SECTION 4. RISK ASSESSMENT

4.2 Methodology and Tools

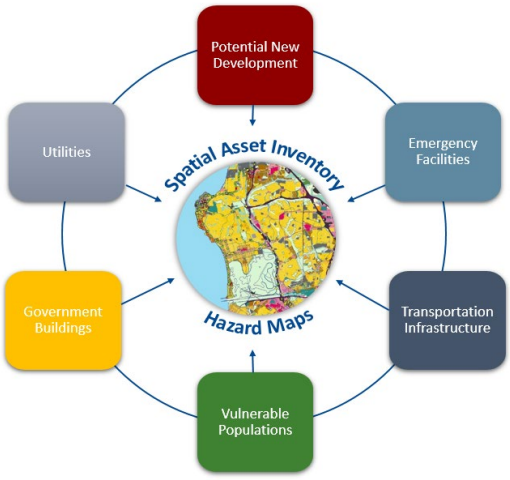
2021 HMP Changes

- The risk assessment was updated using best available information.
- Hazard events and associated impacts were researched and summarized from 2015 to 2020
  - 2015-2019 American Community Survey (ACS) 5-year estimates were utilized
  - Building footprints from the 2021 Camden County footprint dataset, footprint boundaries from the New Jersey Department of Environmental Protection's 2019 impervious surface layer, updated parcels from the 2020 MODIV tax assessor dataset, and RS Means 2020-dollar values were used to develop a structure-level building inventory and estimate replacement cost value for each building.
  - The 2017 critical facility was reviewed and updated by the Planning Partnership.
  - Lifelines were identified in the critical facility inventory to align with FEMA's lifeline definition.
  - Hazus v4.2 was used to estimate potential impacts to the flood, wind, and seismic hazards.
  - Best available hazard data was used as described in this section.

The following summarizes the asset inventories, methodology and tools used to support the risk assessment process.

4.3 Asset Inventories

Camden County assets were identified to assess potential exposure and loss associated with the hazards of concern. For the HMP update, Camden County assessed exposure vulnerability of the following types of assets: population, buildings and critical facilities/infrastructure and the environment. Some assets may be more vulnerable because of their physical characteristics or socioeconomic uses. To protect individual privacy and the security of critical facilities, information on properties assessed is presented in aggregate, without details about specific individual personal or public properties.



Population

The risk assessment included the collection and use of an expanded and enhanced asset inventory to estimate hazard exposure and vulnerability.

Total population statistics from the 2015-2019 ACS 5-year estimate were used to estimate the exposure and potential impacts to the County's population in place of the 2010 U.S. Census block estimates. Population counts were evenly distributed by the number of residential buildings per municipality generated from the building stock inventory used in the hazard mitigation plan update. This estimate is a more precise distribution of population across the County compared to only using the Census block or Census tract boundaries. Limitations of these analyses are recognized, and thus the results are used only to provide a general estimate for planning purposes.

As discussed in Section 3 (County Profile), research has shown that some populations are at greater risk from hazard events because of decreased resources or physical abilities. Vulnerable populations in Camden County included in the risk assessment are children, elderly, and population below the poverty level.

Buildings

The building stock inventory was updated countywide. To develop the building inventory, parcels from the 2020 MODIV tax assessor data were obtained from the New Jersey Geographic Information Network Open Data portal. The building inventory was developed using the 2021 building footprints provided by Camden County and footprint boundaries from the 2019 New Jersey Department of Environmental Protection (NJDEP) impervious surface layer. The 2021 building footprints provided by Camden County included structures within the 1-percent annual chance flood extent and contained building attributes for the structure's occupancy class and square footage. The remaining structure inventory outside of the 1-percent annual chance flood extent for the County was created using the footprint boundaries from the NJDEP 2019 impervious surface data. Where building footprints did not exist, the 2020 MODIV tax assessor parcel data was used to fill in the structure gaps throughout the County if the tax assessor data indicated the presence of a structure.

