CREATING RESILENT COMMUNITIES; UNDERSTANDING AND DEFINING FLOOD RISK

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ABSTRACT

Flooding is one of the most significant natural hazards faced by communities around the world. Floods create hazardous conditions to which humans are particularly vulnerable. It is essential to understand the flood risk faced by a community and to be able to assess the potential impact of these hazards on the built environment. Flood fragility curves and flood hazard definitions, such as those provided in the Australia Rainfall Runoff Guidelines 2016 (ARR2016) and in the RiskScape methodology detailed in NIWA's technical report 'RiskScape: Flood fragility methodology', August 2010 (NIWA, 2010), are critical for assessing flood hazards and predicting associated damages.

Flood fragility curves are graphical representations of the relationship between flood depth and the likelihood of damage to a building. Flood fragility relates to the likely damage or disruption that a community may suffer from flood events. Fragility functions are typically developed based on expert opinion or historic flood and damage survey data. The ARR2016 provides a set of standard flood fragility curves that can be used to assess the flood hazard faced by a building. Flood hazard definitions are also provided in the ARR2016, which define the different levels of flood hazard for people, vehicles and structures. It is important to understand the significance of each hazard classification and its underlying flood behaviour when assessing the potential impacts on the built environment.

The process of assessing flood hazards using flood fragility curves and flood hazard definitions involves several critical steps including an assessment which commences with review of topography around the area of interest, developing a hydrodynamic model to be simulated for various storm events and tools for post processing of model results. Once the flood scenarios have been simulated, the results are used to quantify the flood hazard by determining the flood extents, peak flood depths, peak velocities as well as the peak depth * velocity (d * v). The flood results are compared to the flood fragility curves to determine the likelihood of damage to each building. The flood hazard definitions are also used to classify the flood hazard faced by each building and create a damage index for each building, based on the relevant criteria. This can be used to analysis the significance of damage within different scenarios and prioritize the buildings that are most at risk. The damage index can be used to identify the buildings that are most in need of flood protection measures, such as flood barriers or elevating the building, and to inform the development of flood emergency response plans.

This paper outlines the process of assessing flood hazards using flood fragility curves and flood hazard definitions, with a focus on the methodology to analyse flood hazards and define associated flood damage. A series of examples with varying levels of risk using recent storm data from 2022-2023 events will be provided to illustrate how this methodology is put into practice.

Keywords

Flood Fragility, Flood Risk, Hazard Classification, Hydrodynamic Modelling