

Risk MAP CDS

Hazus Tools and Data

User Release Notes

Version 1.0

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Document Management History

Revision History

Version Number	Date	Summary of Changes	Team/Author
0.1	11/20/2019	Draft version	Risk MAP CDS

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1. Introduction

The Hazus Team is excited to provide new open source risk assessment tools and updated inventory datasets for the public. Our latest projects, described below, are aimed at leveraging best available public data, open source technology, and transparent methodology in order to increase the accessibility of data-driven risk reduction in communities across the U.S.

Open Source Tools

- Hazus Flood Assessment Structure Tool (FAST) – rapidly analyzes structure-specific flood losses using open source Python – no mapping or coding skills required! More information [here](#).
- Hazus Export Tool – extracts and summarizes Hazus risk assessment results in a handful of spreadsheets, shapefiles, and a visual report using open source Python. More information [here](#).

State Database Updates

- U.S. Territories – inventory data updates enable flood, tsunami and earthquake risk assessments in Puerto Rico and the U.S. Virgin Islands.
- Nationwide Infrastructure – a Hazus Program partnership with the Homeland Infrastructure Foundation Level Data (HIFLD) Program provides consistently updated infrastructure layers across the U.S. Check out these data updates [here](#).

2. Contents of the Release

State Database Updates – Infrastructure

Infrastructure – in partnership with the Homeland Infrastructure Foundation Level Data (HIFLD) Open program

Updated Hazus essential facilities, transportation and utilities infrastructure data are incorporated into Hazus state databases, which contain all necessary inventory data for Hazus risk assessments. Download the new and updated Hazus State Database(s)

from the Map Service Center (MSC) <https://msc.fema.gov/portal/resources/hazus>, extract in the Hazus Data folder, and aggregate a new study region.

If a user has previously downloaded Hazus data to their computer, the user you will need to follow the instructions below to replace older databases:

1. Download updated Hazus state databases
 2. Close Hazus and any SQL programs
 3. Navigate to the folder where Hazus databases are stored – generally “HazusData/Inventory” on the user’s C: drive
 4. Delete the file <state_name>_log.ldf
 5. Extract the newly downloaded state database into the folder where <state_name>_log.ldf was stored
 6. When asked to overwrite the previous <state_name>.mdf with the new one, click yes.
- Hazus State Databases have been updated using the latest version available at the time of this release of Homeland Infrastructure Foundation-Level Data (HIFLD) Open Essential Facility (<https://hifld-geoplatform.opendata.arcgis.com/>) datasets for care facilities, emergency operation centers, police stations, fire stations, and schools.
 - All State databases were updated except for American Samoa, Florida, Guam, Hawaii, Northern Marianas Islands, and Virgin Islands due to data gaps in HIFLD data for some of the Territories and previous enhancements provided by users in Florida and Hawaii.
 - Hazus attributes were dynamically calculated using Python scripts to enable frequent future updates. Detailed documentation can be obtained from hazus-outreach@riskmapcdis.com.
 - New HIFLD feature classes were added for each facility type incorporating both the HIFLD attributes and calculated Hazus attributes which can be useful for UDF modelling and other assessments.

A summary of the HIFLD Open data used to update the Hazus default State Data are provided in the tables below:

Element	Legacy Source	Valuation Approach	Target States	
Highway Bridge	National Bridge Inventory (2001) 441,041 records	New square-footage cost table provided by Caltrans and are added to Hazus Comprehensive Data Management System (CDMS) and adjusted for other States relative to California based on RS Mean State non-residential factors.	All States, including Alaska, District of Columbia, Hawaii, and Puerto Rico	National Bridge Inventory (2018) 616,096 records: https://hifld-geoplatform.opendata.arcgis.com/datasets/national-bridge-inventory-nbi-bridges Significant improvement, more recent, better valuations, more comprehensive. Reconstruction date is used to reclassify bridges to seismic (less vulnerable) classes. Better classification using National Bridge Inventory attributes, in California Class types were directly provided by Caltrans (2019) and provided as a new table in CDMS. Deficient and functionally obsolete bridges based on NBI are now described in the Comments field. Bridges in water bodies between Tracts are now preserved and available for analysis.
Highway Tunnel	National Bridge Inventory (2001)	Escalated legacy 2003 costs to 2019 using CPI to \$18.6K per foot (\$60.9 per meter) and adjusted by State RS Means factors.	All States, including Alaska, District of Columbia, Hawaii, and Puerto Rico	Road Tunnels (2019) 745 records: https://hifld-geoplatform.opendata.arcgis.com/datasets/road-tunnels poly line data to convert to points. Improves valuations by calculating length, not a significant increase in coverage, locations are enhanced since points fall on line HIFLD line segments.

