

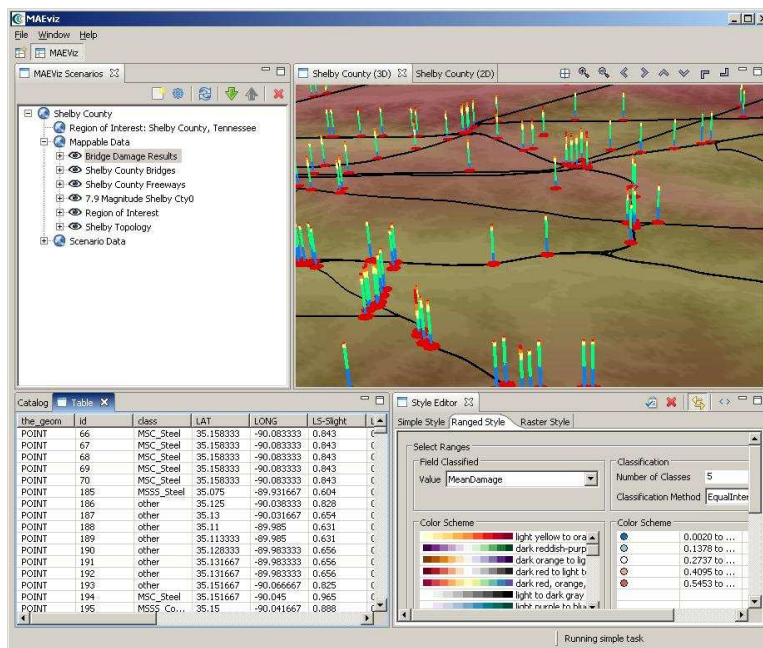
MAEviz Introduction & Tutorial

Mid America Earthquake Center

University of Illinois at Urbana-Champaign

May 2007

Earthquake Risk Assessment Using MAEviz 2.1: A Tutorial for the MAE-Center Year 10 Annual Meeting



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Mid-America Earthquake Center

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Running MAEviz

First, ensure that you have Java version 5.0 (also known as 1.5.0) installed. (available from <http://java.sun.com/>)

The MAEviz Portal

The primary means of running MAEviz is via the MAEviz web portal. To login to the portal and run MAEviz:

- Point your browser to <http://maeviz.ncsa.uiuc.edu>
- If this is your first time logging in, click the “New Account” link from the right hand navigation menu, and create a new account.
- You will now need to add yourself to the MAEviz users group. To do this, once you are logged in, click the “Membership” link from the navigation, then click “Joinable Sites” from the choices at the top. You will see MAEviz in the list below. Click “Join” to join the MAEviz worksite group.
- Now, MAEviz should appear as a choice in the top bar, next to “My Workspace.” Click this choice to enter the MAEviz area of the portal.
- Click “MAEviz Viewer” from the right hand navigation to open the MAEviz scenario screen.
- From here, you can expand the MAEviz Repository folder to open an existing scenario, or click the “New Scenario” choice to create a new scenario. For this tutorial, we will choose “New Scenario”
- If you follow the link for your choice, java should launch, and MAEviz should begin downloading the appropriate files to run. This will take a few minutes the first time you run MAEviz, as all the code and necessary files will be downloaded. Each time after this, it should be faster.
- If, when you click the link for the scenario, it tries to save the .jnlp file, you most likely do not have java set up correctly. Make sure the Java 1.5.0 runtime is installed, including Webstart.

MAEviz Overview

Welcome

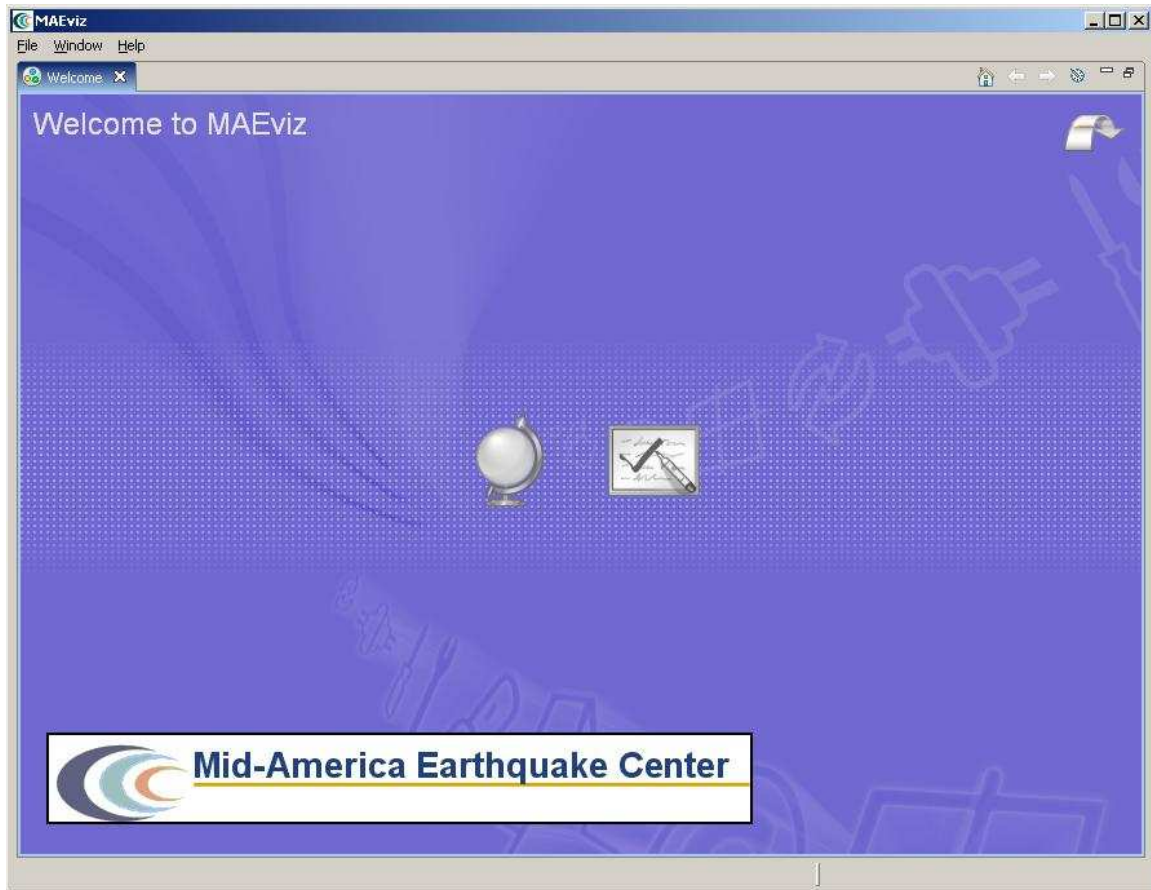


Figure 1

When MAEviz is first launched, the welcome screen appears. From the welcome screen, users can select to read an overview of information about MAEviz, follow built-in tutorials, or just begin working in MAEviz (by selecting *Workbench* which will take you to the main MAEviz screen, also known as the *Workbench*).

Workbench Layout

The MAEviz workbench consists of a number of *Views* which each contain information about a specific part of MAEviz. Each view is like a sub-window within the MAEviz workbench window, and can be minimized, maximized, moved, or even torn away from the main window into its own window. These interactions are done by clicking the minimize and maximize view icons in the view's title bar, or by clicking and dragging on the view's border or title bar.

Figure 3 shows some of the most commonly used views in MAEviz.

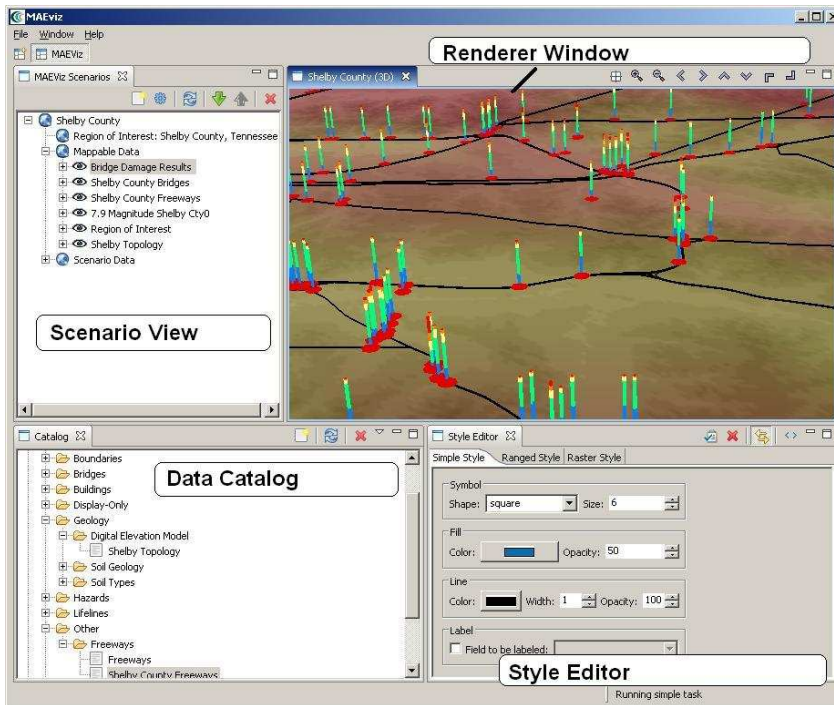


Figure 3

Scenario View

The Scenario View is where you find a list of all the data for the scenario or scenarios that you are currently working with. Each scenario that you are working with is listed as a top-level item in this view, which can be expanded by clicking the plus (+) icon next to its name, to see the details of the scenario. Inside each scenario, you can see a list of the Mappable scenario data, which are the layers of data that appear in your rendered map, as well as a list of Scenario Data, which includes all non-renderable data for the scenario (e.g. tables).

