3.1: Identifying Hazards

> ***44 CFR 201.4(c)(5)(i)(ii) – The State mitigation strategy shall include the following elements: A Plan Maintenance Process that includes:***
>
> ***An established method and schedule for monitoring, evaluating, and updating the plan. A system for monitoring implementation of mitigation measures and project closeouts.***

Introduction

Hazard identification is the process of is recognizing events threatening a particular planning area. An event becomes a hazard when it harms people, and property or interferes with commerce and human activity. Such events would include but are not limited to, hurricanes, floods, earthquakes, tornadoes, and other hazards affecting populated areas. Natural hazards harming the State in the past are likely to happen in the future. Consequently, the process of identifying hazards includes determining whether or not the hazard occurred previously. Approaches to collecting historical hazard data include researching newspapers and other records, conducting a review of planning documents and reports in all relevant hazard subject areas, gathering hazard-related GIS data, and engaging in discussions with relevant experts throughout the state.

A variety of sources were used to determine the full range of potential hazards within the state of Mississippi, including internet research and a careful evaluation of approved local mitigation plans. Even though a particular hazard may not have occurred in recent history in the state, it is important to consider all hazards potentially affecting the planning area during the hazard identification stage.

Mississippi is vulnerable to a wide variety of natural and man-made hazards threatening life and property and is typically in the top ten most vulnerable states in the nation due to risks from hurricanes, tornadoes, and other hazards.

Table 3.1.1 outlines each major disaster declaration that Mississippi has received over the last decade. This establishes the vulnerability and historic occurrences of hazards with which Mississippi regularly deals with. This table also includes Individual Assistance (IA) statistics, accurate as of March 26, 2023.

Table 3.1.1
FEMA Major Disaster Declarations and Individual Assistance (IA) 2002 – 2023

Date	Disaster Type	Disaster Number	Amount of IA
March 26, 2023	Severe Storms, Straight-Line Winds, Tornadoes	DR-4697	$11,654,059
October 22, 2021	Hurricane Ida	DR-4626	$10,531,002
May 4, 2021	Severe Winter Storms	DR-4598	None
December 31, 2020	Hurricane Zeta	DR-4576	$21,167,837
July 9, 2020	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	DR-4551	None
April 23, 2020	Severe Storms, Flooding, and Mudslides	DR-4538	None
April 16, 2020	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	DR-4536	7210690
April 5, 2020	COVID-19 Pandemic	DR-4528	$40,979,703
March 12, 2020	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	DR-4478	None
December 6, 2019	Severe Storms, Straight-line Winds, and Flooding	DR-4470	None
June 20, 2019	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	DR-4450	None
April 23, 2019	Severe Storms, Straight-line Winds, Tornadoes, and Flooding	DR-4429	$1,682,322
February 14, 2019	Severe Storms, Flooding, and Tornadoes	DR-4415	None
November 22, 2017	Hurricane Nate	DR-4350	None
May 22, 2017	Severe Storms, Tornadoes, Straight-line Winds and Associated Flooding	DR-4314	None
January 25, 2017	Severe Storms, Tornadoes, Straight-line Winds and Associated Flooding	DR-4295	$3,314,757
March 25, 2016	Severe Storms, Tornadoes, and Flooding	DR-4268	$8,144,330
January 4, 2016	Severe Storms, Tornadoes, Straight-line Winds and Associated Flooding	DR-4248	$2,903,899
December 23, 2014	Severe Storms, Tornadoes, and Flooding	DR-4205	None
April 30, 2014	Severe Storms, Tornadoes, and Flooding	DR-4175	$5,899,175
February 13, 2013	Severe Storms, Tornadoes, and Flooding	DR-4101	$3,241,008
August 29, 2012	Hurricane Isaac	DR-4081	$17,667,440
May 11, 2011	Flooding	DR-1983	$13,724,525
April 29, 2011	Severe Storms, Tornadoes, Straight-line Winds and Associated Flooding	DR-1972	$10,730,970

