

Scenario Driven Workshops and the Need to Incorporate Improved Datasets

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Presentation Overview

Jim Wilkinson

- Use of the scenarios to support planning
- Deficiencies with the scenarios
- Regional workshops and beyond

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- Steps to improving scenarios
- Understanding HAZUS data
- Improving data sets

Use of the Scenarios to Support Planning

Planning needs to be:

- Based on solid foundation
 - Clear understanding of the hazard, and
 - models which reflect that hazard
- Credible

The Scenario provides the backdrop for planning process by estimating planning needs

- Potential number of displaced persons
- Number of damaged structures
- Etc.

FEMA's Loss Estimation Model, HAZUS is used to provide outputs based on the users needs

- Provides a baseline for planning
- Determining the appropriate categories is important

Deficiencies with the scenarios

Not always consensus based

Subject experts must have an active role

Scenarios can result in unexpected results

- use of non traditional source zones
- use of default data versus enhanced
- unexpected/conflicting program fields within the model

Regional workshops - and beyond

Local/State workshops focused on worst case for each state

Planning effort will roll up to the next level utilizing a regional scenario

- 4 separate regional
- 1 consolidation – 8 states, 4 regions

Regional planning scenario will model the 1811/12 event

Planned 2011 NMSZ Exercise

Final Remarks

Solid credible scenarios are critical to not only the planning but public education about the hazard

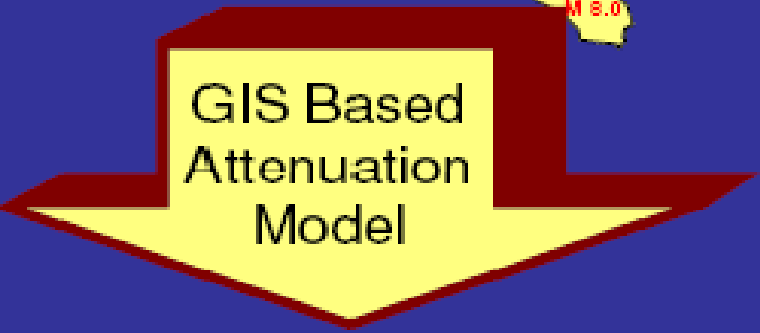
Good data is essential to improving the model

Understanding HAZUS Data

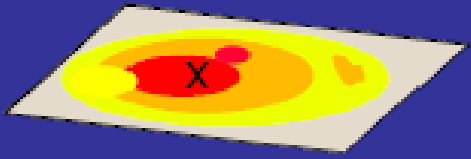
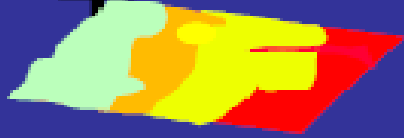
Epicenter Location and Magnitude



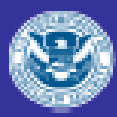
GIS Based Attenuation Model



Soil Maps



Ground Shaking Maps



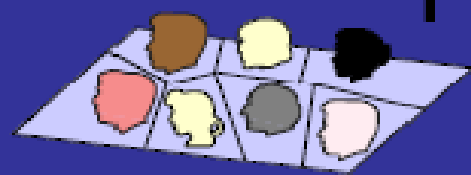
FEMA

EARTHQUAKE LOSS ESTIMATION USING HAZUS

(Courtesy S. McAfee, CA OES)



Building Inventory Maps



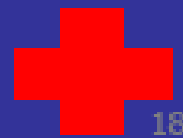
Demographic Maps



Direct and Indirect Losses



Casualties/ Shelter Needs Estimation



Direct Damage Data

Buildings and Facilities

- General building stock
- Essential facilities
- High potential loss facilities

Transportation Systems

- Highway Systems
- Railways
- Light Rail
- Bus System
- Ports and Harbors
- Ferry
- Airports

Lifeline Utility Systems

- Potable Water Systems
- Waste Water
- Oil Systems
- Natural Gas Systems
- Electric Power
- Communication



Direct Economic and Social Loss
Demographics Data (census data)

Default Occupancy Class Square Footage
(calculated using census data)

Origin of Default Data (Level 1)

Extensive amounts of national data

Data is derived from a variety of sources

Data sets originate from agencies other than FEMA

Originally collected for other purposes

The initial purpose of the data collection was not loss estimation

Data detail and applicability to loss estimation varies by data type

Data Source Examples:

