

## 1) Introduction

Risk assessment is the process of evaluating the vulnerability of people, buildings, and infrastructure to estimate the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. The Risk Assessment section answers the fundamental question that fuels the natural hazard mitigation planning process: *What would happen if a natural hazard event occurred in New York City?*

### a) Risk Assessment Approach

- Determine which natural hazards pose a serious risk to New York City.
- Describe what these hazards can do to physical, social, and economic assets of New York City.
- Identify which areas of New York City are most vulnerable to damage from these hazards.
- Determine damages that may result from the identified natural hazards.
- Use the Risk Assessment section to identify mitigation actions and set priorities for implementation.

### b) FEMA Requirements Addressed in this Section

The Office of Emergency Management (OEM) Hazard Mitigation Planning Team (Planning Team) used a risk assessment process consistent with the procedures and steps presented in the Federal Emergency Management Agency’s (FEMA) How-To-Guide “Understanding Your Risks: Identifying Hazards and Estimating Losses.” The Planning Team used the four-step risk assessment process shown in Figure 1.

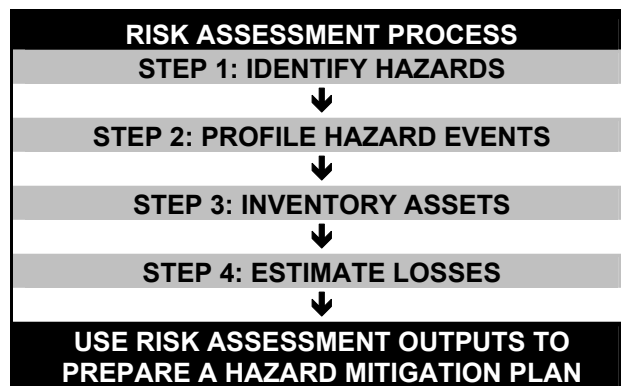


Figure 1: Risk Assessment Process

The following FEMA requirements are addressed in this section:

- **Requirement §201.6(c)(2)(i):** [The risk assessment *shall* include a] description of the type... of all natural hazards that can affect the jurisdiction.

[The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan *shall* include information

on previous occurrences of hazard events and the probability of future hazard events.

- **Requirement §201.6(c)(2)(ii):** [The risk assessment *shall* include a] description of the jurisdictions vulnerability to the hazards described in paragraph §201.6(c)(2)(i). This description *shall* include an overall summary of each hazard and its impact on the community.

[The risk assessment] *must* also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

- **Requirement §201.6(c)(2)(ii)(A):** [The plan *should* describe vulnerability in terms of types and numbers of] existing and future buildings, infrastructure, and critical facilities located in the identified hazard area....
- **Requirement §201.6(c)(2)(ii)(B):** [The plan *should* describe vulnerability in terms of types and numbers of an] estimate of the potential dollar losses to vulnerable structures identified in §201.6(c)(2)(ii)(A) of this description the methodology used to prepare the estimate....
- **Requirement §201.6(c)(2)(ii)(C):** [The plan *should* describe vulnerability in terms of types and numbers of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

## 2) Hazard Identification

The first step in the risk assessment process is to determine which hazards to include in the plan. To initiate this process, the Planning Team, with input from the Mitigation Planning Council Steering Committee (Steering Committee), identified an initial list of hazards that might affect the City and then selected the priority hazards of concern for further profiling and analysis.

### a) Hazards in New York State

To begin the hazard identification process, the Planning Team took the full range of hazards identified in the New York State Multi-Hazard Mitigation Plan (NYS HMP) and made a few minor alterations, which included wording and organization, to produce a comprehensive natural hazard list. Figure 2 lists the full range of New York State hazards the Planning Team considered for inclusion in the New York City Hazard Mitigation Plan (HMP).

Hazards in New York State	
Hazard	Description
Coastal Erosion	Loss or displacement of land along the coastline due to the action of wind, waves, currents, tides, wind-driven water, waterborne ice, runoff of surface waters, or groundwater seepage.
Coastal Storms/Hurricanes	Tropical cyclones formed in the atmosphere over warm ocean areas. Wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center or "eye. Circulation is counterclockwise in the Northern Hemisphere.
Dam Failure	An uncontrolled release of impounded water resulting in downstream flooding.
Drought	A prolonged period with no rain. Limited winter precipitation accompanied by moderately dry periods during the spring and summer months can also lead to drought conditions.
Earthquakes	The sudden motion or trembling of the ground produced by abrupt displacement of rock masses, usually within the upper 10–20 miles of the earth's surface.
Extreme Temperatures	<i>Extreme Cold:</i> temperatures that drop well below normal in an area. Whenever temperatures drop well below normal and wind speed increases, heat can leave your body more rapidly (known as the wind-chill effect). <i>Extreme Heat:</i> temperatures that hover 10° F or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.
Floods	A general and temporary condition of partial or complete inundation on normally dry land. Flooding can be categorized as coastal, riverine, or flash.
Hailstorms	Shower-like precipitation in the form of irregular pellets, or balls of ice more than five millimeters in diameter, falling from a cumulonimbus cloud.