May 14, 2010	Severe Storms, Tornadoes, and Flooding	DR-1916	$1,320,029
April 29, 2010	Severe Storms, Tornadoes, and Flooding	DR-1906	$4,302,971
May 12, 2009	Severe Storms, Tornadoes, and Flooding	DR-1837	None
September 22, 2008	Hurricane Gustav	DR-1794	$7,176,481
May 28, 2008	Severe Storms and Tornadoes	DR-1764	$549,481
May 8, 2008	Severe Storms and Flooding	DR-1753	$1,598,082
August 29, 2005	Hurricane Katrina	DR-1604	$1,296,454,555
July 10, 2005	Hurricane Dennis	DR-1594	None
September 15, 2004	Hurricane Ivan	DR-1550	$8,514,433
May 23, 2003	Severe Storms, Tornadoes, and High Winds	DR-1470	$740,552
April 24, 2003	Severe Storms, Tornadoes, and Flooding	DR-1459	$18,270,790
November 14, 2002	Severe Storms and Tornadoes	DR-1443	$2,028,549
October 1, 2002	Tropical Storm Isidore	DR-1436	None

Source: FEMA Disaster Declarations-Mississippi

Hazard Identification Process

This section profiles the potential hazards posing the greatest threat to Mississippi. As part of the 2023 revision, a comprehensive list of hazards was compiled from the following sources that include, but were not limited to:

- Review of the 2018 State of Mississippi Standard Mitigation Plan
- Review and assessment of historical data from the NCDC. FEMA Disaster Declarations, USGS, NFIP, and various internet resources.
- Review of the local hazard mitigation plans

In addition to the sources above, hazard data and input were collected from direct communication with various agencies, discussions with the consultant team's in-house experts, historical records, and Internet searches

The screening process did not vary from the 2018 process. Working with the consultant, the HMC considered which hazards could realistically be addressed at the state level in terms of mitigation. The HMC still believes that many hazards are best addressed by the local mitigation plans. The HMC has not changed its position regarding the lack of a specific hazard profiled in this plan. Again, it does not mean the state will not provide adequate support to local jurisdictions in mitigating the effects of locally-specific hazards.

The HMC's position regarding hazard selection and profiling remains the same. Many of the hazards selected are related (*e.g.* flooding and tornadoes can develop during a coastal storm) because other hazards may result from a disaster event. In such instances, these hazards are not listed separately but concurrently.

Table 3.1.2 shows a summary of the hazard identification results for Mississippi, followed by the results of the hazards not included in this plan update. This table includes the hazard ranking and subsection where

the hazard is addressed. Details of the hazard ranking and profiling process are provided following the identification tables.

Table 3.1.2
Summary of Hazards Selected

Hazard Type	Reasons for Inclusion	Section Reference
Flood	Almost 17% of the State's total land area is in a floodplain. Mississippi has the 5th largest floodplain in the U.S. Flash floods and other flood events occur regularly during rainstorms due to terrain and hydrology of the state of Mississippi. There have been numerous Disaster Declarations as a result of flooding in Mississippi.	Section 3.6
Tornado	Tornadoes are common disasters in Mississippi, with the most active season is from March through May. Recent tornado event trends indicate a shift from "Tornado Alley" in the Great Plains States to "Dixie Alley" in the Southeast magnifies the need for more research and a closer focus on mitigation.	Section 3.3
Tropical Cyclone	Hurricanes/tropical storms are common and devastating in Mississippi. Data indicates a trend toward more intense hurricanes.	Section 3.5
Wildfire	The State of Mississippi experiences wildfires regularly although they are typically experienced in more rural areas.	Section 3.7
Earthquake	Significant research indicates the potential for an impactful earthquake event in the future.	Section 3.10
Extreme Winter Weather	There have been more than 47 significant winter weather events between 1993 and 2009, with a reported $25 million in property damages and $5 billion in crop damages.	Section 3.9
Drought	Research indicates the possibility of inadequate water supply because prolonged drought conditions could impact the health of the population and jeopardize economic resources such as timber, livestock, and crops.	Section 3.8

