



Exploring the Colorado Resiliency Framework: Flood

Setting the Stage

The Colorado Resiliency Framework was developed after the Boulder area floods in 2013. Governor Hickenlooper created the Colorado Resilience Office, which put together the framework and works with state offices across the board to include resiliency in planning and operations.

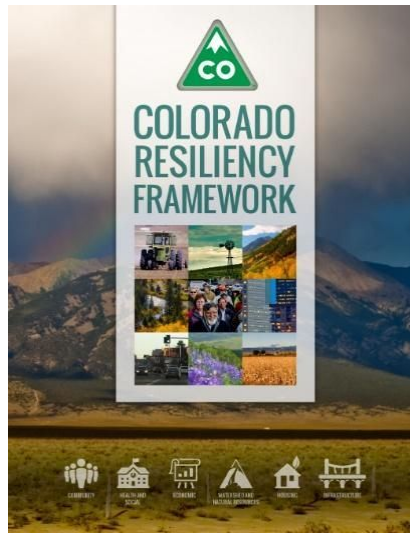


Photo: Colorado Resiliency Framework

Lesson Overview

Students will interact with a story map to explore the Resiliency Framework and learn more about the six sectors of the Resiliency Framework. Sectors are categories or lenses the state has used to divide up the Resiliency Framework and include: Community; Economic; Health and Social; Housing; Watersheds and Natural Resources; and Infrastructure.

- **Activity 1 – Engage (10 minutes) Warm-Up Planning Activity**
Individually, students will brainstorm what they would need for a kit to prepare for a hazard in their community. They will share ideas and identify items or services that fit within each of the six sector categories.
- **Activity 2 – Explore (30 minutes) Story Map Exploration**
Individually, students will explore the Story Map using handouts.
- **Activity 3 – Explain (10 minutes) Class Discussion**
As a class, share out what was learned from the different sectors. Discuss the meaning of resilience, shocks, and stresses across the sectors.





Instructional Overview	
Grade Level	Middle/High School
Instructional Time	50 minutes
Standards Alignment	NGSS: MS-ESS3-2 , HS-ESS3-1 CDE: MS3.ESS.GLE9 , HS3.ESS.GLE9
Anchoring Phenomenon	<ul style="list-style-type: none"> The long-term effects of natural hazards (flood, wildfire, and/or drought) on a community.
Driving Question	<ul style="list-style-type: none"> What does resilience look like in Colorado? What are some of the shocks and stresses experienced in each sector?
Learning Goals	<ul style="list-style-type: none"> Students will understand the six different sectors the state of Colorado has used as a lens to plan for resilience. Students will analyze spatial data to visualize some of the shocks and stresses experienced by each sector.
Materials	<ul style="list-style-type: none"> <input type="checkbox"/> Computers with internet access for each student (or pairs of students) <input type="checkbox"/> Colorado Resiliency Framework Student Handouts (one per student) <input type="checkbox"/> Colorado Resiliency Framework Sector Handouts (several copies of each sector handout for at least one handout per student in that sector group)
Material Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Make sure that the Story Map works on your class computers (https://arcg.is/i44Se). <input type="checkbox"/> Post the link to the Story Map for students (in your Google Classroom, on the board, etc.). <input type="checkbox"/> Print handouts
Vocabulary	<p><u>Shocks</u> are intense, short term events that can disrupt communities (e.g., floods and wildfires).</p> <p><u>Stresses</u> are underlying long-term economic, social, and environmental conditions that can negatively impact a community's environmental, social, and economic health (e.g., drought, extreme heat, lack of affordable housing, depressed economy).</p>

Activities	Web Links for Lesson Resources Note: all resources are downloaded as pdfs in the <i>Activity Resources Folder</i>
Activity 2	Activity 2 <ul style="list-style-type: none"> Data: Colorado Resiliency Framework Story Map - Flood https://arcg.is/i44Se





Activity 1 (Engage)

Warm-Up Planning Activity (10 minutes)

Hazard Preparedness & Resiliency Kit:

Distribute the student handouts. Ask students to think about what they would do if a natural hazard were to occur in their community tomorrow. If they were able to create a kit to respond to and recover from the hazard in their community, what would they include? Set a timer for 5 minutes and ask them to create a list in their student handouts of items they would include and services or people they would want to have access to, after the hazard has occurred.

Answers vary.

