

Risk management in civil engineering

advanced course

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A RISK MANAGEMENT FRAMEWORK FOR EMERGENCY MANAGEMENT

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Abstract

Providing for safety and security of its citizens is a primary responsibility of government. The emerging discipline of risk management offers a promising approach to the rational allocation of effort and resources to minimize the potential impacts of extreme events upon society and the economy. The discipline of emergency management may be viewed as the operational implementation of risk management. Creating a risk management framework for emergency management, however, requires clarity of purpose and a willingness to address difficult conceptual and analytic issues. The objective of risk management is to reduce risk through reducing the probability of dangerous events, reducing vulnerability to these events, and reducing consequences if the event should occur. Emergency management is the profession of mitigating, preparing for, responding to, and recovering from extreme events. Governments must be willing to make investments and take actions that protect citizens, mitigate potential threats or consequences, and provides for social and economic recovery, or risk management becomes an exercise in analysis. This presentation develops a risk management framework for emergency management, demonstrating how this framework supports critical emergency management functions and decisions. The focus is on the preparedness for, response to, and recovery from potential catastrophic events. A catastrophic event in this context is defined as a violent event that destroys physical and social systems to the extent that local governments cannot function and mutual aid from regional sources is impossible.

The United States Department of Homeland Security (DHS) was created by the Homeland Security Act of 2002 and was formed in January 2003. Although the Department was formed in response to an act of terrorism, DHS's strategic goals explicitly imply a commitment to an all hazards, risk management approach. The goals include (National Strategy for Homeland Security, pp. 10-33):

- Awareness-identify and understand threats, assess vulnerabilities, determine potential impacts and disseminate timely information to homeland security partners and the American public
- Prevention-Detect, deter, and mitigate threats to our homeland
- Protection-Safeguard our people and their freedoms, critical infrastructure, property, and the economy of our Nation fro acts of terrorism, natural disaster, or other emergencies
- Response-Lead, manage and coordinate the national response to acts of terrorism, natural disasters, or other emergencies
- Recover-Lead national, state, local and private sector efforts to restore services and rebuild communities after acts of terrorism, natural disasters, or other emergencies.

The commitment to a risk management approach has been emphasized by DHS Secretary Michael Chertoff, including the following remarks made at the George Washington University Homeland Security Policy Institute on in March 2005 (emphasis added):

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“We need to adopt a risk-based approach in both our operations and our philosophy. Risk management is fundamental to managing the threat, while retaining our quality of life and living in freedom. Risk management must guide our decision-making as we examine how we can best organize to prevent, respond and recover from an attack.”

Steps of the risk management process that are critical to successful emergency preparedness and response include risk definition, risk perception, risk analysis, risk characterization, and risk communication. The recent experiences of Hurricane Katrina and Hurricane Ike are used to illustrate the requirements for these risk management functions and their implementation in an emergency management context. The current U.S. Federal Emergency Management Agency catastrophic preparedness effort is used to describe how a risk management approach can define preparedness and response capability and capacity requirements. The potential of a catastrophic central US earthquake on the New Madrid Seismic zone is described in detail. The calculation of catastrophic earthquake risk requires an extensive modeling effort. Seismic and geological data and models are required to estimate ground shaking. Engineering fragility models are used to estimate building and infrastructure loss, and socio-economic models are used to estimate human casualties, displaced persons, and economic impacts based on the severity of the event, the exposed population, and the vulnerability of the exposed population. Additional models are used to develop estimates for response and recovery resources, capability, and capacity required. These models are highly complex, and require extensive data sets. The results of this New Madrid Seismic Zone modeling effort are being used as the basis for the largest preparedness and planning effort in US history, involving eight states and four Federal regions.

The presentation concludes with a detailed description of four challenges that must be met to ensure that the quality of risk based emergency management policies, doctrines, and decisions are improved.

Challenge # 1: Developing appropriate risk models for rare, extreme events.

Challenge # 2: Developing more rigorous methods of qualitative risk assessments.

Challenge # 3: Improving methods of characterizing and effectively communicating results of risk analysis to decision makers and to the general public

Challenge # 4: Investment in collection, cleansing, and structuring of data required for quantitative risk assessment.