

Unraveling the Complexity of Human Behavior and Urbanization on Community Vulnerability to Floods

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Floods are among the costliest natural hazards and their consequences are expected to increase further in the future due to urbanization in flood-prone areas. It is essential that policymakers understand the factors governing the dynamics of urbanization to adopt proper disaster risk reduction techniques. Peoples' relocation preferences and their perception of flood risk (collectively called human behavior) are among the most important factors that influence urbanization in flood-prone areas. Current studies focusing on flood risk assessment do not consider the effect of human behavior on urbanization and how it may change the nature of the risk. Moreover, flood mitigation policies are implemented without considering the role of human behavior and how the community will cope with measures such as buyout, land acquisition, and relocation that are often adopted to minimize development in flood-prone regions. Therefore, such policies may either be resisted by the community or result in severe socioeconomic consequences. In this study, we present a new Agent-Based Model (ABM) to investigate the complex interaction between human behavior and urbanization and its role in creating future communities vulnerable to flood events. We identify critical factors in the decisions of households to locate or relocate and adopt policies compatible with human behavior. The results show that when people are informed about the flood risk and proper incentives are provided, the demand for housing within 500-year floodplain may be reduced as much as 15% by 2040 for the case study considered. On the contrary, if people are not informed of the risk, 29% of the housing choices will reside in floodplains. The analyses also demonstrate that neighborhood quality—influenced by accessibility to highways, education facilities, the city center, water bodies, and green spaces, respectively—is the most influential factor in peoples' decisions on where to locate. These results provide new insights that may be used to assist city planners and stakeholders in examining tradeoffs between costs and benefits of future land development in achieving sustainable and resilient cities.