

Strand 8.4: Interactions with natural systems and resources	Interactions of matter and energy through geologic processes have led to the uneven distribution of natural resources. Many of these resources are nonrenewable and per-capita use can cause positive or negative consequences. As energy flows through the physical world, natural disasters can occur which affect human life. Humans can study patterns in natural systems to anticipate and forecast future disasters and work to mitigate the outcomes.	
Standard 8.4.5 (MS-ESS3-2.)	Analyze and interpret patterns of the occurrence of natural hazards to forecast future catastrophic events and investigate how data are used to develop technologies to mitigate their effects. Emphasize how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow prediction, but others, such as earthquakes, may occur without warning.	
SEP/CCC	Analyzing and Interpreting Data Analyze and interpret data to determine similarities and differences in findings.	<u>Patterns</u> Graphs, charts, and images can be used to identify patterns in data.
DCI	ESS3.B: Natural Hazards <ul style="list-style-type: none"> 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. 	
Student Friendly Objective	<p>I can analyze data and identify patterns in the occurrences of natural hazards to predict future catastrophic events.</p> <p>I can obtain information on how data can be used to develop new technologies to limit the effects of the catastrophic events.</p>	
Anchor Phenomena	There are patterns in the occurrences of natural hazards and these patterns can be used to predict future catastrophic events.	
Vertical Learning Progression	<p align="center">Previous Science Content (Discussed in K-7 Standards)</p> <ul style="list-style-type: none"> In a region, some kinds of severe weather are more likely than others. Forecasts allow communities to prepare for severe weather. A variety of hazards result from natural processes. Humans cannot eliminate hazards but can reduce their impacts. Interactions between air masses cause changes in weather conditions. (6th grade) Design solutions for homes, roads, bridges etc. that are sustainable during a geologic hazard. (7th grade) Mapping of earthquakes and volcanoes relative to plate boundaries. (7th grade) 	<p align="center">Future Science Content (Discussed in 9-12 Standards)</p> <ul style="list-style-type: none"> Natural hazards and other geological events have shaped the course of human history at local, regional, and global scales. Specifics about why natural hazards occur. How to determine epicenter etc. Fujita scale, Richter scale, etc.
What students will be doing this year:	Organizing data <ol style="list-style-type: none"> 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.

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.

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).