The Scenario View is also where you would go to do the major operations on your scenarios: adding an earthquake hazard or other data, running damage analyses, etc.

Visualization View


The Visualization Window Views are where the rendered maps of your scenario will appear. Each scenario can have its own rendered 2d and 3d map, so you can see the visualization of your scenario. It is here that you can get a quick visual overview of the results of your analyses. You can control the camera position by using the mouse, or click the view control buttons in the toolbar.

Data Catalog View

The Catalog is a list of all the data that is available for you to use in your scenarios. It is organized first by *repositories*, which are stores of MAE Viz data. Repositories can represent local data, or data stored on a remote server. Within each repository, the data is

organized by the type of data that it is. To add data to a scenario, you can navigate to and find the data within this view, then drag it into either the Visualization View for your scenario, or onto the scenario's name in the Scenario View.

Style Editor View

The Style Editor is used to adjust the way in which a layer of data is displayed in the Visualization View. If the Style Editor is not visible, you can show it by right clicking a Mappable Data layer in the Scenario View, and selecting *Change Layer Style*. Once this view is showing, you can adjust the color, shape, opacity, etc of the map layer. To apply your style changes, you must click the *Apply* button () in the view's toolbar.

Other Views

Although these are some of the main views you will use, there are a few other views that are shown at various times while using MAEviz.

Table View

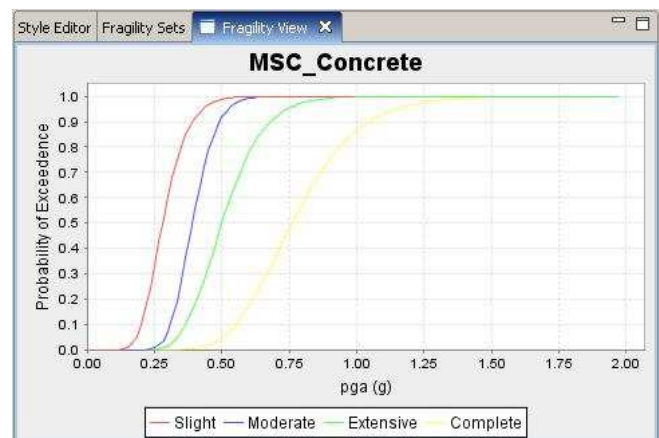
The Table View is used to display tabular data, generally the attributes of a set of inventory data or analysis results. The most common way to see this view is by right-clicking a Mappable Data layer in the Scenarios View and selecting *Show Attribute Table*.

Reports View

By right-clicking on a scenario name in the Scenarios View, and selecting *Reports*, you can access the Reports View. From the Reports View, you can select a report to run, right-click and run it. Then the selected report will be generated and displayed. From that point, you can choose to print or save the report.

Fragility View

If you right-click a fragility dataset from the Catalog View, you can select *View Fragility* to access the Fragility View. The Fragility View shows a list of fragility types, that you can drill down into to select and view a particular fragility curve. When you have found the fragility curve that you want to view, right-click it and select *View Fragility Set* to view a graph of the fragility curve.





MAEviz Tutorial

Example Situation

In this demonstration, we will use MAEviz as a specific stakeholder would use the tool. Consider the stakeholder to be an Emergency Manager who wishes to determine possible impacts of earthquake hazard on Shelby Co, TN buildings. The Emergency Manager wishes to investigate the impact of a specific speculated earthquake on the existing building stock in Memphis and Shelby County Tennessee. Consider this analysis to be preliminary, and therefore limit the scope of the study by neglecting single family residences. Consider hazard from a 7.7 M_w event located at Marked Tree, AR.

In the process, we will see how the Emergency Manager will launch the MAEviz application, load the GIS data for Shelby County, and then generate earthquake hazard information based on the scenario he wants to investigate. After he has loaded this base information, he can interactively choose and display information for the specific items he wants to evaluate – the buildings, as well as load fragility information about these particular structures. From there, we will witness an analysis of the impact of the hazard. These factors have important social and economic impacts.

Creating a New Scenario

- When you start MAEviz for the first time, you will be shown the welcome screen (Figure 2). To begin working with MAEviz, click the rightmost icon () which will take you directly to the MAEviz workbench.
- From the application's menu bar, click File->New, then expand MAEviz and choose *MAEviz Scenario* (See figure 4). Alternatively, you can click the *New Scenario* button () from the Scenario View's tool bar.

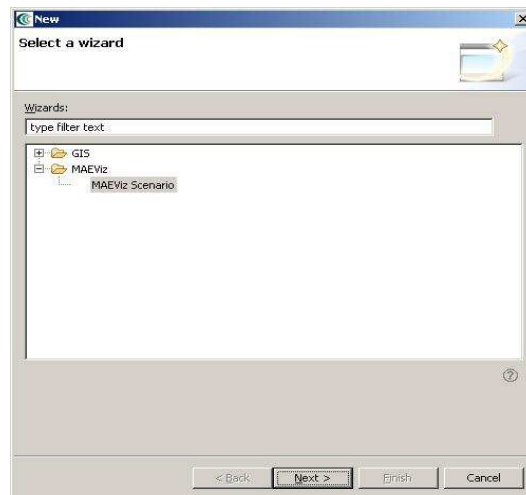


Figure 4

- The New Scenario Wizard will now be showing. This is where you define the scenario that you would like to work with. Enter a name for your scenario, such as “Shelby County”, and then optionally enter any descriptive information about the scenario in the large text box. Click *next*.
- At this point, you will be selecting the region of interest that you would like to work with. We will be analyzing Shelby County, TN, so select United States of America from the Country menu. Then select Tennessee and Shelby County from the sub-region dropdown menus that appear. (See Figure 5 below) Note: after pressing the arrow to show a drop down menu, striking the first letter of the entry you wish to select will jump to the first entry in the drop down menu with that letter. For instance, when selecting “Shelby County,” click the arrow for the drop down and strike the “S” key to zoom to Scott County. Shelby County will then be only a few entries away in the drop down list. Click *next* when finished.

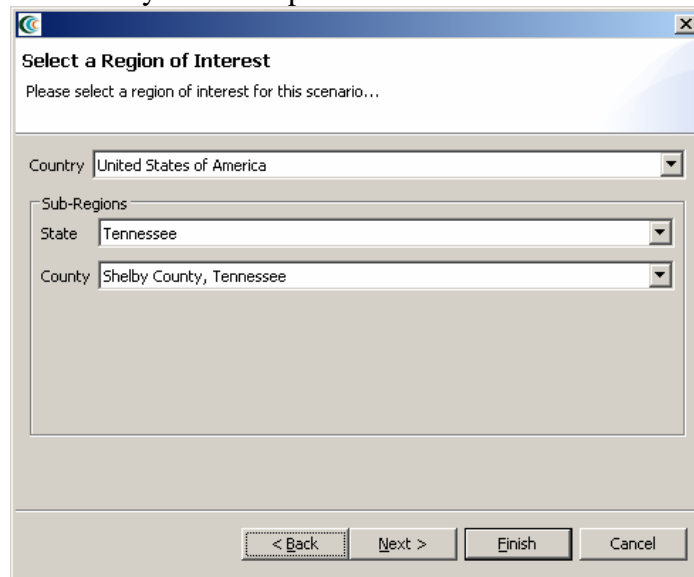


Figure 5

- The next screen of the wizard allows you to select an analysis to run immediately. If we wanted to run an analysis first, we could continue with this screen. But for this tutorial, we will add some other data to our scenario first, then come back and run an analysis later. So at this point, just select *Finish* to complete the wizard and have MAEviz initialize your new scenario.

Viewing the Scenario and Adding Data

At this point, your scenario has been created. You will see your scenario listed in the Scenario View and a blank outline of Shelby County has appeared in the Visualization View. See Figure 6.

