

Sustainable Cities and Communities

Objectives

Students will be able to:

- **Apply** their understanding of sustainability as they **compare** and **contrast** two different cities.
- **Perform** and **synthesize** research in order to understand factors that contribute to sustainability.
- **Develop** an action plan that improves their community's disaster resiliency.
- **Review** and **assess** the work of their peers in order to select an action plan that has the most potential to improve their community's disaster resiliency and sustainability.

Lesson Overview

In this digital lesson bundle, students will take on the role of youth members on their state's new Sustainability and Disaster Resiliency Board. In this new role, students will explore sustainable and unsustainable communities, research contributing factors to sustainability, and consider possibilities for sustainable development in their own communities with a focus on disaster resilience. They will then apply their learnings as they ultimately develop an action plan to improve sustainability and resiliency on a home, community, and state level.

The accompanying presentation was created with PowerPoint so that it can be used in a variety of classrooms. If you are using a laptop with an LCD projector, simply progress through the PowerPoint by clicking to advance. All interactive aspects in the presentation are set to occur on click. This includes images, text boxes, and links which will appear in your web browser. If you are using an interactive whiteboard, tap on each slide with your finger or stylus to activate the interactive aspects of the presentation. There will be information on how to proceed in the notes section for each slide.

Activity Duration

Three class sessions (45–60 minutes each)

Grade Level

Grades 5–8

Essential Questions

- What factors contribute to sustainability?
- How are disaster resiliency and sustainability interconnected?
- What steps can communities take to improve their sustainability and disaster resiliency?

Materials

All days:

- Device with the ability to project and play video, one for the instructor

Day 1:

- Devices with internet access, enough for half the class
- Handout 1: Sustainable Communities, one per student
- Handout 2: Compare/Contrast, one per student
- Handout 3: Sustainability Research

Day 2:

- Handout 4: Sustainable Improvements, one per student
- Handout 5: Resiliency Plan (2 pages), one per student
- [Now is the Time to Invest in Resilient Cities](#) video (until 1:01)
- Optional: "[Mapping America's Wicked Weather and Deadly Disasters](#)" article, for educator/student background

Day 3

- Handout 6: Action Plan Presentation Notes, one per student
- Sustainability Ballot, one per student

Background:

The Environmental Protection Agency (EPA) defines sustainability based on one principal: "Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations."

In order to be sustainable, communities must put the environment at the forefront. Sustainable planning considers how to minimize inputs like energy, water, and food, as well as how to reduce waste outputs of heat, air pollution, and water pollution. Such planning also ensures that basic needs like health services, housing, education, food security, transportation, and work are fulfilled. In addition, it is important that sustainable planning helps communities become more adaptable and resilient to the effects of extreme weather events.¹

There are currently an average of 400 extreme weather events each year, which underscores the necessity of resilient communities. Since June 2017, about 41 million people have been affected by flooding. By 2100, it is projected that more than 150 million people will be living on land that is either below sea level or at flood level. In addition to flooding, earthquakes, droughts, wildfires, and hurricanes are increasingly threatening communities.² It is therefore extremely important that communities improve/increase their resilience to disasters in order to be more adaptable to extreme weather events.

This guide strives to give educators a resource to promote awareness about the factors that constitute a sustainable community and the actions that communities can take to improve their sustainability and weather

resilience. It provides slide-by-slide details to help educators be prepared to explain, discuss, and facilitate the hands-on content in the presentation. The presentation is designed to cover three class sessions, but it is flexible depending on the students' needs and the time available. Ideas for an additional extension is included at the end of this manuscript.

This lesson plan follows an inquiry-driven 5E instructional model: Engage, Explore, Explain, Elaborate, and Evaluate. The lesson begins as students watch a video that provides an overview of the concept of building sustainable cities and communities, as well as the importance of improving communities' resiliency to extreme weather and natural disasters. Students will then be welcomed to their state's new Sustainability and Disaster Resiliency Board. Their first order of business will be to ensure that each board member fully understands the concept of sustainability. To accomplish this, the class will work together to deconstruct the definition of sustainability, as well as use mapping technology, to explore one of the world's most sustainable cities. They will also examine a city that has challenges in this area.

Students will then further investigate one of eight sustainability areas: food, water, nature, transport, energy, waste, health, and disaster resilience. Students will perform research in order to learn more about how their assigned factor contributes to sustainability and what a community can do to become more sustainable in this area. Students will then participate in a jigsaw discussion in which they teach small groups of other board members what they have learned.