Once the structure inventory was established, the 2020 MODIV tax assessor attribute data was used to further define each structure in terms of occupancy class, construction type, etc. Default information was used to fill in the gaps for building attributes. The centroid of each building footprint, or parcel when a footprint was missing, was used to estimate the building location. Structural and content replacement cost values (RCV) were calculated for each building utilizing available assessor data and RSMeans 2020 values. Zip codes within the County were referenced to assign a regional location factor: residential and non-residential structures with zip codes beginning with 080 were assigned a location factor of 0.98 and 1.11, respectively; residential and non-residential structures with zip codes beginning with 081 were assigned a location factor of 0.99 and 1.11, respectively. Replacement cost value is the current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials. Total replacement cost value consists of both the structural cost to replace a building and the estimate value of contents of a building. The occupancy classes available in Hazus were condensed into the following

categories (residential, commercial, industrial, agricultural, religious, governmental, and educational) to facilitate the analysis and the presentation of results. Residential loss estimates address both multi-family and single-family dwellings.

Critical Facilities and Lifelines

> *A **lifeline** provides indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security (FEMA).*

The 2017 HMP critical facility inventory, which includes essential facilities, utilities, transportation features and user-defined facilities was updated by the Planning Partnership. The update involved a review for accuracy, additions or deletions of new/moved critical assets, identification of backup power for each asset (if known) and whether the critical facility is considered a lifeline in accordance with FEMA's definition; refer to Appendix E (Risk Assessment Supplement). To protect individual privacy and the security of assets, information is presented in aggregate, without details about specific individual properties or facilities.

Environment

The New Jersey Department of Environmental Protection (NJDEP) Land Use Land Cover dataset was published in 2019 for the 2015 aerial coverage. This dataset models land cover change between 2012 and 2015. The classes used from this dataset summarized land use exposure aggregated by agricultural, barren, forested, urban, and wetland land use land cover types.

New Development

In addition to assessing the vulnerability of the built environment, Camden County examined recent and anticipated new development. Each jurisdiction was asked to provide input via survey 123 for all major development that has taken place over the last 5 years and anticipated major development over the next 5 years. Additionally, the New Jersey Highlands Council has identified areas of potential growth (Existing Community Zones [where both in-fill of new development and/or re-development may occur], Designated Centers, as well as Sewer Service Areas) that may provide insight as to where potential new development may occur in Camden County. Further, the New Jersey Pinelands Commission has identified Pinelands Management Area Boundaries, including regional growth areas and rural development areas that may also provide insight to where development and growth may occur in the County.

An exposure analysis was conducted in GIS to determine hazard exposure to recent and anticipated major development as provided by the County and municipalities. Identifying and integrating these changes into the risk assessment provides communities information to consider when developing the mitigation strategy to reduce these vulnerabilities in the future (one tool in the Mitigation Toolbox discussed in Section 6 – Mitigation Strategy). The identified new development is listed in Section 3 (County Profile) and hazard exposure analysis results are presented in Section 9 (Jurisdictional Annexes) as a table in each annex.

4.4 Methodology

To address the requirements of the DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Camden County used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. Three different levels of analysis were used depending upon the data available for each hazard as described below. Table 4.2-1 summarizes the type of analysis conducted by hazard of concern.

- ***Historic Occurrences and Qualitative Analysis*** *– This analysis includes an examination of historic impacts to understand potential impacts of future events of similar size. In addition, potential impacts and losses are discussed qualitatively using best available data and professional judgement.*
- ***Exposure Assessment*** *– This analysis involves overlaying available spatial hazard layers, or hazards with defined extent and locations, with assets in GIS to determine which assets are located in the impact area of the hazard. The analysis highlights which assets are located in the hazard area and may incur future impacts.*
- ***Loss estimation*** *— The FEMA Hazus modeling software was used to estimate potential losses for the following hazards: flood, earthquake, hurricane. In addition, an examination of historic impacts and an exposure assessment was conducted for these spatially delineated hazards.*