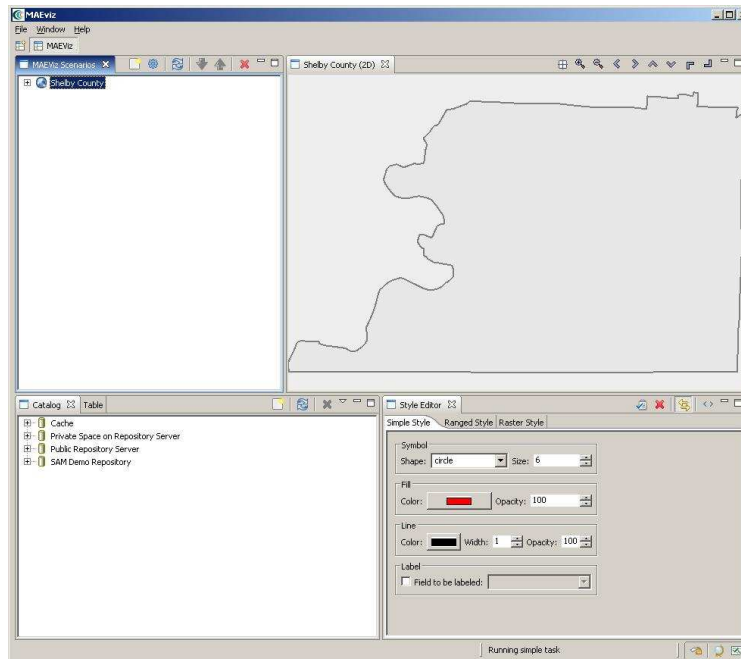


Figure 6

At this point, we will learn how to add data to our scenario, and how to manipulate the Visualization View.

- First, we will add elevation data to the scenario. In the Catalog view (the lower-left view of your workbench is arranged in the default setting, as shown in Figure 6), expand the *MAE Viz Demo Data* item, then *Topography*, *Digital Elevation Model*. Click and drag the *Shelby County Topography* item into the Visualization View.

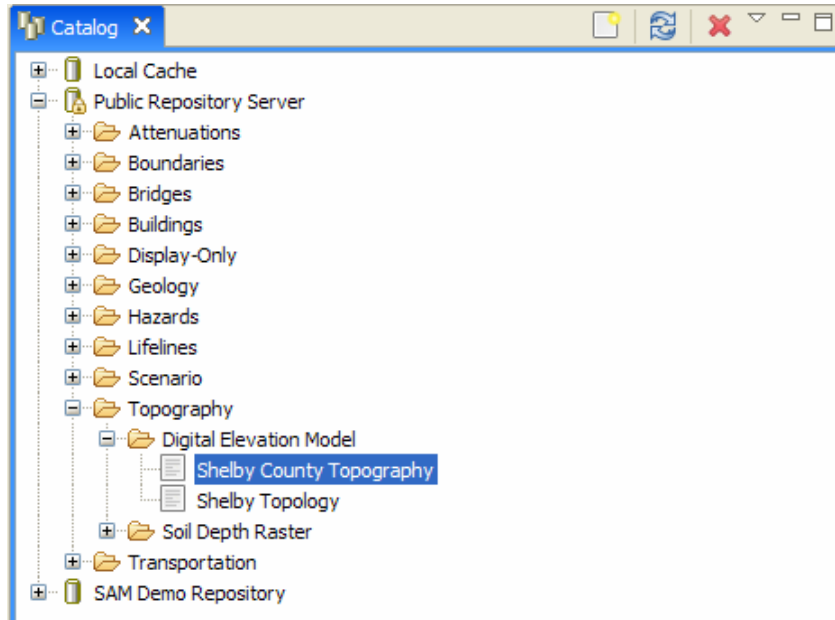


Figure 7

- At this point, an elevation map should have been added to the Visualization View. We will also add building information to the Scenario. Under the Catalog View, still under the MAEviz Demo Data item, expand *Buildings*, then *Building Inventory v4*, then *MTB Inventory v4 no SF*. Drag the dataset for Shelby County buildings excluding single family residences into the Visualization View as well. Alternatively, you can right-click the item and select *Load Dataset*.
- At this point, your Visualization View should look something like Figure 8.

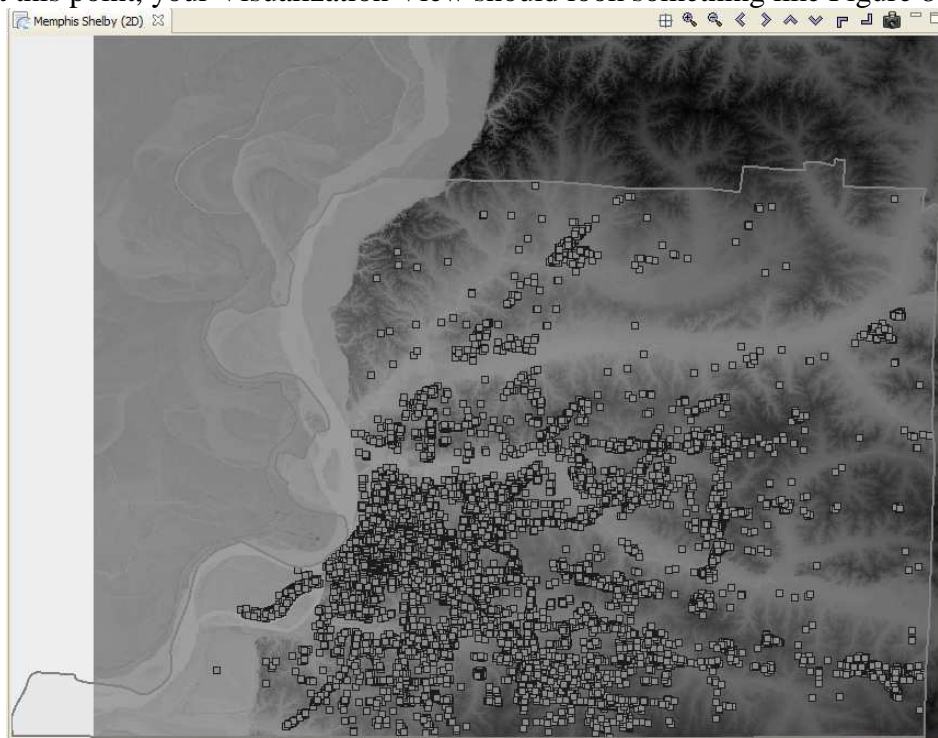



Figure 8

- To make the buildings easier to see, we will adjust their map style. From the Scenario View, expand Shelby County, then Mappable Data. You should see the list of the data that you added to the Scenario. Right click on *MTB Inventory v4 no SF*, and choose *Change layer style*.
- In the Style Editor (Figure 9), the Simple Style tab should be active. Click the black box labeled *Color*, and select a color that is easier to see, such as yellow. Click *ok* in the color selection box, then to apply the style change, click the *Apply Style* button in the Style Editor's tab bar. ()

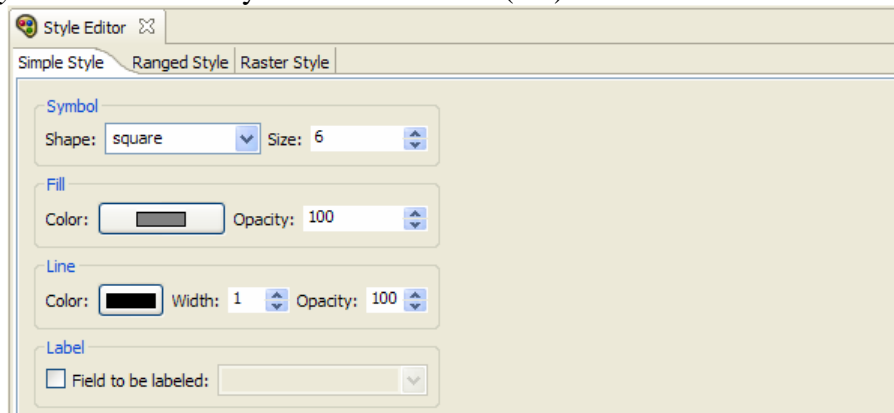




Figure 9

- To zoom/pan/etc, use the controls at the top of the Visualization View. Use these to adjust your view.
- To view a 3d rendered view of the same information, right click the entry for your Scenario, and choose *Render in 3D (VTK)*. This will bring up a second Visualization View that shows the same map, but from a 3d rendered perspective.
- After adjusting your view, if you want to restore to the original default view in the Visualization, click the *Zoom to full extent* button in the toolbar ()

Running an Analysis

Now that we have a basic map to look at, we will learn how to run an analysis. Analyses in MAEviz consist of any sort of calculation that generates data. For example, generating a deterministic earthquake map based on a magnitude and epicenter would be considered one type of analysis. Using that earthquake map as well as building inventory data to generate information about building damage would be another type of analysis.

In this example, we want to find building damage results based on a deterministic earthquake hazard that we will specify.