Next, use the sectors from the Colorado Resiliency Framework (Community; Economic; Health and Social; Housing; Watersheds and Natural Resources; and Infrastructure) to create a categorized list of items and resources. Begin by writing the title of each sector on the board and, as a class, go through each sector one at a time. Announce the name of a sector and ask students to raise their hands (or stand up) if one of their items fell within the category. Ask students who raised their hand (or stood up) to volunteer items or people/services on their list for the sector.

A final list may look something like this:

Community:

- Access to neighbors
- Access to local government resources
- Access to community center

Health and Social:

- First Aid Kit
- Access to mental health resources
- Access to hospital/urgent care
- Extra Medications

Watersheds & Natural Resources:

- Water filter
- Access to stream gauge data

Economic:

- Savings (cash)
- Access to open stores
- Time off work if needed

Housing

- Access to emergency shelter
- Access to home insurance

Infrastructure:

- Drinking water
- Generator (power backup)
- Access to roads
- Cell phone service

Discuss with your students what kinds of items or resources on the list would be helpful in the short term, and which would be helpful in the long term. Next, explain that the students have just played the role of a planner for their household. Community planners are professionals that think about the same types of things, but on a larger scale for the entire community or state. In





this lesson, they will be exploring the work of planners in all six of the sectors and learning about how these planners are incorporating resilience into their work.

Activity 2 (Explore)

Colorado Resilience Framework Story Map Exploration (30 minutes)

Activity 2.1 Colorado Resilience Framework Story Map Introduction

Assign students to work individually or in pairs on computers. Ask them to access the [Colorado Resiliency Framework Story Map - Flood](#) and begin by reading the Introduction and watching the video on the Introduction page.

Have them answer the questions about the Story Map on their student handouts.

1. In your own words, why was the Colorado Resiliency Framework created?
Answers vary.
2. What's the difference between resilience, hazard mitigation, and disaster preparedness?
Hazard mitigation uses planning tools and strategies to reduce a community's risk and vulnerability to natural hazards. Disaster preparedness means having plans and policies in place for how a community will respond to a natural hazard. Resiliency is a holistic view that looks at underlying factors that would increase a community's vulnerability to a natural hazard, and considers the long term effects of a hazard.
3. Contrast and compare shocks and stresses.
Shocks are short term events that may be intense and create damage in a short period of time, whereas stresses are long term conditions that weaken the fabric of a community and may negatively impact how a community is able to respond to a natural hazard.

Activity 2.2 Colorado Resilience Framework Story Map Sector Exploration

Next, students will explore the sectors of the Resiliency Framework. You can choose to have students explore each sector and answer questions for only one or two sectors, or have students focus on one sector and share out what they've learned with their classmates. Each sector has a short summary of the sector from the Colorado Resiliency Framework, a video from an expert, and a few questions that ask students to explore the accompanying map. The first three questions are general and relate to the video/summary, and the following questions are meant to be answered specifically for the student's hometown or neighborhood.





We suggest putting sector handouts in six piles (one for each sector), and letting students choose the handout for whichever sector they are interested in.

Community Sector

4. In your own words, explain what the community sector is.

Answers vary. The Sector figure (on the Introduction Page) shows topics in the Community Sector are Land Use/Planning, Smart Growth, Floodplain Management, Emergency Management, Mitigation, Governance, Capabilities, and Culture.

5. According to the summary from the Colorado Resiliency Framework and the expert video, what does resilience look like in this sector?

Resilience can mean three things: integrating the understanding of risk into long range plans; ensuring that the social fabric of the community is strong (people are connected and have access to resources); and the local government is stable.

6. What are the types of shocks and stresses that might affect the community sector?

Community can experience shocks like flooding and wildfire. Long term stressors could be, for example, if a large singular employer leaves that community, it has impacts for the tax base and employees that are residents.

7. The floodplain is in light blue. Schools and places of worship (including churches, mosques, and synagogues) are often places where community members gather. Are there any schools or places of worship in the floodplain?

Answers vary.

8. How would the loss of community gathering places in a flood affect a community's ability to bounce back?

Answers vary. Communities rely on gathering places to come together in times of need. Vital connections and relationships might be harder to access if a place where people naturally come together is destroyed.

9. Would the loss of a community gathering place be considered a shock or a stress?

The loss itself would be a shock because it would happen over a short time period. The absence of community gathering places may be considered a long-term stress on the community.





