

## LESSON 1: IS THE EARTH'S CLIMATE CHANGING?

### OVERVIEW:

*The main purpose of this lesson is to introduce the concept of climate change and to re-examine the earth as an energy system. The lesson begins by students watching short video clips with different perspectives on global climate change. The class then discusses whether or not they believe the climate is changing and what would count as evidence of climate change. Finally, the class analyzes temperature data from the past 120 years and then the past 1000 years that illustrates how the climate has become warmer over time. In the next lesson, students will explore why that climate change is occurring.*

### SUB-QUESTION:

Is the earth's climate changing?

## Ways of Knowing Urban Ecology:



*Students will...*

### Understand

- Understand that the earth as a large energy system that consists of inputs and outputs with the sun being the major external source of energy. (*forces and drivers, ecosystem state and structure*)
- Recognize that climate change as a systematic change in the long-term characteristics of weather patterns (such as temperature, precipitation, pressure, or winds) sustained over several decades or longer. (*ecosystem change, forces and drivers*)

### Talk

- Write and present an argument using evidence for whether or not the earth's climate has changed.

### Do

- Analyze data which illustrates that the global climate is becoming warmer because of changes that have occurred in the energy system.

### 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 1.1

1. computer with projector
2. Video clips from youtube.com – either through internet or from cd
  - If you use the clips on the CD, you may need to download VLC media player to watch them - <http://www.videolan.org/vlc/>
3. Optional - Guide for Writing the Argument

**Activity 1.2**

For each student:

- LCD
- Earth\_Energy\_System.ppt slide

**Activity 1.3:**

For each student:

- Student investigation sheets with global climate change data

**Reflections:**

Student notebooks

**INSTRUCTIONAL SEQUENCE****Activity 1.1: Discussion – Is the earth’s climate changing?**

1. Tell students that you are going to show them two short videos that provide different perspectives on whether or not the climate is changing. After watching the videos, the students are going to write their own argument for whether or not they believe the climate is changing. Before continuing, it may be necessary to review the basic elements of a scientific argument. A supplementary sheet has been provided to scaffold students in the process if they have not had sufficient practice writing in this type of genre.

**Teacher Background Information**

- **Scientific Argument.** Science is about constructing arguments while considering and debating multiple explanations for phenomena. This is a core practice of what scientists do, but it is also important for students to learn. Students need to understand arguments that are presented in the mass media through text and video in order to make informed decisions. One way to help students become more critical of arguments presented to them is to have them write their own scientific arguments where they support the *claim* that they are making with appropriate *evidence* and *reasoning* that articulates why the evidence supports the claim.

2. Show students the following video clips about global warming from youtube.com:
  - Clip #1 - <http://www.youtube.com/watch?v=iJTDSEPSfhk> (6:29 min – stop at 3:10) created by an individual in England pulling from sources such as the Discovery channel and the Environmental Defense.
  - Clip #2 - [http://www.youtube.com/watch?v=Wq\\_Bj-av3g0](http://www.youtube.com/watch?v=Wq_Bj-av3g0) (1:00min) created by the Competitive Enterprise Institute

\*\*\*These videos are meant to stimulate discussion. They are not intended to be viewed as sources of factual information that students should memorize.

**Converting Youtube files**

**www.Zamzar.com-** In those schools where access to youtube is denied due to internet restrictions, teachers can convert these video files at this website. By pasting the youtube

video http: address into the window and designating the new format to which it should be converted, zamar will convert and than email you the file.

3. Have students write their argument for whether or not they believe the climate is changing.
  - The purpose of this writing assignment is to get students' thinking about this issue which they will be exploring over the module and to determine what they see as counting as evidence for this argument. Students should use information from their prior knowledge, personal experience and also the video clips, if they choose.
4. Have students share their arguments. You may have a couple of students read them for the class. While students are sharing their arguments, you may want to create a T-chart on the board with one side having evidence for climate change and the other side including evidence against climate change. Tossing back student responses for further comments by other students is important. Questions that might help discussion are
  - What do you think about what *Maria* said?
  - Do you think there are limitations to that evidence?
  - Is the evidence presented by Joe convincing? Why or why not?
  - Are there other reasons why that might be happening?

This is a good point at which students can be encouraged to question the limitations of data and measurements in science.
5. After summarizing the overall points that students made during the discussion, ask students what other data they would want to build a stronger argument for whether or not climate change is occurring.
6. (Optional) At the end of this activity, you may also want to have students critically analyze the video clips in discussion. Key questions could be: What are the biases/ assumptions associated with these video clips? Who might be interested in producing these different types of media (individuals/organizations)?

#### **Teacher Background Information**

- **Critical Consumers of Media.** There are different strategies for helping students to become critical consumers of information that they find on the web. This article provides three different strategies - <http://novemberlearning.com/default.aspx?tabid=159&type=art&site=19&parentid=18> - 1. Purpose – why was the website/video created? What is it trying to do? 2. Author – Who created the webpage/video? What are their credentials? 3. Meta-Web Information – Is the website sponsored by a particular institution? Who references the website? The article discussed each of these strategies in more detail.

#### **Activity 1.2: Climate Change and Energy**

1. Ask students about the relationship between energy and climate change. Where does the energy come from? How does it impact the climate?
  - The sun is the major source of energy for the earth.

- Some of the sun's energy is radiated back into space while much of the energy is trapped by the gases in the atmosphere and warms the earth's surface.
2. Show students the PowerPoint slide with the image of the sun and earth's energy system. Ask students – what would have to happen for the temperature of the earth to increase? (more energy from the sun or more gases in the atmosphere to trap the heat) What would have to happen for the temperature of the earth to decrease? (less energy from the sun or fewer gases in the atmosphere to trap heat).
  3. Finally give students the following ideas relating to climate change.
    - Climate change is a systematic change in the long-term characteristics of weather patterns (such as temperature, precipitation, pressure, or winds) sustained over several decades or longer.
    - Evidence of climate change would be long term data such as temperature weather patterns or precipitation that shows change over time.

### **Activity 1.3: Examining Global Climate Data**

#### **1. Introduce Activity 1.3**

- Tell students they are going to analyze data from the National Oceanic and Atmospheric Administration (NOAA). The data shows the temperature of the earth over different time spans.
- You may want to go over each of the graphs as a class.

#### **2. Students Complete Activity 1.3**

- Have students work in groups using the student sheet as a guide to analyze the climate change data.

#### **Teacher Background Information**

More information about climate change can be found at the National Oceanic and Atmospheric Administration (NOAA) website - <http://www.ncdc.noaa.gov/oa/climate/globalwarming.html>

#### **3. Discussion of Activity 1.3**

- Discuss as a class students' responses to the three questions about the NOAA data and what other data they would want to determine whether or not global warming is occurring.
- You may want to discuss the differences between direct evidence, such as temperature and precipitation data that are characteristics of the climate, versus indirect evidence, such as snow cover and glacier recession data that are a result of the changes in climate.

#### **Concluding the Lesson**

- As an end of the class reflection, have students consider the following questions, in either discussion or writing: Why do students think climate change/global

warming is such a contentious issue? Why can you find so many different videos, web pages, etc. that present climate change as either fact or fiction?