Element	Legacy Source	Valuation Approach	Target States	New HIFLD Open Source
Railway Segment	National Rail Network Database (2000)	Use Table 3.22 Flood Tech Manual per km costs as \$1,500K. Did not escalate to 2019 since there is uncertainty in base year and conversion issues in the legacy data. Adjusted by State RS Means factors.	All States, including Alaska, District of Columbia, Hawaii, and Puerto Rico	Railroads (2019) 302,118 records: https://hifld-geoplatform.opendata.arcgis.com/datasets/railroads Newer more complete data. Valuations improve based on length and State adjustments.
Railway Bridge	National Bridge Inventory (2001)	Use Flood Technical Manual Table 3.22 of \$5M. Chose not to escalate to 2019 since the value is already well above the G&E 1994 report recommendation and with the new dataset, a large range of bridges, including more minor structures are included.	All States, including Alaska, District of Columbia, and Puerto Rico, not including Hawaii	Railroad Bridges (2018) 86,894 records: https://hifld-geoplatform.opendata.arcgis.com/datasets/railroad-bridges Significant improvement in coverage. Will include rail bridges not related to highways. No size or class related fields, cost is default.
Light Rail Segment	Fixed Guideway Transit and Ferry Network database (2007)	Use Table 3.22 Flood Tech Manual per km costs as \$1,500K. Did not escalate to 2019 since there is uncertainty in base year and conversion issues in the legacy data. Adjusted by State RS Means factors.	All states and District of Columbia, not including Alaska, Hawaii, or Puerto Rico	Fixed Guideway Transit Links (2,571): https://hifld-geoplatform.opendata.arcgis.com/datasets/fixed-guideway-transit-links Improvements to valuations, not significant increase in numbers of segments.

Element	Legacy Source	Valuation Approach	Target States	
Light Rail Facility	Bureau of Transportation Statistics (2007)	Escalate Table 3.23 Flood Tech Manual default of \$2,600K to 2019 CPI of \$3,200K, and adjust by RS Means State factors.	All states and District of Columbia, not including Alaska, Hawaii, or Puerto Rico	Fixed Guideway Transit Stations: https://hifld-geoplatom.opendata.arcgis.com/datasets/fixed-guideway-transit-stations Improvements to valuations, not a significant increase in numbers of facilities.
Bus	InfoUSA (2001)	Escalate original \$1M Table 3.24 of the Flood Technical manual (1997) to 2019 \$1.6M per facility and apply the State RS Means factors.	All states, including Alaska, District of Columbia, and Hawaii, not including Puerto Rico	Intermodal Passenger Connectivity Database (IPCD) (2019) https://hifld-geoplatom.opendata.arcgis.com/datasets/intermodal-passenger-connectivity-database-ipcd/data where facility type = 2. Fairly significant improvement in coverage and location, represents intermodal bus stations, not just major bus companies.
Port	U.S. Army Corps of Engineers Ports Database (2007)	Escalated to 2019 to \$3,160K and adjusted by State RS Means nonresidential ratios	All states, including Alaska, Hawaii and Puerto Rico	Port Facilities: https://hifld-geoplatom.opendata.arcgis.com/datasets/port-facilities almost 3x more. Did not see increase in Los Angeles County.

Element	Legacy Source	Valuation Approach	Target States	New HIFLD Open Source
Airport Facility	National Transportation Atlas Database (2007)	Large passenger airports area proxy is based on annual passenger volume and COM4 replacement value. Other urban facilities use larger default from manual (\$12,600K 2019), while rural facilities will use default for hangar and lighter facilities (\$5,000K 2019).	All states and territories. Will use new FEMA deliverable for U.S. Virgin Islands	Aircraft Landing Facility: https://hifld-geoplatform.opendata.arcgis.com/datasets/aircraft-landing-facilities/data Current issues with legacy valuations, new approach developed and implemented provide reasonable base cost estimations.
Airport Runway	National Transportation Atlas Database (2007)	Length and width values provided by HIFLD Open for area and \$95 sqft with nonresidential state ratios.	All states and territories, including U.S. Virgin Islands	Airport Runway: https://hifld-geoplatform.opendata.arcgis.com/datasets/runways Current issues with legacy valuations, new approach developed and implemented provide reasonable base cost estimations.