Table 4.2-1. Summary of Risk Assessment Analyses

Hazard	Population	General Building Stock	Critical Facilities	New Development
Coastal Erosion and Sea Level Rise	E	E	E	E
Dam/Levee Failure	Q	Q	Q	Q
Disease Outbreak	Q	Q	Q	Q
Drought	Q	Q	Q	Q
Earthquake	E, H	E, H	E, H	E
Extreme Temperatures	Q	Q	Q	Q
Flood	E, H	E, H	E, H	E
Geological Hazards	E	E	E	E
Hurricane and Tropical Storm	E, H	E, H	E, H	E
Invasive Species and Harmful Algal Blooms	Q	Q	Q	Q
Severe Summer Weather	Q	Q	Q	Q
Severe Winter Storm	Q	Q	Q	Q
Wildfire	E	E	E	E

E – Exposure analysis; H – Hazus analysis; Q – Qualitative analysis

Hazards U.S. – Multi-Hazard (Hazus)

In 1997, FEMA developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. or Hazus. Hazus was developed in response to the need for more effective national-, state-, and community-level planning and the need to identify areas that face the highest risk and potential for loss. Hazus was expanded into a multi-hazard methodology, Hazus-MH, with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. Hazus is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk calculations,

which have been developed by hazard and information technology experts, to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

Hazus uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems and utility systems. To generate this information, Hazus uses default Hazus provided data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. Hazus' open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. More information on Hazus is available at http://www.fema.gov/hazus.

In general, modeled losses were estimated in the program using user-defined flood depth grids for the flood analysis and probabilistic analyses were performed to develop expected/estimated distribution of losses (mean return period losses) for hurricane wind and seismic hazards. The probabilistic model generates estimated damages and losses for specified return periods (e.g., 100- and 500-year). Table 5.1-2 displays the various levels of analyses that can be conducted using the Hazus software.

Table 4.2-2. Summary of Hazus Analysis Levels

Hazus Analysis Levels	
Level 1	*Hazus provided hazard and inventory data with minimal outside data collection or mapping.*
Level 2	*Analysis involves augmenting the Hazus provided hazard and inventory data with more recent or detailed data for the study region, referred to as "local data"*
Level 3	*Analysis involves adjusting the built-in loss estimation models used for the hazard loss analyses. This Level is typical done in conjunction with the use of local data.*

Coastal Erosion and Sea Level Rise

Best available data was used to assess Camden County's vulnerability to coastal erosion. To help understand the geographic distribution of coastal risk, the Limit of Moderate Wave Action (LiMWA) boundary was referenced from FEMA's 2016 Effective DFIRM flood data. The LiMWA boundary was selected to assess coastal erosion because it represents land area that is susceptible to wave action. Wave action can be a driver for coastal erosion in Camden County. Asset data (population, building stock, critical facilities, and new development) were used to support an evaluation of assets exposed and potential impacts and losses. To determine what assets are exposed to coastal erosion, the County's assets were overlaid with the hazard area. Assets with their centroid located in the hazard area were totaled to estimate the number and values exposed to coastal erosion.

In addition, projected sea-level rise data (in one-foot increments) available from the NOAA Office of Coastal Management (https://coast.noaa.gov/slrdata/) was considered and used for this analysis to understand the assets within communities projected to be impacted by sea level rise (refer to Section

4.3.1 – Coastal Erosion and Sea Level Rise). Please note these levels do not include additional storm surge due to a hurricane or Nor'easter. The current Flood Insurance Rate Maps (FIRMs) also do not include the effects of sea-level rise. Rutgers University Science and Technical Advisory Panel (STAP) Report, entitled, Assessing New Jersey's Exposure to Sea-Level Rise and Coastal Storms: Report of the New Jersey Climate Adaptation Alliance Science and Technical Advisory Panel details several projected sea level rise scenarios for New Jersey between 2030 and 2100. Using these estimates, the sea level rise +1 ft and sea level rise +3 ft inundation areas were chosen and used in the 2019 New Jersey State Hazard Mitigation Plan. To be consistent with the State HMP, these spatial datasets were used for the 2021 Camden County HMP update in addition to the +2 ft and +4 ft inundation areas.