Hazards in New York State	
Hazard	Description
Landslides	The downward and outward movement of slope-forming materials reacting to the force of gravity. Slide materials may be composed of natural rock, soil, artificial fill, or combinations of these materials. The term landslide includes rock falls, rockslides, block glide, debris slide, earth flow, mudflow, slump, and other such terms.
Subsidence	Depressions, cracks, and sinkholes in the earth's surface, which can threaten people and property. Subsidence depressions, which normally occur over many days to a few years, may damage structures with low strain tolerances such as dams, factories, nuclear reactors, and utility lines.
Tornadoes/Windstorms	A local atmospheric storm, generally of short duration, formed by winds rotating at very high speeds, usually in a counterclockwise direction. The vortex, up to several hundred yards wide, is visible to the observer as a whirlpool-like column of winds rotating about a hollow cavity or funnel.
Wildfires	Any instance of uncontrolled burning in grasslands, brush, or woodlands.
Winter Storms	Includes ice storms and blizzards. Extreme cold often accompanies winter storms. The National Weather Service (NWS) characterizes blizzards as being combinations of winds in excess of 35 mph with considerable falling or blowing snow, which frequently reduces visibility.

Figure 2: Natural Hazard Definitions

**b) Hazard Selection Process**

**i) Existing Plans and Procedures**

When considering which natural hazards to include in the HMP, the Planning Team identified the City’s existing emergency plans and procedures that address natural hazards. The New York City Office of Emergency Management (OEM) and other City agencies have plans and procedures in place for many natural hazards, including coastal storms, drought, extreme temperatures, floods, tornadoes/windstorms, and winter storms. Therefore, it was evident these hazards significantly affect New York City and should be included in the HMP.

**ii) Hazard Selection Worksheet**

The Steering Committee supported the hazard identification process by completing a hazard selection worksheet. The hazard selection worksheet asked members of the Steering Committee to indicate which natural hazards would affect their agencies’ operations, policies, and/or physical infrastructure. The worksheet also asked for an example or explanation for each hazard checked. Table 1 summarizes the results of the worksheets.

New York City Hazard Selection Worksheet Results								
Hazard	Agency							
	DCP	DOB	DEP	Parks	OLTPS	DOT	MTA	OEM
Coastal Erosion	✓	✓	✓	✓	✓	✓		✓
Coastal Storms/ Hurricanes	✓	✓	✓	✓	✓	✓	✓	✓
Dam Failure			✓		✓			
Drought		✓	✓	✓	✓			✓
Earthquakes		✓	✓				✓	✓
Extreme Temperatures		✓	✓	✓	✓	✓		✓
Floods	✓	✓	✓	✓	✓	✓	✓	✓
Hailstorms					✓		✓	
Landslides		✓		✓		✓		
Subsidence		✓	✓		✓	✓		
Windstorms/ Tornadoes		✓	✓	✓	✓	✓	✓	✓
Wildfires			✓	✓				
Winter Storms		✓	✓	✓	✓	✓	✓	✓

Table 1: New York City Hazard Selection Worksheet Results

A majority of Steering Committee members checked the following hazards: coastal erosion, coastal storms, drought, extreme temperatures, floods, tornadoes, and winter storms. The other hazards listed required additional research to determine whether they should be in the Plan. The Planning Team collected and analyzed additional data on dam failure, hailstorms, landslides, subsidence, and wildfires from newspapers, City records, and the National Oceanic and Atmospheric Administration (NOAA), NWS, and FEMA databases.

### c) Eliminated Hazards

After conducting additional research, the Planning Team eliminated dam failure, hailstorms, landslides, subsidence, and wildfires from the HMP. Given the scope of this plan, the Planning Team chose to address only prevalent natural hazards for this submission. The Planning Team concluded dam failure in New York City is a technological hazard and therefore outside this Plan's scope. Dam failure can occur as a secondary effect from a natural hazard and in that context, it is addressed in the Mitigation Strategy section. Further research into landslides in New York City revealed this phenomenon is generally related to human activity and most often occurs as the result of a failed retaining structure. Based on consultation with the New York State

Geological Survey (NYSGS) and a review of the NYS HMP, the Planning Team determined subsidence is highly unlikely due to New York City's hard soils. Although hailstorms are possible in New York City, there is little risk to agriculture here, and City property damage from this particular hazard is minimal. Finally, the City is too urbanized for large wildfires and while brushfires are possible in some areas, historic records and a review of OEM Watch Command notifications showed property damage from such fires is rare. Consequently, because of their limited impacts, hailstorms and wildfires are not included in the final list of hazards.

**d) Final List of New York City Hazards**

At the end of the hazard identification process, the Planning Team retained eight natural hazards for profiling and analysis in the HMP.

- (1) Coastal Erosion
- (2) Coastal Storms
- (3) Drought
- (4) Earthquakes
- (5) Extreme Temperatures
- (6) Flooding
- (7) Windstorms and Tornadoes
- (8) Winter Storms