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AER Supply:

Fun Facts

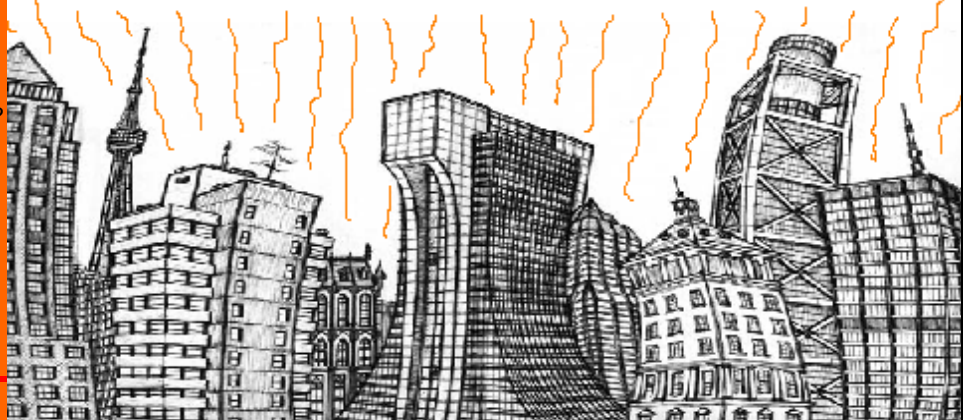
Quick Quiz

Learn More About It!

Did You Know?

A simple tree can reduce the urban heat island effect by removing particulates from the air and shading the ground.

URBAN HEAT ISLANDS



Humans have long been interacting with our Earthly environment, and evidence of this seems to crop up everywhere. It is difficult to convince some people, however, that current climate change is caused by human activity. One area of climate change that is easily attributed to human causes is the urban heat island effect. For over 180 years, humans have been aware of this incredible affect we have on local urban climate.

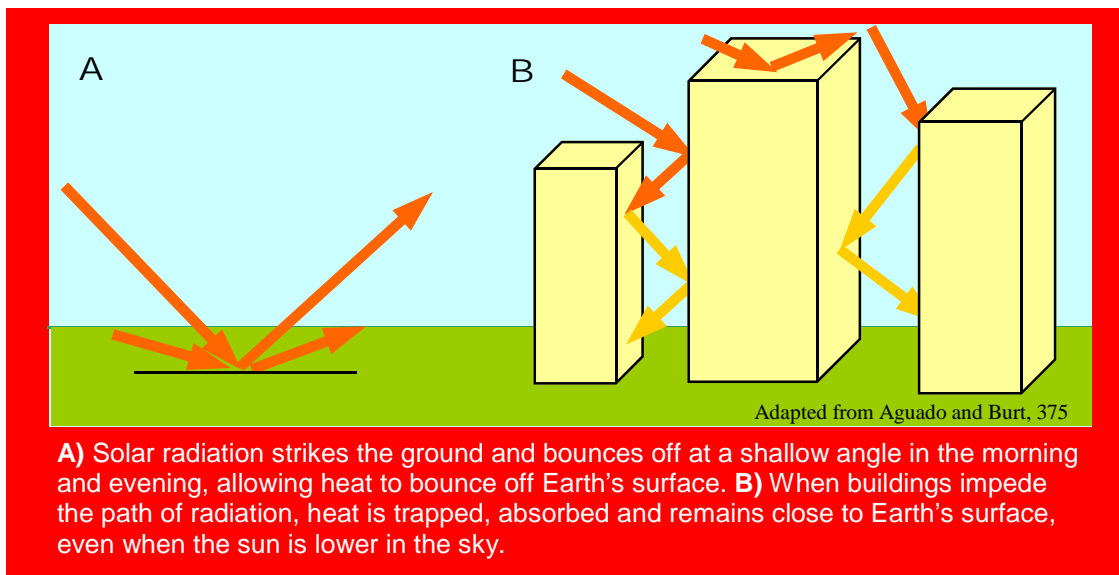
One important word to know for this discussion is *anthropogenic*. The word comes from two Greek parts: *anthropos* meaning “human beings” and the root of “genesis,” *gignesthai*, “to be born.” [Www.m-w.com](http://www.m-w.com) says things that are anthropogenic are “resulting from the influence of human beings on nature.” So we say that urban heat islands are a type of anthropogenic environmental change.

