

Climate Resilience in Your Community

Activity Book: Educators' Guide

Motivation for the Activity Book

NOAA's Environmental Literacy Program (ELP) in the Office of Education developed a Community Resilience Education Theory of Change to communicate the philosophy of the program. It also provides a new way to demonstrate the value of K-12 formal and informal education in local, state, and national efforts to build community resilience to extreme weather, climate change, and other environmental hazards.

The Theory of Change was developed to serve audiences including NOAA colleagues, employees of other government agencies, resilience practitioners, philanthropic organizations, education professionals, environmental non-governmental organizations, and ELP grantees. However, the content of the Theory of Change and its ideas about building community resilience to climate change are applicable to a much broader audience, including children. This activity book is our way of translating the theoretical information about resilience and the work that can be done in one's own community for children in a format that is engaging, fun, and hopefully, leaves them inspired to take action. Learners complete each section and award themselves points that they add up at the end to see what badge they earn on their journey to resiliency.

In this Educators' Guide we provide instructions for how the activities can be used in the classroom or other learning environments, and we provide a table showing the alignment of the activities with the Next Generation Science Standards. We also provide links to additional educational resources that relate to these topics that have been developed by NOAA's education grantees.

If you have any questions, comments, or feedback, feel free to contact NOAA at oed.grants@noaa.gov.

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Education Activity

Crossword Puzzle (pages 2-3 of activity book)

Introduction

In this section, learners are introduced to many important vocabulary terms that are relevant to building community resilience. Many of these terms will be used throughout the rest of the activity book, so this section includes the terms used in a narrative format in addition to the definitions.

Goal

The overarching goal of this section is to introduce learners to resilience-related vocabulary.

Activity

Learners will read the narrative paragraph that includes all of the terms in the crossword puzzle in bold. They will then use the definitions as clues to complete the crossword puzzle. The answer key to the crossword is available at the end of the activity book.

Relevant Resources

ELP Theory of Change: <https://www.noaa.gov/education/explainers/noaas-community-resilience-education-theory-of-change>

Climate Resilience Toolkit: <https://toolkit.climate.gov/>

Center for Climate and Energy Solutions: <https://www.c2es.org/content/climate-resilience-overview/>

World Resources Institute: <https://www.wri.org/equitable-development/climate-resilience>

Community Resources Activity

Exploring your Community (pages 4-5 of activity book)

Introduction

In this section, learners explore the various characteristics and assets within their community that contribute to sustainability and resiliency. A range of questions about their community's organization, its natural environment and built landscape, the environmental hazards it experiences, and the activities that take place there help learners gain a better understanding of what makes up their community. Every community has people, places, and resources that keep it functioning and that contribute to resilience.

Goal

Learners will get to know their community and become familiar with how the community is organized/run, what natural and built assets it has, and what environmental hazards affect it. Learners will begin to think critically about the characteristics of a community that contribute to sustainability and resiliency.

Activity

Have the learners read through all the questions first, and then try to answer as many as they can. They may need to do some online research or ask friends or neighbors in order to answer some of the questions. Require the learners to answer at least 1 question in each of the 5 sections and encourage them to answer all of them. Provide a list of resources for the learners or connect them to community leaders to help answer the questions. For example, you could provide a city website or list of community organizations that could help the learners find out some of the answers to these questions. Every community is different so the resources available will vary. One specific resource to provide to your learners to discover a community's risks is available from FEMA: <https://www.fema.gov/blog/what-natural-hazards-put-your-community-risk-find-out-using-national-risk-index>

You could consider having the learners work in pairs or small groups. Have the group of learners or class discuss the answers together. What other questions or information can the learners seek to find out to better understand their community?

Additional questions are provided below if you have more advanced learners or want to expand this activity to address a wider range of topics.

About Your Community

1. What is the population size of your community?
2. Who is the leader of your town/community? It could be a mayor or other official. What is their name?
3. Does your community have fairs, festivals, farmer's markets, or other events where the community gets together? Describe any that you have attended.
4. What is your community known for? It could be a natural feature or a historical landmark or a notable business or attraction.
5. Is there a website for your town/community? If yes, what types of information are provided on it? Is there a newsletter you can sign up for to get updates on what is happening in your community?

