

APPENDIX VOL II - A. HAZUS REPORT

FEMA's Hazus MH was used to perform an analysis as part of the Warren County Hazard Mitigation Plan update. 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: Flood Global Risk Report

Region Name: Warren_County_NJ

Flood Scenario: 1pctFlood

Print Date: Tuesday, August 17, 2021

Disclaimer:

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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 approximately 363 square miles and contains 3,866 census blocks. The region contains over 41 thousand households and has a total population of 108,692 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 41,905 buildings in the region with a total building replacement value (excluding contents) of 17,566 million dollars. Approximately 90.51% of the buildings (and 78.70% of the building value) are associated with residential housing.



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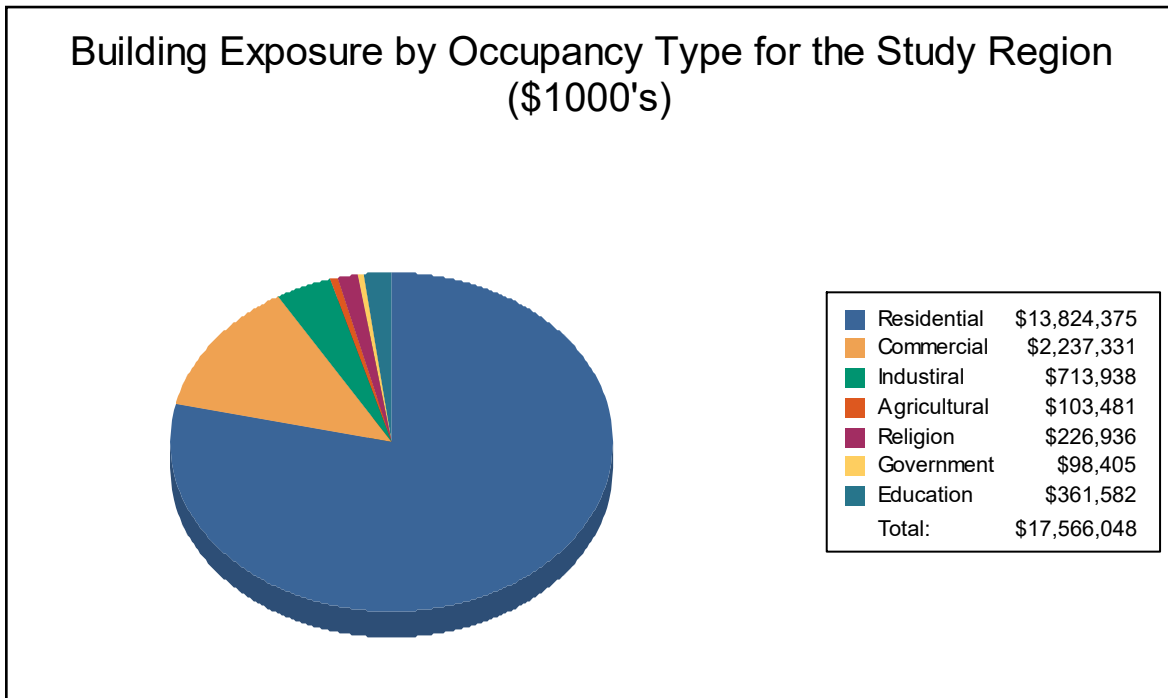
Building Inventory

General Building Stock

Hazus estimates that there are 41,905 buildings in the region which have an aggregate total replacement value of 17,566 million 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.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure (\$1000)	Percent of Total
Residential	13,824,375	78.7%
Commercial	2,237,331	12.7%
Industrial	713,938	4.1%
Agricultural	103,481	0.6%
Religion	226,936	1.3%
Government	98,405	0.6%
Education	361,582	2.1%
Total	17,566,048	100%



