14. HAZARD RANKING

Hazard rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Volume II. These rankings may vary among the jurisdictions. For example, a hazard may be ranked low in one municipality but due to differences in vulnerability and impact, be ranked as high for the County or another municipality. Jurisdictional ranking results are presented in each jurisdictional annex in in Volume II.

14.1 Hazard Ranking Methodology

Each jurisdiction participating in this HMP has differing levels of vulnerability to and potential impacts from each of the hazards assessed in this plan. Each jurisdiction needs to recognize the hazards that pose the greatest risk to its community and direct its attention and resources accordingly to manage risk and reduce losses. To achieve this, the hazards of concern were ranked using methodologies promoted by FEMA's hazard mitigation planning guidance and input from all participating jurisdictions. Relative ranking scores were generated by FEMA's Hazus risk assessment tool.

14.2 Categories Used in Ranking

The ranking methodology is based on four risk assessment categories, with the following scoring parameters defined for each category:

- **Level**—The level is a qualitative description of how each hazard rates in each category (such as low to high, or unlikely to frequent)
- **Benchmark value**—The benchmark values are clearly determinable quantities or descriptions that define which level should apply to each hazard
- **Numeric value**—The numeric value is the hazard's score in each category, based on the assigned level
- **Weighting**—The weighting is a multiplier applied to each hazard's numeric value in each category, to represent the relative importance of the category (the higher the weighting, the more important the category)

The following sections describe the categories and their associated scoring parameters.

14.2.1 Probability of Occurrence

The probability of occurrence of the hazard scenario evaluated was estimated by examining the historical record or calculating the likelihood of annual occurrence. When no scenario was assessed, an examination of the historical record and judgment was used to estimate the probability of occurrence of an event that will impact the County. Table 14-1 summarizes the scoring parameters for probability of occurrence.

The hazard ranking methodology for some hazards of concern is based on a scenario event that only impacts specific areas (such as a floodplain), while others are based on their potential risk to the County as a whole. In order to account for these differences, the hazard ranking scores were adjusted using professional judgment.

Table 14-1. Values and Weights for Probability of Occurrence

Level	Benchmark Value	Numeric Value	Weighting
Unlikely	Hazard event has less than a 1 percent annual probability of occurring.	0	30%
Rare	Hazard event has between 1 and 10 percent annual probability of occurring.	1	
Occasional	Hazard event has between 10 and 100 percent annual probability of occurring.	2	
Frequent	100 percent annual probability; hazard event is likely to occur multiple times per year.	3	

CONSEQUENCE

Consequence represents the expected vulnerability and impact associated with the hazard. This is rated for three subcategories: vulnerability of people; vulnerability of property; and economic impacts on the community. A numeric value based on defined benchmarks is assigned for each subcategory, and a factor is applied to those values representing the relative importance of each subcategory. The total numeric value for consequence is the sum of the factored numeric values for each subcategory. Table 14-2 summarizes the scoring parameters for consequence.

Table 14-2. Values and Weights for Consequence

Level	Benchmark Value	Numeric Value	Factor	Weighting
Population (Numeric Value x 3)				30%
None	No population vulnerable to the hazard	0	3	
Low	14 percent or less of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	1		
Medium	15 to 29 percent of population is exposed to a hazard with potential for measurable life-safety impact due to its extent and location.	2		
High	30 percent or more of population is exposed to a hazard with potential for measurable life-safety impact, due to its extent and location.	3		
Property (Numeric Value x 2)				
None	No property vulnerable to the hazard	0	2	
Low	Property vulnerability is 14 percent or less of the total number of structures for your community.	1		
Medium	Property vulnerability is 15 to 29 percent of the total number of structures for the community.	2		
High	Property vulnerability is 30 percent or more of the total number of structures for the community.	3		
Economy (Numeric Value x 1)				
None	No estimated loss due to the hazard	0	1	
Low	Loss estimate is 9 percent or less of the total replacement cost for the community.	1		
Medium	Loss estimate is 10 to 19 percent of the total replacement cost for the community.	2		
High	Loss estimate is 20 percent or more of the total replacement cost for the community.	3		

Adaptive Capacity

Adaptive capacity describes a jurisdiction's administrative, technical, planning/regulatory and financial ability to protect from or withstand a hazard event. Mitigation measures that can increase a jurisdiction's capacity to withstand and rebound from events include codes or ordinances with higher standards to withstand hazards due to design or location; deployable resources; or plans and procedures for responding to an event.