Once these main areas of sustainability are explored, students will be directed to move forward with developing an action plan that focuses on disaster resiliency, while keeping the other aspects of sustainability in mind. Students will select a relevant extreme weather event/natural disaster on which to focus and use a planning template to develop an action plan for improving disaster resiliency on a home, community, and state level.

The lesson will conclude as students present their ideas to the rest of the Sustainability and Disaster Resiliency Board. After hearing from all groups, the board will make an informed decision and vote for the sustainability action plan that they believe will be most effective.

Sources

1— "Sustainable Foundations: A Guide for Teaching the Sustainable Development Goals." Manitoba Council for International Cooperation. mcic.ca/pdf/SDG_Primer_FINAL.pdf.

2 —"5 Natural Disasters That Beg for Climate Action." Oxfam International. oxfam.org/en/campaigns/grow/5-natural-disasters-beg-climate-action.

Engage | Slide 1

Overview

As students watch a video that provides an overview of the concept of building sustainable cities and communities and the importance of improving communities' resiliency to extreme weather and natural disasters, they will jot down their initial thoughts.

DAY 1, Slide 1

- Pass out one *Handout 1: Sustainable Communities* to each student.
- Click once and tell the class that they are about to watch a short video that dives into this topic. As students watch the video, they should jot down their initial thoughts, reactions, and key takeaways on the handout's word web.

*Note: There are no right or wrong answers: The goal of the word web is to prompt engagement and student thinking.
- Click the image to play the Sustainable Cities and Communities video.

Explore | Slide 2–4

Overview

Students will be welcomed to their state's new Sustainability and Disaster Resiliency Board. Their first order of business will be to ensure that each board member fully understands the concept of sustainability. To accomplish this, the class will work together to deconstruct the definition of sustainability, as well as use mapping technology to explore one of the world's most sustainable cities, in addition to a city that has challenges in this area.

Day 1, Slide 2

- Once the video is complete, welcome students to their state's new Sustainability and Disaster Resiliency Board. Explain that their state has decided that they need an action plan to improve sustainability and resiliency on a state, community, and home level—so community members of various ages and backgrounds have been invited to take part in developing a plan.
- Go on to explain that the first order of business is to ensure that each board member fully understands the concept of sustainability.
- Click to display the Environmental Protection Agency's definition of sustainability, and invite a "board member" to read it aloud.
- Then click again to display the United Nations' definition of sustainability. Invite another "board member" to read this definition, and explain that it was written by the World Commission on Environment and Development when the concept of sustainable development was first introduced in 1987.
- As you review both definitions, ask students to help you highlight key words in each. Be sure to highlight: present, future, needs, natural environment, humans, and nature.

- Once these key words have been highlighted, challenge students to create a definition of sustainability in their own words, and ask several students to share.

Day 1, Slide 3

- Explain that, before students consider sustainability in their own community, they will be challenged to apply their understanding of sustainability as they investigate cities around the world.
- Click once to project two lists of cities, and explain that student pairs should choose one city from List A and one city from List B.
- Distribute one *Handout 2: Compare/Contrast* sheet to each student. Review the directions provided and explain that pairs will have about 15 minutes to use Google Maps to explore both cities. As they do, they should use the handout's Venn Diagram to compare and contrast each city and take note of any factors that may contribute to or detract from the city's sustainability.

* Note: If needed, demonstrate how to access [google.com/maps](https://www.google.com/maps), and show students where to enter the city name in the top left search box. Explain that students can view the city in map view and satellite view, as well as "walk around" in street view by dropping the yellow person (in the screen's bottom right corner) onto various sections of the map.

Day 1, Slide 4

- Once students have completed their Venn Diagrams, call on various pairs to share the two cities they explored, which one they believe is more sustainable, and why.
- As students share, begin to develop a list of elements that make a city sustainable.
- Before moving on to the next slide, prompt students to analyze the list they developed by asking the following questions:
 - Do you notice any similarities among these sustainability factors?
 - If you were to group these factors into several main sustainability categories, how might you do this?

Explain | Slide 5–7

Overview

The board director will ask board members to research one of eight sustainability areas: food, water, nature, transport, energy, waste, health, and disaster resilience. Students will perform research in order to learn more about how their assigned factor contributes to sustainability, and what a community can do to become more sustainable in this area. Students will then participate in a jigsaw discussion in which they teach small groups of other board members what they have learned.