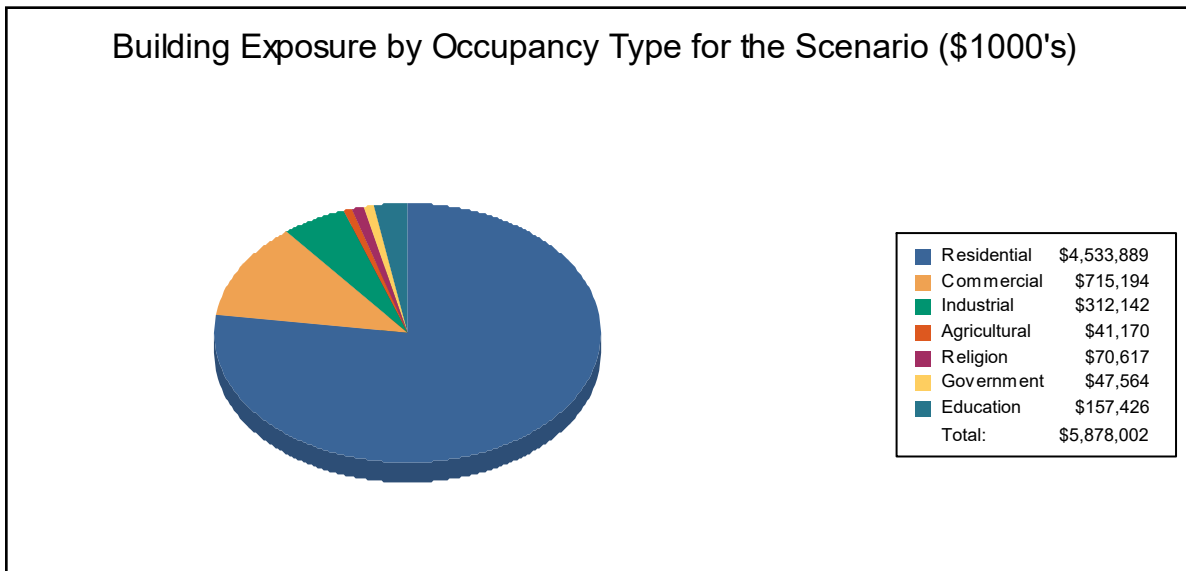
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Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Residential	4,533,889	77.1%
Commercial	715,194	12.2%
Industrial	312,142	5.3%
Agricultural	41,170	0.7%
Religion	70,617	1.2%
Government	47,564	0.8%
Education	157,426	2.7%
Total	5,878,002	100%



Essential Facility Inventory

For essential facilities, there are 18 hospitals in the region with a total bed capacity of no beds. There are 42 schools, 25 fire stations, 8 police stations and 2 emergency operation centers.