A rating of "weak" for adaptive capacity means a jurisdiction does not have the capability to effectively respond, which increases vulnerability. A "strong" adaptive capacity means the jurisdiction does have the capability to effectively respond, which decreases vulnerability. These ratings were assigned using the results of the core capability assessment, with input from each jurisdiction. Table 14-3 summarizes the scoring parameters for adaptive capacity.

Table 14-3. Values and Weights for Adaptive Capacity

Level	Benchmark Value	Numeric Value	Weighting
Weak	Weak, outdated, or inconsistent plans, policies, codes, or ordinances in place; no redundancies; limited to no deployable resources; limited capabilities to respond; long recovery.	1	30%
Moderate	Plans, policies, codes/ordinances in place and meet minimum requirements; mitigation strategies identified but not implemented on a widespread scale; county/jurisdiction can recover but needs outside resources; moderate county/Jurisdiction capabilities.	0	
Strong	Plans, policies, codes/ordinances in place and exceed minimum requirements; mitigation/protective measures in place; county/jurisdiction has ability to recover quickly because resources are readily available, and capabilities are high.	-1	

Climate Change

Current climate change projections were evaluated as part of the hazard ranking to account for potential increases in severity or frequency of the hazard. This is important because the hazard ranking helps guide and prioritize the mitigation strategy as a long-term future vision for mitigating the hazards of concern. The potential impacts that climate change may have on each hazard of concern are discussed in the risk assessment chapters for each hazard. Table 14-4 summarizes the scoring parameters for climate change. The benchmark values are similar to confidence levels outlined in the Fifth National Climate Assessment.

Table 14-4. Values and Weights for Climate Change

Level	Benchmark Value	Numeric Value	Weighting
Low	No local data are available; modeling projects are uncertain on whether there is increased future risk; confidence level is low (inconclusive evidence).	1	10%
Medium	Studies and modeling projections indicate a potential for exacerbated conditions due to climate change; confidence level is medium to high (moderate evidence).	2	
High	Studies and modeling projections indicate exacerbated conditions and increased future risk due to climate change; very high confidence level (strong evidence, well documented, and acceptable methods).	3	

14.2.2 Total Ranking Score

The total ranking score based on the categories described above is calculated using the following equation:

Risk Ranking Score Equation

Ranking Score= [(Consequence on Population x 3) + (Consequence on Property x 2) + (Consequence on Economy x 1) x 0.3] + [Adaptive Capacity x 0.3] + [Climate Change x 0.1] + [Probability of Occurrence x 0.3]

Using this equation, the highest possible ranking score is 6.9. The higher the number, the greater the relative risk. Based on the score for each hazard, a hazard ranking is assigned to each hazard of concern as follows:

- Low = Values less than 3.9
- Medium = Values between 3.9 and 4.9
- High = Values greater than 4.9.

All Planning Partners applied the same methodology to develop the hazard rankings to ensure consistency in the overall ranking of risk. However, each jurisdiction had the ability to alter rankings based on local knowledge and experience in handling each hazard.

14.3 Hazard Ranking Results

Using the methodology described above, the hazard ranking for the identified hazards of concern was determined for each planning partner. The hazard ranking for Hudson County is detailed in the following tables that present the stepwise process for the ranking:

- Table 14-5 shows the unweighted numeric values assigned for the probability of occurrence for each hazard.
- Table 14-6 shows the numeric values assigned for each subcategory of consequence for each hazard. Results are shown for applying the subcategory factors, but not the category-wide weighting.
- Table 14-7 shows the unweighted numeric values assigned for adaptive capacity and climate change for each hazard.
- Table 14-8 shows the total weighted hazard ranking scores for each hazard of concern.

The countywide hazard ranking includes the entire planning area and may not reflect the highest risk for all Planning Partners. The overall ranking for each jurisdiction is included in Table 14-9 and in the annexes in Volume II.