Asset data (population, building stock, critical facilities and lifelines, and new development) were used to support an evaluation of assets exposed and potential impacts and losses. To determine what assets are exposed to sea-level rise, the County's assets were overlaid with the hazard area. Assets with their centroid located in the hazard area were totaled to estimate the number and values exposed to sea-level rise.

Dam Failure

Assets that fall with dam inundation hazard areas within Camden County are at greatest risk of impacts from dam failure events. A qualitative assessment was conducted for the dam failure hazard. Because of the sensitive nature of the dam failure inundation zones, potential losses have not been quantified and presented in the vulnerability assessment.

Disease Outbreak

All of Camden County is exposed to disease outbreak events. A qualitative assessment was conducted for the disease outbreak hazard. Research from the Centers for Disease Control and Prevention was utilized to qualitatively assess the most recent COVID-19 outbreak.

Drought

To assess the vulnerability of Camden County to drought and its associated impacts, a qualitative assessment was conducted. The United States Department of Agriculture (USDA) Census of Agriculture 2017 was used to estimate economic impacts. Information regarding the number of farms and farmland area was extracted from the report and summarized in the vulnerability assessment. Additional resources from New Jersey 2019 Hazard Mitigation Plan, New Jersey Department of Environmental Protection and the Environmental Protection Agency were used to assess the potential impacts to the population from a drought event.

Earthquake

A probabilistic assessment was conducted for Camden County for the 100 and 500-year mean return period (MRPs) through a Level 2 analysis in Hazus to analyze the earthquake hazard and provide a range of loss estimates. The probabilistic method uses information from historic earthquakes and inferred

faults, locations and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by Census tract.

As noted in the Hazus Earthquake User Manual, "*Although the software offers users the opportunity to prepare comprehensive loss estimates, it should be recognized that uncertainties are inherent in any estimation methodology, even with state-of-the-art techniques. Any region or city studied will have an enormous variety of buildings and facilities of different sizes, shapes, and structural systems that have been constructed over a range of years under diverse seismic design codes. There are a variety of components that contribute to transportation and utility system damage estimations. These components can have differing seismic resistance.*" However, Hazus' potential loss estimates are acceptable for the purposes of this HMP.

Groundwater was set at a depth of five (5) feet (default setting). The default assumption is a magnitude 7.0 earthquake for all return periods. In 2012, the New Jersey Department of Transportation published a map of zip-codes in New Jersey and their associated soil classification. It shows that Camden County contains Class C, Class D, and Class E soils. An associated soil layer was imported into Hazus in order to estimate loss from ground-shaking. Although damages are estimated at the census tract level, results were presented at the municipal level. Since there are multiple census tracts that contain more than one jurisdiction, a density analysis was used to extract the percent of building structures that fall within each tract and jurisdiction. The percentage was multiplied against the results calculated for each tract and summed for each municipality.

Damage estimates are calculated for losses to buildings (structural and non-structural) and contents; structural losses include load carrying components of the structure, and non-structural losses include those to architectural, mechanical, and electrical components of the structure, such as nonbearing walls, veneer and finishes, HVAC systems, boils, etc.

Additionally, an exposure analysis of the County's assets (general building stock, population, critical facilities and lifelines, and new development) was conducted referencing the Class D and Class E soils. Soft soils (NEHRP Soil Classes D and E) can amplify ground shaking to damaging levels even during a moderate earthquake. Therefore, buildings located on NEHRP Classes D and E soils are at increased risk of damage from an earthquake.

Extreme Temperatures

All of Camden County is exposed to extreme temperature events. A qualitative assessment was conducted for the extreme temperatures hazard. Information from FEMA, the Centers for Disease Control and Prevention, New Jersey Office of Emergency Management, and the U.S. Fire Administration were used to assess the potential impacts to the County's assets.

Flood

The 1- and 0.2-percent chance flood events, National Oceanic and Atmospheric Administration 2014 Sea, Lake, and Overland Surges from Hurricanes (SLOSH) data, and urban/stormwater flooding problem areas were examined to evaluate Camden County risk and vulnerability to the flood hazard.