Dam/Levee Failure	High-hazard dams require Emergency Action Plans which include Inundation mapping.	Section 3.4
Severe Weather (heavy rain, thunderstorm, strong wind, hail, and lightning)	Not typically a state-wide occurrence and is best addressed in local plans.	
Coastal Erosion	Coastal erosion is primarily caused by hurricanes and coastal flooding, which are addressed in their respective sections.	Section 3.11
Climate Change/Sea Level Rise	Climate change/sea level rise is an evolving hazard that is largely caused by increased levels of atmospheric carbon dioxide. Often considered a coastal issue, climate change has potential to create statewide impacts.	Section 3.11
Cyberterrorism	A widespread cyberterrorism attack could have significant impacts to government operations, commerce, and education systems.	Section 3.12
Pandemic	Challenges associated with the COVID-19 pandemic beginning in 2020 necessitate the inclusion of pandemic scenarios as a state-wide hazard of concern.	Section 3.16

Excluded Hazards

During the review of hazards included in the 2013 and 2018 plans, the HMC determined they would not change the process or how the hazards were categorized. Therefore, the hazard profiled and not profiled will remain the same in the 2023 HIRA update. Again, this decision was based on the belief they were not prevalent hazards within the State and would pose little or no threat to the state as compared to the other hazards. **Table 3.1.3** gives a brief description of those hazards and the reason for their exclusion.

Avalanches, landslides, and volcanos are recognized by FEMA as hazards prone to the U.S. but were not considered because they pose no threat to Mississippi.

Table 3.1.3
Summary of Hazards Excluded from Hazard Profiling

Hazard Type	Description	Reasons for Exclusion
Expansive soils	Expansive soils shrink when dry and swell when wet. This movement can exert enough pressure to crack sidewalks, driveways, basement floors, pipelines and even foundations.	Only 36% of local mitigation plans identified expansive soils as a hazard to be profiled. The state has concluded that it does not pose a significant state-level threat. The decision was also partially based on the fact that the impacts to state-owned or critical facilities would be minimal.
Extreme heat	Extreme heat conditions exist when temperatures hover 10 degrees or more above the average high temperature for the region and last for several weeks.	Only 24% of local mitigation plans identified extreme heat as a hazard to be profiled. While extreme heat can create emergencies in Mississippi, the state has concluded it does not pose a significant state-level threat. The decision was partially based on potentially minimal impacts to state-owned or critical facilities.
Liquefaction	Liquefaction occurs in saturated soils when the space between individual particles is filled with water. This water exerts pressure on the soil particles which influences how tightly the particles themselves are pressed together. Before an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move in relation to each other.	Soils in the state are mostly compact. Presents a minor threat. No significant historical record of this hazard in the region.
Land subsidence	Occurs when large amounts of groundwater are withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rocks fall in on themselves.	Addressed in the earthquake section.
Tsunamis	A tsunami is a series of ocean waves generated by sudden displacements in the	MEMA participates in the National Tsunami Hazard Mitigation

	sea floor, landslides, or volcanic activity. In the deep ocean, the tsunami wave may only be a few inches high. The tsunami wave may come gently ashore or may increase in height to become a fast-moving wall of turbulent water several meters high.	Program (NTHMP). There is no identified history of tsunamis in the Gulf. Mitigation would be similar to that for large hurricanes which are addressed.

Assessment of Local Mitigation Plans

The 2023 plan considers risks identified outside this process to be more aware of the hazards facing local jurisdictions. Chapter 5: Coordination of Local Mitigation Planning, covers in detail, hazards identified and addressed in the local plans. Generally, the hazards selected and profiled in this plan coincide with the highest-ranked local hazards.

All nine MEMA Districts decided to create District Regional Hazard Mitigation Plans instead of continuing with single jurisdictional plans. This review concluded that the nine hazards of concern - flood, hurricane, wildfire, tornado, extreme winter weather, earthquake, drought, severe weather, and dam/levee failure - are included in over 72% of the regional and local plans. Floods and tornadoes are common in all counties in Mississippi. For other hazards identified in local plans but not in the HMC ranking, a threshold was established. The HMC decided to continue with their decision from the prior plan update that if 45% or fewer of the local plans identified a particular hazard, it was deemed to pose no significant threat to the state. The results of the local hazard identification review are summarized in the table below.

