

## HAZUS-MH APPLICATION:

# Using HAZUS-MH to Promote Seismic Safety

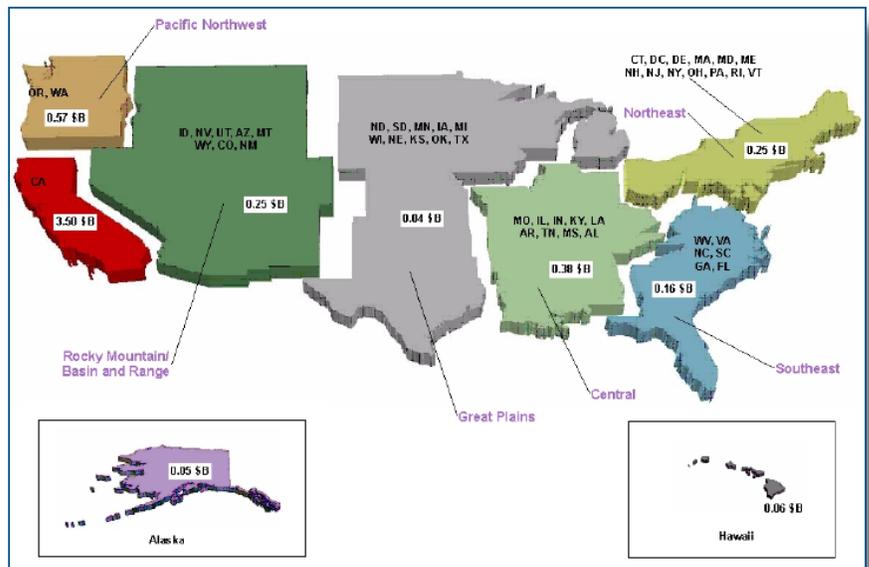


HAZUS-MH has become a valuable tool for risk and emergency managers at all levels of government and the private sector. The earthquake model has been used to carry out national studies of annualized earthquake loss, to develop scenarios for catastrophic planning, to support evaluations of seismic safety of hospitals and other essential facilities, and to support risk assessments and mitigation planning in seismically vulnerable regions of the United States. Additional information on the following applications of the HAZUS-MH earthquake model can be found on the FEMA HAZUS website at [www.fema.gov/plan/prevent/hazus/index.shtm](http://www.fema.gov/plan/prevent/hazus/index.shtm).

## Annualized Earthquake Loss (AEL) Study

HAZUS-MH was used in the preparation of the AEL, which estimates seismic risk in all regions of the United States by using two interrelated risk indicators:

1. The Annualized Earthquake Loss (AEL), which is the estimated long-term value of earthquake losses to the general building stock in any single year in a specified geographic area (e.g., state, county, metropolitan area).
2. The Annualized Earthquake Loss Ratio (AELR), which expresses estimated annualized loss as a fraction of the building inventory replacement value.



The HAZUS-MH analysis indicates that the Annualized Earthquake Loss (AEL) to the national building stock is \$5.3 billion per year. The majority (77 percent) of average annual loss is located on the West Coast (California, Oregon, Washington), with 66 percent (\$3.5 billion per year) concentrated in the state of California. The high concentration of loss in California is consistent with the state's high seismic hazard and large structural exposure. The remaining 23 percent (1.1 billion per year) of annual loss is distributed throughout the rest of the U.S. (including Alaska and Hawaii).

This loss study is an important milestone in a long-term, FEMA-led effort to analyze and compare the seismic risk across regions in the U.S. and contributes to the mission of the National Earthquake Loss Reduction Program (NEHRP)—to develop and promote knowledge and mitigation practices and policies that reduce fatalities, injuries, and economic and other expected losses from earthquakes.



# FEMA

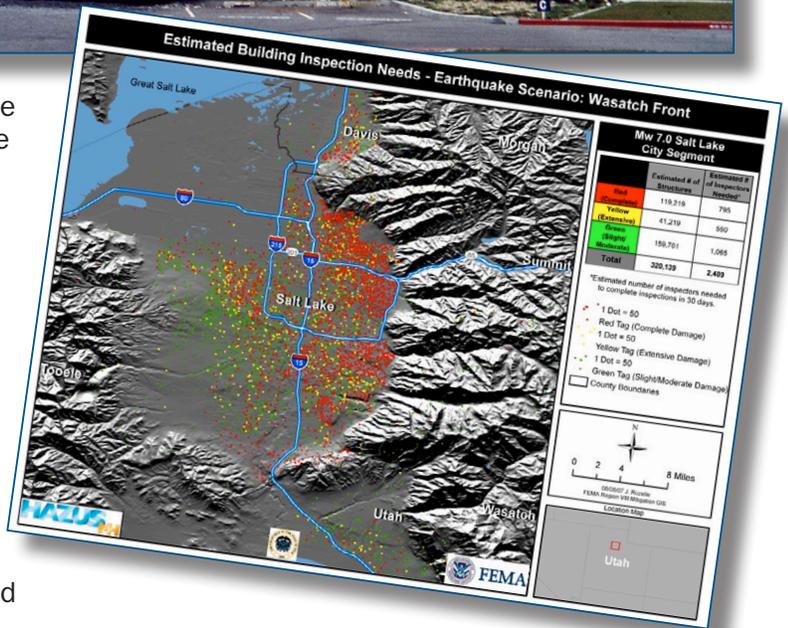
## Using HAZUS to Assess Hospital Seismic Safety

