

## LESSON 3: WHY SHOULD WE CARE ABOUT CLIMATE CHANGE?

### OVERVIEW:

*This lesson explores the connection between global warming, climate change and weather, with a special examination of the influence of climate change on the changing energetics of storms. The big idea is that global climate change is having a significant impact on a planetary scale and the most visible impact of that is on ocean temperatures. The lesson begins with brainstorming possible effects of global warming and allows students to analyze real weather data. There is special attention paid to how these climate and weather changes may affect students' own neighborhoods.*

### SUB-QUESTION:

What is the impact of climate change on the weather?

### **Ways of Knowing Urban Ecology:**



*Students will...*

#### Understand

- Recognize that climate change can be observed by measuring aspects of the weather, such as the strength and frequency of storm.
- Understand that climate change has influenced ocean temperatures and this has in turn impacted weather patterns.

#### Talk

*No specific goals connected with acting on urban ecology in this lesson.*

#### Do

- Predict the benefits and trade-offs of their actions – as embodied in their action plans – for future generations of members of the ecological community, human and non-human.
- Complete a timeline to chart the benefits and trade-offs of their action plans over seven generations.

#### Act

*No specific goals connected with acting on urban ecology in this lesson.*

### SAFETY GUIDELINES

No specific safety issues are associated with this lesson.

### PREPARATION:

#### Time:

1-2 class periods

#### Materials:

##### **Activity 3.1**

- Blackboard or white board
- Copy of PowerPoint presentation
- Computer and LCD projector

**Activity 3.2**

- Computer with Google Earth installed
- Google Earth layer: Sea surface temperature
- Google Earth layer: Hurricane path layers
- LCD Projector
- Copies of student handouts
- For each group of 2 to 4 students:
  - Color copies of student handouts *or* computer with Google Earth and layers installed

**Activity 3.3**

- PowerPoint of rising temperatures and intensity of storms.
- Computer and LCD projector.

**INSTRUCTIONAL SEQUENCE****Activity 3.1: How does global warming affect me?**

1. Begin the class by asking students, “Why should we care about Climate Change?” A probe may be, “What are some of the effects of climate change that you know of?”
  - Allow students as a class to brainstorm ideas and capture these ideas on the board. If students have difficulty coming up with ideas, you may want to suggest that they think back to the video clips they watched in Lesson 1. What types of consequences of global warming did the videos show?
  - If students do not bring up the idea of sea levels, ask them what they think would happen to the sea levels and why.
2. Show the Global Warming PPT to summarize some of the possible consequences of global warming.
  - The first slide provides a graphic organizer of potential effects and the following slides illustrate those different effects. Point out the effects of the rising sea levels.
  - Have the students locate (generally) their school and where they live on the map of the Northeast and Boston.

**Activity 3.2: Global Warming and Hurricanes**

*Before beginning this activity, make sure you have Google Earth and the two layers (found on the cd) installed but unselected. This activity can be done so that small groups of students work together or this activity can be done as a class activity with the teacher projecting the images of Google Earth for the entire class. If technical difficulties arise this activity can also work on paper using print outs.*

1. Project an image of Google earth zooming in on the Atlantic/Caribbean area, and
2. Turn on sea surface temperatures layer.
  - Ask the students what they think the color refers to? (In other words, red is warmer, blue cold)

3. Remind students that rising ocean temperatures may be one cause of global climate change
  - Ask students – Is this a problem? Why? Why not?
4. Introduce concept of hurricanes/typhoons as storms which form over the ocean (hurricanes over the Atlantic, typhoons over the Pacific). Some potential questions to guide this discussion include:
  - What is a hurricane/typhoon?
  - Where do they form?
  - Where do they get their energy?

**Teacher Background**

Hurricanes draw their energy from the ocean. In essence warmer water means more evaporation, and when water evaporates it releases energy which fuels the development of a hurricane.

5. Put the students into groups of 2-4 students.
  - Pass out color copies of Google Earth image (or if available, one laptop per group) and copies of the student handouts
6. Have students work in groups for approximately 10 minutes to interpret the data
7. Have students come back together and share their ideas. Some potential guiding questions to ask students include:
  - What is the relationship between ocean temperatures and hurricane strength?
  - If ocean temperatures are rising, what affect do you think that might have on hurricanes?

**Activity 3.3: Atlantic Storms Over Time**

1. Project the PowerPoint presentation: M3\_L3\_Increasing Temperatures and Stronger Hurricanes PPT,
2. First slide shows the drastic increases in the last century.
  - Ask students: What might be some reasons for this increase?
  - Review some of the reasons for this increase.

**Teacher Background**

- Students will probably say fossil fuels; however, an interesting connection is that when one studies the graph one will notice a strong connection with the timing of the **industrial revolution**. While the industrial revolution has been powered in a large part by fossil fuels, such as coal, oil, and gasoline, other sources of energy have been tapped as well, both historically and presently, especially water and wind.
- The rise in factories, automobile and airplane travel, and deforestation and land use changes (ranching, housing and commercial building) are all good answers.

3. Display the graphs showing the increases in Categories 4 and 5 hurricanes. Note that the number of severe and dangerous hurricanes is increasing.

**Teaching Strategy**

- The graphs in this PowerPoint can be confusing for students. Give students a few minutes to interpret the graph with a partner before discussing what it means. Guiding questions are also provided on the slides to help students focus on the main point.

4. Remind students back to Google Earth images in Activity 3.2.

**Teacher Background**

- **Potential factors** may include:
  - Rising surface temperatures, causing more powerful storms;
  - Increased populations and diminishing natural environments to accommodate this increasing population along the US coast line, increasing the amount of destruction these storms bring.
- **Common misconceptions** may include:
  - Increases in the total number of storms, hurricanes, and typhoons (no scientific consensus on this point, and is still up for debate; the fact that the hurricanes and typhoons are more destructive is better established);

**Concluding the Lesson**

The primary walk-away from this lesson is that *global is having a significant impact on a planetary scale and the most visible impact of that is on ocean temperatures*. Close the lesson by asking the students the following question to discuss or write about:

1. What is global warming doing to the planet? And why should we care?
  - You will get answers such as warming it up, making it hotter. However, the main idea is that temperature is a measure of energy and weather is driven by energy that is stored in the oceans and the atmosphere. So when the planet warms up there is more and more energy available for storms and that is why we are going to see more strong storm events such as big hurricanes like Katrina.