE were employed to analyze terrestrial water storage anomalies in the basin. Results confirmed important contribution of lakes in overall water storage capacity of the basin. Similar studies in the other river basins of the world would contribute to better flood management.

The third paper explored a comparison of property flood loss assessment methodologies employed in the United States (Mostofiz et al.). The study was motivated by the need to compare the role of different methodologies when assessing flood damages at different scales (e.g. building scale or neighbourhood scale). The results point to the need to consider multiple models to assess flood-related losses such that uncertainty in the results can be more robustly incorporated into assessments. This is an interesting finding, and one that is supported by the general research direction in flood risk management, which suggests moving towards ensemble modelling to capture uncertainty estimates into forecasts and predictions.

As noted earlier, flood management consists of a range of activities, from forecasting of inputs that govern flood generation to damage control and assessment. As society moves forward, there is a pressing need for governments to be ready to manage increasing flood hazard in future, since such hazards will have a significant impact on populations, livelihoods and economic growth. The papers presented here clearly highlight the need to consider uncertainties in future projections to develop robust adaptation measures. Thus future research in this area should address developing better techniques for flood forecasting, uncertainties in forecasts, climate variability, change in land use and land cover and other related drivers. Another important topic would be to develop reliable models to determine flood inundation for riverine and urban floods that use the accurate elevation data generated by DEMs or LIDARs. Use of satellite data to generate hydro-meteorological data is a rapidly developing field and such data, among other applications, have immense potential in providing improved flood forecasts. Additionally, artificial intelligence is increasingly used in recent real-time flood forecasting models in urban drainage system and further developments of this technique are expected to appear in future works.

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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