Natural Environment

6. What types of wildlife live in your community? Are there special ecological areas in or near your community, e.g., an estuary or a protected forest? List a few examples here.

Environmental Hazards

7. What people or organizations help when your community is facing an environmental hazard? List them here.
8. What improvements would you like to see made to your community to be better prepared for environmental hazards?

Learning and Action in Your Community

9. What do you like most about your community? What can you do to protect what you like most about your community?

Calculating Points

Learners should try to answer at least 1 question in each of the 5 sections, and will need to write out answers for 10 questions in order to get 10 points. Encourage learners to try to answer as many as they can.

Relevant Resources

Resilient City coloring sheet: <https://www.noaa.gov/education/multimedia/photos-images/community-resilience-coloring-page>

School/community vulnerability assessment guide and associated curriculum: <https://www.riscnyc.org/curriculum-1>

Exploring Local Hazard Mitigation Plans (lessons that are developed for learners in Colorado, but the process and guide is generally applicable): <https://cires.colorado.edu/outreach/resources/lesson/exploring-local-hazard-mitigation-plans>

The Vocabulary of Hazards: <https://cires.colorado.edu/outreach/resources/lesson/vocabulary-hazards>

Traditional Ecological Knowledge Activity

Exploring the Seasons (pages 6-9 of activity book)

Introduction

In this section, learners will consider how traditional forms of knowledge are valuable in their own right and can help to bolster scientific knowledge to create a more holistic understanding of the environment. They will also consider how something familiar, the seasons, are understood in different ways by certain traditional groups of people. Learners will also have the opportunity to consider the importance of Indigenous Peoples in their own communities by learning about the Indigenous Peoples who were, are,

and will continue to be stewards of the land. Learners are introduced to the concept of stewardship and asked to reflect on their own connection with the natural resources and land they live on.

Goal

The overarching goal of this section is to introduce learners to Traditional Ecological Knowledge, emphasize its importance, and have learners apply this framework to something familiar (i.e., the seasons and related activities). The section also strives to introduce learners to the concept of stewardship and have them reflect on their connection to the land and natural resources.

Activity

Learners will first draw a picture of their favorite activity and the season it typically occurs in. Then, they will review an example of traditional subsistence seasons that are different from the four seasons (spring, summer, fall, winter). Have a conversation with your learners about the traditional subsistence seasons. What are the differences between the four seasons and traditional subsistence seasons? How are the traditional subsistence seasons helpful to people living in rural Alaska and northern Minnesota? After your group conversation and reviewing the two example calendars, the learners will create their own table of activities. If learners are not familiar with terms in the traditional subsistence seasons, please look them up and share images and/or definitions with them.

After finishing the activity on the seasons, transition to talking about Indigenous Peoples that were, are, and will continue to be stewards of the land that the learners live on. Using the website in the activity book (<https://native-land.ca/>), identify your own community and which Indigenous Peoples traditionally occupied that land. You are welcome to have the learners do research on these Indigenous Peoples to learn more about them. Discuss the concept of stewardship with the learners and have them reflect on their connection with local natural resources and land, and how they are or might be stewards of the land. Have learners write answers and discuss them in pairs or as a group.

Calculating Points

Learners receive 5 points for drawing a favorite activity in the season it typically happens, 5 points for creating their own table of activities, and 5 points for answering the questions related to gratitude, connection and stewardship.

Relevant Resources

Climate toolkit article: <https://toolkit.climate.gov/case-studies/relocating-kivalina>

Additional example of a traditional knowledge seasons from the Inuit Peoples:
<https://opentextbc.ca/indigenizationfoundations/chapter/topic-inuit/>

Additional information on land acknowledgements and why they are important:
<https://americanindian.si.edu/nk360/informational/land-acknowledgment>

Community Preparedness Activity

iSpy and Community Tour (pages 10-13 of activity book)

Introduction

In this section, learners are introduced to the full landscape of a resilient community, Resilience City. The illustrated community is fictitious, but it is a model for what communities can strive to achieve. The features and actions depicted in Resilience City are not meant to represent every community. For example, many communities do not have an aquarium or planetarium, but more have a library. Other communities are not located in coastal areas where coastal flooding and strong storms are a concern, but many communities have rivers, forests, parks, and schools.

