A Planning Decision Support Tool for Evaluation and 3d Visualisation of Building Risks in Flood Prone Areas

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SUMMARY

Floods are the most common and costliest natural disasters around the globe. The severity of the recent events (e.g. 2010/2013 Queensland floods) and the predicted increase in the frequency and intensity of future floods have highlighted the need for their effective management levels and establishing flood resilience in the society. Buildings, on the other hand, have special importance in this context and their damage forms a significant portion of the overall cost of flood damages to the community. Additionally, the strength and performance of buildings are essential to the safety of people. Accordingly there has been a recent call for higher safety standards in building construction for mitigating their potential flood damages and protecting people in such disastrous situations.

The Building Code of Australia (BCA) has recently developed a number of requirements for ensuring the flood resilience of new buildings. However, the focus of the current Australian and New Zealand standards is mainly on the design for wind and earthquake events with little attention to designs mitigating against flood impacts. On the other hand, engineers/designers and the responsible authorities (e.g. councils and referral authorities) have limited decision support tools that can effectively evaluate the flood risks of a building at its planning stages. The majority of the existing tools are suitable for assessment of potential damages and risks where a large number of buildings are in focus. Although some tools can be applied on an individual building basis, they either use generalisation that ignores the unique characteristics of the building construction or are limited to only certain types of flood damages. As a result, simple and approximated models are commonly employed for this purpose with limited use for building planning and for assessing its suitability in flood prone areas.

This paper presents and discusses the development of a planning decision support tool for assessing the flood risks to a building. This prototype system has a multi-tier architecture and is designed according to the analysis of general requirements for assessment of risks to a building. By integrating Building Information Model (BIM) with Geographic Information Systems (GIS) and employing civil engineering principles, this tool supports a detailed assessment and 3D visualisation of the cost, mode, and the location of damages to a proposed building and determining the risks to its components. The proposed tool was evaluated using expert opinion and a case study. This evaluation showed that the system can facilitate decision-making for a range of technical and non-technical decision makers and support a number of applications in the planning and development process to improve the resilience of new developments.