

## **1.8 HAZUS Earthquake Scenario Loss Estimations for Riverside County**

HAZUS™ is a standardized methodology for earthquake loss estimation based on a geographic information system (GIS). A project of the National Institute of Building Sciences, funded by the Federal Emergency Management Agency (FEMA), it is a powerful advance in mitigation strategies. The HAZUS project developed guidelines and procedures to make standardized earthquake loss estimates at a regional scale. With standardization, estimates can be compared from region to region. HAZUS is designed for use by state, regional and local governments in planning for earthquake loss mitigation, emergency preparedness, response and recovery. HAZUS addresses nearly all aspects of the built environment, and many different types of losses. The methodology has been tested against the experience of several past earthquakes, and against the judgment of experts. Subject to several limitations noted below, HAZUS can producing result that are valid for the intended purposes.

Loss estimation is an invaluable tool, but must be used with discretion. A loss estimation analyzes casualties, damage and economic loss in great detail. It produces seemingly precise numbers that can be easily misinterpreted. A loss estimation's results, for example, may cite 4,054 left homeless by a scenario earthquake. This is best interpreted by its magnitude. That is, 4,000 homeless is clearly more manageable than 40,000 homeless; and an event that leaves 400,000 homeless would overwhelm a community's resources. However, a loss estimation that predicts 7,000 homeless should probably be considered equivalent to the 4,054 result. Because HAZUS results make use of a great number of parameters and data of varying accuracy and completeness, it is not possible to assign quantitative error bars. Although the numbers should not be taken at face value, they are not rounded or edited because detailed evaluation of individual components of the disaster can help mitigation agencies ensure that they have considered all the important options.

The more community-specific the data that is input to HAZUS, the more reliable the loss estimation. HAZUS provides defaults for all required information. These are based on best-available scientific, engineering, census and economic knowledge. The loss estimations in this report have been tailored to Riverside County by using the maps of soil type, liquefaction and landslide susceptibility done as part of this study. Loss estimations can be further refined with new census data, and an inventory of the buildings, lifelines and infrastructure specific to Riverside County.

Uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effect upon buildings and facilities, and in part from the approximations and simplifications necessary for comprehensive analyses.

Users should be aware of the following specific limitations:

- HAZUS is driven by statistics, and thus is most accurate when applied to a region, or a class of buildings or facilities. It is least accurate when considering a particular site, building or facility.
- Losses estimated for lifelines may be less than losses estimated for the general building stock.
- Losses from smaller (less than  $M_w$  6.0) damaging earthquakes may be overestimated.
- Pilot and calibration studies have not yet provided an adequate test concerning the possible extent and effects of landsliding.
- The indirect economic loss module is new and experimental. While output from pilot studies has generally been credible, this module requires further testing.

### **1.8.1 Methodology and Terminology Used in Earthquake Loss Estimation**

The flow chart in Figure 1-25 presents the modules (components) of a HAZUS analysis. HAZUS input and output are based on 1990 census tract boundaries. The census tracts that best cover the County of Riverside were chosen for this analysis, and are illustrated in Figure 1-26.