Appendix F Hazus Reports

Hazus-MH: Flood Global Risk Report

Region Name: PA_Huntingdon

Flood Scenario: PA_Huntingdon

Print Date: Monday, May 18, 2020

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.

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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):

- Pennsylvania

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

The geographical size of the region is 838 square miles and contains 3,339 census blocks. The region contains over 17 thousand households and has a total population of 45,913 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 22,004 buildings in the region with a total building replacement value (excluding contents) of 4,178 million dollars (2010 dollars). Approximately 95.59% of the buildings (and 83.50% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 22,004 buildings in the region which have an aggregate total replacement value of 4,178 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.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,488,682	83.5%
Commercial	370,530	8.9%
Industrial	100,146	2.4%
Agricultural	25,998	0.6%
Religion	76,788	1.8%
Government	63,289	1.5%
Education	52,624	1.3%
Total	**4,178,057**	**100.0%**

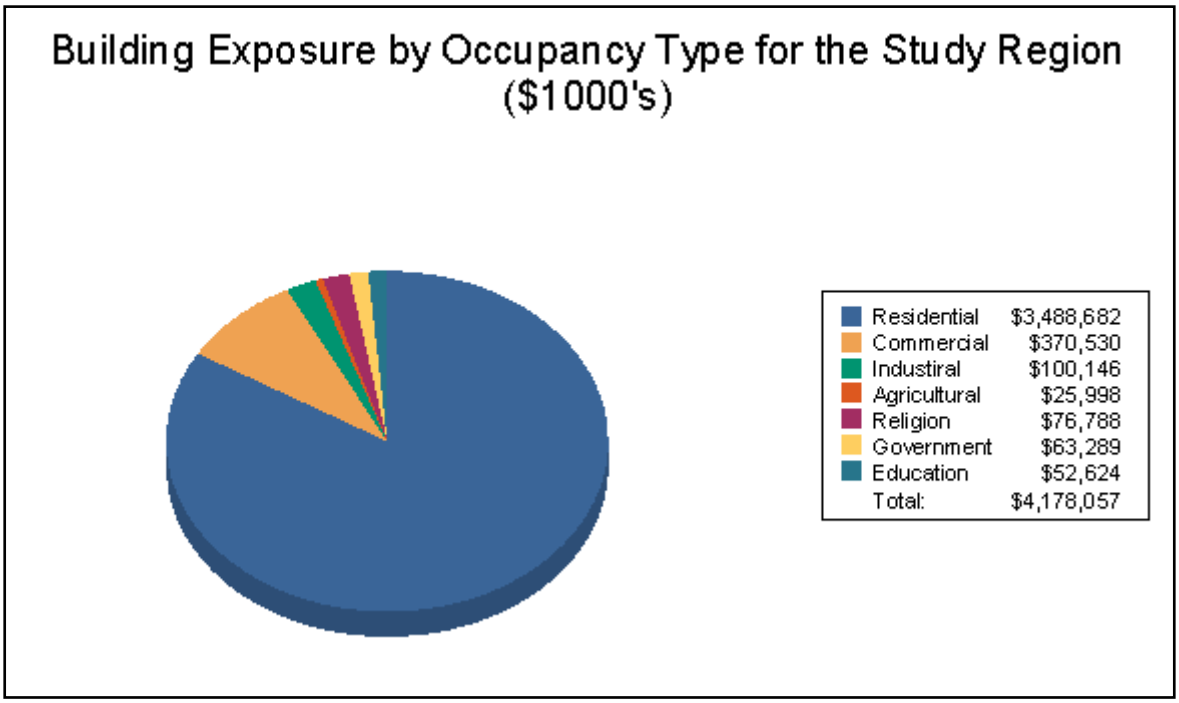
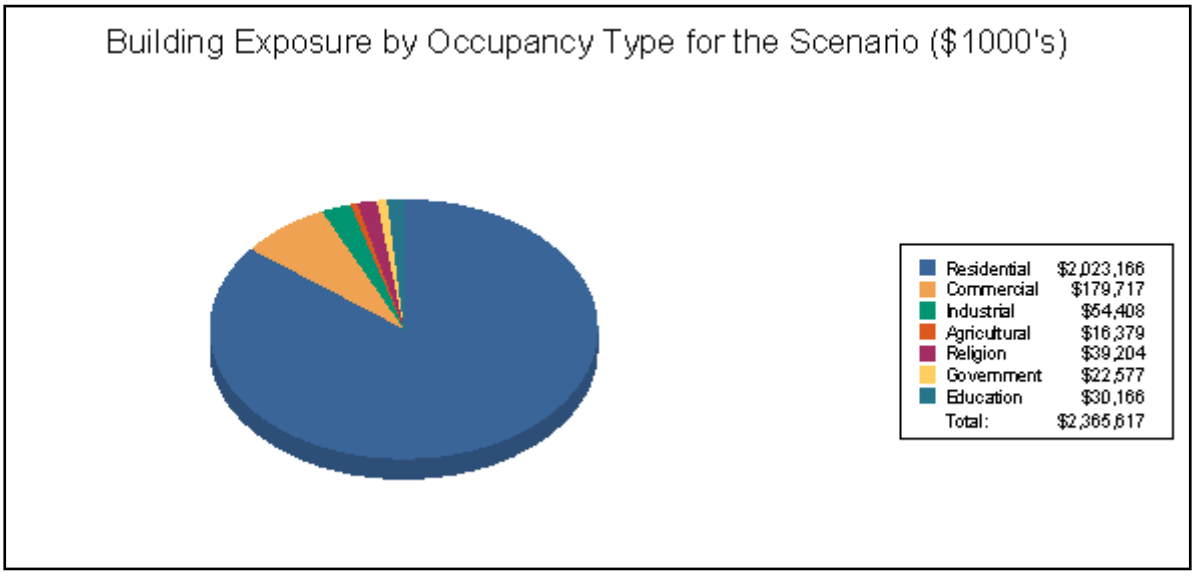