A review of local plans revealed that severe weather (thunderstorms, hail, lightning, and high wind events) was identified and addressed by 48% of the local plans. The HMC continues to hold the position that this hazard is best addressed at the local level and is addressed under Section 3.13 Non-Profiled Hazards. As with the 2018 HIRA, components of these hazards are addressed in the tropical cyclone and tornado sections of this plan as applicable. This plan update will do the same.

Drought was addressed in 75% of the local plans and included as a limited profiled hazard as it can have statewide impacts, but is best mitigated by local practices. Coastal erosion is included as a non-profiled hazard and determined to pose no significant statewide threat to Mississippi and little or no threat to state-owned or critical facilities.

Hazards identified and addressed in local plans, but not included in this plan, will receive the support of the state mitigation program. These hazards include but are not limited to, sea level rise, saltwater intrusion, tsunamis, and expansive soils. Many of the coastal communities are in the process of conducting studies to understand the potential impacts of sea-level rise and those impacts should continue to be explored by the state.

Natural Hazards	Percent of Plans Included	Natural Hazards	Percent of Plans Included
Flood	98%	Expansive Soils	67%
Tornado	100%	Extreme Heat	46%
Hurricane	54%	Storm Surge	5%
Thunderstorm/High Wind/Lightning	48%	Erosion/Coastal Erosion	46%
Wildfire	98%	Tropical Storm/Coastal Storm	36%
Severe Winter Storm/Extreme Cold/Ice Storms	1%	Land Subsidence	37%
Earthquake	94%	Tsunami	2%
Drought	75%	Sea Level Rise	0%
Dam/Levee Failure	62%		

Hazard Ranking

For the 2023 HIRA update, the HMC elected to use the same methodology adopted during the last plan update. Again, since the hazard ranking methodology was used in the majority of approved local mitigation plans, the HMC wanted to continue with a consistent methodology that is reflective of the statewide evaluation of hazards. The basis for the ranking methodology used in this plan update is presented in **Table 3.1.4**.

Table 3.1.4
Hazard Ranking Methodology

RISK CHARACTERISTIC (VULNERABILITY)		SCORE
AREA IMPACTED (The percentage of the state at risk of an impact from each hazard)	No area in the state directly impacted	0
	Less than 25% of the state impacted	1
	Less than 50% of the state impacted	2
	Less than 75% of the state impacted	3
	Over 75% of the state impacted	4
HEALTH AND SAFETY CONSEQUENCES (The health and safety consequences that can occur)	No health and safety impact	0
	Few injuries or illnesses	1
	Few fatalities but many injuries or illnesses	3
	Numerous fatalities	4
PROPERTY DAMAGE	No property damage	0
	Few properties destroyed or damaged	1
	Few destroyed but many damaged	2

(The amount of property damage that can occur)	Few damaged and many destroyed	3
	Many properties destroyed and damaged	4
ENVIRONMENTAL DAMAGE (The environmental damage that can occur)	Little or no environmental damage	0
	Resources damaged with short-term recovery	1
	Resources damaged with long-term recovery	2
	Resources destroyed beyond recovery	3
ECONOMIC DISRUPTION (The economic disruption that can occur)	No economic impact	0
	Low direct and/or indirect costs	1
	High direct and low indirect costs	2
	Low direct and high indirect costs	3
	High direct and high indirect costs	4
FUTURE OCCURRENCE		**SCORE**
PROBABILITY OF FUTURE OCCURRENCE (The probability of a future occurrence)	Unknown but anticipated rare occurrence	1
	1 - 4 documented occurrences over the last 10 years	2
	5 - 7 documented occurrences over the last 10 years	3
	8 – 10 documented occurrences over the last 10 years	4
	9a More than 10 occurrences over the last 10 years	5

In keeping with the same process, the HMC studied each state-wide hazard and, based on data provided by the council members and planning team, considered the statewide implications each would present. Each risk characteristic including area impacted, health and safety consequences, property damage, environmental damage, and economic disruption, was assigned the same scoring value as dictated by the 2018 plan of 0-4, multiplied by a future occurrence value of 1-5 to determine the overall risk level. The sum of each risk characteristic value was added together and multiplied by the probability of future occurrence to determine each hazard's total risk rating score. The formula is as follows: vulnerability x probability of occurrence = risk. Below is the definition of each risk level and its total rating score value.