Goal

The overarching goal of this section is to introduce learners to different types of resilience features and actions. Having clear examples of resilience will make it easier for learners to identify if their own community has any of these features in place and the type of actions they can take to make their community more resilient.

Activity

Learners are welcome to search for any of the features and actions within the image as part of the iSpy activity. However, it is recommended that you go through the list yourself prior to sharing this with learners to provide them with specific features and actions that are more relevant for your local community.

Once learners identify the features and actions in the image, they should use the empty space on the page to draw a map of their community. To help with this exercise, please provide or show a simplified map of your community for learners to copy. On the new map that they draw, help them to identify resilience features or actions such as the ones included in the iSpy activity. Relatedly, also help them to identify places in their community where resilience features or actions do not currently exist but are needed. Particularly for younger grades, a discussion of the basics of a map, including the legend, compass, and purpose, is important. Additionally, the identification of resilient features or actions in your community map is more suitable as a group or class exercise, while drawing the map is an individual activity.

Calculating Points

For each resilient feature or action identified in Resilience City, please allocate 1 point for up to 10 points. If a student drew a community map and identified resilient features or actions and places where improvement is needed, please allocate 10 points.

Relevant Resources

Envisioning a Resilient Future (lesson): <https://cires.colorado.edu/outreach/resources/lesson/envisioning-resilient-future>

The Resilient Schools Consortium (RiSC) 1.0 curriculum enables learners to understand the fundamentals of climate science and extreme weather risks. The accompanying RiSC Vulnerability Assessment helps learners to assess their schools' and neighborhoods' vulnerability to these risks:

<https://www.riscnyc.org/curriculum-1>

How to read a map: <https://www.nationalgeographic.org/education/map-skills-elementary-students/>

U.S. Climate Resilience Toolkit: <https://toolkit.climate.gov/>

Environmental Justice Activity

Writing a Headline and Article (pages 14-17 of activity book)

Introduction

In this section, learners will be introduced to a few examples of environmental justice issues and how everyone deserves to live, play, go to school, and work in healthy areas. This section will help them explore a variety of environmental problems that keep individuals in underserved communities from living the healthiest life possible.

Goal

The goal of this activity is to introduce learners to environmental justice issues facing underserved communities throughout the US. Learners will learn about the impact these injustices have on communities and begin to think about the types of actions that can be taken to assist these problems.

Activity

Instruct learners to read the provided news headlines and their corresponding paragraphs on environmental justice issues in different US cities. Tell learners that these are not the only environmental justice issues and that environmental justice issues impact every community. After reading the example articles, have learners write their own news article. Learners may need internet access to assist them with collecting information for their article. You can also have a group discussion about the articles and have the students reflect on their own communities and what environmental justice issues they may already identify. To make the discussion more meaningful, you can construct a place-based scenario relevant to your local area to show as an example to your learners.

Encourage and assist learners with identifying trusted individuals within their local community to interview about environmental justice problems there. Interviews will provide learners with personal accounts of how this person or people experienced impacts related to environmental justice issues. Learners can use the questions provided to help guide their discussions.

Using all of the information gathered from their research and interview, learners should write a news article on the chosen issue. Articles should include an interesting headline and paragraph describing this issue in their community. Once completed, learners can share their news article with others. Additionally, you may want to facilitate a discussion with learners on how their communities can progress from problem to solution.

Examples of environmental justice issues:

- Environmental pollution
- Radiation hazards
- Poor infrastructure
- Air pollution
- Water pollution
- Garbage pollution
- Extreme heat
- Flooding risk

Calculating Points

Learners should receive 5 points for talking with a community member or researching an issue and 10 points for writing the headline and article summary.

