

A GIS-Based Methodology for Exporting the Hazards U.S. (HAZUS) Earthquake Model for Global Applications

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HAZUS Is a 3 Step Process

1) Create Study Region

2) Develop Hazard

3) Run Analysis



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Concept

Utilize HAZUS earthquake model outside the U.S.

Start with a U.S. Proxy Building Stock.

Focus limited global resources towards developing inventories, engineering parameters and hazard data.



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Developing International Building Inventories

EERI's World Housing Encyclopedia www.eeri.org

**HAZUS Advanced Engineering Building Module (AEBM),
included with program – model building type fragilities can
be edited**

HAZUS-MH InCAST Web Edition



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Integration of Data Sources

LANDSCAN Global Population Database, Oak Ridge National Labs, <http://www.ornl.gov/gist/> , *For more information on LandScan™, please contact: Dr. Budhendra Bhaduri, bhaduribl@ornl.gov, Free to research institutions*

PAGER (Prompt Assessment of Global Earthquakes for Response) <http://earthquake.usgs.gov/eqcenter/pager/>, U.S. Geological Survey, Golden, Colorado, *For more information on PAGER, please contact: Dr. David Wald, wald@usgs.gov, Free*

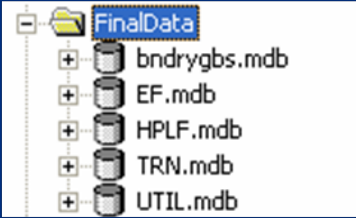
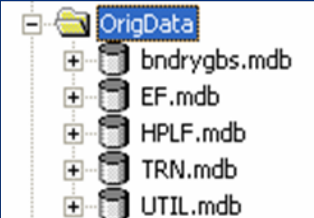


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Step 1: Build Study Region

Requires advanced GIS skills and use of the ArcInfo version of the ESRI software

Step-by-step instructions to modify the U.S building stock information are provided and will be summarized in this presentation.

FinalData Folder	OrigData Folder
 A screenshot of a file explorer window showing the contents of a folder named 'FinalData'. The folder contains five database files: 'bndrygbs.mdb', 'EF.mdb', 'HPLF.mdb', 'TRN.mdb', and 'UTIL.mdb'. Each file is represented by a cylinder icon with a plus sign to its left.	 A screenshot of a file explorer window showing the contents of a folder named 'OrigData'. The folder contains five database files: 'bndrygbs.mdb', 'EF.mdb', 'HPLF.mdb', 'TRN.mdb', and 'UTIL.mdb'. Each file is represented by a cylinder icon with a plus sign to its left.

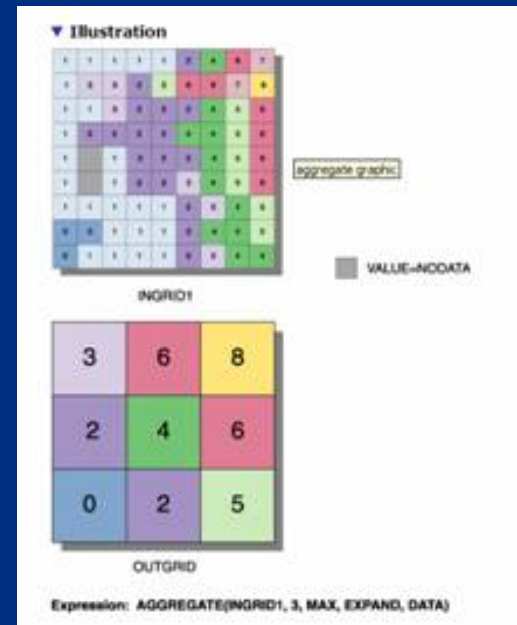


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Create International Grid

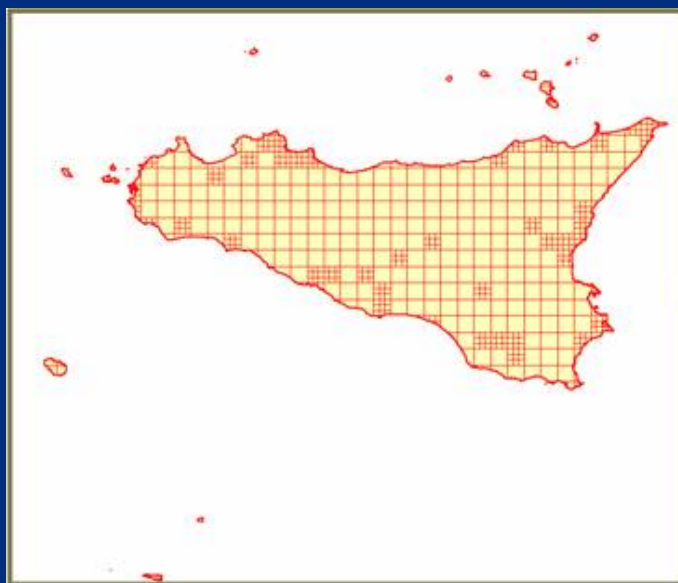


Aggregate two manageable grids to represent urban and rural populations.