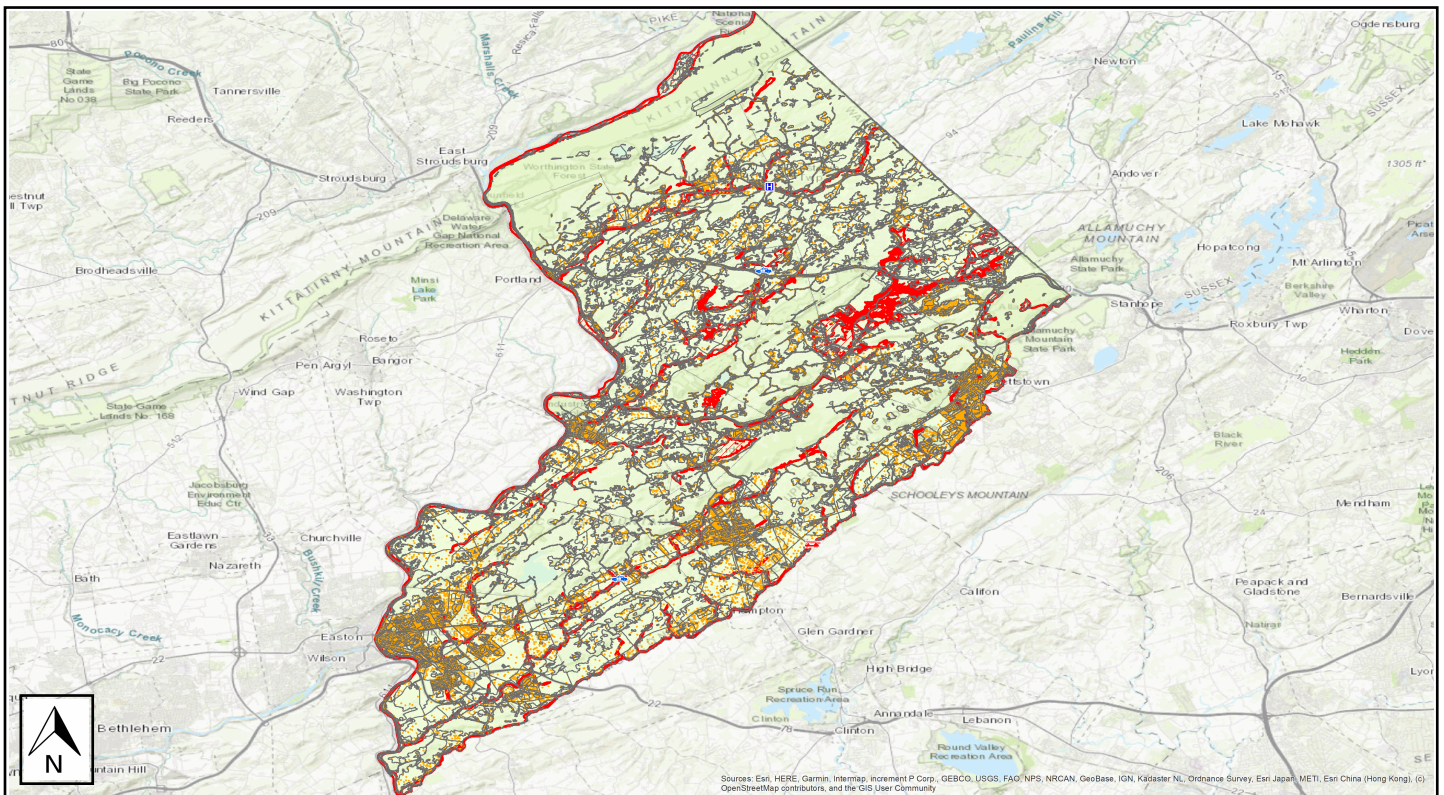
Flood Scenario Parameters

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

Study Region Name:	Warren_County_NJ
Scenario Name:	1pctFlood
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