The effective Camden County FEMA Digital Flood Insurance Rate Map (DFIRM) dated August 16, 2016 was used to evaluate exposure and determine potential future losses caused by the 1-percent and 0.2-percent annual chance flood events. These flood events are generally those considered by planners and evaluated under federal programs such as the NFIP. SLOSH represents potential flooding from worst-case combinations of hurricane direction, forward speed, landfall point, and high astronomical tide were used to estimate exposure. Please note these inundation zones do not include riverine flooding caused by hurricane surge or inland freshwater flooding. The model, developed by the NOAA National Hurricane Center to forecast surges that occur from wind and pressure forces of hurricanes, considers only storm surge height and does not consider the effects of waves. The SLOSH spatial data includes boundaries for Category 1 through Category 4 hurricane events. Further, urban and stormwater flooding problem areas were provided by the County's Planning Partners using ArcGIS Survey123.

A coastal depth grid for the 1-percent annual chance flood event was provided by the New Jersey Department of Environmental Protection (NJDEP) and FEMA Flood risk database dated August 26, 2016. A riverine depth grid for the 1-percent annual chance flood event was generated using the effective August 16, 2016 DFIRM boundaries and a 2015 1-Meter resolution Digital Elevation Model (DEM) downloaded from the United States Geological Survey. The riverine area was selected based on the limits of extent from the Delaware River depth grid. This area was interpolated using the DEM to capture water surface elevation and the depth of flooding. The final depth grids were integrated into the Hazus v4.2 riverine flood models used to estimate potential losses for the 1-percent annual chance flood event.

A Level 2 Hazus v4.2 riverine analysis was performed. Both the critical facility and building inventories were formatted to be compatible with Hazus v4.2 and its Comprehensive Data Management System (CDMS). Once updated with the inventories, the Hazus v4.2 riverine and coastal flood model was run to estimate potential losses in Camden County for the 1-percent annual chance flood event. A user-defined analysis was also performed for the building stock. Buildings located within the floodplain were imported as user-defined facilities to estimate potential losses to the building stock at the structural level. Hazus v4.2 calculated the estimated potential losses to the population (default 2010 U.S. Census data), potential damages to the general building stock, and potential damages to critical facility inventories based on the depth grids generated and the default Hazus v4.2 damage functions in the flood model. Furthermore, social impacts and debris were estimated by Hazus at the census block level. These results were presented at the municipal level. Since there are multiple census blocks that contain more than one jurisdiction, a density analysis was used to extract the percent of building structures that fall within each block and jurisdiction. The percentage was multiplied against the results calculated for each block and summed for each municipality.

To estimate exposure to the 1-percent annual chance flood event, 0.2-percent annual chance flood event, and SLOSH Category 1 through Category 4 flood hazard areas, the spatial flood hazard boundaries were overlaid on centroids of updated assets (population, building stock, critical facilities and lifelines, and new development). Centroids that intersected the hazard areas were totaled to estimate the building replacement cost value and population vulnerable to the flood inundation areas.

National Flood Insurance Program (NFIP) was also provided to review the locations of properties identified as repetitive and severe repetitive properties. These properties were summarized by jurisdiction and general occupancy class to obtain an understanding of repetitive flood loss areas within the County.

Geological Hazards

This updated Hazard Mitigation Plan referenced landslide and subsidence hazard areas to assess the County's risk to the geologic hazard. To assess the vulnerability of the County to landslide events and its associated impacts, a quantitative assessment was conducted using ESRI ArcGIS v10.5.1 and a landslide layer that was created using the 2015 Digital Elevation Model (DEM) from the United States Geological Survey (USGS). The ArcGIS slope tool was used to calculate the degrees of the slopes in the DEM. Areas where slopes are greater than or equal to 15-percent grade may be susceptible to landslide events. Therefore, areas where the slope angles were equal to or greater than 15-percent grade were converted to degrees (e.g., 15-percent is equal to 8.5 degrees). Degrees that are equal to or greater than 8.5 were converted to vectors, which created the final landslide hazard layer. To estimate potential exposure to the landslide hazard area, assets (population, building stock, critical facilities and lifelines, new development) with their centroid in the hazard area were totaled to estimate the numbers and values exposed to the landslide hazard boundary.