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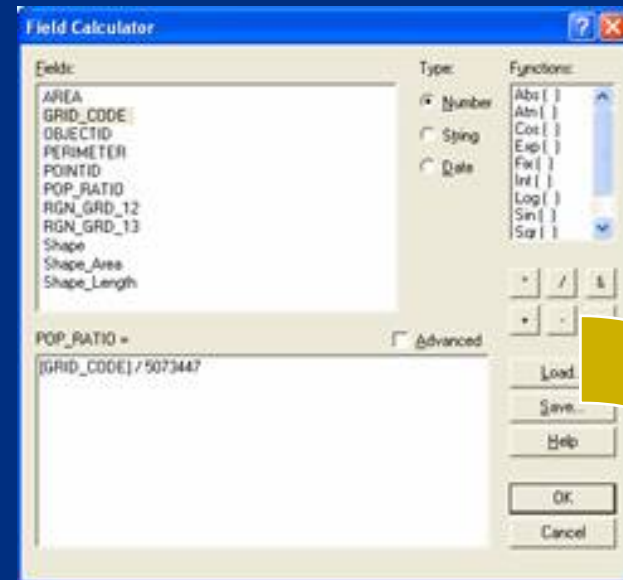
Merge Urban and Rural Grids



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Calculate Population Ratio of Each Grid Cell

The sum of 5,073,447 represents the total population for our study area. You will use this number to calculate the Population Ratio.



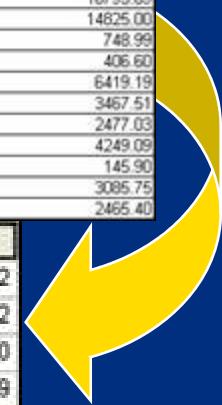
POP_RATIO
0.000032
0.000022
0
0.000019
0
0.000004
0.000051

Calculate the General Building Stock Distribution of Each Grid Cell

Create a summary table containing total values for each of the HAZUS GBS attribute tables.

General Building Stock Totals by Occupancy				
Occupancy	hzBldgCountOccupT	hzExposureOccupT	hzExposureContent	hzSqFootageOccupT
RES1I	1022374	111670824	55845945	1635083.97
RES2I	4602	184469	95071	5972.07
RES3AI	13528	2787205	1401364	48191.79
RES3BI	7672	1865429	940337	29673.86
RES3CI	3391	3916231	1962727	36245.81
RES3DI	1842	2770523	1387808	28577.17
RES3EI	160	1235579	619254	13197.69
RES3FI	420	3258578	1630950	35700.17
RES4I	17	290182	145103	3224.90
RES5I	801	2231679	1116156	21839.70
RES6I	10	35394	17707	393.40
COM1I	267	1989179	1989179	32330.93
COM2I	1133	1860408	1860408	34942.30
COM3I	546	419320	419320	5616.57
COM4I	260	1973705	1973705	23191.11
COM5I	488	264789	264789	1999.70
COM6I	51	391602	572411	3068.60
COM7I	473	391781	587733	3509.29
COM8I	999	592851	592851	5031.01
COM9I	12	14453	14453	164.20
COM10I	0	0	0	0.00
IND1I	308	598589	897916	9428.70
IND2I	548	894148	1341265	16793.69
IND3I	325	1523691	2265571	14825.00
IND4I	14	76981	115482	748.99
IND5I	8	41792	62691	406.60
IND6I	189	341771	341771	6419.19
AGR1I	107	184621	184621	3467.51
REL1I	140	243019	243019	2477.03
GOV1I	383	329978	329978	4249.09
GOV2I	14	17076	25616	145.90
EDU1I	13	246271	246271	3085.75
EDU2I	45	243149	364735	2465.40

POP_RATIO
0.000032
0.000022
0
0.000019
0
0.000004
0.000051



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Additional Modifications

EDIT COUNTY TABLE in ArcMap

OBJECTID	SHAPE	CountyFips	CountyFips3	CountyName	State	StateFips	NumAggr Tracts	SHAPE_Length	SHAPE_Area
1	Polygon	72001	001	Sicily	PR	72	679	14.740645	2.630179

Record: 1 Show: All Selected Records (0 out of 1 Selected.) Options

Use population served to estimate utility systems,
UTILITIES – LOAD hzTract into DISTRIBUTION LINE MDBs

CALCULATE Ductile/Brittle/Total Pipe using POP_RATIO

UPDATE SYBOUNDARY.MDB with new Grid



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Build Study Region

Create New Region

State Selection
The state selection narrows down the location of the region to be created to specific state(s).