10. The pink color represents population density. How might population density affect a community's ability to bounce back after a natural hazard? Would more densely populated areas recover more quickly or slowly?

If there were damage in a more densely populated area, the area may take longer to recover due to more people's lives and property being affected. On the other hand, more densely populated areas may have more access to resources and be able to implement recovery efforts more quickly and efficiently.

Economic Sector

11. In your own words, explain what the economic sector is.

Answers vary. The Sector figure (on the Introduction Page) shows topics in the Economic Sector are Small Business, Agriculture, Tourism, Commercial Environment, Jobs, and Diversity.

12. According to the summary from the Colorado Resiliency Framework and the expert video, what does resilience look like in this sector?

Resilience means having a diverse economic base, meaning a lot of different industries without any specific reliance on one. It also means strong small businesses, support for entrepreneurship, and a well educated and mobile workforce.

13. What are the types of shocks and stresses that might affect the economic sector?

Job losses could be a shock in the economic sector. Floods, wildfires, and an economic downturn are other examples of shocks. No stresses are mentioned in the expert video, but examples could include high unemployment rates and/or lack of access to higher education or job training programs.

14. The floodplain is in light blue. Are any portions of your downtown in the floodplain? If so, do you know of any restaurants or businesses in the floodplain? Which ones?

Answers vary.

15. Unemployment (the percentage of working-age adults unemployed) is in purple (see the key at the bottom). In your neighborhood, what percentage of people are unemployed?

Answers vary.

16. How might unemployment affect a community's ability to bounce back after a natural disaster?





If jobs are lost due to a natural hazard, unemployment may increase and make unemployment worse. If unemployment is high, people have less resources to respond to a hazard and rebuild their community.

17. Is unemployment a shock or a stress? Why?

Unemployment is a stress because it is a long-term condition that may negatively affect a community's ability to bounce back after a natural hazard.

Health and Social Sector

18. In your own words, explain what the health and social sector is.

Answers vary. The Sector figure (on the Introduction Page) shows topics in the Health and Social Sector are Access to Services, Physical/Psychological Health and Well-Being, and Social Vulnerabilities.

19. According to the summary from the Colorado Resiliency Framework and the expert video, what does resilience look like in this sector?

A shock is when the disaster disrupts people's ability to get their medicine, have health services available, or have access to flushable toilets. The expert does not discuss stresses, but examples could be a large population of diabetics, a lack of access to mental health resources, and/or high health insurance costs.

20. What are the types of shocks and stresses that might affect the health and social sector?

Resilience is tied to the idea of health equity, which is the idea that everyone has the opportunity to thrive and have a good quality of life.

21. The floodplain is in blue. Are there any urgent care centers, hospitals, or emergency service stations in the floodplain? If so, which ones? Why would that be a concern?

Answers vary. If urgent care centers, hospitals, or emergency services stations are damaged in a flood, the access to health services in the community will decrease. Community members would have to look elsewhere for care, putting more pressure on other facilities in town or in nearby towns.

22. Are there any childcare centers or nursing homes in the floodplain? If so, which ones? Why would that be a concern?

Answers vary. Children and elderly people are vulnerable populations that are less mobile and may need support evacuating an area.

23. The gray shading represents the number of residents that are 65 years or older. Zoom into your neighborhood. How many residents are 65+ in your neighborhood?

Answers vary.





24. Why would knowing how many residents are older than 65 matter for a community's resilience in the case of natural hazard? Would a high population of elderly people be a shock or stress for the health sector?

Elderly people may take longer to recover from medical shocks. Elderly populations usually have more medical needs, and may be a long-term stress for the health sector.

Housing Sector

25. In your own words, explain what the housing sector is.

Answers vary. The Sector figure (on the Introduction Page) shows topics in the Housing are Affordable Housing, Accessibility, Range of Housing Options, Durable Materials, Energy Efficiency, and Insurance.

26. According to the summary from the Colorado Resiliency Framework and the expert video, what does resilience look like in this sector?

Resilience is the ability to overcome challenges.

27. What are the types of shocks and stresses that might affect the housing sector? You may have to think of some on your own.

The expert doesn't speak to shocks and stresses in the video. Potential shocks are wildfires or floods that could damage a home. Long-term stresses could be lack of affordable housing, aging homes that are falling apart, etc.

28. The floodplain is in light blue. Are any mobile home parks or nursing homes in the floodplain?

Answers vary.

