

Title: Flood hazard forecasting and management systems: A review of state-of-the-art modelling, management strategies and policy-practice gap

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Abstract: The effects of flood disasters on human society have now taken precedence in today's world; despite improvements in flood hazard and exposure models, there is still a shortage of knowledge regarding regional and temporal susceptibility patterns. Thus, building real-time flood prediction models for early warning to the public has become more popular over the years due to the frequent development of flood hazards around the world and their catastrophic impacts; the technique and ability of flood hazard modelling to accurately anticipate and identify flood-prone or affected locations has significantly improved, meeting the goal of policymakers. Till now, enormous state-of-the-art modelling approaches such as deep learning (DL), machine learning (ML) and metaheuristic models have been introduced for proper flood-prone area demarcation and early warning systems. Henceforth, our present research provides an understanding of the applicability, advantages, disadvantages, and uncertainties of the previously applied state of the modelling approaches based on the global climate change scenario; it also deals with flood-occurring drivers including hydrogeological, geomorphological, and socioeconomic perspectives; globally several developed and developing countries have employed different flood mitigation strategies but those are failed to fulfil expected outcomes due to a lack of knowledge on practical protection levels, suitable observation, surveillances, management plans, and passive funding sources for such techniques. This work will assist future researchers in creating notable flood hazard modelling techniques by considering current research constraints. This will serve as a valuable tool in the future and aid in closing the adopted policy practice gap.

Keywords: Flood disasters, Flood hazard modelling, Early warning systems, Deep learning (DL), Machine learning (ML), Metaheuristic models, Climate change, Flood susceptibility, Hydrogeological factors, Geomorphological factors

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