
GETTING STARTED WITH HAZUS-MH 2.1

SYSTEM AND SOFTWARE REQUIREMENTS

In order for Hazus-MH to run properly, your system must meet certain minimum requirements. Figure 1 provides guidance for supported operation levels. System requirements are directly related to the volume of data to be used in the analysis. For example, reasonable processing times can be expected when using the “Recommended” computer system if the software operator is analyzing multiple earthquake scenarios for large cities (population > 500,000). The operator is assumed to be working on an Intel PC.

Computer Speed	2.2 GHz dual core or higher. 2 GB or higher of memory/RAM.
Disk Space	Approximately 10 GB of disk space is needed to store one multi-hazard large urban study region. Inventory data size varies by state; for the entire U.S., 30 GB are needed.
Video/Graphics Adapter	24-bit capable video card with at least 128 MB of video memory. A resolution of 1078 x 768 or higher is recommended.
Supporting Software	Microsoft Windows XP SP3 32-bit or Windows 7 Professional/Enterprise 32-bit or 64-bit. Only US English versions are supported* ESRI ArcGIS 10 SP2 Spatial Analyst extension required with flood model *Hazus-MH installation will allow user to install Hazus-MH on other operating systems/service packs, but Hazus-MH is not certified to work as well with those operating systems/service packs.

FIGURE 1: HARDWARE AND SOFTWARE REQUIREMENTS FOR HAZUS-MH

ArcGIS can be purchased by contacting Esri, Incorporated at 1-800-447-9778, or online at <http://www.esri.com>. ArcGIS and Windows products should be installed using the manufacturer’s instructions.

Internet access is highly recommended, although not a system and software requirement. The Hazus operator may occasionally need to access online digital elevation models, technical support, software patches, and current program status reports.

For technical support regarding the installation of Hazus-MH, please contact the Hazus Help Desk at <https://support.hazus.us> or call **1-877-FEMA MAP (1-877-336-2627)**.

UPGRADING FROM HAZUS-MH 2.0 TO HAZUS-MH 2.1

Study regions created in a previous version of Hazus-MH (Hazus-MH 2.0) cannot be used in Hazus-MH 2.1. If you want to re-use study regions from Hazus-MH 2.0, do the following:

- 1) Export those regions from Hazus-MH 2.0.
- 2) Un-install Hazus-MH 2.0.
- 3) Optional: Archive or rename the Inventory folder from Hazus-MH 2.0.
- 4) Install Hazus-MH 2.1.
- 5) Import the previously exported regions in Hazus-MH 2.1. The import routine will take care of making the needed conversion from the 2.0 to the 2.1.

6) Select imported regions and re-run the analysis modules.

Note: Since there were significant changes in the Ground Motion analysis of the Earthquake Module, the Import routine does not import the hazard scenario definitions from 2.0 into 2.1. Prior to step 6 above, the scenarios need to be re-created with the Hazard Wizard.

INSTALLATION

Before installing Hazus-MH, the minimum requirements listed in Figure 1 above should be met. If you are upgrading from Hazus-MH 2.0, read the section before this one titled “Upgrading from Hazus-MH 2.0 to Hazus-MH 2.1.”

To install Hazus-MH, follow the steps outlined below.

1. Start Windows and log in with an account with full Administrator privileges.
2. Confirm that the user account that is running the setup (in addition to having admin rights) has the following Local Security Policy rights. Check with your Network Administrator on how to verify/access the Local Security Policy interface.

Local Policy Object Display Name	User Right
Debug Programs	SeDebugPrivilege
Manage auditing and security log	SeSecurityPrivilege

For Windows 7, select Start and type secpol.msc /s in the *search programs and files* box. Figure 2 below highlights the *Debug Programs* policy.

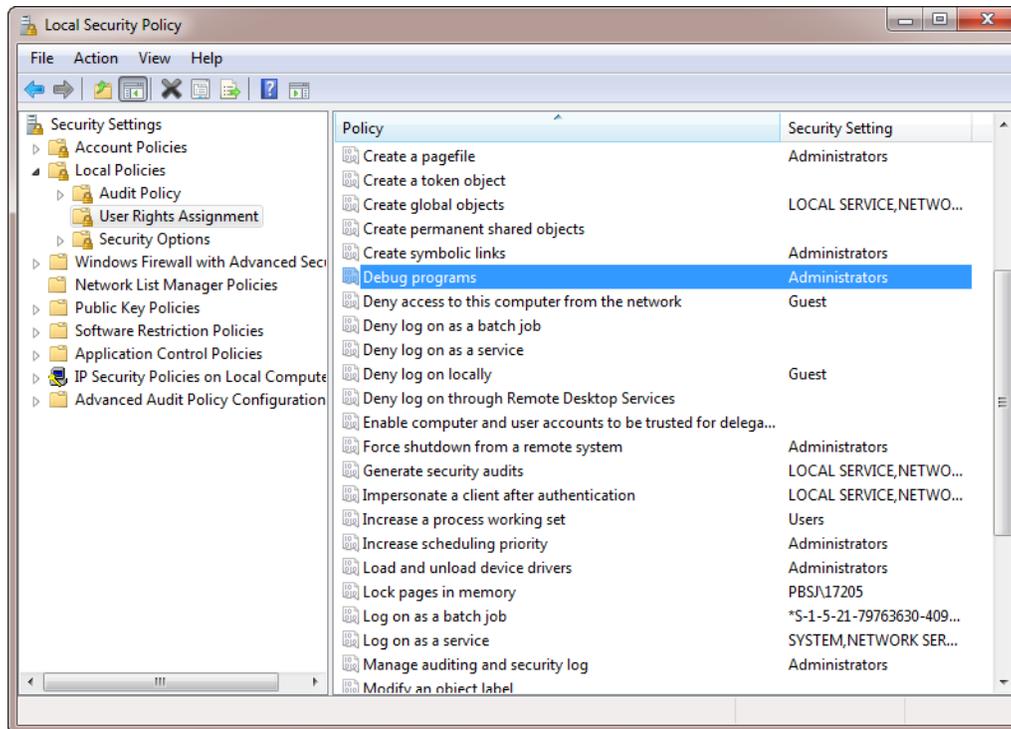


FIGURE 2: LOCAL SECURITY POLICY TOOL

3. Insert “**Hazus-MH Application DVD**” in your **DVD-ROM drive**.

4. Launch Windows Explorer (if not already running), and navigate to the DVD-DROM drive (d:\ for example).
5. For Windows XP, double-click **setup.exe** to start the installation. For Windows 7, right-click **setup.exe** and select **Run as administrator**. If Windows 7 UAC (User Access Control) is not lowered, you will be prompted to allow an 'Unknown Publisher' to make changes to the computer, select **Yes**.