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,023,166	85.5%
Commercial	179,717	7.6%
Industrial	54,408	2.3%
Agricultural	16,379	0.7%
Religion	39,204	1.7%
Government	22,577	1.0%
Education	30,166	1.3%
Total	**2,365,617**	**100.0%**



Essential Facility Inventory

For essential facilities, there are 9 hospitals in the region with a total bed capacity of 104 beds. There are 25 schools, 23 fire stations, 5 police stations and 1 emergency operation center.

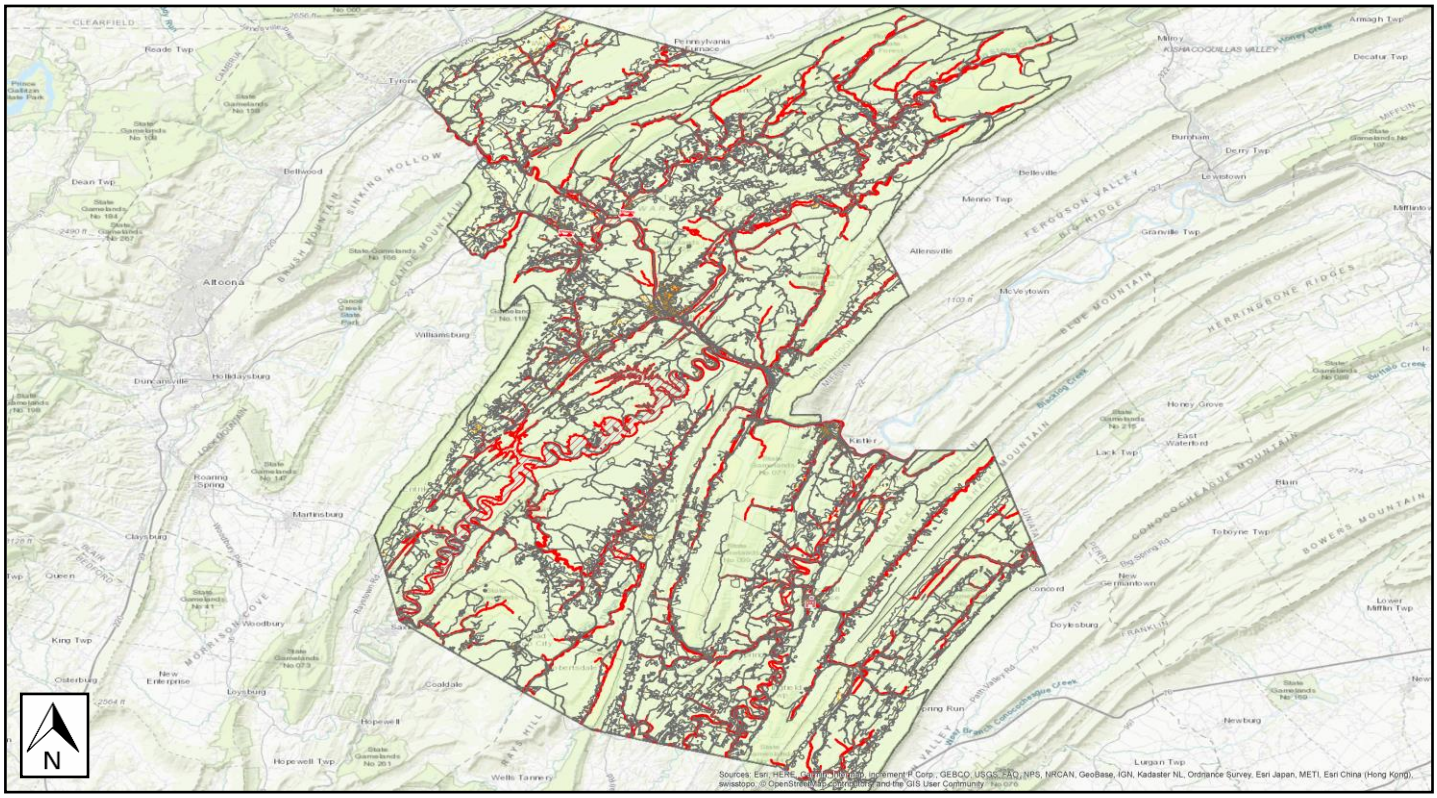
Flood Scenario Parameters

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

Study Region Name:	PA_Huntingdon
Scenario Name:	PA_Huntingdon
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 252 buildings will be at least moderately damaged. This is over 86% of the total number of buildings in the scenario. There are an estimated 8 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

