

HAZUS-MH: Hurricane Event Report

Region Name: Killingworth Hurricane

Hurricane Scenario: UN-NAMED-1938-4

Print Date: Tuesday, January 04, 2005

Disclaimer:

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 Hurricane. These results can be improved by using enhanced inventory data.

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Buiding Stock	
Essential Facility Inventory	
Hurricane Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Hurricane Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. 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 hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:

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

The geographical size of the region is 35.76 square miles and contains 1 census tracts. There are over 2 thousand households in the region and has a total population of 6,018 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 2 thousand buildings in the region with a total building replacement value (excluding contents) of 328 million dollars (2002 dollars). Approximately 100% of the buildings (and 93% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 2,151 buildings in the region which have an aggregate total replacement value of 328 million (2002 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Total
Residential	303,835	92.6%
Commercial	14,475	4.4%
Industrial	4,824	1.5%
Agricultural	701	0.2%
Religious	2,065	0.6%
Government	181	0.1%
Education	1,933	0.6%
Total	328,014	100.0%

Essential Facility Inventory

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

Hurricane Scenario

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

Scenario Name:	UN-NAMED-1938-4
Type:	Historic
Max Peak Gust in Study Region:	137 mph

Building Damage

General Building Stock Damage

HAZUS estimates that about 1,363 buildings will be at least moderately damaged. This is over 63% of the total number of buildings in the region. There are an estimated 433 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	8.85	0	12.51	1	28.05	1	48.36	0	2.22
Education	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
Industrial	0	8.73	0	9.96	0	24.19	1	52.26	0	4.86
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	229	10.68	558	26.00	579	26.95	348	16.22	433	20.15
Total	230		559		580		350		433	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	7	9.16	15	19.58	20	26.31	24	31.15	11	13.80
MH	66	25.44	34	13.03	70	26.95	21	8.23	68	26.36
Steel	0	9.57	0	8.47	0	23.94	1	57.82	0	0.21
Wood	169	9.30	495	27.28	493	27.17	305	16.80	353	19.45

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		Expected Loss of Use < 1 day
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	
Schools	2	2	0	0

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. 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 6,506 tons of debris will be generated. Of the total amount, Brick/Wood comprises 33.5% of the total, Reinforced Concrete/Steel comprises of 11% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 901 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 801 households to be displaced due to the hurricane. Of these, 149 people (out of a total population of 6,018) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 191.1 million dollars, which represents 58.25 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage 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 hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 191 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 93% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Property Damage</u>						
	Building	109,327.17	3,543.28	1,372.40	1,123.36	115,366.22
	Content	50,343.28	2,542.05	1,267.24	782.55	54,935.11
	Inventory	0.00	55.17	206.42	12.14	273.74
	Subtotal	159,670.45	6,140.51	2,846.06	1,918.05	170,575.07
<u>Business Interruption Loss</u>						
	Income	11.31	447.91	29.75	16.12	505.09
	Relocation	13,798.50	602.63	73.54	258.43	14,733.11
	Rental	4,226.45	400.36	16.82	19.72	4,663.36
	Wage	26.71	467.59	50.43	31.50	576.23
	Subtotal	18,062.98	1,918.50	170.55	325.77	20,477.79
Total	Total	177,733.43	8,059.00	3,016.61	2,243.82	191,052.86

Appendix A: County Listing for the Region

Connecticut
- Middlesex

Appendix B: Regional Population and Building Value Data

	Building Value (thousands of dollars)			Total
	Population	Residential	Non-Residential	
Connecticut				
Middlesex	6,018	303,835	24,179	328,014
Total State	6,018	303,835	24,179	328,014
Total Study Region	6,018	303,835	24,179	328,014