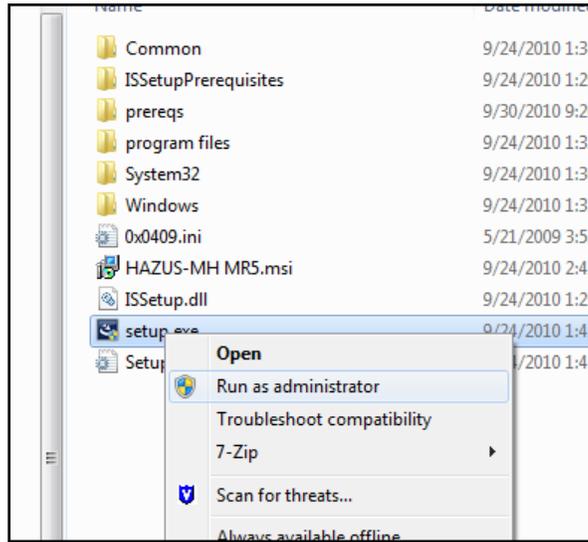


FIGURE 3: LAUNCHING HAZUS-MH SETUP UNDER WINDOWS 7

6. Initially, the setup will install an instance of the Hazus-MH database (SQL Server Express 2008 R2). Next the requirements screen (figure 1 above) will be shown and then the setup program startup screen (as shown below) will appear. Click on the **Next** button.



FIGURE 4: STARTUP SCREEN OF THE HAZUS-MH INSTALLATION PROGRAM

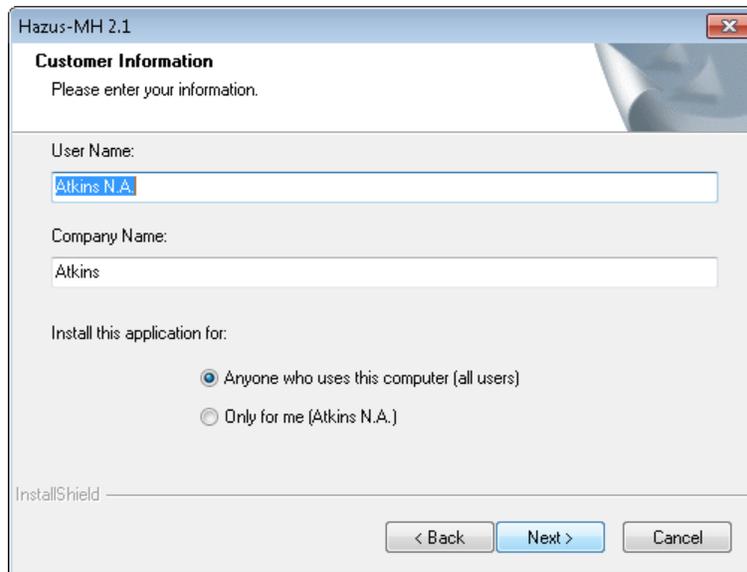


FIGURE 5: REGISTER USER NAME AND PROGRAM PERMISSIONS

7. Permit program access to anyone who uses the computer or exclude others from accessing Hazus-MH program and data. Enter your User Name and Company (or Agency) information. Select the appropriate installation choice for your needs. Then, click on the **Next** button.
8. Select the preferred type of installation shown in Figures 6 and 7. Install the complete set of Hazus-MH modules (3 hazard modules, CDMS and FIT tools), the compact set (3 hazards, no tools), or select to customize your installation from one or more hazard and tool modules. Click on the **Next** button.

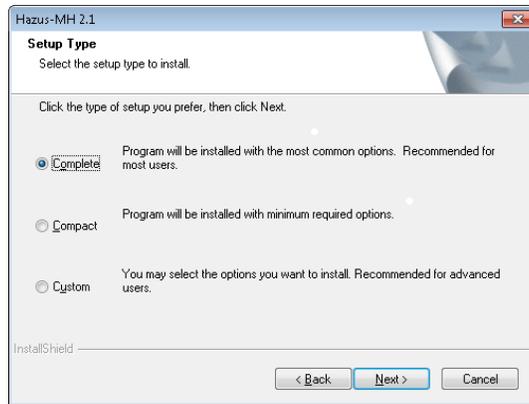


FIGURE 6: COMPLETE INSTALLATION

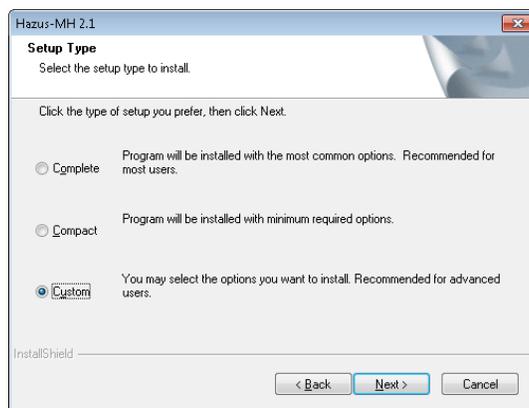


FIGURE 7: CUSTOM INSTALLATION

- Specify the directory where you wish Hazus-MH to be installed. The default directory is **C:\Program Files\Hazus-MH** as shown in Figure 8. If you accept the default destination directory, click on the **Next** button.

