

Lesson 9: Assessing Vulnerability and Risk

SKILLS:



Lesson question: What parts of our community are most vulnerable and most at risk?

Learning objectives:

- Students identify places that they value in their local area and assess their vulnerability to hurricanes and tropical storms.
- Students determine what risk each place faces now and in the future.

Timing: One class period

Materials:

- Classroom computer, projector, and Internet access
- Slide 2 from Lesson 8 slide deck (download from scied.ucar.edu/HurricaneResilience)
- Student pages:
 - › *What's Vulnerable?* (pages 65-66)
 - › *What's the Risk?* (page 67)

Preparation:

- Make one copy of each student page for each student.

Directions

Define resilience.

1. Remind students that resilience (introduced in Lesson 8) is the ability to bounce back from a shock or stress, acquire new capabilities, or handle changing conditions.
 - Have students think of a time in their life when they have been resilient and share with a partner.
 - Shift from personal resilience to hurricane resilience:
 - › Ask students to name actions that they heard about in Storm Stories interviews that helped people be resilient when facing a hurricane.
 - › Ask students what resilience strategies they remember from the previous lesson.
2. Provide a more detailed definition of resilience.
 - Resilience is the capacity of individuals, communities, and systems to survive, adapt, and grow despite ongoing stresses and unexpected shocks. Adaptation is a piece of resilience and is defined as modifying how we live in a place to survive despite changing environmental conditions (according to LA SAFE, Louisiana's resilience planning effort).
 - Note that resilience planning takes into account many different ways that people or communities are vulnerable (because of sinking land, changing economics, demographics, disease, etc.). In this project, we are looking at resilience to hurricanes specifically.

Assess vulnerability.

3. Tell students that now they will identify places that they think are valuable in their community and then identify their vulnerability. Remind students that **vulnerability** means that something, some place, or someone is exposed or sensitive to harm.

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4. Project for the class the graphic entitled *What is vulnerable?* (Slide 2) from the Lesson 8 slide deck. Remind students that they saw this during the previous class period.
5. Hand out the *What's Vulnerable?* student page. Orient students to the table on the student page by relating the column headings to the sections of the *What is vulnerable?* graphic from Slide 2.
 - › Column B (Is the place in harm's way?) is exposure in the graphic.
 - › Column C (Could the place physically withstand a hurricane?) is sensitivity.
 - › Column D (Are people in the place able to handle a hurricane?) is the adaptive capacity.
6. Have students complete the *What's Vulnerable?* student page to consider what places in their community that they value are most vulnerable. Explain that to assess the vulnerability, they will estimate how exposed certain places are and how sensitive the places and the people in those places are to hurricanes.
 - › Filling in information will require that students make their best estimates.
 - › For column D, students should estimate whether the people are likely to be negatively affected by a hurricane. Provide examples for students of how some people may be more vulnerable than others (e.g., those who lack the financial resources or a car that would allow them to evacuate, those who have a disability that would make hurricane preparations difficult). This is called social vulnerability.
 - › Students will then calculate the vulnerability in column E.
 - › After calculating for five places, students should identify the most vulnerable place they found. On the second page of the *What's Vulnerable* student page, have students cite evidence and explain their reasoning for why it is the most vulnerable.
7. Have students share which places they claim to be most vulnerable and why.
 - › As students share, ask them to describe their evidence and reasoning to support their claim. (If short on time, have students work in groups of three to five to share their most vulnerable location, evidence, and reasoning.)
 - › To add a geography component, mark each vulnerable location on a map as students share their evidence and reasoning.

Determine risk.

8. Tell students that **vulnerability** to an event, like a hurricane, combined with the **consequences** if the event occurred, and the probability of the event, adds up to **risk**.
9. Have students use the *What's the Risk?* student page to assess the consequences if the places they value were destroyed and calculate the **risk** of hurricanes now and in the future, when the probability of harm will be higher.
 - › When orienting students to the student page, facilitate a discussion to help students decide what they feel distinguishes between high/med/low consequences: the number of people impacted, the importance of the service provided (for example a hospital being destroyed versus a home), the monetary value, the uniqueness, etc.
 - › Remind students that, in this exercise, they are comparing the relative risk of different places. (The numbers used in the student page calculations are only meaningful in comparison with the numbers for other locations.)
 - › Explain why the risk now might be different than the risk in 2050. Students should recall from Lessons 5-7 that climate warming is causing hurricanes to become stronger and sea level to rise. Sea level is also rising due to land subsidence in many areas. This all contributes to a higher probability of a strong hurricane and more extensive flooding in the future.

Sensemaking

- Facilitate a class discussion of the following questions.
 - › What trends do you notice when comparing the risk now to future risk (columns C & D)?
 - › What is different between the places with the highest risk values and the lowest?
 - › Can you accept the risks of hurricanes and sea level rise now? How about future risks?
 - Tell students that there isn't a correct level of risk, that everyone is different in the way they perceive risk, so no two people will have exactly the same idea about how much risk is too much. What's most important is to know how much risk you feel comfortable with.

