Appendix Volume II – A - Hazus Reports

FEMA's Hazus MH was used to perform an analysis as part of the Hazard Mitigation Plan development. This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region. The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.





Hazus-MH: Flood Global Risk Report

Region Name:

Monmouth_NJ_082819

Flood Scenario: Monmouth_1per_082819

Print Date:

Wednesday, August 28, 2019

Disclaimer: This version of Hazus utilizes 2010 Census Data. Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.







Table of Contents

Section	Page #	
General Description of the Region	3	
Building Inventory		
General Building Stock	4	
Essential Facility Inventory	5	
Flood Scenario Parameters	6	
Building Damage		
General Building Stock	7	
Essential Facilities Damage	9	
Induced Flood Damage	10	
Debris Generation		
Social Impact	10	
Shelter Requirements		
Economic Loss	12	
Building-Related Losses		
Appendix A: County Listing for the Region	15	
Appendix B: Regional Population and Building Value Data	16	



RiskMAP



General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- New Jersey

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 477 square miles and contains 14,704 census blocks. The region contains over 234 thousand households and has a total population of 630,380 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 226,284 buildings in the region with a total building replacement value (excluding contents) of 106,755 million dollars (2010 dollars). Approximately 90.38% of the buildings (and 79.74% of the building value) are associated with residential housing.







Building Inventory

General Building Stock

Hazus estimates that there are 226,284 buildings in the region which have an aggregate total replacement value of 106,755 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Occupancy	Exposure (\$1000)	Percent of Total		
Residential	85,130,125	79.7%		
Commercial	15,251,203	14.3%		
Industrial	2,852,007	2.7%		
Agricultural	443,888	0.4%		
Religion	1,165,421	1.1%		
Government	480,633	0.5%		
Education	1,431,786	1.3%		
Total	106,755,063	100.0%		

Table 1 Building Exposure by Occupancy Type for the Study Region









Table 2 Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Residential	29,762,987	80.0%
Commercial	4,958,418	13.3%
Industrial	1,113,684	3.0%
Agricultural	162,314	0.4%
Religion	369,566	1.0%
Government	194,412	0.5%
Education	621,660	1.7%
Total	37,183,041	100.0%



Essential Facility Inventory

For essential facilities, there are 136 medical facilities in the region with a total bed capacity of 2,095 beds. There are 575 schools, 128 fire stations, 47 police stations and 1 emergency operation center.







Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Monmouth_NJ_082819
Scenario Name:	Monmouth_1per_082819
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure









Building Damage

General Building Stock Damage

Hazus estimates that about 5,754 buildings will be at least moderately damaged. This is over 66% of the total number of buildings in the scenario. There are an estimated 97 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = \$300K) Overview Map





RiskMAP Increasing Resilience Together



	1-1	0	11-	20	21-	30	31-	40	41-	50	Substar	ntially
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	6	28.57	15	71.43	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2,078	26.58	4,058	51.91	1,107	14.16	340	4.35	137	1.75	97	1.24
Total	2,084		4,073		1,107		340		137		97	

Table 3: Expected Building Damage by Occupancy









Building Type	1-10)	11-20	21-30		31-40		41-50		Substantially		
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	3	10	5	17	5	17	0	0	3	10	13	45
Masonry	62	19	221	68	35	11	6	2	2	1	1	0
Steel	3	33	6	67	0	0	0	0	0	0	0	0
Wood	2,014	27	3,840	51	1,064	14	334	4	132	2	83	1

Table 4: Expected Building Damage by Building Type







Before the flood analyzed in this scenario, the region had 2,095 hospital beds available for use. On the day of the scenario flood event, the model estimates that 2,095 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

	# Facilities				
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use	
Fire Stations	128	9	1	14	
Medical Facilities	136	10	1	11	
Police Stations	47	1	1	2	
Schools	575	16	1	18	

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.







Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.



The model estimates that a total of 194,637 tons of debris will be generated. Of the total amount, Finishes comprises 47% of the total, Structure comprises 32% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 7,785 truckloads (@25 tons/truck) to remove the debris generated by the flood.







Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 17,398 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 41,655 people (out of a total population of 630,380) will seek temporary shelter in public shelters.









Economic Loss

The total economic loss estimated for the flood is 1,962.68 million dollars, which represents 5.28 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 1,954.52 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 70.18% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.



RiskMAP Increasing Resilience Together



Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building La	<u>ISS</u>					
-	Building	901.35	100.57	27.54	14.77	1,044.23
	Content	474.07	287.97	50.95	87.58	900.56
	Inventory	0.00	3.35	5.94	0.45	9.74
	Subtotal	1,375.42	391.89	84.43	102.79	1,954.52
Business Ir	nterruption					
	Income	0.04	1.69	0.00	0.24	1.97
	Relocation	1.53	0.19	0.00	0.09	1.82
	Rental Income	0.30	0.11	0.00	0.00	0.41
	Wage	0.12	1.52	0.00	2.33	3.97
	Subtotal	1.98	3.51	0.01	2.66	8.16
ALL	Total	1,377.40	395.40	84.44	105.45	1,962.68









Appendix A: County Listing for the Region

New Jersey

- Monmouth



Flood Global Risk Report



Page 15 of 16



Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)						
	Population	Residential	Non-Residential	Total				
New Jersey	_							
Monmouth	630,380	85,130,125	21,624,938	106,755,063				
Total	630,380	85,130,125	21,624,938	106,755,063				
Total Study Region	630,380	85,130,125	21,624,938	106,755,063				