Day 1, Slide 5

- Tell students that now that the Sustainability Board's Executive Director feels confident in their understanding of sustainability, it's time to begin working toward the board's objective of creating a sustainability and resiliency action plan.

- Click once and explain that the Executive Director would like all board members to research one of eight sustainability areas: food, water, nature, transport, energy, waste, health, and disaster resilience.
- As you read through the focus areas, try to connect them back to the categories that students formed on Slide 4.
- Click again and tell students that the goal of their research is to understand:
 1. How each factor is connected to sustainability, *and*
 2. What a community can do to become more sustainable in this area.
- Distribute one *Handout 3: Sustainability Research* sheet to each student. Review the directions provided and explain that each student will focus on one sustainability focus area for their research. It will then be each student's responsibility to teach the rest of the board members what they have learned.
- Evenly assign the eight sustainability categories among students, and instruct students to work either individually or with their peers who were also assigned this focus area (depending on the resources available and the needs of your students).
- Explain that students will have all of the time remaining in this class session to complete their research, and encourage the class to begin!

*Note: If needed, students may finish their research at home.

DAY 2, Slide 6

- As class is beginning, direct students' attention to the slide's instructions, and explain that they are about to use their research notes to teach the other board members about their sustainability focus area.
- Encourage students to review their notes and think of a concise way to explain their answers to each of the research questions.

Day 2, Slide 7

- Assist the class in forming groups of about eight students, so each sustainability focus area is represented in every group. If necessary, it will be better for groups to have two students who represent the same focus area in the same group rather than having a group where several focus areas are missing.
- Distribute one *Handout 4: Sustainable Improvements* to each student and review the directions provided.
- Tell students that each group will have about 15 minutes to share the results of their research with each other.
- Remind the class that in order to ultimately improve the sustainability of their community, they will have to consider each of these focus areas—so it is important to listen carefully to what each board member has learned!

Elaborate | Slide 8–9

Overview

Students will be directed to move forward with developing an action plan that focuses on disaster resiliency, while keeping the other aspects of sustainability in mind. Students will select a relevant extreme weather/natural disaster on which to focus and use a planning template to develop an action plan for improving disaster resiliency on a home, community, and state level.

Day 2, Slide 8

- Once groups have finished sharing, bring the board members back together and thank them for their thorough research.
- Click once and announce that the Executive Director has decided that the board will first move forward with developing an action plan that focuses on disaster resilience, while keeping the other sustainability factors in mind.
- While students should have an understanding of disaster resiliency from their group discussions, click the image to play the first 1:01 of the [Now is the Time to Invest in Resilient Cities](#) video and ask students to listen especially carefully for details that describe the concept of disaster resiliency.
- Then ask students to think-pair-share* an answer to: What exactly is disaster resiliency? Encourage students to consider concepts from this video *and* their notes from the board member research discussion.

*Note: In a think-pair-share, students think about the question independently, discuss their answers with a partner, and then share their thoughts with the larger class.

Day 2, Slide 9

- Ask the class to consider: What extreme weather events and/or natural disasters is our state at risk for? Keep a list on the board as students brainstorm.
- Optional: If you or your students need help brainstorming, project and review this Washington Post [article](#).
- Then divide students into groups of three or four and distribute one *Handout 5: Resiliency Plan* to each student.
- Review the directions provided, and ensure students understand that they must choose one of the weather events/natural disasters listed on the slide.
- Explain that students will have the remainder of this class session and 15 minutes of the next class session to work with their group to complete their plan.
- When the class period is over, remind students to save their notes in a safe place so they can quickly retrieve them next period!

Evaluate | Slide 10–13

Overview

Students will conclude by presenting their ideas to the rest of the Sustainability and Disaster Resiliency Board. After hearing from all groups, the entire board will make an informed decision and vote for the sustainability action plan that they believe will be most effective.

DAY 3, Slide 10

- Set the timer on the slide for 15–20 minutes.
- As students enter the classroom, instruct them to read the directions on the slide, continue working on their resiliency plan, and prepare to share the community portion of their plan with the board.