- Bureau of Land and Water Management
- Bureau of Transportation Statistics
- Energy Information Administration
- Environmental Protection organization
- Federal Aviation Administration
- Federal Energy Regulatory Commission
- Federal Highway Administration
- Highway Performance Monitoring System
- North American Electric Reliability Council
- National Highway Planning Network
- U.S. Army Corps of Engineers
- Department of Transportation
- U.S. Geological Survey

Limitations with Default Data

Although default data is extensive, it has its limitations. These data are highly generalized and their accuracy is provisional.

Example: Building Inventory default data

Fairly representative data

Demographics of a given census tract - *census data*

Use or occupancy and the building value - *census, Dun & Bradstreet and Means cost data.*

Limited data

Model building type (structural system) – *calculated by assumed distribution by square footage of the different building types, given occupancy*

Building height - *all assumed to be low*

Source: Kircher, C., Seligson, H., Bouabidic, J., Morrow, G.C. (2006) When the Big One Strikes Again – Estimated Losses due to a Repeat of the 1906 San Francisco Earthquake, The 100th Anniversary Earthquake Conference Commemorating the 1906 San Francisco Earthquake, CA.
Available at: <http://www.1906eqconf.org/mediadocs/BigonestrikesReport.pdf>

Incomplete Data Sets

Examples

Only main **fire stations** and **police stations**

Partial listings of **essential facilities, principal highways and major bridges, major gas pipeline locations**

*Originated from federal or other national databases

Key **features of electrical and water distribution systems**, such as number of electrical switching stations and miles of pipelines, as a function of population, have been **inferred from nationwide information**

Utility lifelines are especially limited

Example

Police Facilities

all have same replacement costs

Class	Tract	Replacement Cost (thous. \$)	Backup Power
EFPS	4717906070	\$1,252.22	0
EFPS	4717906170	\$1,252.22	0
EFPS	4717906170	\$1,252.22	0
EFPS	4717799040	\$1,252.22	0
EFPS	4717108040	\$1,252.22	0
EFPS	4717108040	\$1,252.22	0
EFPS	4716909020	\$1,252.22	0
EFPS	4716704050	\$1,252.22	0
EFPS	4716704070	\$1,252.22	0
EFPS	4716502040	\$1,252.22	0
EFPS	4716502070	\$1,252.22	0
EFPS	4716502070	\$1,252.22	0
EFPS	4716502100	\$1,252.22	0
EFPS	4716304020	\$1,252.22	0
EFPS	4716304270	\$1,252.22	0
EFPS	4716304340	\$1,252.22	0
EFPS	4716111050	\$1,252.22	0
EFPS	4715997510	\$1,252.22	0
EFPS	4715700730	\$1,252.22	0
EFPS	4715701042	\$1,252.22	0
EFPS	4715702063	\$1,252.22	0
EFPS	4707598030	\$1,252.22	0

Incorrect Data

Example

Table 1. Comparison of Building Occupancy Type for the Rockefeller Census Tract.

GENERAL BUILDING OCCUPATION	HAZUS DEFAULT	ACTUAL
Commercial	465	42
Educational	1	2
Government	0	1
Religious	24	3
Agricultural	1	0
Residential	80	55
Industrial	78	0
Total	649	103

Table 2. Comparison of Building Type for the Rockefeller Census Tract

GENERAL BUILDING TYPE	HAZUS DEFAULT	ACTUAL
Wood	161	0
Steel	251	44
Reinforced Concrete	37	0
Precast Concrete	17	0
Reinforced Masonry	51	0
Unreinforced Masonry	132	59
Mcbile Home	0	0
Total	649	103

Source: Mylonaks, G., Fish, W. and Spiteri, P. (2000), Development of a Building Inventory for Manhattan Region. Available at:
<http://www.nycem.org/techdocs/manhttnBldngs/default.asp#Table%201>

Multiple Databases

General building database

- used to compute social impacts and economic loss
- all building types
residential, commercial, industrial, agriculture, religion, government, education

Essential facilities database

- used to compute expected losses associated with these facilities
- facilities that provide services to the community and will need to be functional following an event
hospitals, police stations, fire stations, schools

Databases are not necessarily consistent

Data is not checked during calculations

Issues

How reliable are the default data?