- First, we will launch the Run Analysis Wizard. To do so, you can click the Execute Analysis toolbar button (), right click your scenario and select *Execute Analysis* or click on the *Analysis* from the top level menu and select *Execute Analysis*.
- This causes the Run Analysis Wizard to be shown. See Figure 10. Here you can select which analysis you want to run. (this is the same as the page that was

displayed in the last step of the New Scenario Wizard). From this page, expand Buildings, and select the Building Damage analysis. Click *next*.

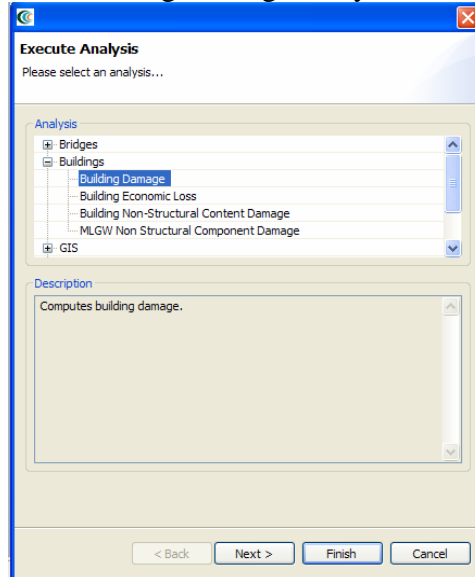


Figure 10

- The next page (Figure 11) prompts you to select the data you want to use in running your Building Damage analysis. It tells you that no datasets containing Fragilities, Expected Value or Fragility Mapping have yet been loaded into your scenario. To run this analysis, you must load datasets that contain this data.
- To help you locate or generate the necessary input data, the Analysis Wizard provides two types of buttons, the *Find Dataset* button (🔍), and the *Generate Dataset from Analysis* button (⚙️)



Figure 11

- To find a Fragilities dataset to run your building damage with, click the *Find Dataset* button (🔍). The window that appears contains a list box of all Fragilities Datasets that could be found in any of the data repositories that you are connected to. Select *Default Building Fragilities* from the list, and click Finish. To find an Expected Value dataset follow the same steps for the related field and select *Building Damage Ratios* from the list, and click Finish. Follow the same steps for the Fragility Mapping dataset but select *Default Building Fragility Mapping* from the list.

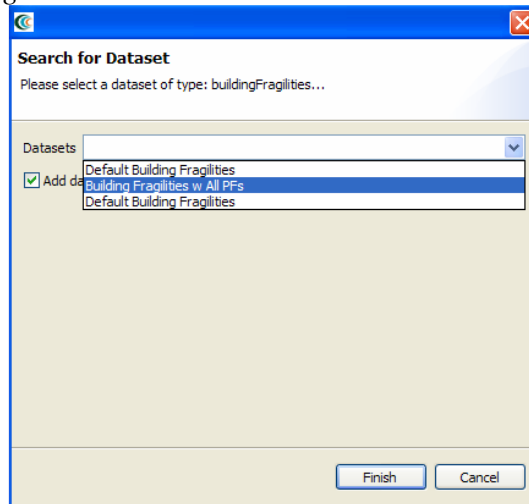


Figure 12

- For our hazard, we want to use a pregenerated hazard earthquake. So this time, use the *Add* button, to add pregenerated hazard earthquake and select both the *Memphis 7.7M PGA* and the *Memphis 7.7M 0.2 sec SA* dataset, and then click *Finish* to run the building damage analysis. Alternatively, we could have clicked the *Apply Retrofits* button to select fragilities for each building. By default, MAEviz will use the as-built fragility for each building.
- Once the progress bar has finished, you should see new datasets added to your Scenario View and map: The Building Inventory v4 dataset that you selected to use, a Building Damages dataset which will contain the damage information, and the earthquake hazard dataset. Your Visualization should now look similar to Figure 13 with the buildings colored by mean damage.
- To change the visualization for this dataset, right click on the *Building Damage* layer, and select *Change Layer Style*. The Style Editor should appear in the bottom right of the application window. Like other windows, you can move or resize it to make it easier to view. Select *MeanDamage* or another field from the drop down menu as the *Value for Field Classified*, and select the *Number of Classes* to classify the mean damage on buildings. To apply the style change, click the *Apply Style* button in the Style Editor's tab bar. (🔗)

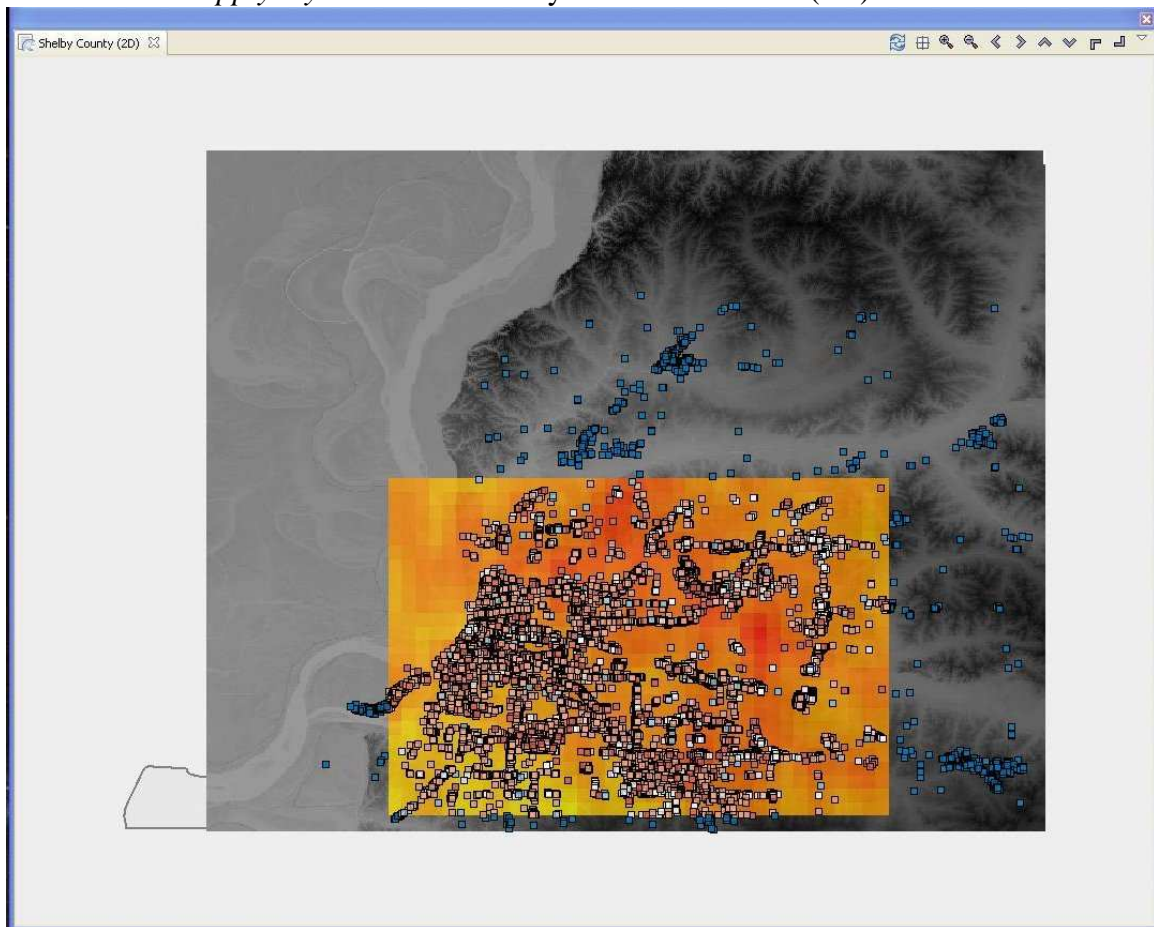


Figure 13

- Before looking at the economic impact of this scenario, we should first compute the non-structural and content damage. To do this, go back to the Execute

Analysis button (⚙️) and select the Building Non-Structural Content Damage and click Next. The new window shows parameters for creating the Building Non-Structural Content Damage like in Figure 14-a, based on the analysis you are executing, you should select the fragility mapping from the related field, and click Finish. Then, to see the economic impact, go back to the Execute Analysis button (⚙️) and select Building Economic Loss and click Next. You should see a page similar to the one in Figure 14-b. The non-structural content damage we created in 14-a is not a required dataset for the economic loss, so you will need to select it from the drop down. For the occupancy mapping, you should use the find dataset button, and click Finish again to create the Building Economic Loss.

- This will generate a Building Economic Loss dataset which will contain the economic losses for the buildings.