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- › Which places are most in need of help in order to reduce risk (now and in the future)?
 - Note that to reduce risk, we can take actions that make us and the places that we value less vulnerable. Tell students that during the next lesson, they will focus on actions that people in the community can take to reduce risk and be more resilient.

Opportunities for Assessment

- On the *What's Vulnerable?* student page, the evidence and reasoning related to the most vulnerable place on their list serve as a brief CER assignment and will allow students to demonstrate that they understand the factors that are a part of vulnerability.
- Answers on the *What's at Risk?* student page should demonstrate that students understand that risk is greater in the future than it is today.
- Answers to the question *Can you accept the risk?* during the sensemaking discussion can serve as a formative assessment for the following lessons. Be aware of students' moods. At this point, some students might be concerned, angry, or feeling vulnerable to disaster. Provide a safe space for students to discuss how this exercise made them feel.

What's Vulnerable?

Lesson 9 Student Pages: Assessing Vulnerability and Risk

- List an important place in your community in each row of **column A** below (you will have a total of five places). The places could be specifically important to you (like your home) or could be important to the community (like a hospital, community center, or shop).
- If a hurricane is heading towards the coast in your area, are the places exposed, or in harm's way? Decide whether each place is very exposed, somewhat exposed, or not exposed to hurricanes and circle an answer in **column B** for each location.
- Can the places, and people in them, withstand hurricanes? Estimate whether each place could physically withstand a hurricane (**column C**) and whether the people in that place are able to handle a hurricane (**column D**).
- To estimate vulnerability, add the numbers from columns B, C, and D together and put the totals for each row into **column E**. The places that are most vulnerable will have the highest numbers. The places that are least vulnerable will have the lowest numbers.

A Places in your community that you value	B Is the place in harm's way? (circle one)	C Could the place physically withstand a hurricane? (circle one)	D Are people in the place able to handle a hurricane? (circle one)	E Vulnerability (Add the numbers from B+C+D together.)
	Very exposed (3) Somewhat exposed (2) Not exposed (1)	Yes, very well (1) Some damage (2) Probably not (3)	Yes, very well (1) It may be difficult (2) Probably not (3)	
	Very exposed (3) Somewhat exposed (2) Not exposed (1)	Yes, very well (1) Some damage (2) Probably not (3)	Yes, very well (1) It may be difficult (2) Probably not (3)	
	Very exposed (3) Somewhat exposed (2) Not exposed (1)	Yes, very well (1) Some damage (2) Probably not (3)	Yes, very well (1) It may be difficult (2) Probably not (3)	
	Very exposed (3) Somewhat exposed (2) Not exposed (1)	Yes, very well (1) Some damage (2) Probably not (3)	Yes, very well (1) It may be difficult (2) Probably not (3)	
	Very exposed (3) Somewhat exposed (2) Not exposed (1)	Yes, very well (1) Some damage (2) Probably not (3)	Yes, very well (1) It may be difficult (2) Probably not (3)	

Name: _____

What's Vulnerable?

Lesson 9 Student Pages

In the spaces below, make a claim about which of the five places you assessed on the previous page (page 65) is most vulnerable, and then support your claim with evidence and reasoning that describes why it's vulnerable.

Make a claim.

Which place (from the five on the previous page) is most vulnerable to hurricanes and tropical storms?

Cite evidence.

What's your evidence that it is vulnerable to these storms?

Share your reasoning.

Why does the evidence suggest that it is vulnerable?

Name: _____

What's At Risk?

Lesson 9 Student Pages: Assessing Vulnerability and Risk

1. What would be the consequences if each place is destroyed? List the **same places (column A)** and **vulnerabilities (column E)** that you included in your *What's Vulnerable?* table.
2. **Estimate the consequences** if the place were destroyed in **column F**.
3. Calculating risk takes into account the vulnerability to an event, the consequences if destroyed, and the probability that the event will happen. In this case, we are exploring the risk associated with hurricanes. The probability of a strong hurricane hitting a place along the coast are increasing as climate warms and sea level rises.
 - › To calculate the **risk now (column G)**, add vulnerability and consequences (E and F) and then multiply by two.
 - › To calculate the **risk in 2050 (column H)**, add vulnerability and consequences (E and F) and then multiply by three (because there will be a high probability of a damaging hurricane in the future.)

A Places in your community that you value	E Vulnerability	F Estimate of consequences if destroyed (circle one)	G Risk now based on medium probability (E+F)*2	H Risk 2050 based on high probability (E+F)*3
		Low (1) Medium (2) High (3)		
		Low (1) Medium (2) High (3)		
		Low (1) Medium (2) High (3)		
		Low (1) Medium (2) High (3)		
		Low (1) Medium (2) High (3)		