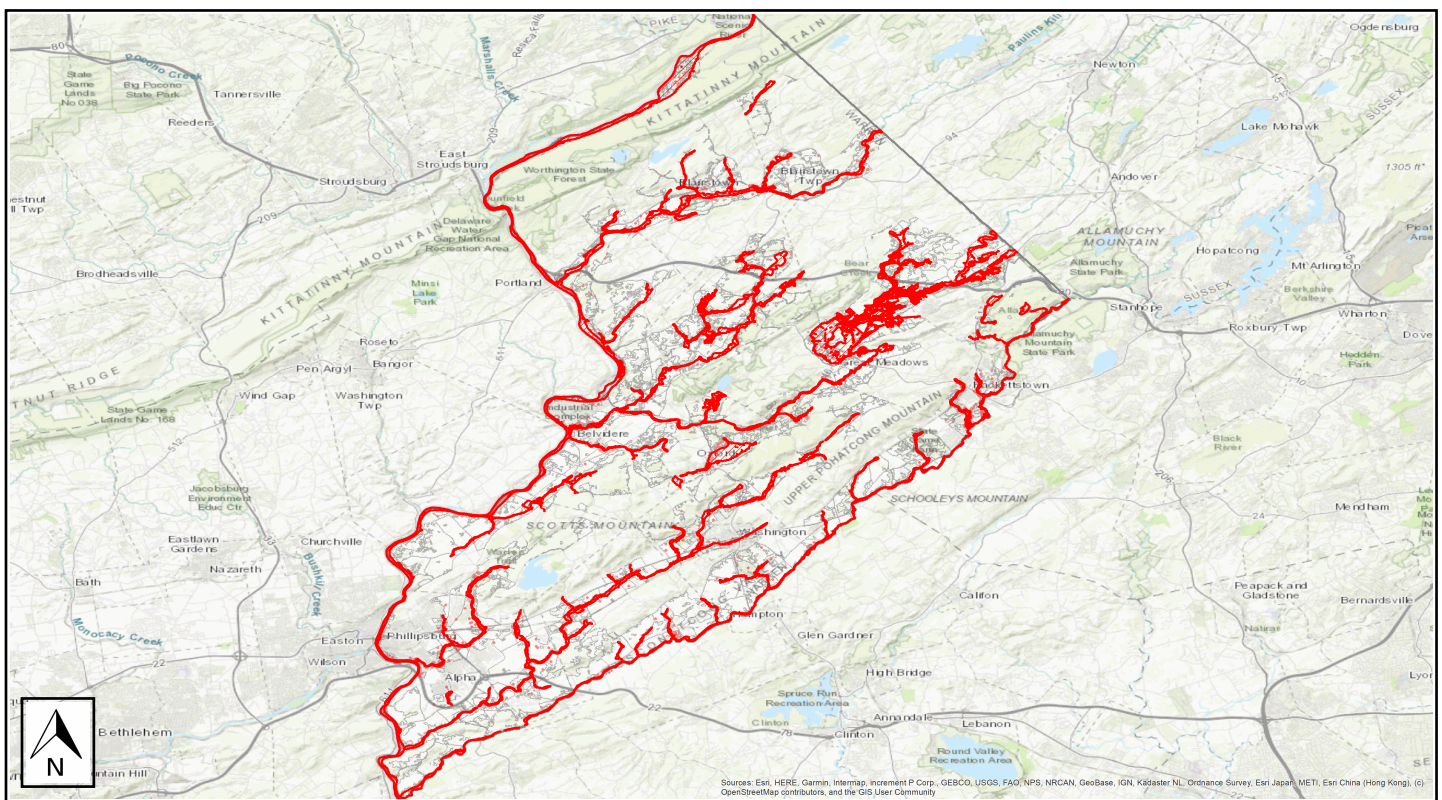


Building Damage

General Building Stock Damage

Hazus estimates that about 256 buildings will be at least moderately damaged. This is over 80% of the total number of buildings in the scenario. There are an estimated 39 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kataster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



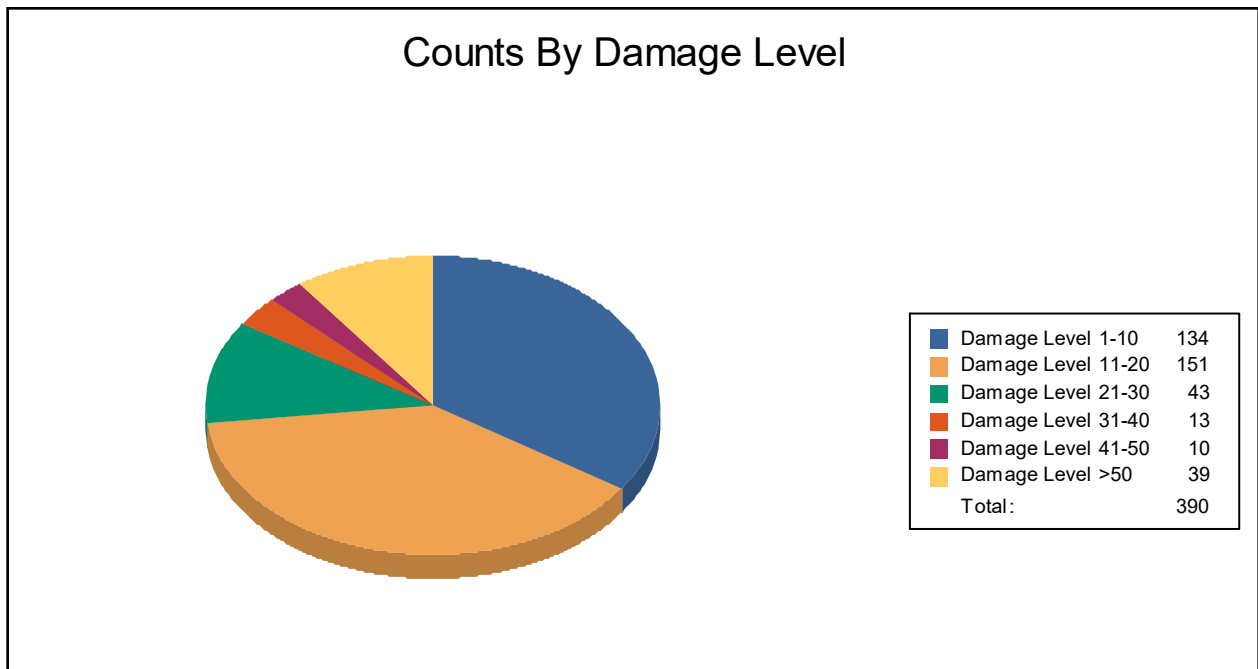
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Table 3: Expected Building Damage by Occupancy

