Appendix B. Hazard Analysis Methodology

The updated hazard risk assessment and analysis was conducted with the support of the Hazards Vulnerability and Resilience Institute (HVRI), University of South Carolina. Using historical hazard occurrence data, risk scores, HAZUS loss estimation modeling, and Social Vulnerability Index (SoVI), the hazard risk analysis determines the counties and populations most at risk to hazards addressed in the SHMP to inform development of mitigation actions and projects. The following hazards are addressed:

1. Coastal hazards
2. Drought
3. Earthquake
4. Extreme cold
5. Extreme heat
6. Flood
7. Hail
8. Hazardous material releases
9. Infectious Disease
10. Landslide
11. Lightning
12. Nuclear facilities
13. Severe thunderstorms
14. Terrorism
15. Tornado
16. Tropical cyclones
17. Wildfire
18. Wind
19. Winter weather

Hazard data was collected from the most credible and up to date sources available specific to each hazard with a preference for U.S. government-generated data. Following are major data sources and partners used in the SHMP hazard analysis.

National Centers for Environmental Information (NCEI), formerly known as the National Climatic Data Center (NCDC), is an official publication of the National Oceanic and Atmospheric Administration (NOAA) documenting:

a. The occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce;
b. Rare, unusual, weather phenomena that generate media attention, such as snow flurries in South Florida or the San Diego coastal area; and
c. Other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occur in connection with another event.

Regarding NCEI data:

a. An episode is an entire storm system and can contain multiple types of events.

b. An event is an individual type of storm event (e.g., thunderstorm, wind, hail, tornado, and flood are events)
c. When listing wind speed values under magnitude, e.g., 81 kts., the value listed is can be either estimated by damage caused or measured by official NWS approved calibrated anemometers. 1 kt. = 1.152 mph. (Measures Gust, Measured Sustained, Estimated Gust or Estimated Sustained)
d. When listing hail size under magnitude, e.g., 2.25 in, the hail size is given in inches and hundredths of inches. Values are assigned a size in inches from their appearance.

Spatial Hazard Events and Losses Database for the United States (SHELDUS) is a database of county-level hazard data for the United States. The database contains information such as: date(s) of event, affected location (county and state), and the direct losses caused by the event (property and insured crop losses, injuries, and fatalities) from 1960 to present. The most recent update of SHELDUS was released February 1, 2022 (Version 20.0). SHELDUS utilizes NCEI, United States Geological Survey (USGS), United States Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA), Oregon Department of Geology and Mineral Industries, Global Disaster Identifier Number (GLIDE), FEMA, United States Bureau of Labor Statistics and United States Census Bureau data. https://cemhs.asu.edu/SHELDUS/

Information regarding SHELDUS data: Loss information retrieved from SHELDUS is adjusted to 2020 U.S. dollar values.

Social Vulnerability Index (SoVI®) is a quantitative index used in the examination of social vulnerability in various geographies. Derived from the 2020 U.S. Census five-year American Community Survey, 2016-2020, SoVI® synthesizes 29 socioeconomic variables which contribute to the reduction in a community's ability to prepare for, respond to, and recover from hazards. For the purpose of the State Hazard Mitigation Plan 2023 update, the SoVI® comparative analysis is scaled to South Carolina census tract level. SoVI® scaled between three classes (low, medium, or high) and five classes (low, medium-low, medium, medium-high, or high) based on the result of the principal components analysis.
(https://www.sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/data_and_resources/sovi/index.php)

SoVI Event Risk Bivariate Map - Social vulnerability is measured by the Social Vulnerability Index (SoVI®) and risk scores are calculated by comparing the future probability of a particular hazard event for each county to every other county's probability. Both SoVI® and hazard event risk values are relative metrics that allow for place-based comparisons between geographies (counties and census tracts). Each census tract is assigned the county's risk score value and then overlaid with the tract's SoVI® score. The lightest (white) areas indicate the tracts with the lowest social vulnerability and lowest hazard risk score. Areas of higher social vulnerability and lowest severe thunderstorm risk are brighter pink, and areas of highest hazard risk and lowest social vulnerability are brighter blue. Areas of the highest combined social vulnerability and severe thunderstorm risk are dark blue. Excluded census tracts (shown in gray/black hatching) are those with zero population and/or zero households that were not included in the SoVI® analysis. A total of 1,303 census tracts in South Carolina were included in the SoVI® analysis.

HAZUS Loss Estimation Tool – HAZUS is a standardized methodology for modeling potential losses for earthquake, flood, and hurricane hazards. HAZUS uses GIS to determine potential losses

included in the assessment are physical damage to infrastructure such as critical facilities, residential and commercial buildings and schools; economic loss for lost jobs, business interruptions, repair and reconstruction costs; and social impacts such as estimates for shelter requirements, displaced households, populations exposed to the hazards. https://www.fema.gov/flood-maps/products-tools/hazus

The **Hazards Vulnerability and Resilience Institute (HVRI)** at the University of South Carolina is an interdisciplinary research and training center focused on the development of spatial analytical information, data, methods, and application for integrating hazard and climate information to advance equitable planning and management and adaptive capacity in communities as they respond to disaster risks and climate change. HVRI research and prepared the data and SOVI analysis in tables and maps in the hazard analysis. https://www.sc.edu/study/colleges_schools/artsandsciences/centers_and_institutes/hvri/index.php/sovi%C2%AE-0

Terminology

Explanation of several terms used in the SHMP hazard analysis:

Future Probability – The likelihood of a specific hazard event occurring. Future probability is calculated by taking the total number of events for a period of time divided by the number of days during the time period multiplied by 100 to calculate a percentage ((# of Events/# Days in Record) *100). The higher the percentage for a given county equates to the higher likelihood of a specific hazard event occurrence on a given day.

Frequency Interval = (# Days in Record/# of Events)

Annualized Losses = ((crop + property losses)/# Years in Record)

Risk Scores – Risk scores are calculated by comparing the future probability of an event for each county to other counties' future event probability. A risk score of zero or near zero does not mean that the county does not experience an event, just that it is less likely to experience the hazard in the future compared to counties with higher risk scores.