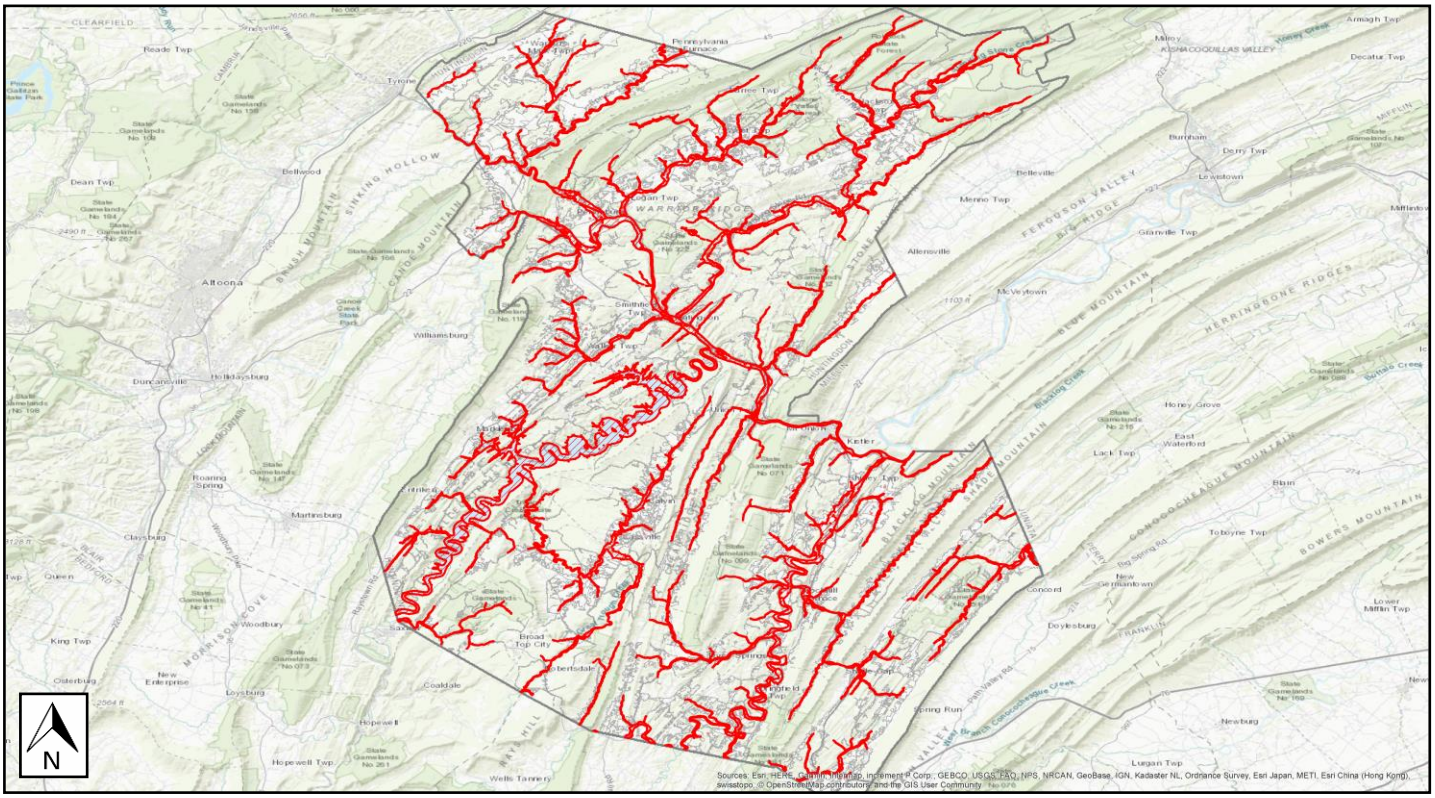


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
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	0	0.00	0	0.00	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	121	32.44	160	42.90	60	16.09	16	4.29	8	2.14	8	2.14
Total	**121**		**160**		**60**		**16**		**8**		**8**	

