

What are Urban Heat Islands?

Overview

In this lesson, students begin their investigation of urban heat islands and their impact on public health. Urban heat is considered an environmental health issue. Environmental health is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health.

Estimated Time

40 minutes plus 10 minute follow up next day.

Materials

Worksheet 1: Urban Heat Islands

Worksheet 2: Vocabulary

Computers and internet access for students

Learning Objectives

After completing the lesson, students will be able to:

- Explain the urban heat island effect and how it is created and measured
- Describe the effects of urban heat islands
- Identify some ways in which the effects of urban heat can be reduced

Vocabulary

Absorb, City, Dense, Development, Energy, Global Warming, Green Roof, Industrial, Insulate, Reduce, Resource, Rural Area, Scatter, Skyscraper, Urban Area, Urban Heat Island (See Handout 2)

GIS Tools and Functions

N/A

Additional Resources

Identify a series of resources available on the internet that deal with urban heat islands and that are accessible to students in your class. Here are some examples:

- Video: YouTube—Urban Heat Islands on the Weather Channel (4:52)
<https://youtu.be/t-sXH13l-rM>

- Video: YouTube—NASA/Urban Heat Islands (2:23)
<https://youtu.be/lnBO4vX82Fs>
- Video: YouTube—The Urban Heat Island Explained (1:08)
<https://youtu.be/-rm4zUJ48rE>
- Video: You Tube—Chicago Fights Extreme Urban Heat with Greener Ideas (10:30) <https://youtu.be/ukGN4PyeNoU>
- Article: Urban Heat Islands:
<http://education.nationalgeographic.org/encyclopedia/urban-heat-island/>
- Article: Heat Island Effect/EPA: www2.epa.gov/heat-islands
- Article: Heat Islands Impacts:
<https://www.epa.gov/heat-islands/heat-island-impacts>
- Article: Measuring Heat Islands:
<https://www.epa.gov/heat-islands/measuring-heat-islands>
- Article: Reduce Heat Island Risks:
<https://www.epa.gov/heat-islands/reduce-heat-island-risks>
- Article: Heat Island Cooling Strategies:
<https://www.epa.gov/heat-islands/heat-island-cooling-strategies>
- Article: What Communities are doing: <https://www.epa.gov/heat-islands/what-communities-are-doing-reduce-heat-islands>
- Article: What you can do:
<https://www.epa.gov/heat-islands/what-you-can-do-reduce-heat-islands>
- Article: Climate Change and Heat Islands:
<https://www.epa.gov/heat-islands/climate-change-and-heat-islands>
- Article: Cooling Summertime Temperatures: <https://www.epa.gov/sites/production/files/2014-06/documents/hiribrochure.pdf>
- Article: What is the urban heat island effect? <http://science.howstuffworks.com/environmental/green-science/urban-heat-island.htm/printable>
- Article: Heat Island Compendium:
<https://www.epa.gov/heat-islands/heat-island-compendium>
- Article: Hottest Place on Earth:
<http://earthobservatory.nasa.gov/Features/HottestSpot/>
- Article: Ecosystem, Vegetation affect intensity of urban heat island effect:
http://www.nasa.gov/mission_pages/terra/news/heat-islands.html
- Article: Satellites Pinpoint Drivers of Urban Heat Islands in the Northeast:
<http://www.nasa.gov/topics/earth/features/heat-island-sprawl.html>
- Article: Heat Island Group: <https://heatiland.lbl.gov/>
- Article: Creating the park cool island in an inner-city neighborhood: heat mitigation strategy for Phoenix, AZ: https://www.academia.edu/2332921/Creating_the_park_cool_island_in_an_inner-city_neighborhood_heat_mitigation_strategy_for_Phoenix_AZ

Opening the Lesson

1. Indicate to students that this lesson focuses on urban heat islands. “As the term urban heat island suggests, temperatures are often higher in cities than they are in their surrounding rural areas. This makes cities into islands of heat. Perhaps the worst result of urban heat islands is the number of heat-related deaths that occur—especially among poor and older people. According to the National Oceanic and Atmospheric Administration (NOAA), heat typically kills more people each year than tornadoes, hurricanes, floods, and lightning combined.
2. Distribute a copy of the **Urban Heat Islands** handout to each student.
3. Show the four YouTube videos (see Additional Resources) dealing with urban heat islands. Ask students to find and record answers to the questions contained in the **Urban Heat Islands** handout, as they watch the videos.

Developing the Lesson

4. After showing the videos, divide students in small groups to discuss their answers to the questions on the handout. Encourage students to modify their answers to the questions, based on their small group discussion.
5. Next, have students work in groups of two at a computer/laptop/tablet to explore the online material contained at the EPA (Environmental Protection Agency) website on the heat island effect. (See Additional Resources) Provide students with copies of the **Vocabulary List** handout. This vocabulary list provides terms that students may be unfamiliar with and will need to check while reading the online material.
6. Have students modify the answers on their Urban Heat Islands handouts, based on information gathered from readings.

Concluding the Lesson

7. For homework, ask students to brainstorm three to five ways to reduce the impact of urban heat islands. Each student should come up with a list that includes what can be done at home, what the school should do, and what the community should do.
8. The next day, discuss some of the ideas the students generated. Create a list of them on a sheet of paper that will be hung in the room for the remainder of the unit (as seen below).

Reducing the impact of urban heat islands		
What I can do	What the school can do	What the community can do

Worksheet I:

Urban Heat Islands

1. What is an urban heat island?
2. How are urban heat islands measured?
3. When are temperature differences between urban and rural land greatest? Why?
4. What are some of the characteristics of cities that affect the development of urban heat islands?
5. What are some of the effects of urban heat islands?
6. Why do you think that young, elderly, and poor people are most affected by urban heat islands?
7. What are some ways of reducing the effects of heat in cities?
8. What are citizens and communities in your state doing to reduce heat islands and achieve the benefits of reducing the effect of urban heat islands? What can you do as a citizen?

Worksheet 2: *Vocabulary List*

Absorb: To soak up.

City: Large settlement with a high population density.

Dense: Having parts or molecules that are packed closely together.

Development: Construction or preparation of land for housing, industry, or agriculture

Energy: Capacity to do work.

Global Warming: Increase in the average temperature of the Earth's air and oceans. Green Roof: Top of residential or industrial building that is wholly or partially covered in vegetation.

Industrial: Having to do with factories or mechanical production.

Insulate: To cover with material to prevent the escape of energy (such as heat) or sound.

Reduce: To lower or lessen.

Resource: Available supply of materials, goods, or services. Resources can be natural or human. Rural Area: Regions with low population density and large amounts of undeveloped land. Also called "the country".

Scatter: To disperse or distribute without a clear pattern.

Skyscraper: Very tall building.

Urban Area: Developed, densely populated area where most inhabitants have nonagricultural jobs.

Urban Heat Island: City area that is always warmer than the surrounding area.