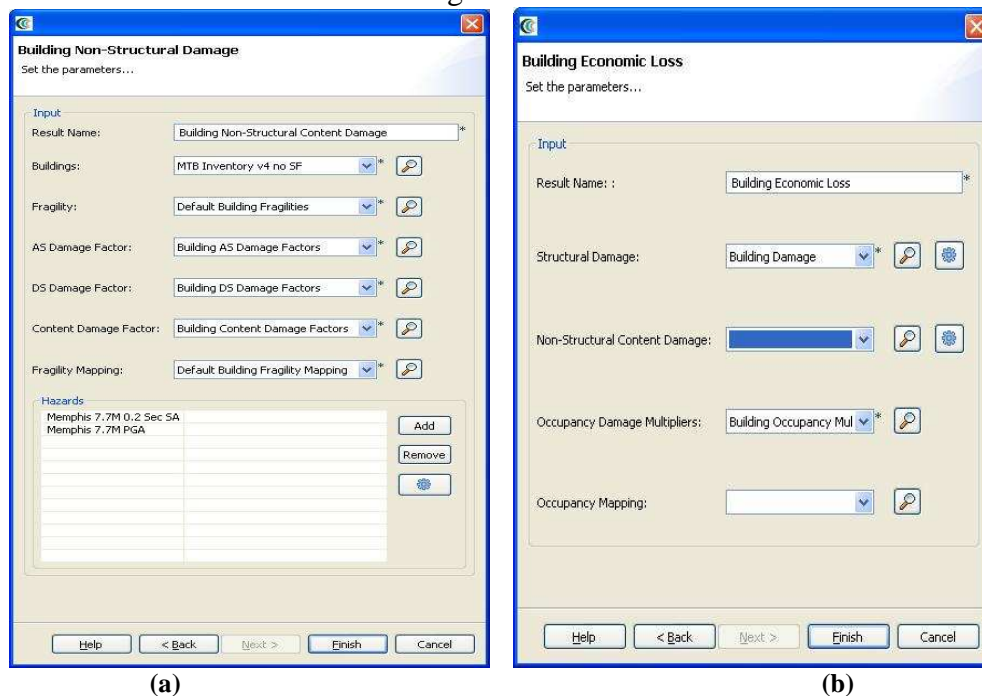


Figure 14

- To determine the fiscal impact of the economic loss, click the Execute Analysis button (⚙️) again and select the Fiscal Impact Analysis under the buildings category and click next. The new window shows the parameters for computing the fiscal impact (see Figure 15). The *tax rate* field is the default property tax rate to use for the region if no property tax map is provided. If a tax map is available, it will first need to be added to MAEviz by ingesting it. For this tutorial, we will ignore this field. For the last field, *Select Minimum DED*, enter the minimum economic loss criteria used to select the buildings for inclusion in the property tax loss calculation. For example, entering 10.0 will only calculate the property tax loss for buildings that lost more than 10% of their value from direct economic damage. Those with less will be given the value 0 for property tax loss. Entering 0 for the field will include all buildings in the calculation, regardless of the

amount of building value loss. For this analysis, we will include all buildings. Click finish to generate the fiscal impact.

Fiscal Impact Parameters Page
Set the parameters to compute fiscal impact based on direct economic damage.

Input

Result Name: Fiscal Impact Analysis*

Direct Economic Damage: Building Economic Loss*

Tax Rate (%): 8.0*

Tax Rate Map:

Select Minimum DED (%): 0.0*

Help < Back Next > Finish Cancel

Figure 15

Decision Support

Now that we have looked at some of the basic analyses in MAEviz, it's time to look at some more advanced analyses that will provide valuable insight into which buildings we might want to retrofit. The two advanced analyses we will look at are the Equivalent Cost Analysis (ECA) and the Multi Attribute Utility Analysis (MAUT). For the utility analysis, the basic utility functions are derived for a specific use case so it is recommended that you filter the building results to only the buildings of interest or derive new utility functions that represent the utility value for losses based on the larger dataset.

Equivalent Cost Analysis

- This analysis will allow us to compute some additional attributes such as monetary loss, injury, death and function loss from the damage results we generated previously. To get started, click the Execute Analysis button (⚙️) again and select *Building Retrofit Cost Estimation* under the *Buildings* category and click next. Make sure the fields selected match the ones in Figure 16 and click Finish.

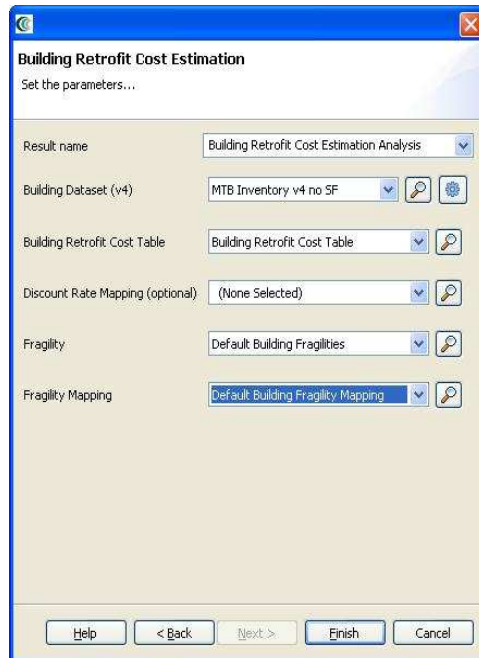



Figure 16

- After the retrofit cost estimation results are complete, click the Execute Analysis button () again and select *Equivalent Cost Analysis* under the *Decision Support* category and click next. You should see a page similar to Figure 17. This analysis will compute the attributes we select later for each damage dataset listed as input. For example, the building damage we previously computed is for the buildings as-built; however, we could go back and create a new building damage dataset where we select some retrofits and see the how the results are effected. For this tutorial, we will use the damage dataset we created previously. Click Next.

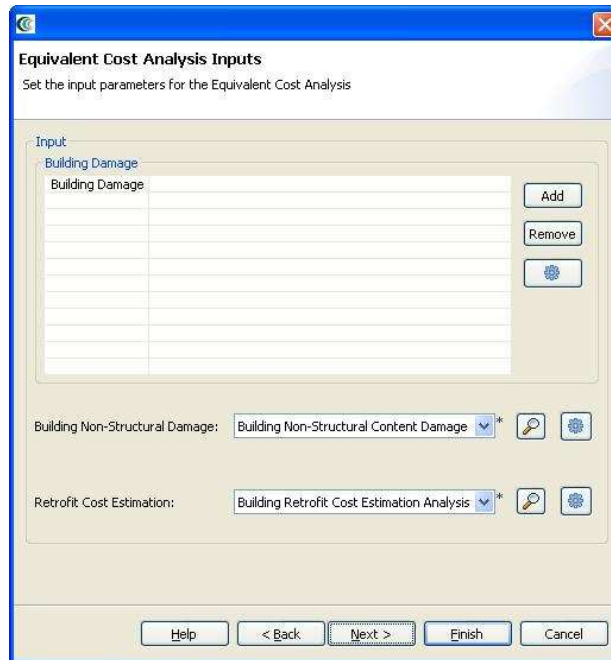


Figure 17

- You should see a page similar to the one in Figure 18. For the sake of time, we will leave all of the values at the defaults; however, the number of simulations is recommended to be at least 500 or 1000 simulations per building to yield better results. More simulations will lead to more accurate results. Click Next.

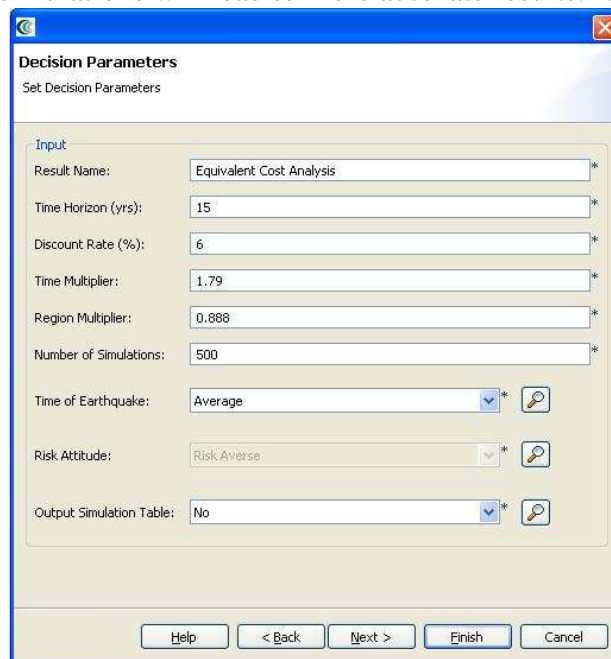


Figure 18

- You should see a page similar to the one in Figure 19. The only change to make is to uncheck the box next to *Initial Structural Cost*. The *Initial Project Cost* includes the initial structural cost which takes into account the cost of

construction plus the engineers and architects involved in the project. Click Next to continue.