Table 14-5. Probability of Occurrence for Hazards of Concern for Hudson County

Hazard of Concern	Probability	Numeric Value
Dam and Levee Failure	Rare	1
Drought	Occasional	2
Extreme Temperature	Frequent	3
Flood	Frequent	3
Geological Hazards	Occasional	2
Severe Weather	Occasional	2
Severe Winter Weather	Occasional	2
Wildfire	Occasional	2

Table 14-6. Consequence Rating for Hazards of Concern for Hudson County

Hazard of Concern	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
	Consequence	Numeric Value	Multiplied by Factor (3)	Consequence	Numeric Value	Multiplied by Factor (2)	Consequence	Numeric Value	Multiplied by Factor (1)	
Dam and Levee Failure	Medium	2	6	Medium	2	4	Medium	2	2	12
Drought	High	3	9	Low	1	2	Low	1	1	12
Extreme Temperature	Medium	2	6	Low	1	2	Low	1	1	9
Flood	High	3	9	Medium	2	4	High	3	3	16
Geological Hazards	Medium	2	6	Medium	2	4	High	3	3	13
Severe Weather	Medium	2	6	High	3	6	High	3	3	15
Severe Winter Weather	Medium	2	6	Medium	2	4	Medium	2	2	12
Wildfire	Low	1	3	Low	1	2	Low	1	1	6

Table 14-7. Adaptive Capacity and Climate Change Ratings for Hazards of Concern for Hudson County

	Adaptive Capacity		Climate Change	
Hazard of Concern	**Level**	**Numeric Value**	**Level**	**Numeric Value**
Dam and Levee Failure	Medium	0	Medium	2
Drought	Medium	0	High	3
Extreme Temperature	Medium	0	High	3
Flood	High	-1	High	3
Geological Hazards	Medium	0	Medium	2
Severe Weather	Medium	0	Medium	2
Severe Winter Weather	Medium	0	Medium	2
Wildfire	Medium	0	Medium	2

Table 14-8. Total Hazard Ranking Scores for the Hazards of Concern for Hudson County

Hazard of Concern	Probability x 30%	Total Consequence x 30%	Adaptive Capacity x 30%	Changing Future Conditions x 10%	Total Hazard Ranking Score
Dam and Levee Failure	0.3	3.6	0	0.2	4.1
Drought	0.6	3.6	0	0.3	4.5
Extreme Temperature	0.9	2.7	0	0.3	3.9
Flood	0.9	4.8	-0.3	0.3	5.7
Geological Hazards	0.6	3.9	0	0.2	4.7
Severe Weather	0.6	4.5	0	0.2	5.3
Severe Winter Weather	0.6	3.6	0	0.2	4.4
Wildfire	0.6	1.8	0	0.2	2.6

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9

Table 14-9. Overall Ranking of Hazards by Jurisdiction

	Dam and Levee Failure	Drought	Extreme Temperature	Flood	Geological Hazards	Severe Weather	Severe Winter Weather	Wildfire
City of Bayonne	Low	Medium	Medium	High	Low	High	Medium	Low
Borough of East Newark	Low	Medium	Low	Medium	High	High	Medium	Low
Town of Guttenberg	Low	Medium	Low	Medium	Medium	High	Medium	Low
Town of Harrison	Low	Medium	Low	High	High	High	Medium	Low
City of Hoboken	Low	Medium	Medium	High	High	High	Medium	Low
City of Jersey City	Low	Medium	Medium	High	Medium	High	Medium	Low
Town of Kearny	Low	Medium	Low	High	Low	High	Medium	Low
Township of North Bergen	Low	Medium	Low	High	Low	High	Medium	Low
Town of Secaucus	Low	Medium	Low	High	Low	High	Medium	Low
City of Union City	Low	Medium	Medium	Medium	Low	High	Medium	Low
Township of Weehawken	Low	Medium	Low	High	Low	High	Medium	Low
Town of West New York	Low	Medium	Low	Medium	Low	High	Medium	Low
Hudson County	Medium	Medium	Medium	High	Medium	High	Medium	Low

Note: Low (yellow) = Values less than 3.9; Medium (orange) = Values between 3.9 and 4.9; High (red) = Values greater than 4.9