

Special Issue on Interdisciplinary and Multimodal Nature of Evacuations: Nexus of Research and Practice

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Practitioners engaged in implementing evacuations, large and small, are keenly aware of the interdisciplinary and multimodal nature of such events. This special issue of *Natural Hazards Review* presents emerging scholarship that will better inform real-life practice in the near- and long-term. A nexus of research and practice is vital to developing evacuation-planning models, which ultimately results in better plans, policies, and successful evacuations. This issue presents leading research that addresses key aspects of evacuation planning, including the role of communication and technology, evaluating existing models predictions for hurricane evacuation response curves, understanding the interdisciplinary nature of evacuation modeling, the role of transit, and the development of a destination choice model.

The past decade has seen tremendous advancements in the theory and practice of mass-evacuation transportation planning, operations, and management. The motivation for these developments has come from a recent history of high-profile disasters and several highly publicized unsuccessful evacuations that have focused international attention on the need to better prepare for and carry out emergency evacuations. These events, in particular those that involved intentional man-made acts, have also brought the topic of evacuation planning to the attention of a wider audience, including those who never envisioned the need to conduct mass evacuations or to include emergency transportation preparedness as part of their responsibilities.

To move forward the discussion of critical needs in evacuation and to promote the exchange of ideas, practices, policies, and emerging knowledge from all fields involved in this subject, the Gulf Coast Research Center for Evacuation and Transportation Resiliency in cooperation with the Stephenson Disaster Management Institute at Louisiana State University cohosted the second National Evacuation Conference (NEC). The conference, held in February 2012 in New Orleans, brought together hundreds of experts from government, private industry, academia, national laboratories, and not-for-profit organizations in the fields of emergency management, transportation planning, engineering, law, sociological and behavioral sciences, human and animal medicine, and law enforcement, among others, to foster an interdisciplinary exchange of ideas in evacuation

planning and management. The event was sponsored by a number of stakeholders, including AARP and the Transportation Research Board of the National Academies. The conference included more than 100 speakers from throughout the United States and numerous other countries who are seeking ways to accommodate the needs of all people before, during, and after major disasters.

The presentations at the NEC illustrated the diversity of interests and needs in evacuation, as well as the knowledge and expertise that is being focused on evacuation-related issues. In summary, the NEC highlighted the importance of the interdisciplinary and multimodal nature of evacuations. We see an emerging nexus between research and practice as successful evacuations stem from many disparate professionals working in a multidimensional framework.

To disseminate the emerging knowledge from the conference more widely, its organizers have partnered with ASCE to develop this special issue of the *Natural Hazards Review*. Five of the papers included in this issue were the best-reviewed works from the conference that covered information on a specific topic, but that also exemplified the overall theme of this special issue. The following paragraphs briefly summarize these works and the contributions that they make to the field.

The detail and complexity of evacuation models has increased significantly over the past decade and a half. Whereas some of these developments have occurred because of advances in computational speed and power, much of it has resulted from the series of major evacuations that have permitted observations of evacuee behavior, traffic routing, and other aspects of evacuations that were previously unavailable. The papers by Trainor et al., Cheng et al., and Koshute each focus on aspects of modeling that develop and analyze evacuation processes. The work by Koshute uses evacuation data from several hurricanes to assess the effectiveness of S-curve and sequential logit models used to forecast evacuation response. The results of this research show that both of these remain insufficient as techniques to reliably predict evacuee behavior. Research conducted by Cheng et al. focuses on the destination end of the evacuation travel process. In their paper, the authors describe the development of a new model to estimate evacuee destinations based on an assortment of key predictive variables. Analyses of the performance of the model showed statistically significant correlations between model-generated forecasts and those observed during actual hurricane evacuation events. In another paper focusing on evacuation modeling, Trainor et al. suggest the need and importance of adopting an interdisciplinary approach to evacuation modeling. Although no results are presented, the authors propose a framework that integrates empirical and theoretical knowledge from the social sciences and transportation planning and engineering within a new five-step modeling process. This paper is likely to guide an emerging area of research into operationalizing future models that can become more interdisciplinary and multimodal.

The importance of effective communication during evacuations cannot be overemphasized. The issuance of guidance on who needs to evacuate, when they need to leave, and what routes and destinations are available to them is vitally important to evacuees and must be conveyed in ways that are timely, accurate, and useful. The paper by Taaffe et al. used data collected in the aftermath of two hurricanes in the Charleston, South Carolina, region to

analyze how communication sources and modes have influenced evacuee decision-making and increased the knowledge of evacuees. Their research shows the importance of timing in the issuance of evacuation orders and how evacuees use various types of information, in addition to official evacuation orders, in making decisions to leave. The findings of this paper are also of value to emergency management officials as they craft and prepare to release guidance information.

In the paper by Cavusoglu et al., the role of transit as part of an overall evacuation plan is examined. As part of their study, the authors present a case study using a large-scale simulation and optimization model for the Birmingham, Alabama, region. Using the model, a number of scenarios involving the loss of link connectivity (as the result of flooding) were simulated to demonstrate opportunities and requirements of transit usage during emergencies to best serve carless populations. Similar to previous research conducted by Naghawi (2010), this work investigates how transit vehicles operate within crowded networks during emergencies and how their routing may be modified to best serve the interests of transport-dependent carless populations.

The papers included in this special issue represent several of the latest discoveries and advanced thinking in the field of emergency

evacuation. They include both theoretical and practical findings and are of value to both researchers and practitioners. And, although these works discuss specific hazards and locations, they can also be used in general for application to other cities and countries, as well as for other types of natural and man-made hazards. It should also be noted that the 2012 NEC also culminated in another related special-issue journal edition. An upcoming issue of the International Sociological Association's *International Journal of Mass Emergencies and Disasters (IJMED)* also features several additional highly reviewed papers that were submitted to the conference on a range of related engineering-oriented topics. The *IJMED* issue is expected to be published at about the same time as this issue. In conclusion, we feel that lessons presented at the NEC, and within this and the *IJMED* special issues, recognize an important nexus between research and practice to develop new scholarship that better informs the interdisciplinary and multimodal nature of evacuations.

References

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