29. Why might nursing homes or mobile home parks be more vulnerable to flooding?

Nursing homes have residents that may need more assistance for evacuation due to lower mobility. Mobile home parks may be more vulnerable because structures may not be permanent and may be washed away or experience more damage.

30. If your town had a shortage of affordable housing, would that be considered a shock or a stress? Why?

This would be considered a long-term stress, because it could negatively affect a community's ability to bounce back after a flood. If homes are damaged in a flood, more housing will be needed and, if housing is already limited, rent will go up and affordable housing availability would likely decrease even more.





31. What areas/neighborhoods would you be most concerned about if a flood were to occur? Look for areas in the floodplain with high population density (which likely means a lot of housing). Population density is in orange.

Answers vary.

Watersheds and Natural Resources Sector

32. In your own words, explain what the watersheds and natural resources sector is.

Answers vary. The Sector figure (on the Introduction Page) shows topics in the Watersheds and Natural Resources Sector are Environment, Streams, Water Quality & Capacity, and Ecosystem/Natural Habitats.

33. According to the summary from the Colorado Resiliency Framework and the expert video, what does resilience look like in this sector?

When something bad or challenging happens, how quickly can a community or group of people recover from a problem or prevent it from becoming a problem in the first place? A resilient watershed would be measured by how quickly it could recover its characteristics.

34. What are the types of shocks and stresses that might affect the watersheds and natural resources sector?

Shocks could be wildfire or flooding. Stresses are slower processes, like drought, which begins as a stress and becomes a shock.

35. The floodplain is in light blue. There are likely several streams or rivers in or near your town, in darker blue. Do all of the streams and rivers have a floodplain? If a stream or river doesn't show a floodplain, why do you think it doesn't?

Smaller streams and rivers may not have a floodplain if they aren't prone to flooding. Additionally, FEMA may not have surveyed floodplains in areas that are not highly populated.

36. Are there any dams close to your town? Where are they? Dams are shown in yellow and may be hard to see unless you zoom in close to reservoirs. What dangers might dams face in the case of a flood?

Answers vary. Dams could over-top or burst in the case of a flood.

37. If a dam were to fail (burst) during a flood, would that be considered a shock or a stress? Why?





This would be considered a shock, because it would be a short-term event that would cause a lot of damage.

38. Are there federal lands close to your town or city? What challenges might federal lands have to bounce back from after a natural hazard?

Answers vary. Ecosystems on public lands may experience long term effects from hazards; they may experience water shortages, habitat loss, and water quality issues.

Infrastructure Sector

39. In your own words, explain what the infrastructure sector is.

Answers vary. The Sector figure (on the Introduction Page) shows topics in the Infrastructure Sector are Transportation, Green Infrastructure, Water, Wastewater, Solid Waste, and Energy.

40. According to the summary from the Colorado Resiliency Framework and the expert video, what does resilience look like in this sector?

Lizzie thinks of resilience as describing someone's ability to survive and thrive in the face of challenge.

41. What are the types of shocks and stresses that might affect the infrastructure sector?

Shocks are things that have an acute impact on the system—for example rockfalls, avalanches, and landslides. Stressors are situations that can limit our ability to recover from shocks—for example, a population that doesn't have cars might not be able to rebound as quickly as others that do have cars.

42. How many cell towers are in your community? Why would they be important if there were a flood?

Answers vary. Cell phone towers are vital to local communication systems and a community's ability to respond to emergencies.

43. Look at the main roads that enter and exit your town. Are they in the floodplain? Are there alternate roads if the primary roads were destroyed?

Answers vary.

44. Are there power plants or landfills in the floodplain in your community? If either a powerplant or landfill were damaged in a flood, how would that affect your community's ability to bounce back?





Answers vary. In the long-term, communities may recover more slowly without power or a nearby dump. Communities would have to look elsewhere for sources of power or create a temporary dump.

45. If your town were to lose power temporarily during a flood, would that be considered a shock or a stress? Why?

This would be considered a shock, because it's a short-term effect.

Activity 3 (Explain)

Class Discussion (10 minutes)

As a class, ask students to share what they learned about each sector. Make sure to discuss all six sectors (figure below).



Use these questions for the discussion:

- How does the idea of resilience vary across sectors?
- How do shocks vary across sectors?
- How do stresses vary across sectors?
- Are there particular shocks or stresses that you believe your community is vulnerable to?