Please select the state(s) for the study region you want to create:

States (1 selected):

- Alabama (AL)
- Alaska (AK)
- Arizona (AZ)
- Arkansas (AR)
- California (CA)
- Colorado (CO)
- Connecticut (CT)
- Delaware (DE)
- District of Columbia (DC)
- Europe (PR)
- Florida (FL)
- Georgia (GA)
- Hawaii (HI)

< Back

Create New Region

County Selection
The county selection defines the county or counties within previously selected state(s), to include in the study region.

Please select the county or counties for the study region you want to create:

States: Europe (PR)

Counties (1 selected): Sicily

Total: 1

Auto select all

Select all counties

Deselect all counties

Show map

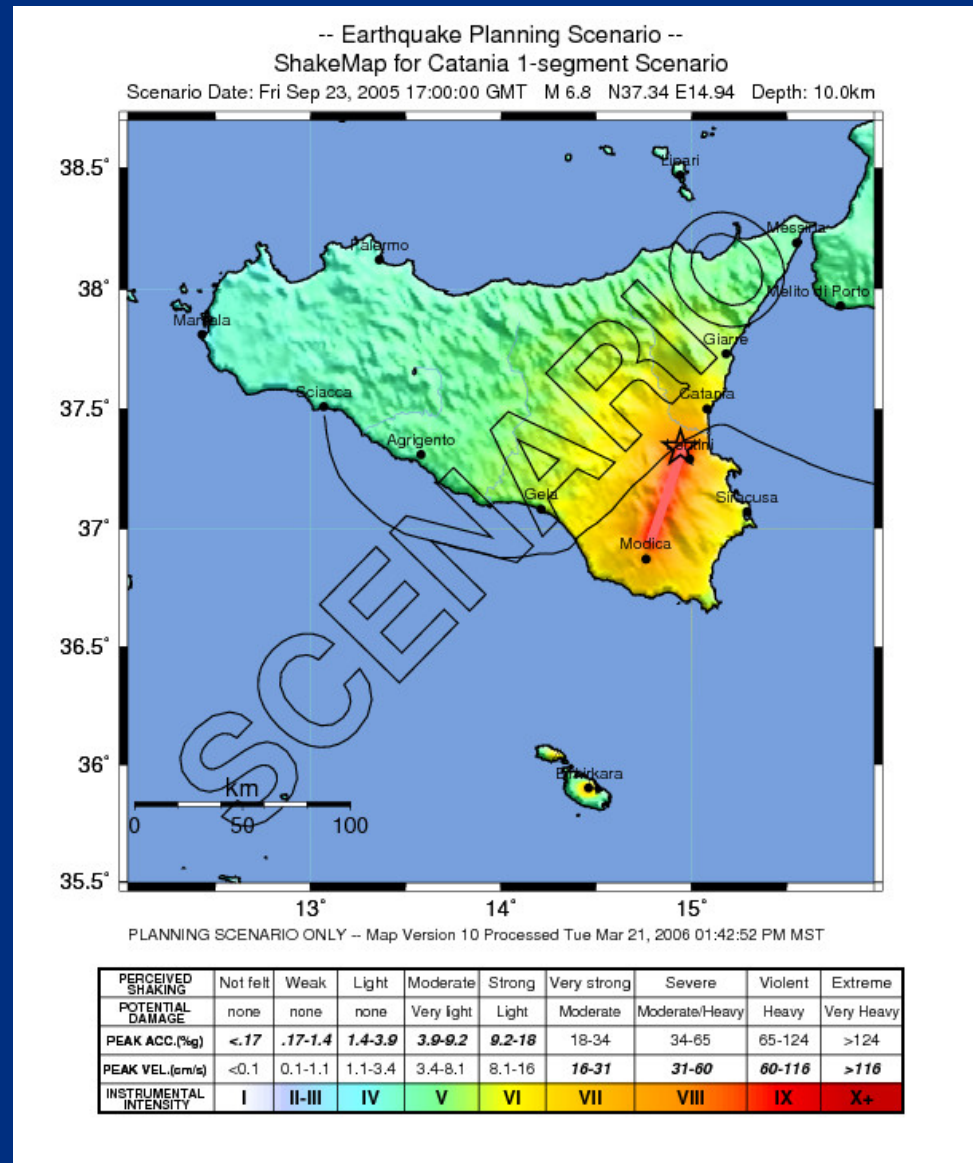
< Back Next > Cancel



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Step 2 – Define Hazard

Prompt Assessment of Global Earthquakes for Response (PAGER)
www.shakemap.org



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Step 2 – Define Hazard-Convert ShakeMap Shape Files to Geodatabase