Occupancy	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	1	100	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	1	100
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	134	35	150	39	43	11	13	3	10	3	38	10
Total	134		151		43		13		10		39	



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Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	3	33	5	56	1	11	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	1	100
Wood	131	35	145	38	42	11	13	3	10	3	38	10



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Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

Classification	# Facilities			
	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	2	0	0	0
Fire Stations	25	1	0	1
Hospitals	18	1	0	1
Police Stations	8	2	0	2
Schools	42	0	0	0

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.

Analysis has not been performed for this Scenario.



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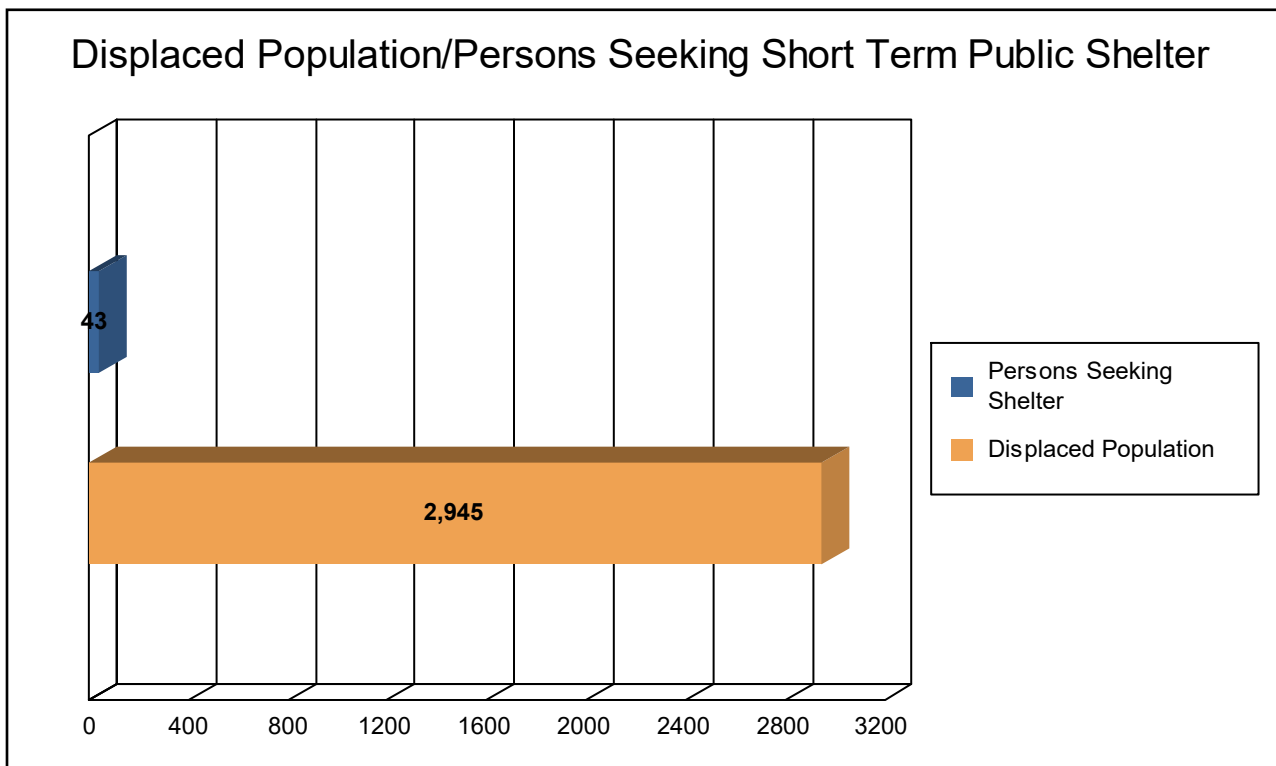
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Social Impact