Relevant Resources

Resources for Creating Healthy, Sustainable, and Equitable Communities:

<https://www.epa.gov/environmentaljustice/resources-creating-healthy-sustainable-and-equitable-communities>

Mapping tool EJSCREEN: <https://www.epa.gov/ejscreen>

Environmental Justice in Your Community: <https://www.epa.gov/environmentaljustice/environmental-justice-your-community>

Learning for Justice Toolkit:

<https://www.learningforjustice.org/magazine/fall-2018/toolkit-for-segregation-by-design>

Mapping Inequality:

<https://resources.newamericanhistory.org/mapping-inequality>

What is Environmental Justice?

<https://detroitenvironmentaljustice.org/what-is-environmental-justice/>

National Integrated Heat Health Information System: <https://nihhis.cpo.noaa.gov/Urban-Heat-Islands>

NCA4 Chapter on Built Environment, Urban Systems, and Cities:

<https://nca2018.globalchange.gov/chapter/11/>

EPA's Urban Heat Island Effect page: <https://www.epa.gov/heatislands>

NASA ClimateKids: What is an urban heat island? <https://climatekids.nasa.gov/heat-islands/>

Action Activity

Telling a Story and Taking Action (pages 18-21)

Introduction

In this section, learners can explore a diversity of activities that lead to resilience. The images depict people working together on citizen science projects, planting trees, planning projects, learning, and more. These scenarios are just a handful of a wide range of resiliency related activities, so we encourage you to explore more local examples with your learners.

Goal

The goal of this section is to get learners thinking about action, putting ideas behind concrete steps that can be taken to make their community more resilient, and considering the time, resources, and people needed to implement action plans.

Activity

Learners are asked to get creative and write their own story using five main narrative questions as prompts. It may help to have the learners brainstorm or even act out some of the scenarios depicted to get ideas for how to craft a story. Have the learners share their story with the rest of the class or group and facilitate a group reflection of the stories shared at the end. What are commonalities among the narratives? What are significant differences?

After the learners have explored the actions shown in the activity book, have them think about actions they have observed in their own community. Are there actions they themselves would like to take to help the community be more resilient? Ask the learners to come up with a brief written plan about local action and note what needs to be done, by whom, for how long, and what resources are needed to complete the action plan. Once again have learners share their plans with the group and facilitate a group discussion about the plans as a whole. Are there plans the group is excited about seeing implemented in the community? What can the group do to help see their plans become reality? Encourage the learners to send their well-developed ideas to local elected officials or attend local community meetings where they may be able to present their ideas.

There is a statement of commitment of action in the activity book that the learners can fill out to note their commitment to taking action.

Calculating Points

Learners should receive 10 points for crafting a narrative and 10 points for coming up with an action plan for their own community.

Relevant Resource

Role-playing environmental hazard games for learners (drought, flood, wildfire):

<https://cires.colorado.edu/outreach/projects/HEARTForce>

Design a Resilient Future lesson: <https://cires.colorado.edu/outreach/resources/design-challenge/design-resilient-future>

How to build a rain garden/basin: <https://watershedmg.org/advocacy/build-your-own-basin>

How to start a youth climate summit and other resources to support youth climate efforts:

<https://www.wildcenter.org/our-work/youth-climate-program/resources/>

Resources to inspire youth resilience: <https://elizabethriver.org/clearinghouse>

Deliberative forums - group role playing and planning games to address floods, sea level rise, heat, and drought in communities: <https://www.mos.org/pes-forum-archive/noaa-forum>

Example of Resilience Planning: <https://planningforhazards.com/resilience-planning>

Activities to Continue to Learn and Explore

Science on a Sphere®

Introduction

In this section, learners are introduced to the Science on a Sphere® (SOS; <https://sos.noaa.gov>) and associated datasets. The SOS exhibit is at sites across the globe, and you can check to see if there is a site near you that learners can visit in person (<https://sos.noaa.gov/sos/locations/>). Learners can also download a free mobile app that features many of the SOS datasets (<https://sos.noaa.gov/sos-explorer/getting-sosx-mobile/>) and find many educational resources related to SOS and its datasets (<https://sos.noaa.gov/education/>).

