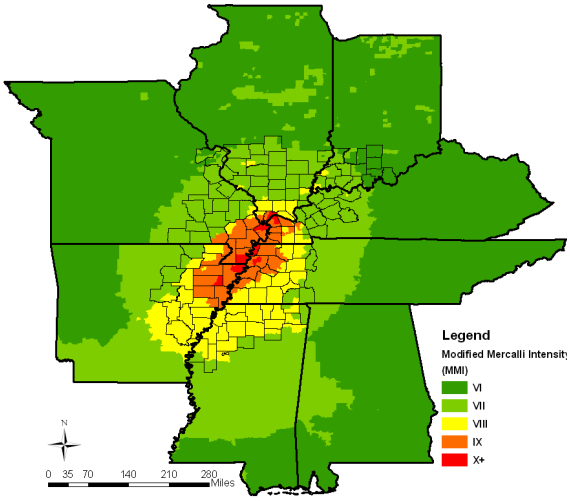
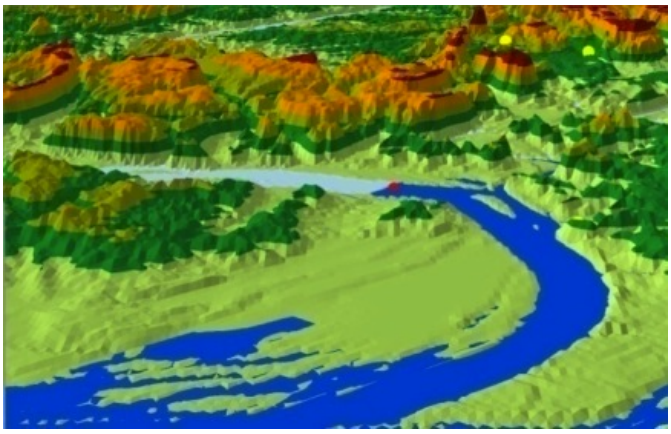
# Models and Methods for Comprehensive Assessment of Disaster Impact on Vulnerable Communities

Natural and malicious hazards continue to exact an increasingly devastating toll on communities of all levels of development and sophistication. Indeed, the more advanced and inter-connected a society's infrastructure and economic, the heaviest is the toll caused by disruption due to hazards. To reduce the impact of such events, policy-makers have two fundamental tools, namely mitigation and response. 'Mitigation' is defined as taking pre-event actions that reduce the impact of the hazard, by reducing the vulnerability of exposed systems. On the other hand, 'Response' is defined by taking action in the immediate aftermath of the event to secure critical facilities, to reduce human and economic losses, and to prepare for recovery to normal operating conditions. The absolutely necessary prerequisite for both Mitigation and Response is a credible estimate of the likely impact of the hazard prior to its occurrence, with neither over- nor under-estimation of the impact. The assessment of disaster impact is an inherently multidisciplinary and complex endeavor that requires a common vocabulary amongst engineers, earth, atmospheric and social scientists, as well as economists and emergency managers, the medical profession, education and community experts. Engineering assessment of the impact of natural or malicious disasters, such as hurricanes, earthquakes, conflagrations, floods, is essential as an input to social and economic impact models. The outcomes require the expert knowledge of emergency managers who understand the nuances of response and recovery.




**Ground shaking map for the central USA**



**Potential flooding in the Central USA due to earthquakes**

Examples abound where failures occurred in response and recovery in the USA and around the world due to the lack of a truly interdisciplinary team and ethos to assess the likely impact, to undertake gap analysis and to prepare for response and recovery. In this presentation, the essential components and competences required to undertake credible disaster impact assessment are described. An example of a major project funded by the US Department of Homeland Security and undertaken by a consortium of universities with support of the 8 central states is used to demonstrate the interdisciplinary nature of such projects. Recently developed models for direct and consequential impact, including fire ignition and temporary housing optimization, alongside structural and geotechnical damage, are presented and discussed. The role of information technology and computer simulations, in regional, national and international contexts, is highlighted.