Day 3, Slide 11

- When the timer goes off, bring the class back together.
- Announce that the Sustainability and Disaster Resiliency Board is almost ready to hear from each group. Click once and explain that groups should take a couple minutes to prepare to share:
 - The weather event/disaster that they focused on and why.
 - The community portion of their action plan, including:
 - ◆ How their community can be better prepared to deal with this weather event/disaster
 - ◆ At least one other sustainability focus area that their plan takes into account. (For instance: Does their plan include any improvements to their community's transportation system or a way to ensure their community has access to sustainable food?)
- Go on to explain that after each group has presented their community resiliency action plan, the board will vote for the plan that they believe will be most effective.
- Give students about 5 minutes to organize their presentations.

Day 3, Slide 12

- Pass out one *Handout 6: Action Plan Presentation Notes* to each student. Explain that since it will be the students' responsibility to help the board decide how to move forward, it is important that they take brief notes on each presentation. Take a moment to review the handout and the categories on which students will be expected to take notes.
- One by one, ask each group to come to the front of the room and present their community action plan.
- Allow a minute for board member questions at the end of each presentation before moving on to the next group.

Day 3, Slide 13

- Once the presentations have concluded, thank the board members for their efforts on behalf of the state of _____ and the Executive Director of the Sustainability and Disaster Resiliency Board.
- Explain that students will now use the time remaining to select an action plan that their community should kick off first. Decide if groups will be allowed to vote for their own plan, and encourage students to use

their notes and apply what they have learned over the course of the board meetings to make their decision.

- Distribute a Ballot handout to each student and instruct them to use the time remaining to cast their vote.
- Once every ballot has been turned in, tally the votes. Then announce the action plan that the Sustainability and Disaster Resiliency Board will begin to institute in communities around the state!

Optional Extension Activity

- Students can build out their sustainability and disaster resiliency action plan, create a community model to illustrate suggested resiliency changes, and take steps to raise the issue in their own community. This also provides a path to student entry for our challenge.

