**Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.*

MS-ESS3-2 Earth and Human Activity

Students who demonstrate understanding can:

MS-ESS3-2. **Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings.

Disciplinary Core Ideas

ESS3.B: Natural Hazards

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.

Crosscutting Concepts

Patterns

- Graphs, charts, and images can be used to identify patterns in data.

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

Observable features of the student performance by the end of the course:		
1	Organizing data	
	a	Students organize given data that represent the type of natural hazard event and features associated with that type of event, including the location, magnitude, frequency, and any associated precursor event or geologic forces.
	b	Students organize data in a way that facilitates analysis and interpretation.
	c	Students describe* what each dataset represents.
2	Identifying relationships	
	a	Students analyze data to identify and describe* patterns in the datasets, including:
		i. The location of natural hazard events relative to geographic and/or geologic features.
		ii. Frequency of natural hazard events.
		iii. Severity of natural hazard events.
		iv. Types of damage caused by natural hazard events.

		v. Location or timing of features and phenomena (e.g., aftershocks, flash floods) associated with natural hazard events.
	b	Students describe* similarities and differences among identified patterns.
3	Interpreting data	
	a	Students use the analyzed data to describe*:
		i. Areas that are susceptible to the natural hazard events, including areas designated as at the greatest and least risk for severe events.
		ii. How frequently areas, including areas experiencing the highest and lowest frequency of events, are at risk.
		iii. What type of damage each area is at risk of during a given natural hazard event.
		iv. What features, if any, occur before a given natural hazard event that can be used to predict the occurrence of the natural hazard event and when and where they can be observed.
	b	Using patterns in the data, students make a forecast for the potential of a natural hazard event to affect an area in the future, including information on frequency and/or probability of event occurrence; how severe the event is likely to be; where the event is most likely to cause the most damage; and what events, if any, are likely to precede the event.
	c	Students give at least three examples of the technologies that engineers have developed to mitigate the effects of natural hazards (e.g., the design of buildings and bridges to resist earthquakes, warning sirens for tsunamis, storm shelters for tornados, levees along rivers to prevent flooding).