HAZUS-MH is playing a central role in the vulnerability analysis of over 1,300 hospitals that were built in California before 1973. The findings of this analysis have significant cost implications for the state. In November, 2007, the California Building Standards Commission approved the use of the HAZUS-MH Advanced Engineering Building Module (AEBM) to re-evaluate hospitals in California. The ability to adapt the AEBM methodology to the evaluation of hospitals in California provides the state with a much more accurate assessment of the seismic safety of these essential facilities, and in the process is saving the state billions of dollars.



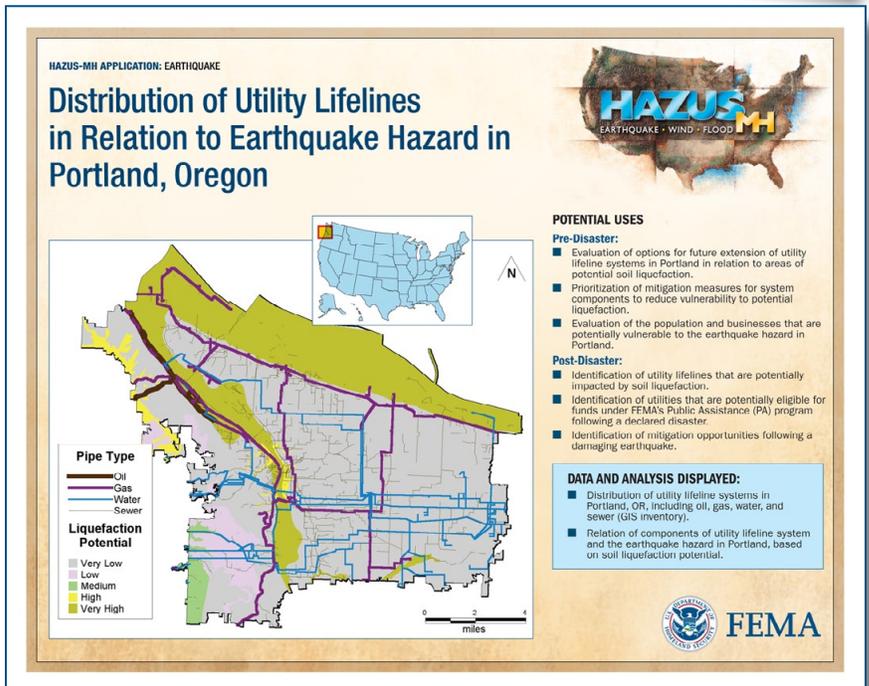
## HAZUS-MH Used in Support of Utah Seismic Safety Legislation

The State of Utah has taken important steps to reduce the vulnerability of schools to damaging earthquakes, as well as addressing its Unreinforced Masonry (URM) building stock. HAZUS-MH has played an important role in these initiatives. The model has sharpened the focus on the vulnerability of schools in this region to damaging earthquakes. Specifically, HAZUS-MH has been used to estimate losses and potential casualties from scenario earthquakes in a region that is among the most susceptible in the U.S. to seismic activity.



## HAZUS Map Templates

Launched in 2006, the intent of the HAZUS-MH Map is to share innovative HAZUS-MH products that have been developed to support risk assessments, mitigation planning and support for disaster operations. A standardized template has been developed to display the maps with descriptions of the data and analysis. Each map includes an explanation of how the analysis can be used to support decision making for hurricanes, floods and earthquakes. The map templates are available as handouts or posters.



## Earthquake Loss Estimation Study for the New York City Area

FEMA Region II and the Multi-Disciplinary Center for Earthquake Engineering Research sponsored this study of potential losses that the New York City area could suffer after an earthquake. The primary objective was to develop and implement a comprehensive risk and loss characterization for Manhattan in the event of an earthquake. This resulted in a comprehensive building inventory for Manhattan that was assembled from a variety of sources. Combined with a detailed geotechnical soil characterization of Manhattan, this building inventory has been used to model scenario earthquakes in HAZUS.

This study is among the most detailed and site-specific applications of HAZUS-MH for earthquake loss estimation.

## HAZUS-MH Used to Generate Scenarios for Catastrophic Planning

HAZUS-MH has been used extensively for scenario development in support of FEMA's catastrophic earthquake planning initiatives in the New Madrid Seismic Zone and Northern California. The earthquake scenarios have provided detailed loss estimates that have been used in a series of state workshops in the Central U.S. Map based templates capture important "essential elements of information" that are critical to response planning, including geographic areas that have sustained the greatest damage, shelter requirements, displaced households, and exposure of lifelines to ground shaking and soil failure.