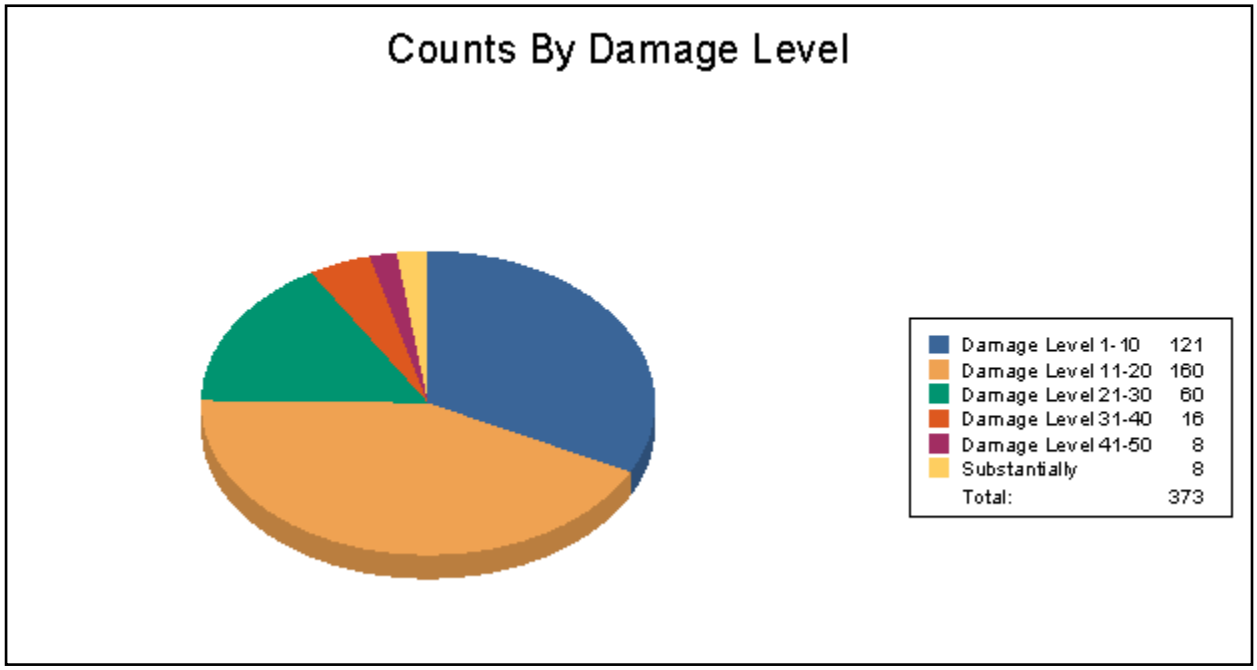


Table 4: Expected Building Damage by Building Type

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	0	0	0	0	0	0	0	0	0	0	3	100
Masonry	34	39	39	45	11	13	3	3	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	87	31	121	43	49	17	13	5	8	3	5	2

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 104 hospital beds available for use. On the