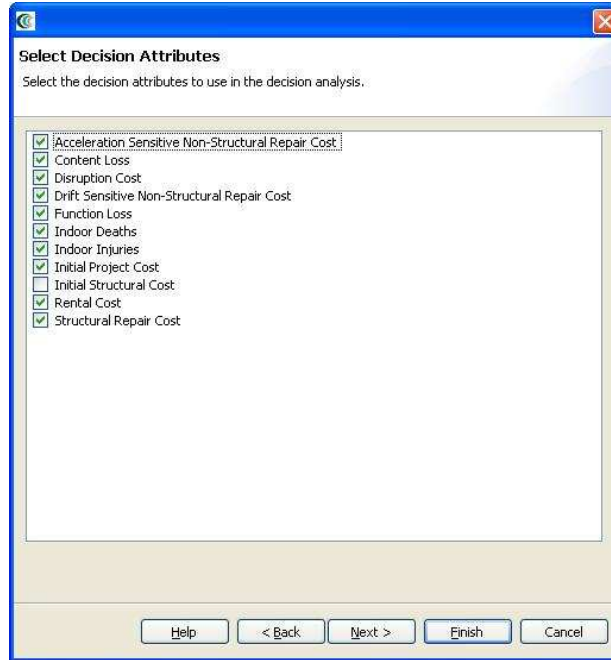


Figure 19

- The final page should be similar to the one in Figure 20. On this page, we set the conversion value for non-monetary variables such as the days of function loss. By default, we set the value at \$100,000 dollars per day of function loss. You can leave the default values and click Finish. This analysis may take a several minutes to several hours depending on the speed of your computer, the number of simulations and the size of the dataset. For the settings used above, it will probably take about 10 minutes. When the analysis completes, you should have a new dataset called Equivalent Cost Analysis that contains the decision support attributes Monetary Loss, deaths, injuries and the days of function loss all in terms of monetary values.

Decision Variable Conversions
Set the value of each non-monetary variable

Deaths	5000000
Function Loss	100000
Injuries	1500000

Buttons: Help, < Back, Next >, Finish, Cancel

Figure 20

Multi Attribute Utility Analysis

- This analysis is similar to the Equivalent Cost Analysis except that the attributes will not be converted to monetary losses and MAEviz will assign a utility value to each decision attribute and an overall utility value based on the Utility Functions selected. For this analysis to produce accurate results, users would need to provide utility functions appropriate to the size of the building dataset we are using. Thus, these utility values will be off since they are derived for a small set of buildings (about 3 buildings). However, this tutorial will illustrate how one could use the analysis if appropriate utilities were available. To get started, first click the Execute Analysis button (⚙️) again and select *Multi Attribute Utility Analysis* under the *Decision Support* category and click Next. You should see a page similar to Figure 21. To find a Utility Functions dataset, click the *Find Dataset* button (🔍). Select the *DS Thesis Utility Functions* for an example set of utility functions and click Next.

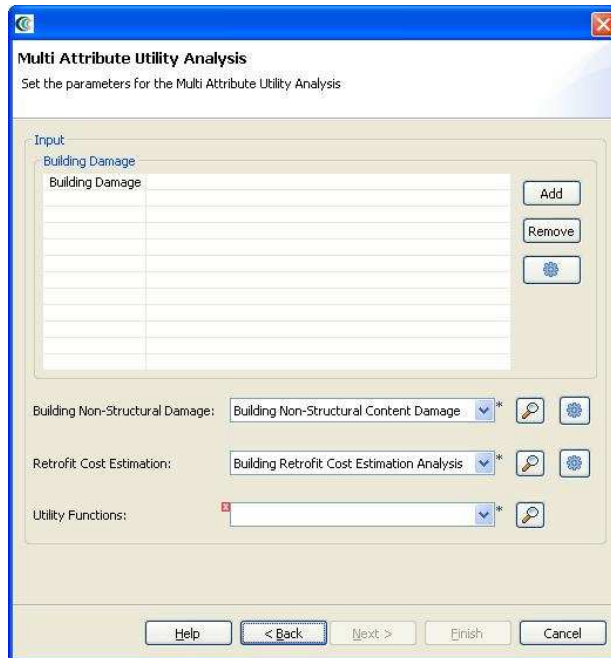


Figure 21

- You should see a page similar to Figure 22. You can leave the default values for all fields and click Next.

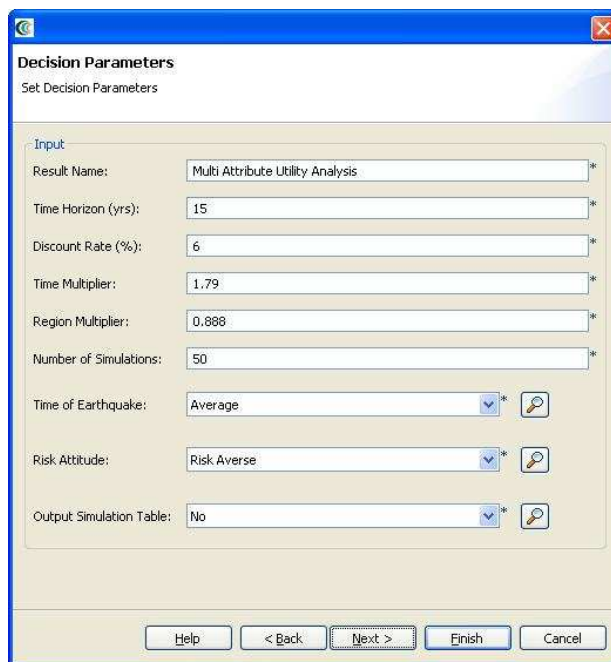


Figure 22

- You should now see a page similar to the one in Figure x for the ECA analysis. As before, you should uncheck the box next to *Initial Structural Cost* and click Next. The final page you see should be similar to the last page for the ECA analysis. You can leave the default values. These values are required for MAUT

to determine the weighting of each utility value for each decision attribute. Click Finish. This analysis also may take from several minutes to several hours depending on the size of the dataset, the number of simulations and speed of your computer. For the settings used above, it will probably take about 10 minutes. When the analysis completes, you should have a new dataset under Mappable data called Multi Attribute Utility Analysis that contains the decision support attributes Monetary Loss, the number of deaths, the number of injuries and the days of function loss. You should also have a table dataset under Scenario data in the category MAUT Utility Summary which contains the utility values for this scheme. The values will be very low since the utility functions were not derived for this dataset.

Analyzing Results

Now that the analysis that we were interested in has been completed, it's time to analyze and try to make sense of the results. There are various ways of viewing and visualizing the results, which we will learn now.

Table View Results

- First, we will view the results in a tabular grid, similar to excel. In the Scenario View, right click on the *Building Damage* layer, and select *Show Attribute Table*. The Table View should appear in the bottom right of the application window. Like other windows, you can move or resize it to make it easier to view.
- Now we will use the Table View to locate the buildings that suffered the most damage. Scroll to the right edge of the table view, and click the column header labeled *MeanDamage*, which is the column for the mean damage value for the building. This will sort the table by the mean damage value.
- Now that we can see which buildings in the table have a mean value of damage, let's locate those buildings in our map of the area. Make sure the Building Damage layer is still selected in the Scenario View, and make sure you are viewing the 2D Visualization View.
- Then, in the Table View, click on the first row with mean damage Value of highest. You will see one of the dots representing a building in the Visualization View change color to show that this is the selected building.
- Hold shift and click the last row with desired mean damage value. This will select all the buildings in between. You will see these buildings all change color in the Visualization View. This way, you can see which buildings will suffer the most damage. See Figure 23.

