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Commentary

Geostatistical Approach for Developing Spatial Coastal-Flooding Models

Trevor Kwan*

Department of Sanitary and Environmental Engineering, Federal University of Santa Catarina, Delfino Conti Street, Trindade, Florianopolis, Santa Catarina, Brazil

ABOUT THE STUDY

Natural disasters have far-reaching consequences for the coastal environment that extend well beyond political-administrative territorial boundaries. Coastal locations are highly populated, and city centres are located at low elevations, making them vulnerable to disasters such as coastal, river, and urban flooding, rising tides, and saltwater intrusion into groundwater. Local governments are responsible for managing these aspects within their jurisdiction. However, the task of analysing and proposing flood prevention and control measures in coastal areas is difficult. Thus, developing management policies for coastal areas necessitates an understanding of the various factors involved and their interactions in the socioeconomic-environmental context.

These issues become even more acute in developing-country coastal cities. The vulnerability to extreme weather events is high, and flood management capacity is limited. In these countries, fiscal and technological resources are scarce, and there is a lack of adequate urban planning. This has implications for disaster risk management and control, which are primarily reactive. Due to financial constraints, funds for public projects are typically used for basic needs, such as drinking water and food supply, affecting flood management and having significant economic and social consequences. Concerns have also been raised about the mismanagement of public funds that should have been used to mitigate flooding and to reduce the scarcity of recorded data to support decision-making. Brazil, the world's fifth largest country in terms of territory and population, is considered an emerging power with the sixteenth largest coastal extension, the situation is no different.

The worsening of flooding events in urban coastal areas, as well as the management of extremely vulnerable ecosystems, has become a global issue that has been the subject of several studies in recent decades. In the integrated management of natural hazards, the combination of statistical modelling techniques and geospatial analysis has gained prominence. The combined approach is a promising strategy for reducing complexity by providing a comprehensive representation of the system. However, in order to apply planning and risk management alternatives in coastal urban areas, the causal relationships between environmental and anthropogenic factor distribution and flooding sites must be thoroughly clarified.

A new strategy for developing Spatial Coastal-Flooding Models based on flooding point records as well as environmental and anthropogenic characteristics of the area. The strategy was developed to combine simple but robust statistical techniques with geospatial data obtained from freely available online databases. The geostatistical strategy was used in a Brazilian coastal city with high environmental vulnerability and constant flooding. According to the strategy, the relationships between environmental and anthropogenic variables and flooding events are not uniform across space. The results show that the strategy can be easily replicated and refined by incorporating other factors of influence, resulting in high precision in the representation and explanation of flooding events in coastal areas. In general, the strategy provides information that can help government agencies make decisions about integrated urban planning and flood risk mitigation in coastal areas.

Correspondence to: Trevor Kwan, Department of Sanitary and Environmental Engineering, Federal University of Santa Catarina, Delfino Conti Street, Trindade, Florianopolis, Santa Catarina, Brazil, E-mail: kwanvor@fus.edu.br

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