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 982 households (or 2,945 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 43 people (out of a total population of 108,692) will seek temporary shelter in public shelters.



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Economic Loss

The total economic loss estimated for the flood is 369.46 million dollars, which represents 6.29 % 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 209.88 million dollars. 43% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 35.67% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.



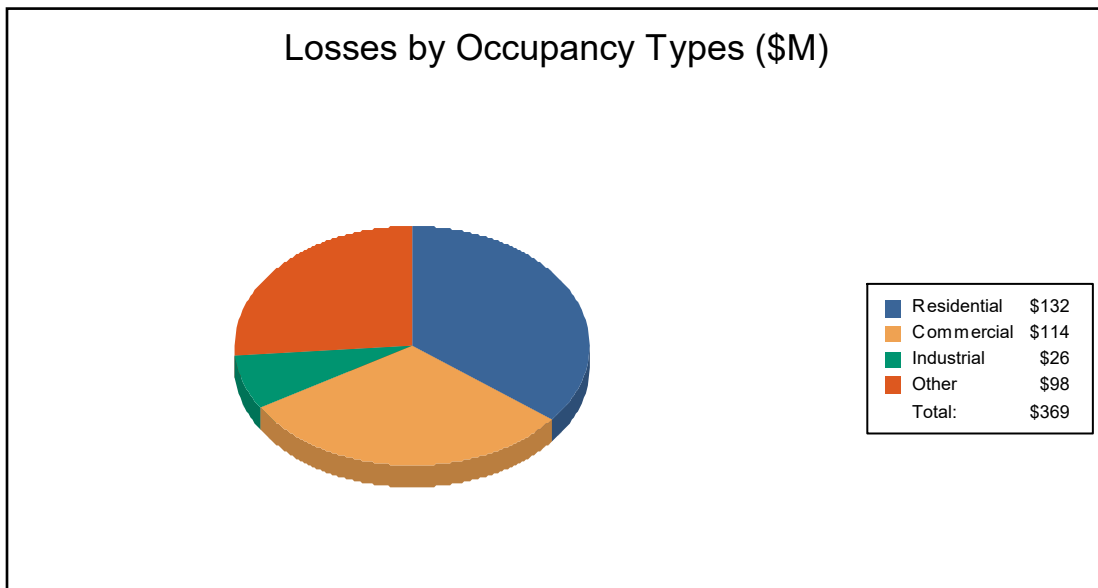
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Table 6: Building-Related Economic Loss Estimates
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	75.90	13.37	6.81	4.60	100.68
	Content	33.77	35.85	15.85	20.95	106.43
	Inventory	0.00	0.68	1.98	0.12	2.78
	Subtotal	109.67	49.90	24.65	25.66	209.88
<u>Business Interruption</u>						
	Income	0.45	25.75	0.41	10.93	37.53
	Relocation	15.27	5.31	0.41	5.52	26.51
	Rental Income	5.33	3.95	0.08	0.43	9.79
	Wage	1.06	28.79	0.70	55.20	85.76
	Subtotal	22.10	63.79	1.61	72.08	159.59
ALL	Total	131.77	113.69	26.25	97.75	369.46



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Appendix A: County Listing for the Region

- New Jersey
 - Warren



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Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
New Jersey				
Warren	108,692	13,824,375	3,741,673	17,566,048
Total	108,692	13,824,375	3,741,673	17,566,048
Total Study Region	108,692	13,824,375	3,741,673	17,566,048



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