



Designing Resilience - teachers guide

Created by: Patrick Chandler (CIRES)

This teacher's guide will feature materials from the Educator's Guide to the Right Here, Right Now Global Climate Summit. It focuses on the "[Impacts](#)" theme and the Cities, Settlements, and Community Infrastructure category. First, students will work through a climate and resilient cities lesson. Then they will read about hurricane impacts in the Caribbean and complete the lesson by considering the risks and steps to resiliency in their communities.

Lesson Overview

In this lesson, students will:

1. Play Beat the Uncertainty: Planning Climate-Resilient Cities: Students will make city planning decisions and then play a game to test their resilience decisions against potential impacts from severe weather, climate change, and natural hazards.
2. Read "Hurricane-hit Caribbean nations can build back better, says UN development official"
3. Work through the exercises listed in the U.S. Climate Resilience Toolkit

Instructional Overview	
Grade Level	Middle/High School
Instructional Time	Two to four class periods depending on grade level, take-home work, and depth of lessons. (1.5-3.5 hrs.)
Driving Question	What does it mean to design a climate-resilient city in the midst of uncertainty?
Standards	NGSS and Common Core ELA standards included, see the "Standards" section at the end of this lesson for details.
Concepts	1. Natural hazards involve uncertainty 2. Climate change will increase the risk of natural hazards



	3. Communities can plan for hazards through planning resilient infrastructure
Outcomes	Students will be able to: 1. Define uncertainty and resilience and what they mean in the context of natural hazards 2. Discuss the relationship between climate change and natural hazards 3. Identify planning steps and infrastructure that can help create more resilient communities
Materials	Listed in the “Beat the Uncertainty” instructions- https://games.noaa.gov/beat-the-uncertainty/welcome.html : • One Resilience Measure Checklist • One Climate Events Booklet • One medium- or large-sized plastic food storage container. • One smaller plastic container that sits upright, floats, and fits inside the vase. This is your “boat”. A small condiment container works well. • Enough water to fill the plastic container halfway. This is your sea. It will change levels to represent sea level rise. • Blue and green food coloring to dye your seawater if desired. • Craft materials for decorating the sides of the large container to represent your city’s “coastline” (e.g. crepe paper, glue, and scissors). You can also print out a strip of coastline using Clip Art and tape it onto the side of the container. • About fifteen glass floral beads with flat bottoms. These will be gradually placed into the boat when players make decisions that are not resilient to climate change impacts. The flat bottoms will prevent the shifting. • Two six-sided dice. • Internet access and devices for students or groups to work through the U.S. Climate Resilient Toolkit- https://toolkit.climate.gov/steps-to-resilience/understand-exposure
Material Preparation	See details in the “Beat the Uncertainty” instructions • Decorate the outside of each large container to represent the city “coastline”. The bottoms of the buildings should be in a



	straight line, about an inch above the container's midline. Instructors can do this in advance or players can create their own coastlines. • Add water to the large container until it is about an inch below the coastline, i.e. about halfway full. • Add food coloring to the water to create the desired "seawater" color. • Run through the game to ensure that the boats will float when up to 12 marbles are added. When more than 12-15 marbles are in the boat, the boat should sink. Calibrate as needed. • Place the Resilience Measure Checklist and booklet at the station. Ensure that players keep the booklet closed until after they have made their resilience decisions!
Vocabulary	<u>Resilience</u>- (NOAA definition)- Resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events. <u>Planning</u>- Creating an intentional plan for the development, maintenance, construction, and growth of a community that focuses on both natural elements and human infrastructure. <u>Economics</u>- The study of how wealth and resources move through society. <u>Uncertainty</u>- The inability to be sure of a specific outcome. <u>Natural hazards</u>- (FEMA definition)- Environmental phenomena that have the potential to impact societies and the human environment. <u>Climate change</u>- (United Nations Definition) - Long-term shifts in temperatures and weather patterns.
DEI/human rights connections	Developing resilience often takes resources. Many of the communities most at risk from climate change, such as low-lying island nations, have the fewest resources to develop resiliency. Considering and discussing this issue can help students better understand and appreciate the human rights impacts of climate change and why an increase in natural hazards can create a humanitarian crisis.



Lesson Flow:

Activity 1 (45-90 min. depending on the depth of discussion):

Beat the Uncertainty: Planning Climate-Resilient Cities, Tarlise Townsend, Astrid Kause, Peg Steffen, Dinh Thai Hung, Than Ngo Duc, Vinh Nguyen Li Ai, Susan Fox, NOAA-
<https://cleanet.org/resources/56001.html>

Description: This learning activity explores the concept of resiliency. It allows students to make city planning decisions and then employs a game to test their resilience decisions against potential impacts from severe weather, climate change, and natural hazards.

See the link above for the full lesson plan, including how to play the game and lead the discussion afterward.

Engage: In the first part of the “Beat the Uncertainty” game, students engage in this lesson by making choices to design their own climate-resilient city.

Explore: In the second half of the “Beat the Uncertainty” game, students explore the topic by testing the resiliency of their city through the game.

Activity 2 (20-30 min.):

Read and discuss “Hurricane-hit Caribbean nations can build back better, says UN development official” from UN News

<https://news.un.org/en/story/2017/10/568922-interview-hurricane-hit-caribbean-nations-can-build-back-better-says-un>

Depending on time and classroom needs, discuss the article in pairs, groups, or as a full class. Focus on the relationship between climate change and this event, what resiliency may look like moving forward for the communities discussed, and how this article relates to the game played in Activity 1.

Explain: After the reading, the instructor guides students through discussion to consider the real-world impacts of natural hazards and climate change.

Activity 3 (30-90 min.):



Work through the exercises listed in the U.S. Climate Resilience Toolkit:

<https://toolkit.climate.gov/steps-to-resilience/understand-exposure>

Ask students to work through section one of the Resilience Toolkit, “Understand Exposure” from the perspective of a planner. Student’s ability to identify and discuss natural hazards their community faces can be used as a formal or informal evaluation and can help students connect the lesson to their own communities and lives.

Five sections in the toolkit move through identifying hazards, prioritizing action, making a plan, and connecting with the community. If time allows, consider working through the additional sections of the toolkit in class. This work can also be assigned as homework or used as the basis for a research project. If students complete the full toolkit, consider having them present to the school board, city council, or other local decision-makers to spur action on creating community resilience and take the lesson beyond the classroom.

Evaluate: Working through the U.S. Climate Resilience Toolkit provides opportunities for both formal and informal evaluation.

Standards:

Next Generation Science Standards

MS-ESS3.C2: Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

HS-ESS3.C2: Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.

HS-ESS3.D1: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

HS-ETS1.B1: When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Common Core ELA



Speaking and Listening, Grades 9-10: 4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Reading Standards for Informational Texts, Grades 9-10: 3. Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Find more activities, lessons, and curricula here:

<https://cires.colorado.edu/outreach/programs/right-here-right-now-global-climate-summit>