day of the scenario flood event, the model estimates that 104 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	23	1	1	2
Hospitals	9	0	0	0
Police Stations	5	0	0	0
Schools	25	1	0	1

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

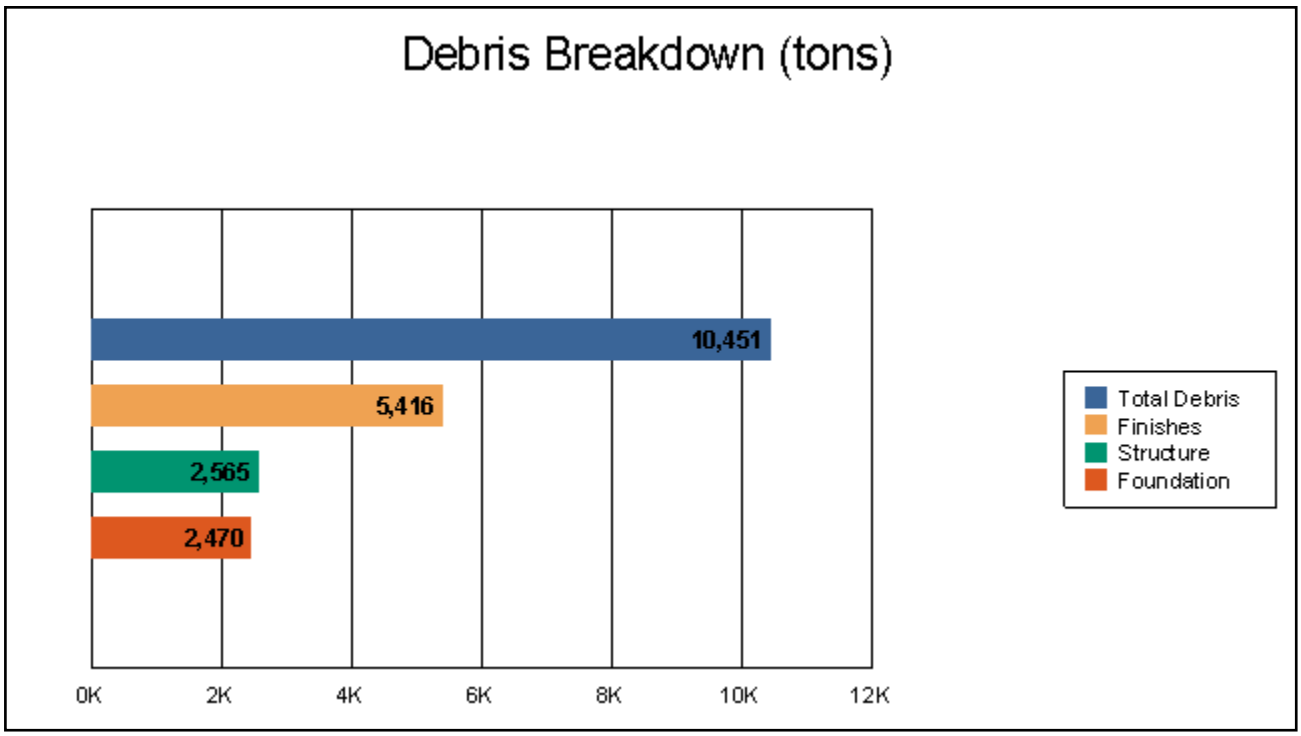
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(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.