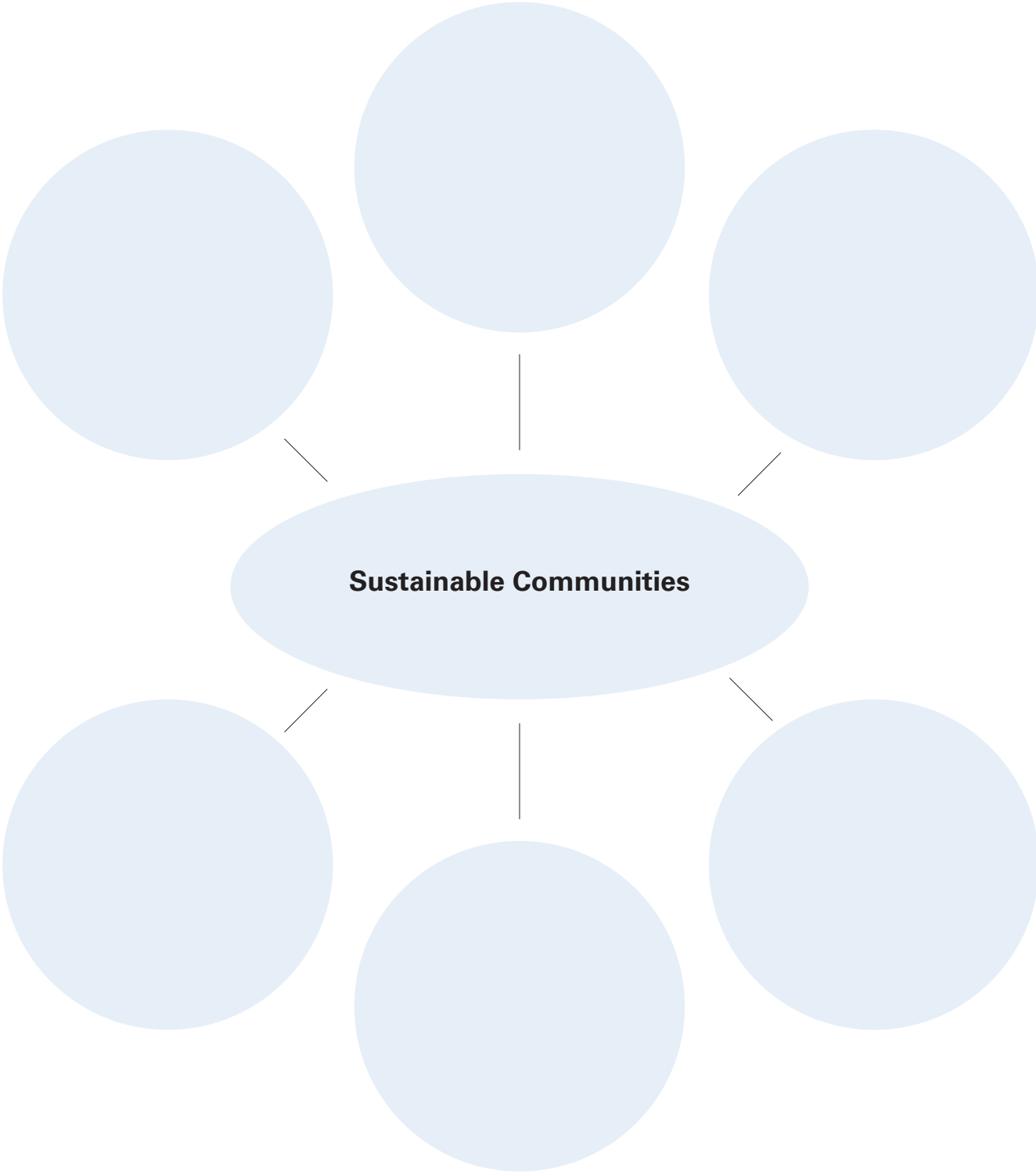
Standards Addressed

Next Generation Science Standards

- Earth and Human Activity
 - ESS3.D: Global Climate Change: Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.
- Engineering Design
 - MS-ETS1-1 Defining and Delimiting Engineering Problems: The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.

Common Core English Language Arts Standards

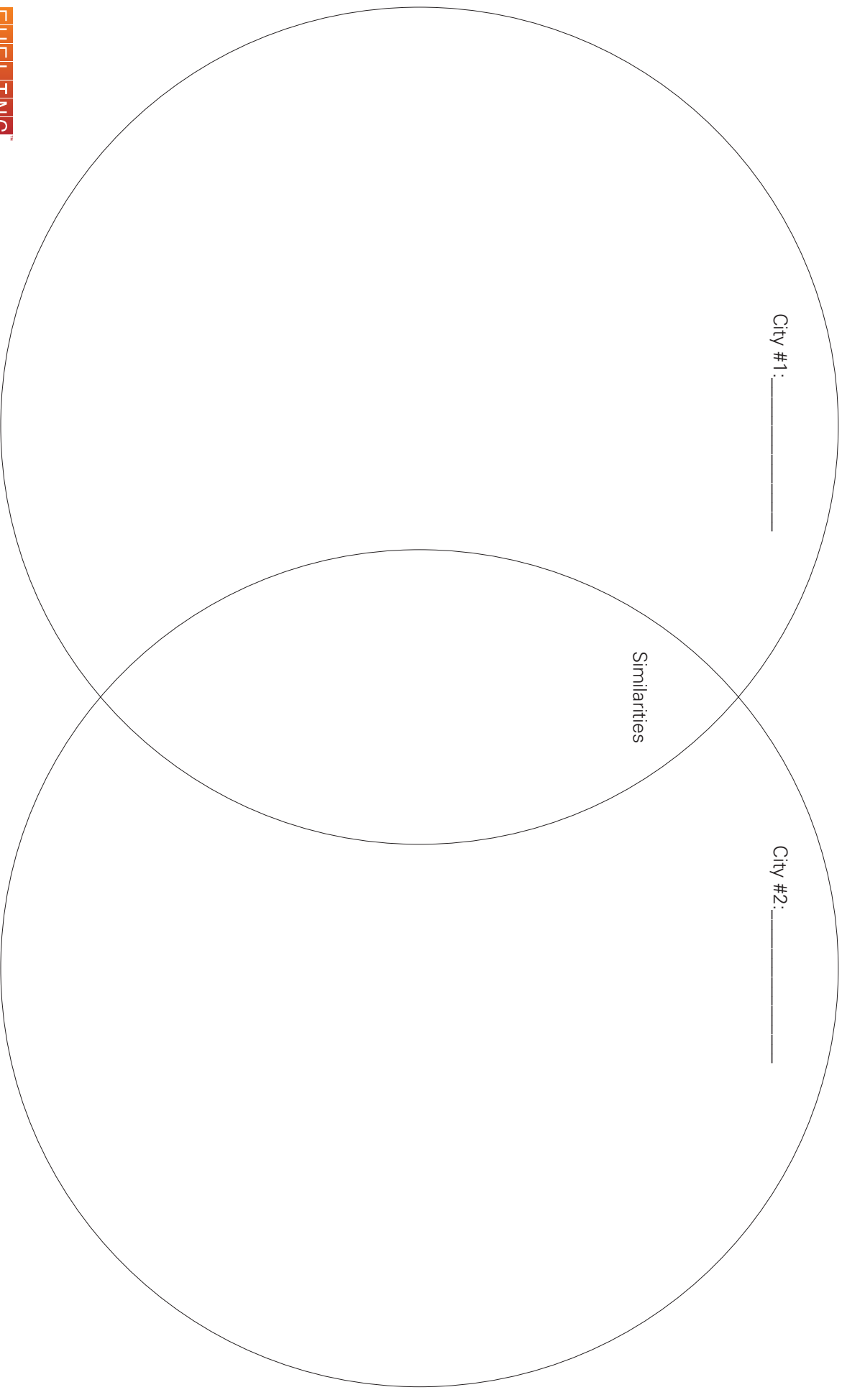
- Reading: Science and Technical Subjects
 - RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- Speaking and Listening
 - SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Writing
 - W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.



