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Editorial: Risk assessment and resilience of extreme weather-induced disasters

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Editorial on the Research Topic
Risk assessment and resilience of extreme weather-induced disasters

Introduction

Extreme weather events include unexpected, unusual, severe, or unseasonable rainstorms, droughts, and extreme temperatures, among others. They are important triggering factors that cause various natural hazards, including mountain flash floods (Figure 1), landslides, debris flows, urban flooding waterlogging, and agro-meteorological hazards, etc (Field et al., 2012; Sang et al., 2018; Sajadi, et al., 2022; Ren et al., 2024; Shi, et al., 2024). Such extreme weather-induced hazards pose a significant global threat to sustainable socioeconomic development. For instance, flooding generated by heavy rainstorms has become a serious "urban disease" in many cities worldwide, posing a serious threat to the safety of people's lives and property and the normal operation of cities (Yang et al., 2020). Because of climate change, the frequency and intensity of extreme weather events and related disasters will worsen (Stott, 2016). Thereby, it is vital to focus on risk assessment and resilience management of extreme weather-induced disasters (Easterling et al., 2000), to inform policymaking and mitigate natural disasters. This is the motivation for proposing this Research Topic.

In this Research Topic, scholars contributed their latest findings on useful methods and techniques for forecasting, providing early warning and assessing the risks of extreme weather-induced disasters. Moreover, they provided in-depth scientific insights and improved our understanding of the resilience and mitigation of extreme weather-induced disasters. Their solid scientific contributions will significantly promote research on extreme weather-induced disasters.

FIGURE 1
Mountain flash flood disaster in a small basin in Southwest China on 18–19 August 2020, following extreme rainstorms.

Overview of the articles

As guest editors, we would like to thank the authors who submitted very interesting articles for this Research Topic. Thanks to the valuable collaboration between the reviewers and authors, eight articles are featured in this Research Topic, which are briefly summarized below.

In the first study, "*Objective identification and forecast method of PM2.5 pollution based on medium- and long-term ensemble forecasts in Beijing-Tianjin-Hebei region and its surrounding areas*", Liu et al. developed an objective identification and forecast method for $PM_{2.5}$ pollution (OIF-$PM_{2.5}$) in the Beijing-Tianjin-Hebei region and its surrounding areas. The authors reported that the observed $PM_{2.5}$ pollution ratio increased with the aggravating $PM_{2.5}$ pollution. Statistical results indicated that the OIF-$PM_{2.5}$ method is highly reliable for forecasts with a leading forecasting time of 1–15 days.

In the second article by Assi et al.,"*Homeowner flood risk and risk reduction from home elevation between the limits of the 100- and 500-year floodplains*", the authors proposed a systematic approach to predicting flood risk for single-family homes using the average annual loss in the shaded X Zone–the area immediately outside the Special Flood Hazard Area (i.e., the 500-year floodplain) in the United States. The results enhanced the understanding of flood risk and the benefits of elevating homes above the first floor in the shaded X Zone.

The third article "*Gaps in the governance of floods, droughts, and heatwaves in the United Kingdom*" was contributed by Carvalho and Spataru. The authors presented the current state of the art of flood, drought, and heatwave governance in the United Kingdom, with a focus on pre-emergency phases and the lack of indicators for the assessment of the effectiveness of adaptation to all three disasters. Gaps and challenges are discussed, along with providing actions for adapting to and building resilience against these three types of disasters.

In the fourth contribution "*Analysis of urban necessities reserve index and reserve quantity under emergency conditions*", Jiang et al. assessed urban safety, and classified the emergency materials of urban necessities in Shanghai, by establishing a corresponding reserve list. To better handle emergencies, the authors provided countermeasures and suggestions for optimizing the material structure of emergency reserves, managing material reserves at different levels, reasonably planning the amount of emergency materials, reducing the cost of reserves and improving the efficiency of emergency reserves.

The fifth study "*Sedimentary records of giant landslide-dam breach events in western Sichuan, China*" was contributed by Ma et al. The authors conducted a detailed investigation of large-scale landslide-dammed lake outburst deposits in two typical River Basins on the Western Sichuan Plateau in China. They found that the sedimentary characteristics of outburst deposits (ODs) explain the hydrodynamic changes during the propagation of outburst floods, and are important records for distinguishing ODs and "*normal*" floods.

The sixth study, by Liu et al., is titled "*A comparative study of regional rainfall-induced landslide early warning models based on RF, CNN and MLP algorithms*". The authors focused on Fujian Province in China, and proposed a four-step process for building a regional landslide early warning model based on machine learning. The process includes data integration and cleaning, sample set construction, model training and validation, and practical application. This study will be valuable for landslide disaster warning research.

In the seventh contribution "*Construction and preliminary analysis of landslide database triggered by heavy storm in the parallel range-valley area of western Chongqing, China, on 8 June 2017*", Liu and Xu identified landslide disasters triggered by extreme rainfall events in the parallel range-valley area of western Chongqing, China, and established a historical landslide database. This database provides scientific support for investigating landslide mechanisms in western Chongqing and mitigating the associated risks.

The eighth study "*Exploring Bayesian network model with noise filtering for rainfall-induced landslide susceptibility assessment in Fujian, China*" was contributed by Zhou et al. The researchers employed a Bayesian network to analyze the factors influencing landslides in Fujian Province, China, which is prone to typhoons and landslides. They introduced a progressive noise filtering method to mitigate the mislabeling effects of non-landslide points. This study provides useful guidance for reliable landslide susceptibility mapping in the study area.

For this Research Topic, further critical and constructive debate, viewpoints and opinions are welcome: they will contribute to more

resilient and sustainable strategies and practices for adapting to extreme weather-induced disasters. We suggest you freely use and discuss these articles—including their methods, solid datasets, key findings and propositions, to promote research on extreme weather-induced disasters.

Author contributions

Y-FS: Writing – review and editing, Writing – original draft. LS: Writing – review and editing. XZ: Writing – review and editing. WY: Writing – review and 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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The author(s) declare that no Generative AI was used in the creation of this manuscript.

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