The local climate change of cities is attributed to several factors. First, when natural surfaces are paved and built upon, the solar absorption for an area changes. Dark surfaces like asphalt roads and tar roofs absorb more of the sun's rays than natural surfaces like grass and trees. Secondly, the industrial processes occurring in a city are more numerous than in the surrounding countryside.

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The most important factor determining the effect of an urban heat island is the size and population density of a city. Highest temperatures occur near the middle of the city and decrease slowly toward the rural outskirts. Urban particulates also contribute to heightened temperatures by increasing absorption and reradiation of solar energy in the area, but this effect is probably small. More obvious is the change in precipitation which can be either greater or smaller downwind of urban centers, depending on the traditional climate of the area.

Our built environment has a huge impact on the urban heat island effect. For starters, solar radiation enters the atmosphere over one place at varying angles throughout the day. In the morning and evening, the angle is shallow, which means the radiation bounces off the ground and often back out into space. At mid-day, the angle is greater - perpendicular to the ground at noon - and fires solar radiation more directly at the ground surface. However, built structures trap more heat and absorb more solar energy, warming the city area. By encountering vertical surfaces, solar radiation at all times of the day has a greater heating effect than it would without man-made structures (see the figure below).



Reflecting radiation is just one part of anthropogenic environmental heating. Storage of solar radiation also plays a part in the urban heat island effect. In a rural area, natural surfaces absorb heat during the day, and begin releasing it back to the atmosphere in the evening. Man-made building materials store heat better than natural surfaces like plants and soil, and buildings create more surface area to store heat. As heat is released from these surfaces at night, the increased daily heat storage causes overnight temperatures to be higher in urban areas than rural areas.

Steamy City

QUICK QUIZ



1. Define the word *anthropogenic* and use it in a sentence relating to climate. _____

2. Name the most important factor that determines urban heat island effect. _____

3. Why do roads and roofs absorb more solar energy than natural surfaces? _____

4. Describe the changing angle of the sun's rays at 6 am, 9 am, noon, and 6 pm on a horizontal surface. Then describe what happens when the rays at each angle strike a rural, unbuilt environment and an urban, constructed environment. Draw a picture to help you explain:

THE DAY AFTER WHEN?!?!?



2004's summer blockbuster The Day After Tomorrow sparked tons of talk about global warming. Some scientists called it a lot of hot air but here's what the film got right: Sea level is rising. Over the last 100 years, Earth's average temperature has risen 1° F and sea level has risen 4-8 inches. In just the past 50 years, Arctic ice thickness has declined by 40%. Glacier melting will decrease the salinity of the ocean, disrupting vital currents, but not by much. The real risk for us? NOAA scientists say warmer, drier summers caused by global warming could spark more wildfires in the United States. Don't expect to see an ocean freighter drift by your classroom window, but you might think twice next time you're riding in a CO₂-spewing car.

URBAN HEAT ISLANDS IN THE NEWS

- In August of 2003 between 3000 and 5000 people, mostly the elderly, died in Paris, France due to a heat wave. Health Minister Jean-Francois Mattei, said "We faced a heat wave catastrophe the likes of which had not been seen for more than 100 years." ~ AP at cnn.com
- "The heat wave in July 1995 in Chicago, Illinois was one of the worst weather-related disasters in Illinois history with approximately 739 heat-related deaths over a 5-day period... The high of 106° F on July 13th set the record for the warmest July temperature since records began at Midway Airport in 1928. Nighttime low temperatures were unusually high (upper 70s and lower 80s F) as well." ~ www.fact-index.com
- The elderly are more prone to heat-related illness because of their restricted mobility. In Houston, an "initiative to have Metro take people to libraries and multiservice centers to cool off [if they do not have home air conditioning] is of limited use to the elderly. 'Young people are more mobile than seniors might be,' said Ronnie Hagerty, director of community relations at United Way. 'So whereas I might get on a bus with two children and go to the library, if I'm 87 years old... and don't see very well, I'm not going to go outside.'" ~ HoustonChronicle.com (June 1, 2003)