How current are they?

What data needs to be obtained, and where do they come from?

What resources are required?

Answers will require: time, money & resources



Next Steps

One point of contact for the submission of data

Establish a central data repository (geodatabase)

Use of ArcCatalog

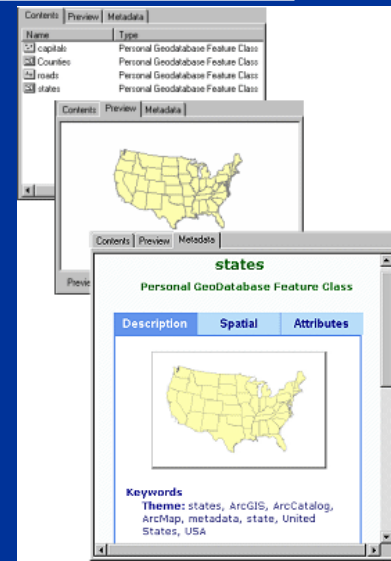
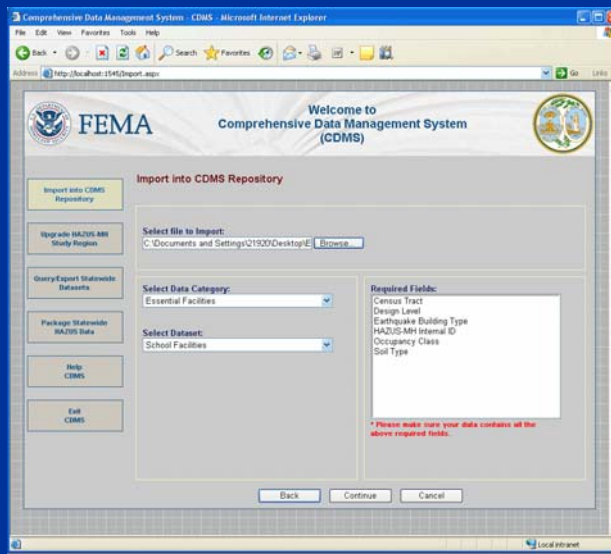
FTP site for data transfer

CDs/DVDs

Comprehensive Data Management System (CDMS)

New Tool in HAZUS-MH MR3

Capability to update and manage statewide datasets



Data Format

2 options

GIS files (ESRI format)

Flat files (xls, cvs, ms access, etc.) with longitude and latitude

Need for consistency

(i.e. always use 60.0 N and 60.0 S or 60.0 and -60.0)

Need to provide metadata

Buildings and Facilities

- General building stock
- Essential facilities
- High potential loss facilities

Transportation Systems

- Highway Systems
- Railways
- Light Rail
- Bus System
- Ports and Harbors
- Ferry
- [Airports](#)

Lifeline Utility Systems

- Potable Water Systems
- Waste Water
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- Natural Gas Systems
- Electric Power
- Communication

Prioritizing Data Efforts

Three essential factors

Is the given component a primary contributor to losses?

Is the default HAZUS database complete and comprehensive?

Are there better data (more precise and/or robust) readily available?

All three questions should be addressed in a formal manner to make accurate comparisons for update priority

For example, Power substation voltage is a key parameter in inferring substation seismic vulnerability. Although this data is very difficult to obtain, it is essential for accurately modeling earthquake losses. Railroad facility information is also difficult to collect, but damage to railroads represents a very small portion of the total losses. Under such circumstances, less effort should be expended to collect enhanced data for railroad facilities but it is worthwhile to explore data sources for power substation attributes.

Resolving Data Issues

Same data, multiple place, conflicting values

Adding one data set may effect another

increase in building inventory most likely means an increase in population data

Confidentiality issues surrounding the data

Incorporating new data, takes time

formatting, ensuring quality/consistency, importing, imported data must be reviewed for accuracy and completeness

Things to remember

Accuracy of HAZUS loss estimates are largely dependent on the quality of the input data

Using default data, HAZUS provides estimates based on national data. In most cases, these data sets originate from agencies other than FEMA, and the initial purpose of the data collection was not loss estimation.

Incorporating additional data should increase the accuracy of the estimates

Obtaining these data, requires collaboration with government, business and universities