The Development of an Agent-Based Model to Support a Science-Based Evacuation and Shelter-in-Place Planning Process within the United States

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Abstract : The evacuation and shelter-in-place planning process employed by most jurisdictions within the United States is not informed by a scientifically-derived framework that is inclusive of the behavioral and policy-related indicators of public compliance with evacuation orders. While a significant body of work exists to define these indicators, the research findings have not been well-integrated nor translated into useable planning factors for public safety officials. Additionally, refinement of the planning factors alone is insufficient to support science-based evacuation planning as the behavioral elements of evacuees—even with consideration of policy-related indicators—must be examined in the context of specific regional transportation and shelter networks. To address this problem, the Federal Emergency Management Agency and Argonne National Laboratory developed an agent-based model to support regional analysis of zone-based evacuation in southeastern Georgia. In particular, this model allows public safety officials to analyze the consequences that a range of hazards may have upon a community, assess evacuation and shelter-in-place decisions in the context of specified evacuation and response plans, and predict outcomes based on community compliance with orders and the capacity of the regional (to include extrajurisdictional) transportation and shelter networks. The intention is to use this model to aid evacuation planning and decision-making. Applications for the model include developing a science-driven risk communication strategy and, ultimately, in the case of evacuation, the shortest possible travel distance and clearance times for evacuees within the regional boundary conditions.

Keywords : agent-based modeling for evacuation, decision-support for evacuation planning, evacuation planning, human behavior in evacuation

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