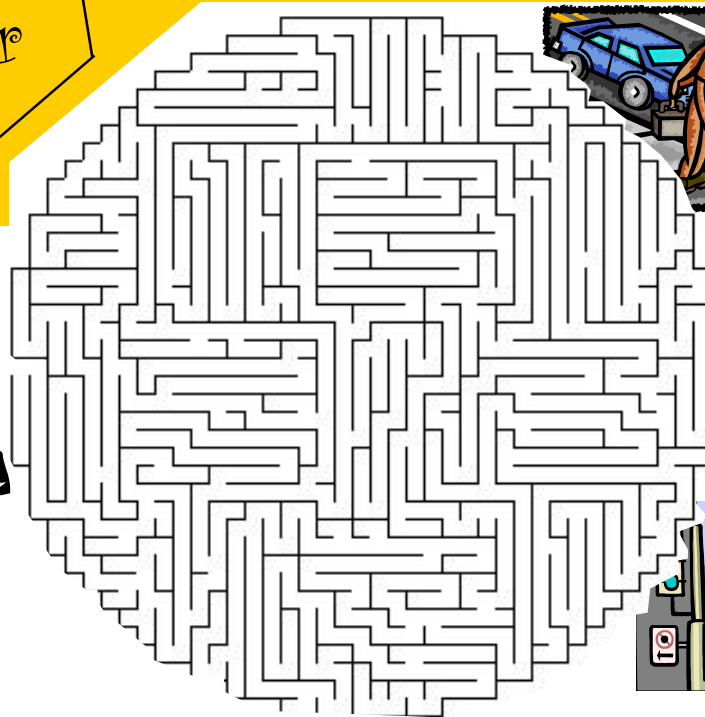
STUDENT SOLUTIONS: In the space below outline your ideas for reducing the **urban heat island** effect.

*Hint: Use the resources in the "Learn More About It" section to explore some possibilities.



Susie Mouse
needs your
help!

Get Susie from one side of the hot city
to the other and fast!



Fun Facts

*Written accounts of urban air pollution
appeared as early as 68 BC.*



In the U.S, the loss of human life in **hot spells** in summer exceeds that caused by all other weather events in the United States *combined*, including **lightning**, **rain**, floods, hurricanes, and **tornadoes**.

Heat waves place **dangerous** strain on more than people. They also affect **livestock** and **crop plants**, **electrical plants** unable to keep up with increased cooling demands, and water supplies which become depleted.

LEARN MORE ABOUT IT!

These resources can help you discover more about Urban Heat Islands and their affect on Earth's climate.

- Fact Index.com: http://www.fact-index.com/u/ur/urban_heat_island.html
- Heat Island Group: <http://eetd.lbl.gov/HeatIsland/>
- EPA: <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsLocalHeatIslandEffect.html>
- National Planning Conference: <http://www.asu.edu/caed/proceedings99/ESTES/ESTES.HTM>

Thanks to all of the following:

References:

- Aguado, Edward, and James E. Burt. Understanding Weather and Climate. Prentice-Hall, 1999. Pp. 372-375.

- Front page image: Michael Jehn, Pittsburgh, PA
- BBC News: news.bbc.co.uk
- Houston Chronicle: www.chron.com
- Fact Index by Wikipedia: www.fact-index.com
- Cool Houston: <http://www.harc.edu/harc/Projects/CoolHouston/>

Remember to check out our website too for more climate resources and fun learning tools!

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