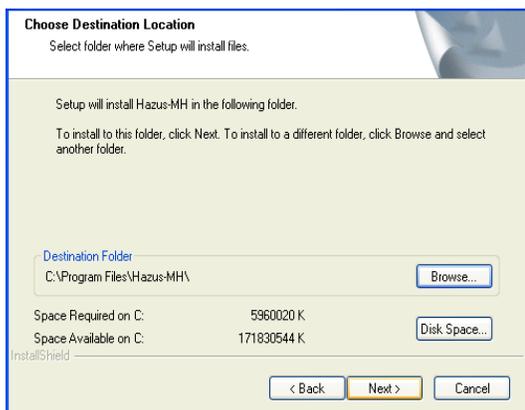


FIGURE 8: SPECIFY THE PATH OF THE HAZUS PROGRAM DIRECTORY

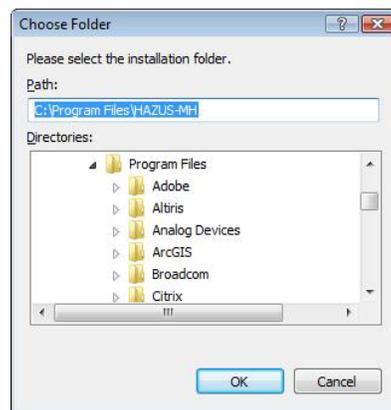


FIGURE 9: SPECIFY THE PATH OF THE HAZUS DIRECTORY INTERACTIVELY

Otherwise click on the **Browse** button and interactively choose a directory. The window will appear as shown Figure 9.

You can select or type-in a new directory path and click on **OK**. You will be returned to the original “Select Installation Directory” window and the directory that you have selected will appear in the middle of the window. Click the **Next** button.

10. Folders will be created for the data files associated with your study regions. Specify the primary destination directory where you prefer the Hazus-MH region subfolders to be created. The default directory is **C:\HazusData\Regions**. If you accept the default destination directory, click on the **Next** button. Otherwise, click on the Browse button and interactively choose a directory.



FIGURE 10: DEFAULT DIRECTORY FOR STUDY REGION FILES

11. When creating new study regions, Hazus-MH expects the default inventory data to reside under the *Data Path* which is by default **C:\HazusData\Inventory** folder. Accept the default location or override as needed by clicking the **Browse** button. Click **Next** to continue.

NOTE: The “Choose Data Path” dialog only specifies the folder where the state inventory data will be copied by the user from the DVD after installation has completed. This dialog doesn’t copy the data from the DVD to the specified folder; that has to be done manually by the user after installation. See the ‘Using the Inventory Data’ section below for more details.

IMPORTANT: Remember the folder specified here since it will be needed later on for copying the default inventory data.

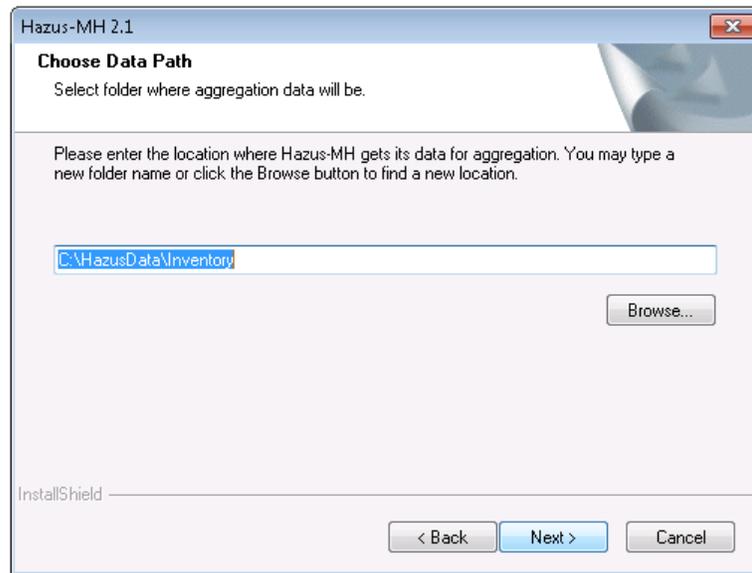


FIGURE 11: DEFAULT DIRECTORY FOR INVENTORY DATA

12. If a custom installation was chosen, the next screen will offer a choice of program modules. One or more hazard modules must be selected (see Figure 12).

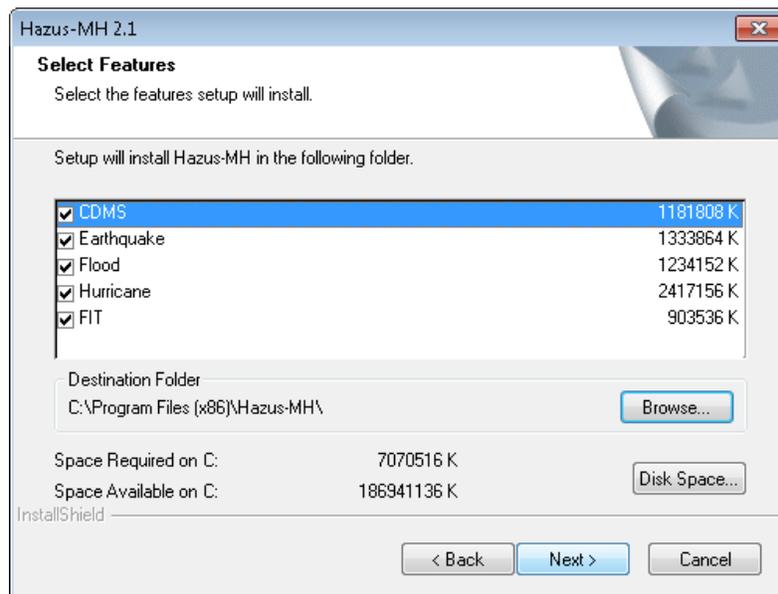


FIGURE 12: SELECT EACH HAZARD MODULE AND TOOLS TO INSTALL

13. Your next screen will show the installation options you selected and the directory paths you designated for the program, region data files, and data path.