To assess the vulnerability of the County to subsidence events and its associated impacts, a quantitative assessment was conducted using a karst carbonate rock spatial layer from USGS. Karst describes a distinctive topography that indicates dissolution of underlying carbonate rocks (limestone and dolomite) by surface water or groundwater over time. The dissolution process causes surface depressions and the development of sinkholes, sinking stream, enlarged bedrock fractures, caves, and underground streams. To estimate potential exposure to the subsidence hazard area, assets (population, building stock, critical facilities and lifelines, new development) with their centroid in the hazard area were totaled to estimate the numbers and values exposed to the subsidence hazard boundary.

High Winds (Hurricane, Tropical Storm, Nor'easters)

A Hazus probabilistic analysis was performed to analyze the wind hazard losses for Camden County for the 100- and 500-year mean return period events. The probabilistic Hazus hurricane model activates a database of thousands of potential storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identifies those with tracks associated with the County. Hazus contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Default demographic and updated building

and critical facility inventories in Hazus were used for the analysis. Although damages are estimated at the census tract level, results were presented at the municipal level. Since there are multiple census tracts that contain more than one jurisdiction, a density analysis was used to extract the percent of building structures that fall within each tract and jurisdiction. The percentage was multiplied against the results calculated for each tract and summed for each municipality.

Invasive Species and Harmful Algal Blooms

All of Camden County is exposed to invasive species and harmful algal blooms. A qualitative assessment was conducted. Resources from the State of New Jersey 2018 All-Hazard Mitigation Plan, the Centers for Disease Control and Prevention, the New Jersey Department of Environmental Protection, and the United States Department of Agriculture were used to assess the County's risk to invasive species and harmful algal blooms.

Severe Summer Weather

All of Camden County is exposed to severe summer weather events. A qualitative assessment was conducted for the severe summer weather hazard. Information from National Oceanic and Atmospheric Administration, Environmental Protection Agency, U.S. Department of Health and Human Services, the New Jersey State 2019 Hazard Mitigation Plan, and the Centers for Disease Control and Prevention were used to assess the potential impacts to the County's assets.

Severe Winter Storm

All of Camden County (population, buildings, and environment) is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard. A percentage of the custom-building stock structural replacement cost value was utilized to estimate damages that could result from winter storm conditions (i.e., 1-percent, 5-percent, and 10-percent of total replacement cost value). Given professional knowledge and currently available information, the potential losses for this hazard are considered to be overestimated; hence, providing a conservative estimate for losses associated with winter storm events.

Wildfire

The NJFFS uses Wildfire Fuel Hazard data to assign wildfire fuel hazard rankings across the State. This data, developed in 2009, is based upon NJDEP's 2002 Land Use/Land Cover datasets and NJDEP's 2002 10-meter Digital Elevation Grid datasets. For the wildfire hazard, the NJFFS Wildfire Fuel Hazard "extreme', 'very high' and 'high' areas are identified as the wildfire hazard area. The defined hazard area was overlaid upon the asset data (population, building stock, critical facilities and potential new development) to estimate the exposure to each hazard.

To determine what assets are exposed to wildfire, the County's assets (population, building stock, critical facilities and lifelines, and new development) were overlaid with the hazard area. Assets with their

centroid located in the hazard area were totaled to estimate building replacement cost value and population exposed to a wildfire event.

Considerations for Mitigation and Next Steps

The following items are to be discussed for considerations for the next plan update to enhance the vulnerability assessment:

- All Hazards
  - Utilize updated and current demographic data. If 2020 U.S. Census demographic data is available at the U.S. Census block level during the next plan update, use the census block estimates and residential structures for a more precise distribution of population, or the current American Community Survey 5-Year Estimate populations counts at the Census tract level.
- Coastal Erosion and Sea Level Rise
  - The general building stock inventory can be updated to include attributes regarding protection against strong winds, such as hurricane straps, to enhance loss estimates.
  - If available during the next plan update, update the risk assessment using a comprehensive coastal erosion hazard area map and updated sea level rise inundation areas.
  - Collect data on historic costs incurred to reconstruct buildings, cultural resources and/or infrastructure due to coastal erosion impacts.
  - Integrate evacuation route data that is currently being developed.
- Flood
  - The general building stock inventory can be updated to include attributes regarding first floor elevation and foundation type (basement, slab on grade, etc.) to enhance loss estimates.
  - Conduct a Hazus loss analysis in the latest version of Hazus and for more frequent flood events (e.g., 10 and 50-year flood events).
  - Further refine the repetitive loss area analysis.
  - Continue to expand and update urban flood areas to further inform mitigation.
- Earthquake
  - Identify unreinforced masonry in critical facilities and privately-owned buildings (i.e., residences) by accessing local knowledge, tax assessor information, and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response/recovery efforts at these properties can be developed.
  - Conduct Hazus loss analysis in the latest version of Hazus
- Extreme Temperatures
  - Track extreme temperature data for injuries, deaths, shelter needs, pipe freezing, agricultural losses, and other impacts to determine distributions of most at risk areas.
- Geological Hazards

- If available during the next plan update, update the risk assessment using a comprehensive landslide susceptibility and subsidence incidence hazard data.
- Collect data on historic costs incurred to reconstruct buildings, cultural resources and/or infrastructure due to geologic hazards.

- Wildfire
  - General building stock inventory can be updated to include attributes such as roofing material or fire detection equipment or integrate distance to fuels as another measure of vulnerability.
- Disease Outbreak
  - Additional information regarding localized concerns and past impacts may be collected and analyzed.
  - Assess the impacts and outcome from COVID-19.

4.5 Data Source Summary

Table 4.2-3 summarizes the data sources used for the risk assessment for this plan.

Table 4.2-3. Risk Assessment Data Documentation

Data	Source	Date	Format
Population data	U.S. Census Bureau; American Community Survey 5-Year Estimates	2010; 2019	Digital (GIS) format
Building footprints	2021 building footprints provided by Camden County and footprint boundaries from the 2019 New Jersey Department of Environmental Protection (NJDEP) impervious surface layer	2021/2019	Digital (GIS) format
MODIV Tax Assessor data	NJ Office of Information Technology	2020	Digital (GIS/Tabular) format
Critical facilities	Camden County Steering Committee and Planning Committee	2017/2020	Digital (GIS) format
Digitized Effective FIRM maps (2016)	FEMA	2016	Digital (GIS) format
NEHRP Soil	NJDOT	2012	Digital (GIS) format
1-Meter Resolution Digital Resolution Model (DEM)	USGS	2015	Digital (GIS) format
Coastal Hazard Area	FEMA Effective DFIRM LiMWA Lines	2016	Digital (GIS) format
Carbonate Rock Soil Data	USGS	n.d.	Digital (GIS) format
Steep Slope Over 15-Percent (derived from DEM)	USGS	2015	Digital (GIS) format
Census of Agriculture	USDA	2017	Digital (PDF Report) format
1-, 2-,3-,4-foot Sea Level Rise	NOAA	2017	Digital (GIS) Format
Sea-Lake Overland Surge from Hurricanes (SLOSH) Model	NOAA	2014	Digital (GIS) Format
Wildfire Fuel Hazard	NJDEP NFFS	2009	Digital (GIS) format
New Development Data	Camden County Planning & Steering Committee	2020	Digital (GIS) Format

Limitations

Loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

1) Approximations and simplifications necessary to conduct such a study
2) Incomplete or dated inventory, demographic, or economic parameter data
3) The unique nature, geographic extent, and severity of each hazard
4) Mitigation measures already employed by the participating municipalities
5) The amount of advance notice residents have to prepare for a specific hazard event
6) Uncertainty of climate change projections

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Camden County will collect additional data to collect additional data, update and refine existing inventories, to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock utilizing best available data. The County acknowledges significant impacts may occur to critical facilities and infrastructure as a result of these hazard events causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure, and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industry such as tourism and the real-estate market were not analyzed.