



Assessment of Flood Losses with Household Responses: Agent-based Simulation in an Urban Catchment Area

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Coastal urban areas with high population density and human welfare exposed are often regions vulnerable to multiple hazards, in particular to floods and storms. Although flood risk management helps mitigate flood impacts, there have only been a few explorations on the significance of the interaction between flood risks and responses. This study developed an agent-based model as an instrument to simulate the process of individual households' losses reduction through flood response investment and damage control. The model implements a subjective response framework in which agents assess flooding scenarios according to warnings, and decide whether to invest in response measures to reduce potential inundation damages. Adopting a Digital Elevation Model (DEM) as the modeling environment and a building map of household locations, the model integrates characteristics of specific households using data from preliminary surveys, guideline-based interviews and literature. Households may have several flood response preferences and actions but they all require investments which are consequently considered as part of the flood loss. A case study has been carried out in the Ng Tung River basin, an urbanized watershed in Northern Hong Kong. Preliminary results show that exposed property value, flood warning information and rainstorm conditions all contribute to household flood losses. The simulation results indicate that in-time, accurate and widely-covered flood warning plays a significant role in reducing flood loss, and earlier investment in response measures is more efficient than late actions. This dynamic agent-based modeling approach has demonstrated its capability to analyze the risks of flooding to people and the effects of individual household response, therefore has the potential to contribute to flood emergency planning, e.g. to determine the optimal arrangement of response facilities throughout the city and beyond.