Shake Map Shapefile to Geodatabase Conversion Utility

Input USGS shapefiles:

PGA: C:\Data\pga.shp

PGV: C:\Data\pgv.shp

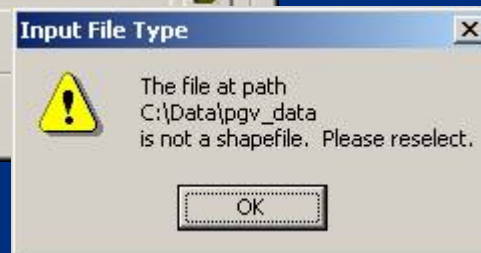
SA 0.3: C:\Data\psa03.shp

SA 1.0: C:\Data\psa10.shp

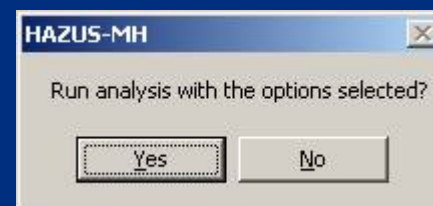
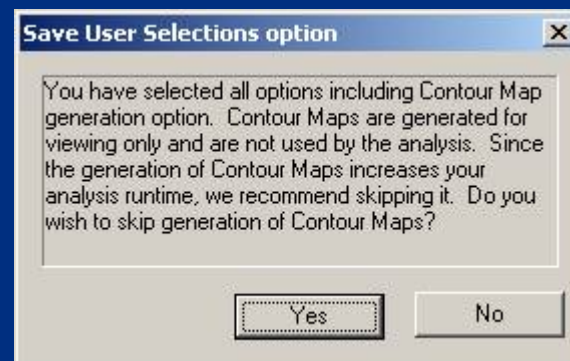
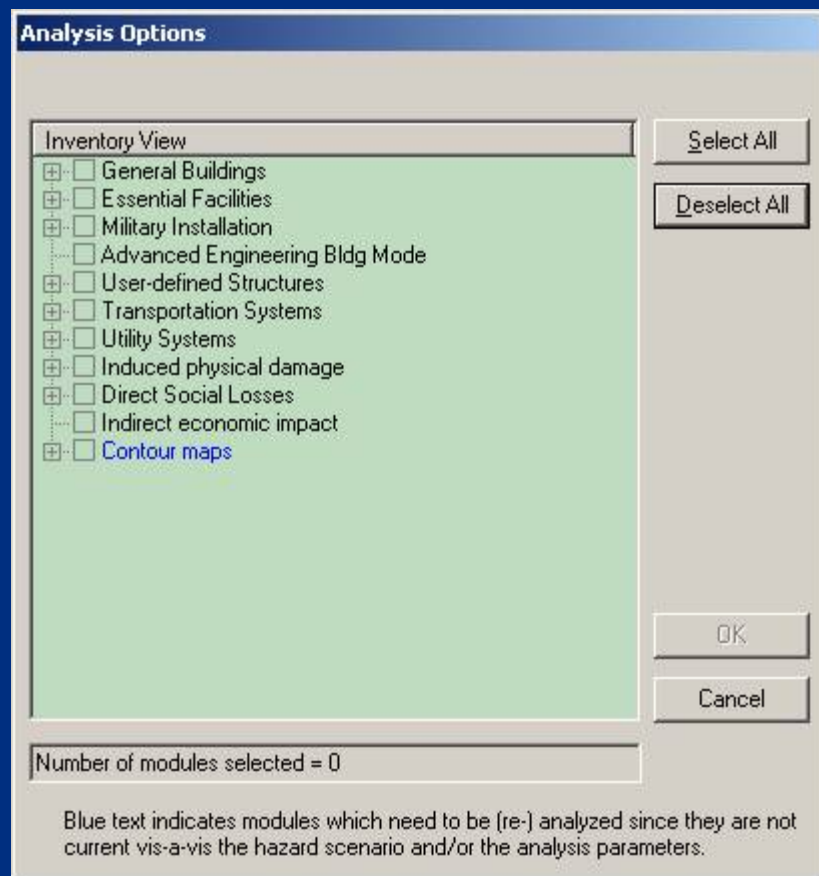
Output geodatabase:

Folder path: C:\Data\

Geodatabase name: ShakeMap



Step 3 – Run Analysis



Class Exercise-”Global HAZUS”

You are now ready to aggregate your study region!

**Start at page 38
“Build the Study Region”**



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