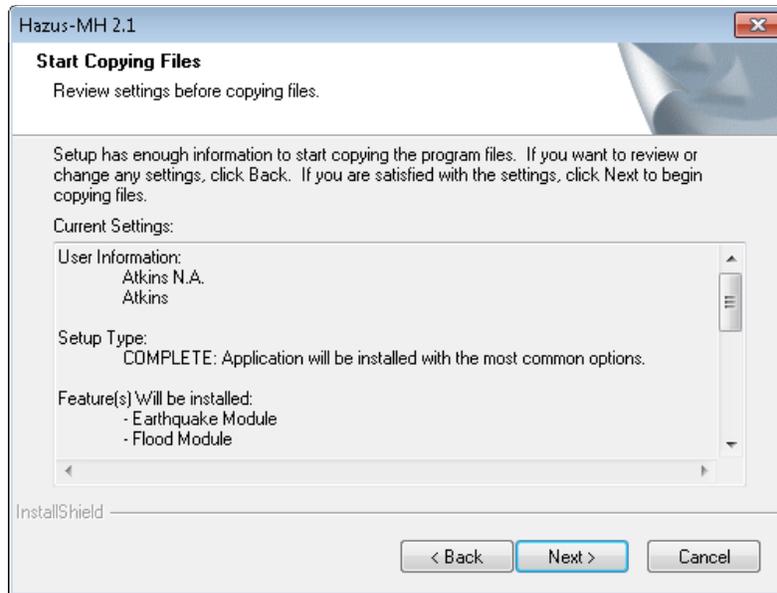


FIGURE 13: COMPLETE INSTALLATION SETTINGS

Review the installation settings. Click on the **Back** button to go back to any of the previous windows and change the previous selections. If you are satisfied with your selection, click the **Next** button.

14. It will take several minutes for the program to install. When the installation is complete, the dialog box in Figure 14 will appear and a Hazus-MH shortcut will automatically be created on your desktop. Click **Finish** to return to Windows. It is recommended that you restart your machine if Windows does not force an automatic reboot.

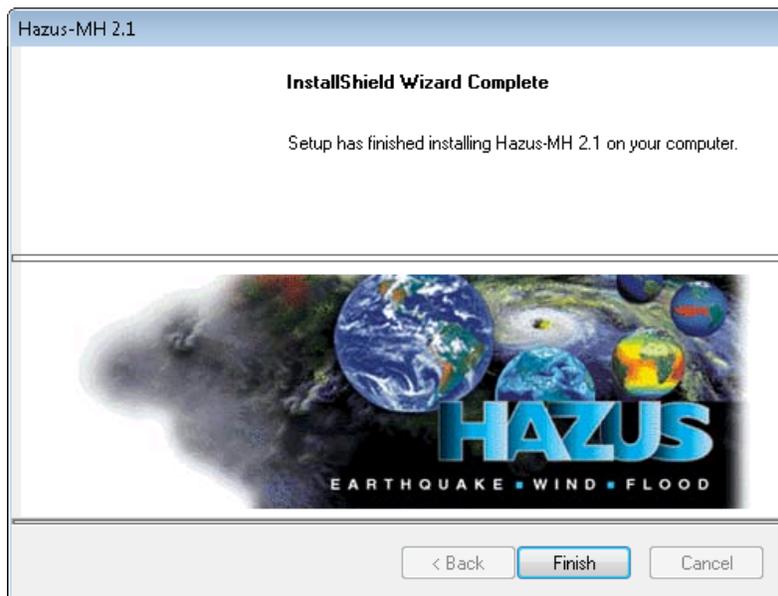


FIGURE 14: DIALOG BOX INDICATING SUCCESSFUL HAZUS-MH INSTALLATION

USING THE INVENTORY DATA

The “Data Inventory” DVD that ships with Hazus-MH contains the default inventory data for the entire U.S. The data is compressed as one file per state. Each file is a self-extracting archive and named simply with the corresponding state code (data for California is in CA.exe, GA.exe for Georgia, and so on).

To make the default inventory data accessible to Hazus-MH (in order to create new study regions), do the following:

- Navigate to the compressed state data file on your DVD.
- Select the file (CA.exe for example) and double-click to uncompress it
- When prompted for the ‘Extract to’ folder, enter the path to the *Hazus-MH Data Path* folder. The Data Path was specified during setup (see Figure 11 above). By default, this folder is **C:\HazusData\Inventory**.

If creating a study region within the state of interest generates errors, then confirm that the steps above were performed correctly.

STARTING THE PROGRAM

The installation program creates a Hazus-MH icon/shortcut on the computer’s desktop. To start the program, double click on the Hazus-MH icon, shown in Figure 15.



FIGURE 15: HAZUS-MH ICON

In order to enter inventory or run an analysis, you must first create a study region. Creating a study region is discussed in Section 3.1 of the Earthquake User’s Manual.

PROGRAM BASICS

Hazus-MH is an ArcGIS-based program with a standard Windows interface that provides a familiar working environment. Hazus-MH resides on top of ArcMap. The only ArcMap function that has been disabled is table loading. Buttons are added to the ArcMap menu bar to perform hazard risk analysis and loss modeling functions (Figure 16).

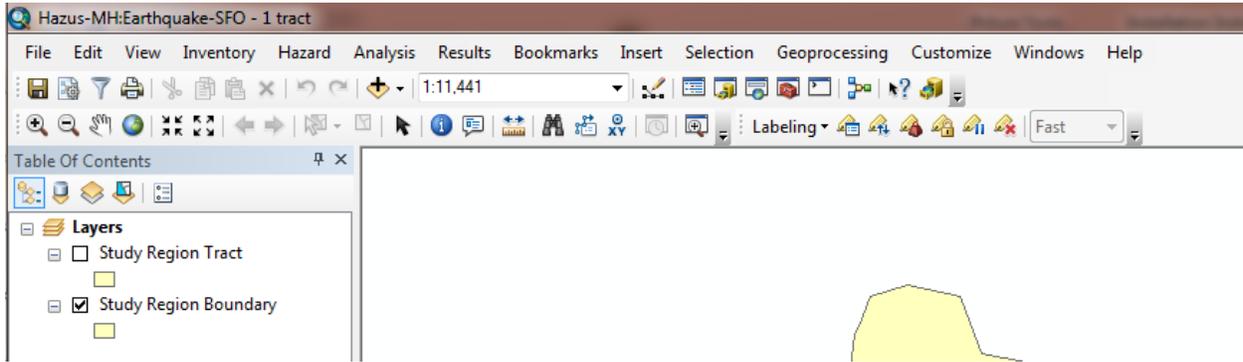


FIGURE 16: HAZUS_MH MENU BAR ADDS FUNCTIONS TO ARCMAP

MENU BAR

The user interface is comprised of a menu bar, tool bar, and various screens and windows. These elements follow standard Windows conventions and allow you to manipulate and analyze data within Hazus-MH. This section briefly describes some of the features.