HIFLD Update Notes:

- *Since Hazus loads the National HIFLD data into State Databases, any differences between State abbreviation and spatial location results in a limited number of dropped records from the HIFLD datasets.*
- *Multiple facilities may occur at the same building site for all essential facility types, such as when Elementary, Middle, and High Schools or Police Precincts share the same building. **This can result in overestimating exposure and losses.***

U.S. Territories

Building counts, values, and square footages were aggregated for every census block and tract in Puerto Rico and the U.S. Virgin Islands (USVI) using best available footprint data and expert methods for estimating risk-related building attributes. Inventory data updates enable flood, tsunami, and earthquake risk assessments for Puerto Rico and USVI. Hurricane-related building data

will be developed for these U.S. Territories in 2020. These updates will significantly increase the accuracy of loss modeling results for Puerto Rico (PR) and USVI. All updates were made using only publicly available data sources.

- General Building Stock counts, area and valuations based on footprints with height data (Puerto Rico) and tax assessor information (USVI)
- Building valuations are now based on 2018 RS Means.
- Infrastructure data for layers listed below, including valuations, building types and design levels updated using local best available data (USVI) and HIFLD Open (PR).
 - Schools, Police Stations, Hospitals, Fire Stations, Emergency Operations Centers
 - Military, Port, and Airport Facilities
 - Utility Systems
- New Hazus program data enable coastal flood modeling for Puerto Rico and USVI (available by contacting the Hazus Team at hazus-support@riskmapcds.com)
- USVI: Depth-damage function data added using a combination of U.S. Army Corps of Engineers and FEMA program data
- Puerto Rico: Large building areas assigned to Single Family Homes or Mobile Homes (>5K and 2K sqft, respectively) were reassigned to appropriate multifamily categories based on area.

Hazus Flood Assessment Structure Tool (FAST)

The Hazus Program designed FAST to make flood risk assessments in the U.S. quicker, simpler, and more cost effective. FAST provides planners, analysts and policymakers with a free and user-friendly tool to characterize flood risk in their communities using completely open methods and technology. FAST will help drive strategic risk reduction initiatives across the U.S. by making flood risk assessments more accessible.

- [Download FAST](#) tool folder
- Supply a table of structures and a flood depth grid

- Economic losses from flooding are calculated at each structure using Hazus depth damage functions
- No mapping or coding skills required
- Analyzes 10k structures per second!
- Built with open source Python – completely free and open methodology documented in the [Hazus Flood Technical Manual](#)
- Supported in Windows 10 Pro and Enterprise

Hazus Export Tool

The Hazus Program designed the Export tool to make Hazus risk assessment results more sharable and easier to analyze. The Export tool will summarize data from any Hazus study on your computer in a handful of spreadsheets, shapefiles, and a one-page visual report. Use the Export tool to probe risk model results for deeper analysis or send reports to stakeholders for quick and effective risk communication – simpler Hazus exports will help drive effective risk reduction strategies in all areas of emergency management.

- Download tool and access documentation from [GitHub](#)
- Tool will scan your Hazus database for study regions to summarize
- Select study region to summarize from dropdown
- No mapping or coding skills required
- Want to summarize Hazus results generated by someone else? First import their study region into Hazus using this [video tutorial](#).
- Supported in Windows 10 Pro and Enterprise

3. Known Issues

Hazus Open Source tools require certain system dependencies specific to each tool and outlined in each tool's documentation. Users should refer to individual tool documentation to make sure tools can function as designed.

- FAST documentation is available in the FAST download folder.

- Hazus Export tool documentation is available directly on the tool's GitHub page.
- Hazus Export tool issues are reported on GitHub [here](#).
- Additional Hazus program data are required to run coastal flood losses for PR and USVI. Please contact hazus-support@riskmapcds.com to obtain the required data and instructions.
- Hazus Level 1 Riverine Flood analysis cannot be completed for multiple return periods for USVI due to a lack of the regression equations necessary to represent hydrology.

Technical questions? Please reach out to our Support Team at hazus-support@riskmapcds.com.