Goal

Learners explore the SOS Explorer, become familiar with navigating datasets in a 3D spherical space, and investigate a dataset showing temperature anomalies around the world over time starting in 1880 through the present. Learners consider patterns and trends in the temperature difference from average for their location.

Activity

Learners need access to a tablet or mobile device so they can download and open the SOS Explorer® app. They are directed to explore the dataset showing yearly temperature anomalies from 1880 to present, which are surface temperature differences from the 20th century average. Learners may need additional

context and resources for understanding the comparison to average - climate datasets can serve as reference points when averaged over longer time spans. Learners are asked to observe patterns and trends and are instructed to use the Analyze Tool feature to get the exact temperature anomaly for their general location in order to compare what the difference was in 1880 to today. Learners are asked to think about why the differences have changed over time. This activity is an excellent complement to a lesson about climate change and its impacts. More advanced learners may be directed to explore where the data came from (source), how it is calculated, and how it compares to other measurements of temperature (satellite, model, ground-based). The data presented in this visualization are from the National Centers for Environmental Information which uses data from thousands of land and ocean temperature stations around the world to determine temperature averages and differences (anomalies).

Calculating Points

Learners will receive 10 points for completing the activity.

Citizen Science

This section provides a brief overview of citizen science and describes a few citizen science initiatives for learners to explore and become involved. The projects (CoCoRaHS and mPing) are just two of many projects available. Hundreds of projects are cataloged at CitizenScience.gov (<https://www.citizenscience.gov/catalog/#>). Encourage learners to explore the catalog and find a project that they are passionate about. Learners could consider joining a project as a group.

Where are you on the Steps to Resilience?

This section describes the U.S. Climate Resilience Toolkit (<https://toolkit.climate.gov/>) and the 5 steps it outlines for resilience:

1. Explore Hazards
2. Assess Vulnerability and Risks
3. Investigate Options
4. Prioritize and Plan
5. Take Action

The toolkit has lots of great content and resources related to resilience including case studies, experts, reports, and state climate summaries. Learners can explore case studies and information by location, region, and topics ranging from the built environment, health, transportation, water, food, energy, ecosystems, coasts, and tribal nations. There are also online tools such as the Climate Explorer (<https://crt-climate-explorer.nemac.org/>) that allows you to see the projected climate change for any county in the United States. These resources can supplement and enhance learners' curriculum related to climate change and resilience.

After learners have completed the various sections of the activity book, they can fill out all their points on the Steps to Resilience page and add up their total points. Learners earn a badge related to each of these steps depending on their overall score for completing the activity book. Each badge and step along the path to resilience is a critical piece. It is important to remember that these steps are part of a journey and

each badge is an accomplishment, necessary to support the end goal of resilience. Learners can cut out the badges they have earned.

Alignment with Next Generation Science Standards

The following table identifies the alignments between the concepts covered in the activities and the Disciplinary Core Ideas (DCI) of the Next Generation Science Standards.

Next Generation Science Standards Performance Expectation	Activity						
	tion Activity	ommunity trees Activity	mmunity Preparedness Activity	onmental Prep Activity	ditional Knowledge	ction Activity	
3-ESS2-2: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over time.							
5-ESS3-1: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.							
5-ESS3-1: Human activities in agriculture, forestry, and everyday life have altered the land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.							
MS-ESS3-5: 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 factors.							
3-5-ETS1-2: At whatever stage, defining a problem clearly and specifying design constraints and criteria, and communicating the design process, and shared ideas can lead to improved designs.							

- 3-ESS2-2: <https://www.nextgenscience.org/pe/3-ess2-2-earths-systems>
- 3-ESS3-1: <https://www.nextgenscience.org/pe/3-ess3-1-earth-and-human-activity>
- 4-ESS3-2: <https://www.nextgenscience.org/pe/4-ess3-2-earth-and-human-activity>
- 5-ESS3-1: <https://www.nextgenscience.org/pe/5-ess3-1-earth-and-human-activity>
- 3-5-ETS1-2: <https://www.nextgenscience.org/pe/3-5-ets1-2-engineering-design>
- MS-ESS3-5: <https://www.nextgenscience.org/pe/ms-ess3-5-earth-and-human-activity>