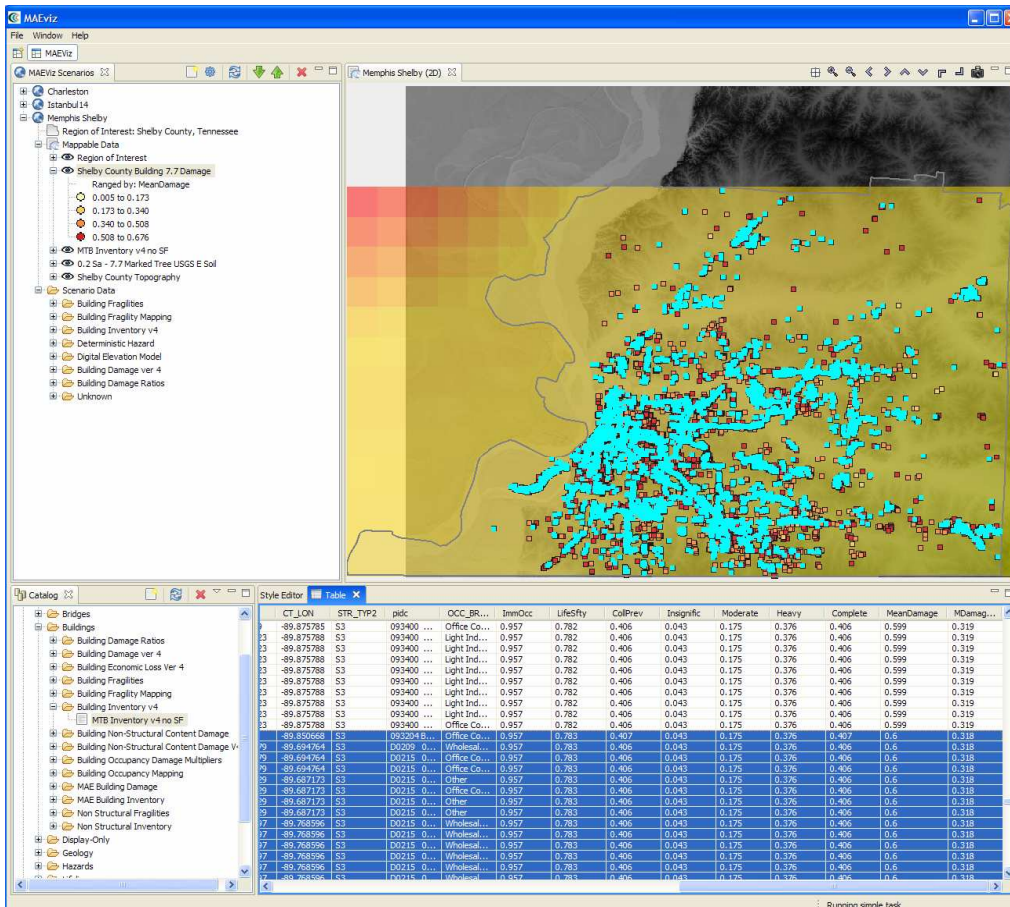


Figure 23

3d Damage Bars

- Now let's add 3d damage bars to the buildings to make it easier to visualize damage across the entire map. Right click the Building Damage layer in the Scenario View, and choose *Ranged 3D Visualization...*
- Now we can choose which fields we want to display 3d damage bars for. For this example, we will want to see the chance of each damage state, so select *Insignific*, *Moderate*, *Heavy*, and *Complete*. See Figure 14

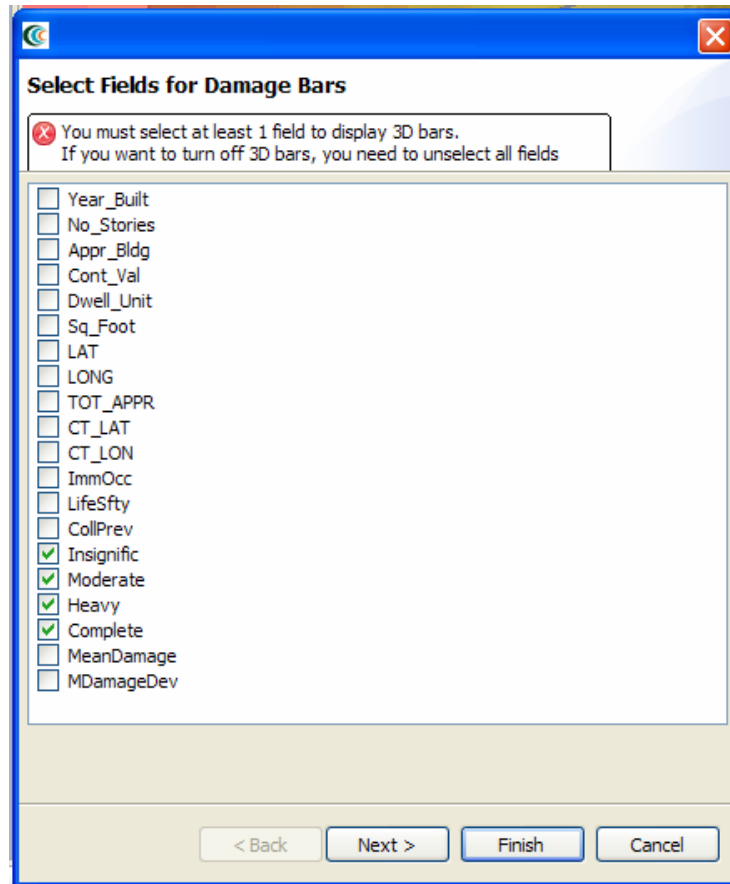


Figure 24

- Click *next*. At the next screen, you can choose colors for the various fields. Choose a reasonable set of colors, or use the defaults, then press *finish*.
- Bring the 3d Visualization View back to the front, and you will see that damage bars have been added for each building. Zoom in and you can quickly see the probable damage states for each building based on the bars. The size of each color in the bar represents the likelihood that the building will be in that damage state. (Figure 25)

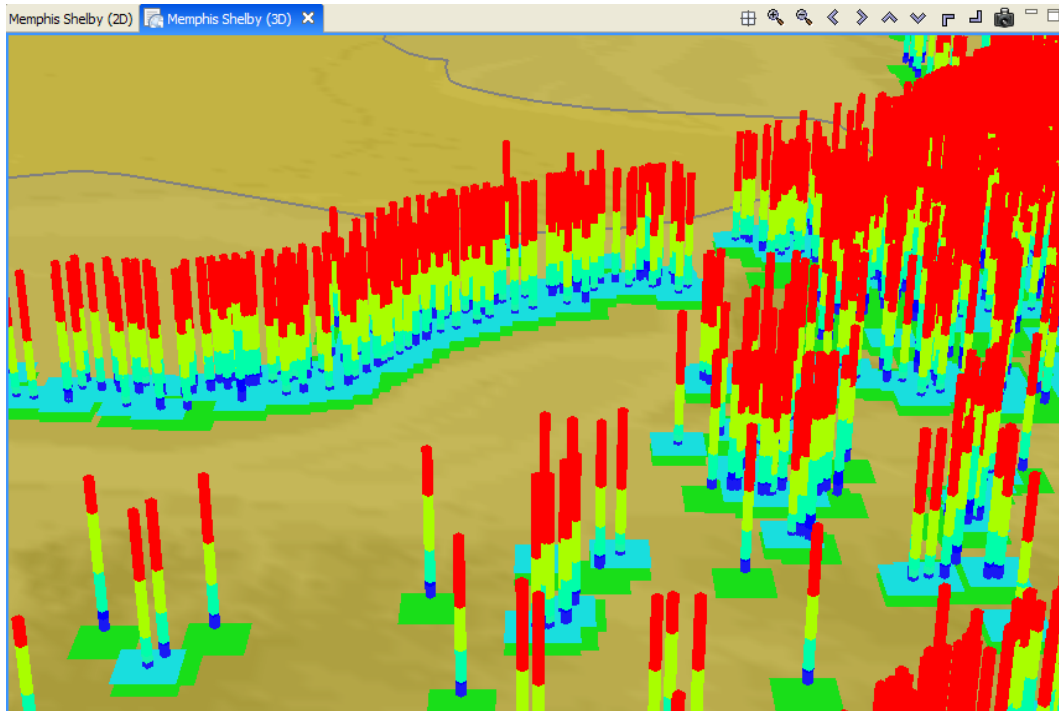


Figure 25

Aggregating Data

- MAEviz also provides the ability to aggregate data to a geographic boundary, such as the census-tract level. To do this, first add census tract boundary data to your scenario by going to the Catalog view and expanding *MAEviz Demo Data->Boundaries->Census Tracts*, then dragging *Shelby County Census Tracts* into your Visualization View.
- Now, we want to do an aggregation analysis. Use the Analysis button (⚙️) again to start the analysis wizard. This time, choose *GIS->Aggregate To Polygon*
- For the *Polygon* field, choose *Shelby County Census Tracts*. This indicates that you want to aggregate your damages to that dataset.
- For the *Dataset* field, choose your Building Damage dataset. This is where you select which layer contains the data that you want to aggregate over the census tracts.
- Also, give the result a descriptive name, such as Building Damages in Census Tract