Functional menus appear alongside the general ArcMap menus: Inventory (Figure 17), Hazard (Figure 18), Analysis (Figure 19), and Results (Figure 20). The menus marked with a (*) are described in Table 1 below are the menus added by Hazus-MH to the ArcMap menu.

TABLE 1: HAZUS MENU ITEMS

File	Execute standard software actions such as open table, save and print.
Edit	Edit text and features including cut, copy, and paste.
View	View data and map display. Zoom in or out. Show the geodatabase Table of Contents.
Inventory*	View the inventory and add, edit, delete and copy inventory information.
Hazard*	Select hazard maps and the scenario event you wish to work with.
Analysis*	Run an analysis and modify the analysis parameters.
Results*	View and map analysis results.
Insert	Customize the layout view.

Selection	Locate multiple inventory items based on criteria you provide, and search for specific record information.
Tools	Basic GIS utilities menu.
Help	Information where Hazus-MH users can receive support online and via telephone. Additionally ArcGIS help files are available

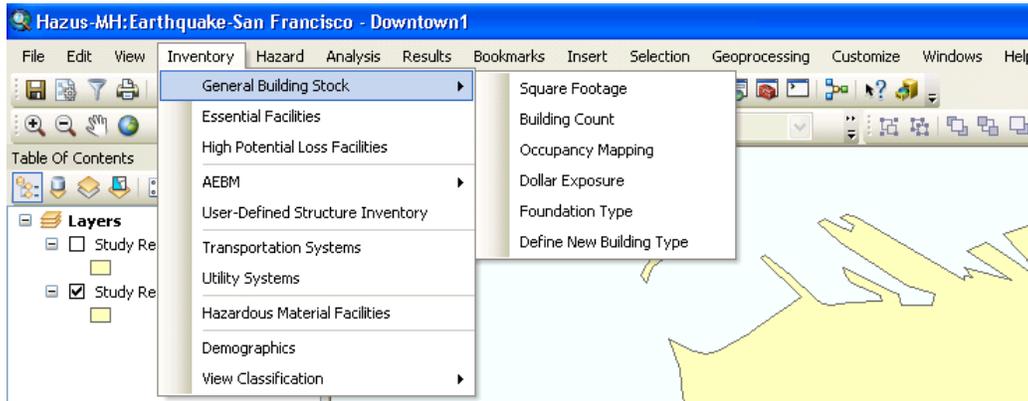


FIGURE 17: HAZUS-MH INVENTORY MENU



FIGURE 18: HAZUS-MH HAZARD MENU

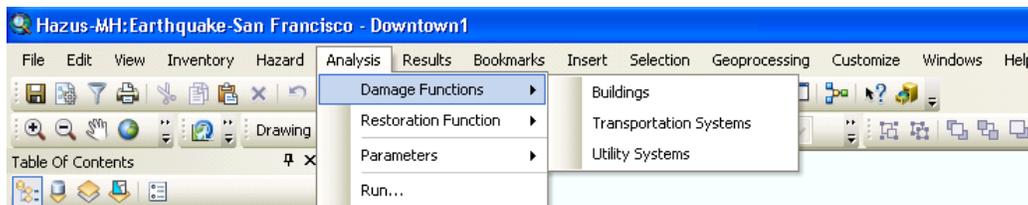


FIGURE 19: HAZUS-MH ANALYSIS MENU

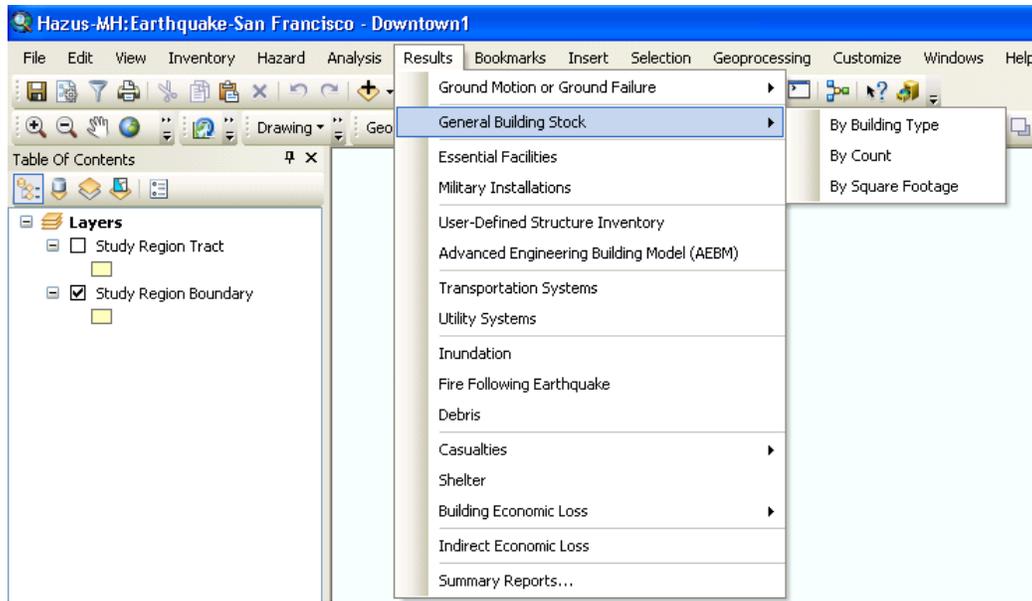


FIGURE 20: HAZUS-MH RESULTS MENU

UNINSTALLING THE PROGRAM FOR WINDOWS XP

To uninstall Hazus-MH, in Windows XP, launch Control Panel from **Start |Settings| Control Panel** as shown in Figure 21.



