

Local Climate Change Impacts & Solutions

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Subjects: Social Studies, STEM; leadership, civic engagement, communication, climate science

Grade Level: 6-8, 9-12

Estimated Time: Each of the activities within the unit could be introduced in 30-minute segments. Additional time for research, practicing facilitation strategies, teaching the activities to others, and iterating on the activities will depend on the opportunities in your setting. This lesson plan was originally used for a six-week internship where high school students had multiple opportunities to conduct investigations and to facilitate the activities with visitors at the museum, in summer camps and in neighborhood learning settings.

About This Lesson Plan:

This unit was developed for a summer career development internship for high school students. It takes climate change education resources developed for use in a museum setting by the Climate and Urban Systems Partnership (CUSP), and asks students to apply them to examine their own neighborhoods. During the internship, students completed the investigations and then facilitated the activities in a variety of community settings. They used a design process to document their own learning about climate science, and get feedback that they used to improve the activities and build their skills as facilitators. CUSP is a network of museum educators, climate scientists, learning scientists and community organizations dedicated to improving local understanding of and engagement with climate change issues.



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About Carnegie Museum of Natural History:

Carnegie Museum of Natural History, one of the four Carnegie Museums of Pittsburgh, is among the top natural history museums in the country. It maintains, preserves, and interprets an extraordinary collection of artifacts, objects, and scientific specimens used to broaden understanding of evolution, conservation, and biodiversity. Carnegie Museum of Natural History generates new scientific knowledge, advances science literacy, and inspires visitors of all ages to become passionate about science, nature, and world cultures.

Pro Tips:

This project's activities could serve as a blueprint for students to conduct original research and field work in their own community, including a follow-up presentation to present their findings. This could be used for a study of climate change or other local environmental or ecological concerns relevant to your students and your community. Explore the [CUSP Pittsburgh kits](#) on the CUSP site to learn more.

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Lesson Plan

Session 1: Brainstorm neighborhood issues

- Lead a discussion with your students about the following questions:
 - What issues do people care about in your community?
 - How can teens get involved in solutions to those issues?
- Make a [mind map](#), KWL chart, or use any other brainstorming format your students are familiar with. Keep these initial ideas for reference throughout the next activities.

Session 2: Introduce a design cycle

- This unit addresses climate change impacts in your city. Students will get an introduction to climate change content through hands-on activities. If you live in Pittsburgh, Philadelphia, New York, or Washington D.C., you may be able to borrow activity kits from your local [Climate & Urban Systems Partnership \(CUSP\)](#).
- After an introductory exploration, students will teach the activity to others. Introduce a design cycle as a framework that students can use to map their own learning, improve the activity to make it more relevant to new audiences, and improve their presentation skills. The CUSP activity kit designers use the same model.

Session 3: Investigate the urban heat island effect

- Make predictions about which outdoor spaces will be hottest and coolest on a sunny day, then use an IR heat gun or other thermometer to collect data.
- There are many excellent online resources for urban heat island experiments; CMNH educators were inspired by [this one](#) from Arizona State University. The [CUSP Urban Heat Islands kit](#) can also be used to introduce the concept.

Session 4: Investigate the impact of green infrastructure

- Experiment with the [CUSP Extreme Events kit](#) and test different models to show the impacts of green infrastructure.

Session 5: Think about ways to address climate impacts and other community concerns

- Use the [CUSP Climate Adaptation in Empty Spaces](#) kit to imagine a future use for community spaces. Refer back to the original brainstorm session about community concerns, and what you learned about urban heat islands and green infrastructure.
- Invite students to discuss the following prompt: Can you redesign an empty space to meet your neighborhood needs?

Session 6: Teach these activities to others

- Students should use the design cycle (as described in Session 2) to document their learning for activities 3, 4, and 5. In the “Improve” part of the cycle, make plans for how to teach this to others.
- Invite students to identify an opportunity to teach others about what they have learned. Depending on the audience (like adults or fellow students), encourage your students to identify what they might hope to learn from the audience and to prepare their presentation accordingly.
- Based on students’ reflections on the previous sessions, update your lesson plans, build your own activity kits, and share resources as you learn.

Session 7: Reflect to track learning

- Revisit your notes from the first brainstorm about community issues and how teens can get involved. Lead a discussion with your students about the following questions:
 - What do you think about these questions now?
 - Which of your ideas have been reinforced, and why?
 - Which of your ideas have changed, and why?
- Definitely do this at the end of the unit, but you can also do this after each activity as part of the design cycle.

Standards, Knowledge, Skills, and Understandings

Next Generation Science Standards

- HS-ESS3 Earth and Human Activity
- HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Understandings

- **Overarching Understandings**
 - People in my community are concerned about topics that connect to climate change
 - Climate Change has local impacts
 - Community-level solutions can address local climate change impacts in environmentally sustainable ways that have additional community benefits
 - I can be a leader in helping others understand this issue and take action
- **Related Misconceptions**
 - Adults don't take teenagers seriously
 - There is nothing we can do about climate change
 - Climate change is a problem in other places, but not where I live
 - People in my community don't care about climate change

Essential Questions

- **Overarching**
 - What does it take to be a leader who helps address neighborhood concerns?
- **Topical**
 - What are urban heat islands? Why are cities hotter?
 - How do different surfaces result in different temperatures?
 - How does green infrastructure help cities cope with extreme rainstorms?
 - What type of green infrastructure is most effective?
 - How can we reimagine empty spaces in our neighborhoods?
 - How is vacant land a resource for climate change resilience?
 - How does climate change connect to other issues of concern?

Knowledge

Students will know that...

- climate change impacts in the Northeast US include increased heat and increased likelihood of intense storms
- cities create a phenomena known as the urban heat island effect when concrete, asphalt, and other building materials retain heat and increase temperatures
- green infrastructure uses plants, soils and other natural materials in engineering projects that mimic natural water cycles and to slow down and treat the flow of stormwater
- climate change impacts connect to a wide range of concerns, including health, utility costs, property value, jobs, and public space
- community-level solutions to impacts of climate change can address a wide range of concerns.

Skills

Students will be able to...

- Discuss issues of concern in their communities
- Explain the local impacts of climate change
- Explain how climate change impacts connect to issues of community concern
- Teach others about the urban heat island effect, and community-level solutions to reduce its effects
- Teach others about how green infrastructure can be used to reduce impacts of stormwater
- Envision the future of their community, and how infrastructure can help address climate change impacts and other community concerns
- use a design process to build knowledge, skills, and adapt activities to audience interests