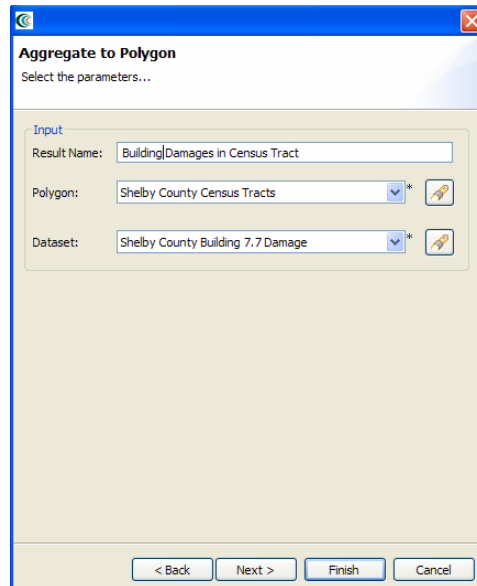

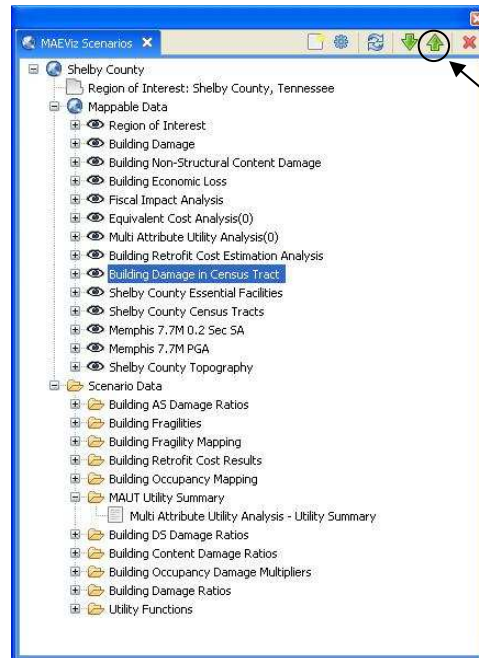


Figure 26

- Click *next*. You will arrive at a dialog page prompting you to choose which fields to aggregate by, and how to aggregate them (sum, max, average, etc). The defaults are fine, so click *finish*.
- When the analysis finishes, we need to change the style on the aggregation so that we can easily visualize the results. Right click your new dataset from the Scenario View, and choose *Change Layer Style*
- In the style view, select the *Ranged Style* tab.
- Under the Value field, select *MeanDamage*. This indicates that we want to color the census tracts by the mean damage value for the buildings in that census tract.
- Under the color scheme box, select a color scheme that will be easy to see, such as light purple to blue.
- Change number of classes to 5, which will give us 5 different colors to shade by. Also change Classification Method to Quantile.

- Next, press the Apply Style button () to apply these style changes. The Visualization view will update to show the census tracts colored by the average damage value of the buildings within them.
- It will be easier to see the color difference if we select the layer we created (Building Damages in Census Tract) under Mappable Data and press the green up arrow to move the layer up to the top. See Figure 27.



Press arrow to move selected layer up

Figure 27

Filtering Data

- Now let's just look at those buildings that are flagged as being Low-rise Hospitals. Right click the Building Damage layer, and select *Filter*.
- This brings up the filters dialog. In the Create a Filter dialog, you must pick a field and value to filter by. Choose *EFacility* to filter by building essential facility by double clicking on it. This adds the field to the query at the bottom of the page. Next, click the “=” sign button. Finally, to find all of the unique values for the field we selected (EFacility), click the *Get Unique Values* button. Double click on the value EFHL. The dialog should look like Figure 28.



Figure 28

- Press *Finish*. When MAE Viz is finished, you should see that many of the damage bars have been removed. This is because it is only displaying the damage bars for buildings of essential facility EFHL.

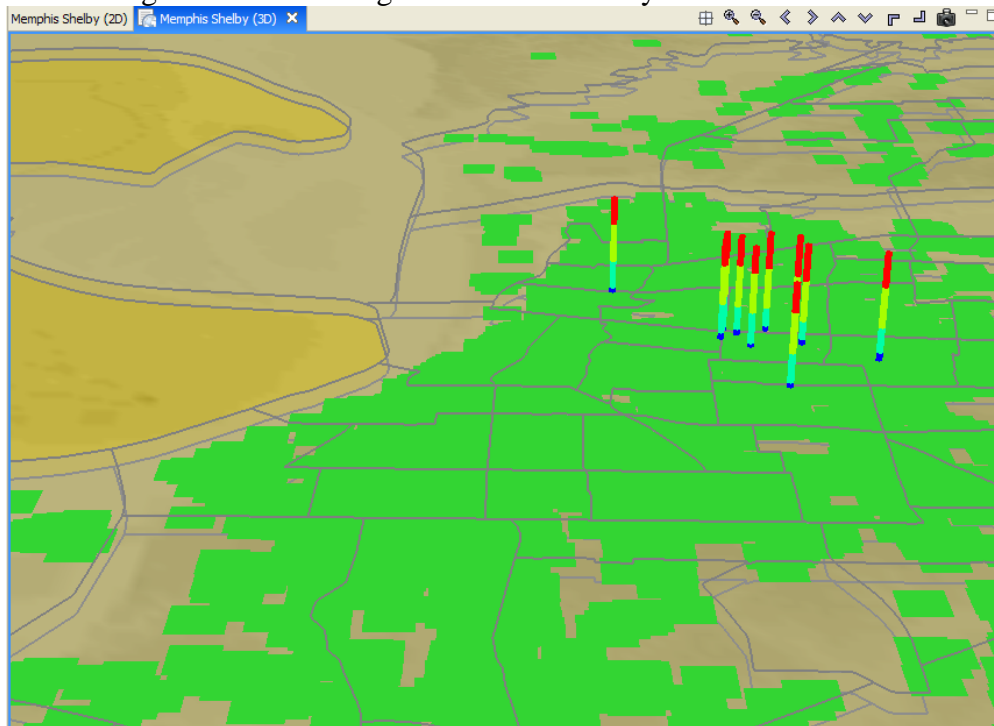


Figure 29

Reporting

- Now we have finished generating and looking at the data, we will generate a printable report of the information that we have learned. Right click the name of your Scenario in the Scenario View, and select *Reports...* This will open the Report Selection View. This gives us a list of reports that MAEviz can generate.
- In this case, we only want a summary of the building damage, so we'll use the *Building Damage*.
- To run the Building Damage report, double click that entry in the list. The Report View will appear, with a preview of your building damage summary report. (Figure 30)

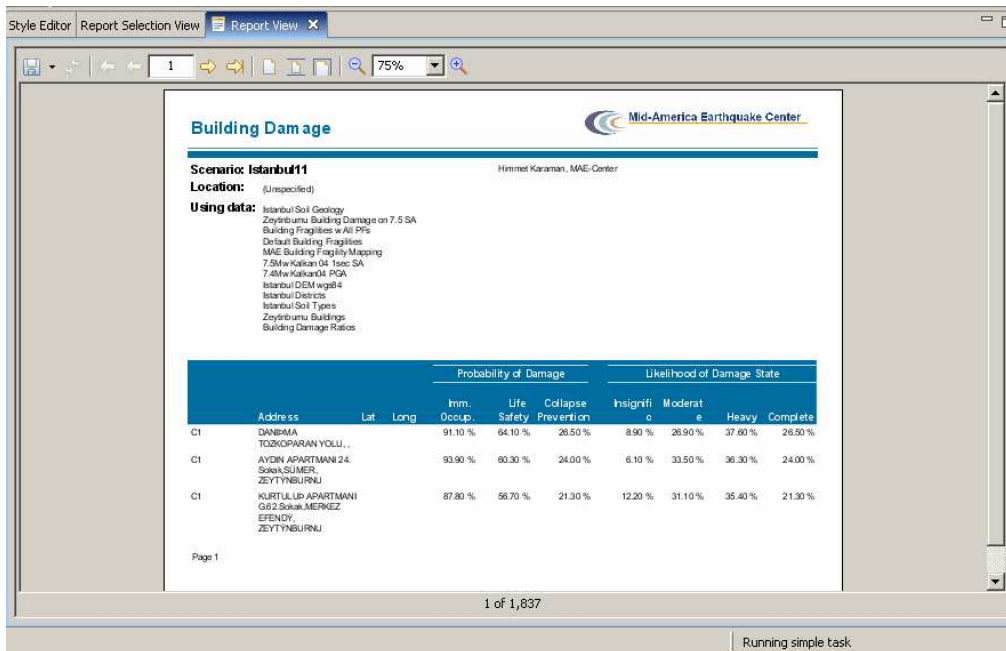




Figure 30

- You can print this report by using the print button () or save it using the save button (). Use the small arrow next to the save button if you want to select a different format for saving the report (such as PDF, HTML, etc)

Conclusion

Based on this simple building damage analysis, we can conclude that the MAEviz tool helps to identify areas of high risk. MAEviz could also have been used to look at some mitigation options that may be beneficial to consider. The Emergency Manager in our example is able to take the information and results from this analysis and evaluate detailed options for specific buildings base on proprietary information in the department's databases and files. Furthermore, probabilistic scenarios can also be

evaluated in addition to a deterministic earthquake such as the one we used in this example. The analysis could also be expanded to look at other components in the region such as the utility networks, schools (since these typically serve as temporary shelters), hospitals, police stations, etc. Some of these data are available with the default installation of MAEviz and is left as an exercise to the user.

The MAEviz tool provides an environment for visual exploration, analysis and evaluation of engineering options pertinent to investigating bridge and building retrofit options. In future version of MAEviz, these results will feed into the traffic models and the decision support to aid in selecting retrofit options, emergency routing, and pre/post mitigation planning. Furthermore, the use of cyberenvironments will enable MAEviz users to more effectively collaborate and share results and the use of web services will allow MAEviz to move computationally intensive analyses to bigger machines when available.

Please contact the Mid-America Earthquake Center for further information on MAEviz.

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