FIGURE 21: OPEN THE CONTROL PANEL

From the Control Panel window, double click on **Add/Remove Programs** as shown in Figure 22.

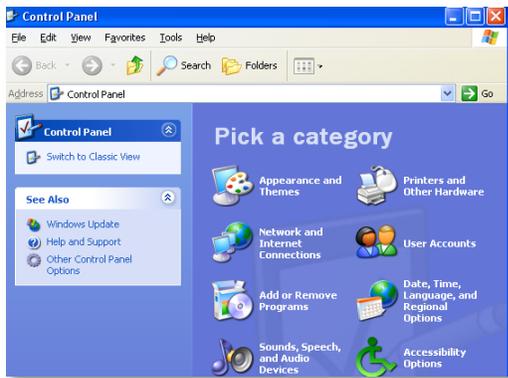


FIGURE 22: SELECT ADD/REMOVE PROGRAMS

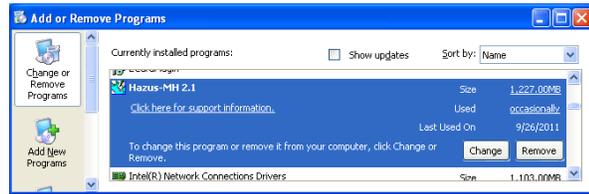


FIGURE 23: UNINSTALL HAZUS-MH

You will be prompted with an “Add/Remove Programs” window as shown in Figure 22 . Highlight Hazus-MH and double click on the **Change** or **Remove** button. The install wizard will start and provide you with three uninstall options shown in Figure 24: Modify your previous installation (ex. Add tools), Repair (reinstall) program components, or Remove all of the previously installed Hazus-MH files.

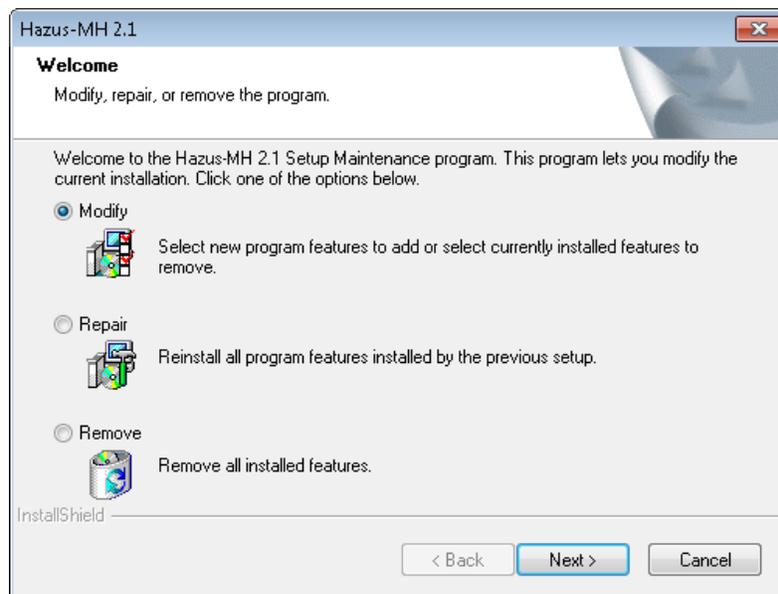


FIGURE 24: MODIFY, REPAIR, OR REMOVE HAZUS-MH

To uninstall Hazus-MH, select the ‘Remove’ option and click **Next** to proceed. Click **OK** when prompted if you are sure you want to remove the program.

UNINSTALLING THE PROGRAM FOR WINDOWS 7

To uninstall Hazus-MH, in Windows 7, select **Start|Control Panel** and select **Uninstall a program**.

Note: The un-installation option requires full-administrative privileges to the computer.

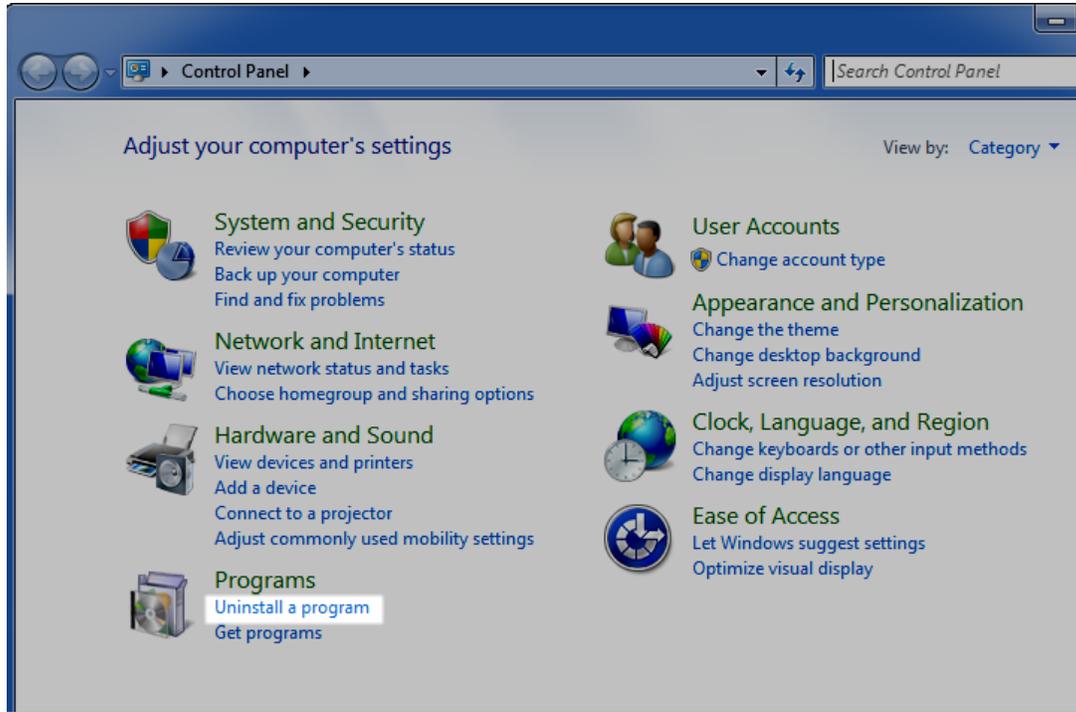


FIGURE 25: CONTROL PANEL FOR WINDOWS 7

Select Hazus-MH and right-click (Figure 26). Select the **Uninstall** option from the pop-up menu, and then select 'Remove' from the next dialog (below in Figure 27).