Risk Level	Total Rating Score
Low	**0-15**
A hazard with a LOW-RISK RATING is expected to have little to no impact on the state. The hazard poses minimal health and safety consequences to the state's residences and is expected to cause little to no property damage. The occurrence of a hazard with a LOW-RISK RATING is rare; however, due to other factors such as geographical location, it is still possible for such a hazard to occur and even cause significant damage based on the magnitude of the event.	

Moderate	**16-30**
A hazard with a MODERATE RISK RATING is expected to have a moderate impact on the state. The hazard poses minor health and safety consequences with minor injuries expected and few to no fatalities. The hazard may cause some property damage and few to no fatalities. The hazard may cause some property to be damaged or destroyed. The occurrence of a hazard with a MODERATE RISK RATING is likely at least once within the next 25 years.	
High	**31 or More**
A hazard with a HIGH-RISK RATING is expected to have a significant impact on the state. The hazard poses high health and safety consequences with numerous injuries and fatalities possible. The hazard may cause some significant property damage or destruction. A hazard with a HIGH-RISK RATING is expected to occur at least once within 12 months but can occur multiple times within a year.	

Table 3.1.5 indicates the overall ranking established by the HMC using the method described above and followed by the definition of profiled, limited, and non-profiled hazards. The completed worksheet is provided in **Appendix 7.3.1-A**. A review of the rankings for the 2022 HIRA update indicated no change except for the inclusion of pandemic as a hazard of concern.

Table 3.1.5
Hazard Ranking

2022 Hazards Selected	Total Vulnerability	Future Occurrence	Total Risk Value	Risk Level
Tornado	18	5	90	High
Dam/Levee Failure	11	5	55	High
Tropical Cyclone (Hurricane/Tropical Cyclone)	19	3	57	High
Flood	14	5	70	High
Wildfire	9	2	18	Moderate
Drought	10	2	20	Moderate
Extreme Winter Weather	11	3	33	Moderate
Earthquake	13	1	13	Low
Climate Change/Sea Level Rise	10	1	10	Low
Cyberterrorism	12	1	12	Low

Non-Profiled Hazards

The HMC chose not to select and rank severe storms, because they do not typically result in a statewide impact, require a state response, and should be mitigated at the local level. During a review of the plan and with 48% of local jurisdictions indicating severe storms (thunderstorms, high wind, lightning, and hail) were of significant concern, the state opted to expand the profile of this hazard under Section 3.13. In this section,

a general discussion of vulnerability was added along with a history of events. Property damage, loss of life, and injuries that can be expected statewide are addressed generally. It is not possible to specifically address expected losses to critical or state-owned facilities with the limited data available.

Beach/Coastal erosion is also included as a non-profiled hazard and determined to pose no significant statewide threat to Mississippi and little or no threat to state-owned or critical facilities.

Infrastructure Interdependency

Reliance on built infrastructure in Mississippi is becoming increasingly important. Infrastructure elements such as roads, bridges, electrical grids, computer networks (the Internet), and similar components provide the economic and supply backbone upon which economic health and future growth rest. At best, failure of any one or all of these elements may result in substantial economic damage; and at worst, significant loss of life. Failure of one system (electrical) may cause cascading failures across multiple systems (water, wastewater, E911, etc.) with far-reaching consequences (large fires, disease, etc.). Complicating matters is the increasing fragility of infrastructure as components age, are threatened by severe weather and climate change, become terrorism targets, or simply fail due to an accident. Initial studies suggest the failure of infrastructure in Mississippi due to aging is a significant concern. Collaborative data sharing by those who investigate critical failure points and weaknesses in Mississippi's infrastructure systems is required.