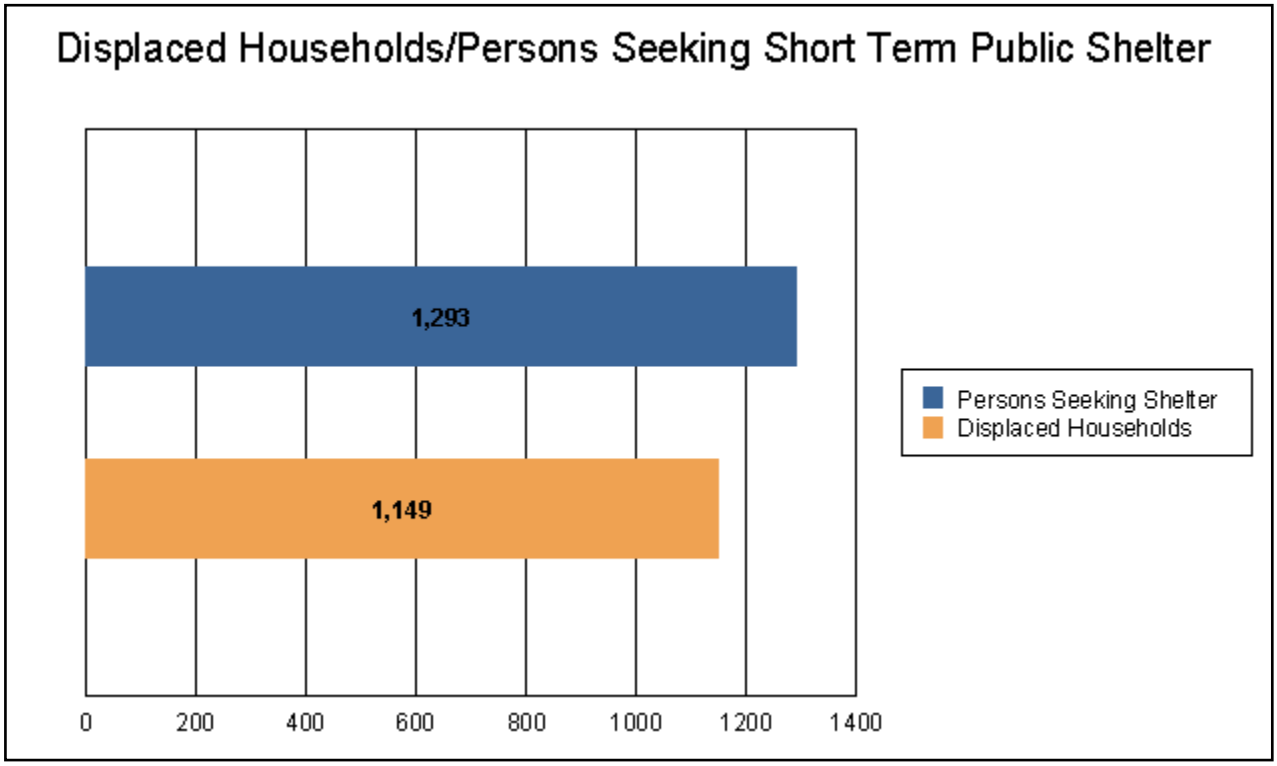


The model estimates that a total of 10,451 tons of debris will be generated. Of the total amount, Finishes comprises 52% of the total, Structure comprises 25% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 418 truckloads (@25 tons/truck) to remove 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 1,149 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,293 people (out of a total population of 45,913) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 116.97 million dollars, which represents 4.94 % of the total replacement value of the scenario buildings.

Building-Related Losses

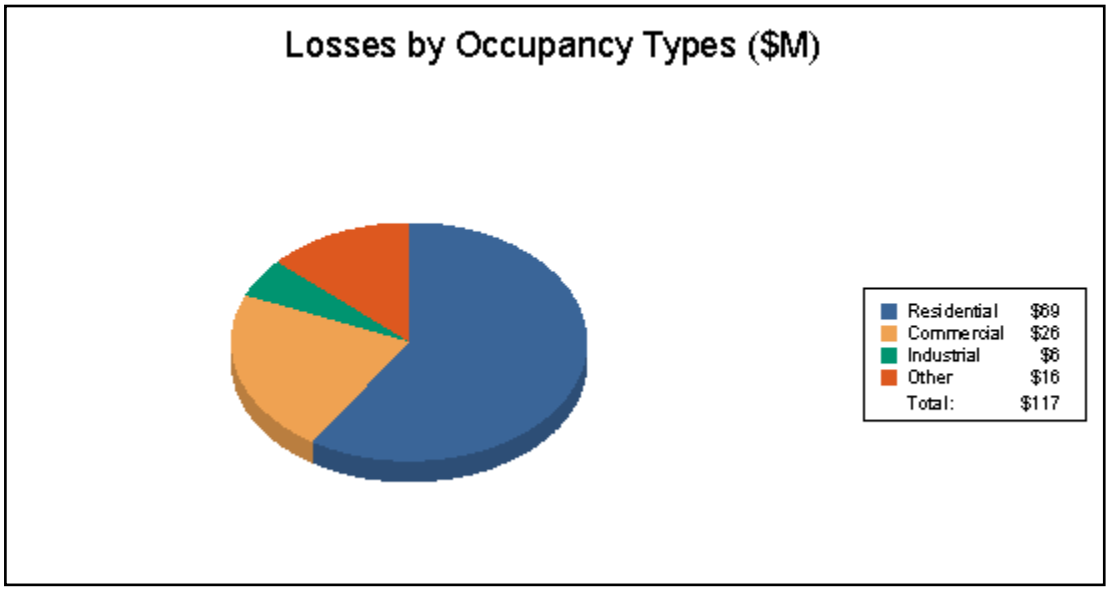
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability 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 116.12 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 59.14% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	46.40	6.14	1.63	2.70	56.87
	Content	22.72	19.26	4.09	12.13	58.20
	Inventory	0.00	0.27	0.47	0.31	1.05
	Subtotal	**69.13**	**25.67**	**6.19**	**15.14**	**116.12**
Business Interruption						
	Income	0.00	0.11	0.00	0.02	0.13
	Relocation	0.03	0.01	0.00	0.01	0.05
	Rental Income	0.01	0.01	0.00	0.00	0.02
	Wage	0.01	0.11	0.00	0.53	0.65
	Subtotal	**0.05**	**0.24**	**0.00**	**0.56**	**0.84**
ALL	**Total**	**69.17**	**25.91**	**6.19**	**15.70**	**116.97**



Appendix A: County Listing for the Region

Pennsylvania

- Huntingdon

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Pennsylvania				
Huntingdon	45,913	3,488,682	689,375	4,178,057
Total	**45,913**	**3,488,682**	**689,375**	**4,178,057**
Total Study Region	**45,913**	**3,488,682**	**689,375**	**4,178,057**