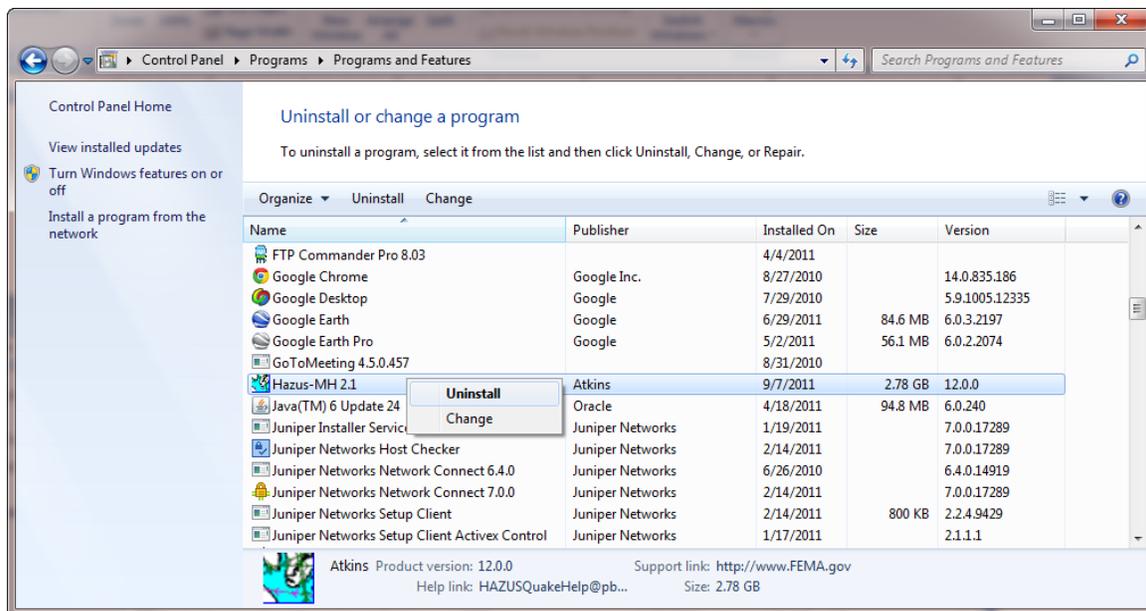


FIGURE 26: UNINSTALL SCREEN FOR WINDOWS 7

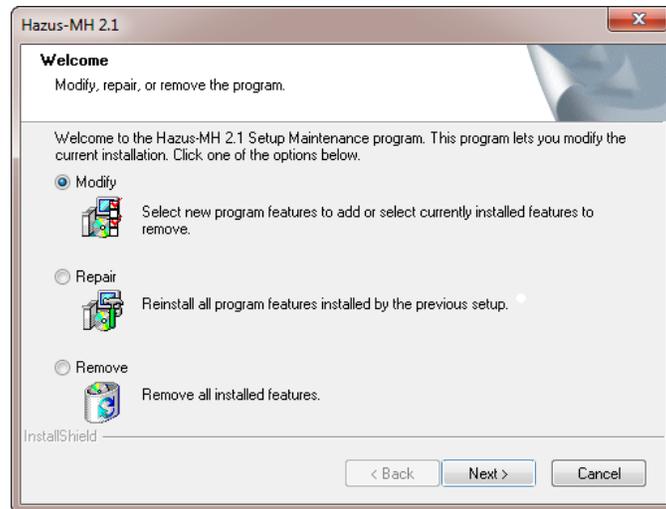


FIGURE 27: MODIFY, REPAIR, OR REMOVE HAZUS-MH

To make partial changes to the modules/features of the original installation (either install additional features that were not installed initially, or remove features that were installed initially but are not needed anymore), select the Change option and select the Modify option.

FREEING MEMORY USING SQL SERVER MANAGER

SQL Server can often lock memory as a working set. Because memory is locked, Hazus-MH or other applications might receive out of memory errors or run slower. To work around this problem, restart the SQL Server service by following *one* of the steps below:

1. Restart your computer by clicking **Start**, and then click **Shut Down**. In the “**What do you want the computer to do?**” list, click **Restart**. NOTE: Restarting will close all open applications, so be sure to save your work before choosing to restart.
2. Restart SQL Server using the SQL Service Manager. Use the following process to open SQL Server Service Manager (SQL SSM) and restart the service:
 - a. Close Hazus-MH, if it is running.
 - b. Open a Command window (**Start | Run | cmd**).
 - c. Type NET STOP MSSQL\$HAZUSPLUSRVR and hit Enter. You should see a message about the service stopped successfully.
 - d. Type NET START MSSQL\$HAZUSPLUSRVR and hit Enter. You should see a message about the service started successfully.
 - e. Close the Command window by typing Exit.

LIMITATIONS

SQL Server Limitations

The database management system of Hazus-MH 2.1 is SQL 2008 Express R2. This system has a size limit of 8 GB per database; which limits the size of the region that can be created to about 6,000 census tracts, equivalent to an area with a population of about 18 million. For a multi-hazard study region that includes data for all three hazards, the 8 GB limit will permit an even smaller study region. To work around this, the full version of Microsoft SQL Server 2008 R2 must be used (see "Running Hazus-MH with SQL Server 2008 R2" appendix in the user manuals). To work-around the 8 GB database limit, there are 2 possible solutions:

1. If running an Earthquake-only region, the *Large Region* option (new in Hazus-MH 2.1) option can be used. Refer to Appendix O of the Earthquake User's Manual for details.
2. If running a Flood and/or Hurricane region, the full version of Microsoft SQL Server 2008 R2 must be used. Refer to Running Hazus-MH with SQL Server 2008 R2 appendix in the User's Manual for details on how to configure Hazus-MH to use a full version of SQL Server.
3. See instructions below on how to change the size of the allocated virtual memory.