Compare/Contrast

STUDENT HANDOUT 2

Directions: Use the Venn Diagram below to compare and contrast how sustainable each city appears to be. Consider factors such as green space (parks, trees, etc.) public transportation, amount of traffic, and if the community looks like it is ready for weather events like raising sea-levels, flooding, and/or strong storms.



Sustainability Focus Area: _____

Directions: Perform research to answer the two research questions below and become an expert in your sustainability focus area. Use the website provided to help you begin.

Food: www.un.org/sustainabledevelopment/sustainable-consumption-production

Water: www.un.org/sustainabledevelopment/sustainable-consumption-production

Nature: www.who.int/sustainable-development/cities/health-risks/urban-green-space/en

Transport: www.who.int/sustainable-development/cities/strategies/transport/en

Energy: www.un.org/sustainabledevelopment/energy

Waste: www.who.int/sustainable-development/cities/strategies/urban-waste/en

Health: www.who.int/sustainable-development/cities/en

Disaster Resilience www.worldbank.org/en/topic/disasterriskmanagement/overview

Research Question #1: How is your focus area connected to the concept of sustainability?

Research Question #2: What can a community do to become more sustainable in this area?

Directions: As you listen to others present their findings, use the boxes below to take notes on what communities can do to become more sustainable in each area.

If a presentation prompts you to think of your own idea, be sure to jot it as well!

Food	Water
Nature	Transport
Energy	Waste
Health	Disaster Resilience

Step 2: Use your notes to develop an action plan to help individual homes, your community, and your state prepare for this type of weather. As you do, try to include some of the other areas of sustainability (food, water, nature, transport, energy, waste, health) as well.

What steps could homes take to improve their resiliency?

Think of your own home and how it would fare during this extreme weather event. Consider its location, how it is constructed, and how it would be affected by this extreme weather. How could you ensure it is as prepared as possible?

What steps could your community take to improve its resiliency?

You may want to think about the location of neighborhoods, as well as how to prepare community buildings (such as schools, stores, and local businesses), transportation (such as local roads and bridges) or public spaces (such as local parks and squares).

What steps could your state take to improve its resiliency?

You may want to think about the location of communities, as well as how to prepare public buildings (such as hospitals and government buildings), public services (such as water and power), transportation (such as major roads, railroads, and airports) or public spaces (such as state parks and beaches).

Presenter Names & Weather Focus	Key Details	Connections to other sustainability areas Circle all that apply	
		Food Nature Waste Health	Water Transport Energy
		Food Nature Waste Health	Water Transport Energy
		Food Nature Waste Health	Water Transport Energy
		Food Nature Waste Health	Water Transport Energy
		Food Nature Waste Health	Water Transport Energy
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		Food Nature Waste Health	Water Transport Energy
		Food Nature Waste Health	Water Transport Energy

Sustainability Ballot

Your vote will help decide how your state moves forward and builds its disaster resiliency. Please review your presentation notes carefully and consider what you have learned about sustainability and disaster resilience since joining the board.

My vote goes to...

Presenters: _____

Weather or Disaster Focus Area: _____

How will this plan improve disaster resiliency and sustainability?

Why do you believe this plan has the most potential to make a difference?

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Why do you believe this plan has the most potential to make a difference?