To maximize the size of the study region that may be analyzed, set the virtual memory size from a minimum of 2048 MB to a maximum of 4096 MB. For the earthquake model, the virtual memory size may be increased from a minimum of 1024 MB to a maximum of 2048 MB for optimal operation.

Here are the steps for setting the virtual memory size for Windows XP. To adjust the virtual memory size settings in Windows XP:

1. Click on **Start | Settings | Control Panel | System**
2. Click on the **Advanced** tab
3. Click on the **Settings** button under the Performance group
4. Click the **Advanced** tab
5. Click on the **Change** button under Virtual Memory
6. Replace the initial and maximum values
7. Click **Set** then **OK** three times to exit to the main screen.

For Windows 7, it is recommended to leave the setting 'Automatically manage paging size file for all drive' as is. To view/edit the settings, do the following:

1. Click on **Start** and right-click **My Computer** and select **Properties**
2. Click **Advanced System Settings** (on the left panel bar)
3. Click **Settings** under "Performance"
4. Click the **Advanced** tab
5. Click **Change...** button under "Virtual memory"
6. Uncheck the "Automatically manage paging file size for all drives"
7. Select "Custom size" option and replace the initial and maximum values
8. Click **Set** then **OK** four times to exit to the main screen. Windows 7 needs to reboot for the changes to take effect.

Region Size	Min Virtual Memory (Scenario other than AAL)	Min Virtual Memory (AAL Scenario - EQ Only)
150 Tracts	328 MB	512MB
500 Tracts	512MB	848MB
2000 Tracts	1024MB	2048MB

General Limitations

- Transferring data, including importing study regions, from HAZUS99, HAZUS-MH and HAZUS-MH MR1 to HAZUS-MH MR5 to Hazus-MH 2.1 will require the assistance of technical support.
- Inventory data and subsequently the Level 1 analysis functionality are unavailable for the US held territories, but are available for Puerto Rico.
- Components of independently developed data sets in the default inventory data might not line up on maps, for example, the placement of bridges and roads, and facilities. This situation can be addressed by updating the default inventory data with user supplied data.

Earthquake Limitations

- Rapid loss estimates for large study regions of 1000-2000 census tracts might require 0.5 to 1.5 hours analysis time.

Flood Limitations

- Due to the lack of default riverine data, users in the State of Hawaii (except Honolulu County/Oahu Island) will be unable to perform hydrologic analyses. These users may still compute the riverine flood hazard; however, the specific return period and suite of return period's options will be unavailable. Instead, specific discharge should be input.
- When running the hydrology analysis the recommended limitation is 125-reaches to ensure completion.
- Performing General Building Stock analysis may require 20 to 80 minutes analysis time, depending on the size of the scenario.
- The flood date (**Analysis | Parameters | Agricultural**) needs to be set before running the agricultural analysis (**Analysis | Run | Agricultural Products**). Failure to do so will result in a message during analysis that will require inputting the flood date before the selected analyses can be completed.
- The coastal What Ifs, Long-term Erosion and Shore Protection features are disabled.
- When analyzing certain study regions, Hazus-MH can run out of memory and fail during coastal floodplain delineation due to the complexity of the region and event. Examples include, but are not limited to, St. Bernard Parish, LA and Miami-Dade County, FL. If an error like this is encountered, a recommended workaround is to divide the region into smaller

geographies such as a census tract.

Hurricane Limitations

- The Hurricane Model can be run only for 22 states on the Gulf and Atlantic coasts and for the state of Hawaii.
- Probabilistic loss estimates for large study regions of 2,000 census tracts or blocks may require up to 2 hours of analysis time.
- Coastal surge can be analyzed for a single event hurricane scenario, but it cannot be run for a probabilistic hurricane hazard.

WHAT'S NEW IN HAZUS-MH 2.1

- Hazus-MH 2.1 is now compatible with Windows 7 (32 and 64 bit) Service Pack 1, and Windows XP Service Pack 3.
- Hazus-MH 2.1 is now compatible with ArcGIS 10.0 Service Pack 2. Hazus-MH 2.1 runs also under Service Pack 3 but is not 100% certified.
- The underlying database engine has been upgraded to SQL Server Express 2008 R2.
- Menu options in the user interface of the three modules in Hazus-MH (Earthquake, Flood & Hurricane) have been adjusted to provide greater consistency.
- IMPLAN default data is no longer provided with Hazus-MH. Users should supply their own data for Indirect Economic Analyses.
- New damage and loss of use functions have been developed for hospitals, schools, and fire stations in the Essential Facilities portion of the Hurricane Module.
- The windfields for several category 4 and 5 historical storms have been re-analyzed and updated in the Hurricane Module.
- In recognition of the uncertainties inherent in hurricane forecasts, the Coastal Surge analysis capability has been disabled for forecast/advisories issued more than 24 hours before the expected time of landfall.
- The Flood Module Average Annualized Loss (AAL) analysis has been reactivated with the following changes:
 - The 2 and 5 year return period extrapolations have been removed from the methodology.
 - The 200 year return period has been replaced by a 25 year return period in the methodology.

Refer to the Hazus –MH 2.1 Flood Technical Manual for complete details on the Flood AAL methodology.

- A riverine level 1 study region automation feature has been added to the Flood Module.
- The Flood Module is now processing Manning's roughness coefficients dynamically based on a LULC grid as part of the Develop Stream Network process.
- The Flood Module Hydraulics process has been optimized for scenarios where a suite of return periods is being analyzed.
- Occupancy Mapping Schemes have been updated for the Earthquake Module.
- The Earthquake Ground Motion Module has been updated to use the latest USGS Next Generation Attenuation (NGA) functions.
- A feature to analyze large study regions (greater than the 8 GB limit of SQL Server Express) has been added to the Earthquake Module.