



## 4.7 INTRODUCTION TO CLIMATE CHANGE

### OBJECTIVES

The students

- Begin their study of climate change.
- Identify and describe some of the indicators of global warming.
- Review the water cycle and hypothesize about how global warming could affect this process.

### CLIMATE EDUCATION FRAMEWORK

- 3-5Changes.A.1 Our planet's ocean temperatures and air temperatures are becoming higher than they have been for the past centuries. This change is called global warming.
- 3-5Changes.A.2 Rain patterns and other climate features are also changing. Scientists use the term global climate change as the name that describes all these changes.
- 3-5Changes.A.3 Pacific Islanders and other people who have lived in a place for a very long time have knowledge about their local climate that is based on centuries of experience. Comparing today's climate conditions to this historical knowledge provides evidence of global climate change.
- 3-5Changes.A.4 Scientists get evidence of today's climate and also of past climates by making scientific observations. These observations indicate that global climate change is happening now.
- 3-5Energy.B.2 The ocean has a major influence on weather and climate because it absorbs and holds much of the sunlight energy that reaches Earth.
- 3-5Matter.B.1 Water is found almost everywhere on Earth. Nearly all of Earth's water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. Water is also in the air in the form of a gas.
- 3-5Matter.B.2 The Sun provides the energy that powers the water cycle. The Sun's energy evaporates the water. The energy from the Sun also causes the winds that move water in the air and in the ocean.
- 3-5Matter.B.3 The ocean has a major influence on weather and climate because it plays a major role in the water cycle. Most water in the air comes from the ocean. This water vapor in the air eventually cools, condenses into clouds, and returns to the ocean or the land as precipitation

## BACKGROUND

This activity introduces students to the study of global warming and climate change. There are at least 10 signs of global warming. The NOAA poster, *Ten Signs of a Warming World*, provides a brief synopsis of each of these indicators. Teachers may use the poster as an introduction to the activity or as a summary to the activity but students are expected to go beyond these brief summaries.

This is primarily a student research project. Students can work in groups or individually to investigate and report on these indicators. Sharing their findings with the class is critical to the activity. Sharing can be accomplished through posters, oral presentations, plays, or whatever the teacher or students choose, even written reports. SP 4.8 EVIDENCE OF GLOBAL WARMING or something similar can be used to help students individually summarize the reported information on each indicator.

In their indicator report students are asked to describe their sign, tell how scientists have found evidence for it, and discuss observed and other potential effects including climate changes. They are encouraged to interview grandparents and others in the community about any changes they have observed over the years in the local environment and climate due to global warming.

## STUDENT ROLES

Meteorologist  
Climatologist

## MATERIALS

NOAA Poster *Ten Signs of a Warming World*  
<http://cpo.noaa.gov/warmingworld>  
Internet access and other reference materials  
SP 4.7 EVIDENCE OF GLOBAL WARMING  
Working Dictionary

## PRODUCTS

Reports on the signs of global warming  
Working definition of global warming  
Completed student pages

## PROCEDURES

1. **Help the students make a class concept map about climate change.**  
Ask such questions as
  - Has anyone heard the term *global warming*?
  - What do you think global warming means?
  - What do you think might be happening if the Earth is getting warmer?
  - How do you think scientists have provided evidence for this?
  - What things on Earth might be getting warmer?  
✓Help them to include such things as the ocean and the air.
  - What kinds of effects might this have on the weather?  
✓A review of the water cycle may help with ideas. See Activity 3.8 WATER CYCLE.

- What happens when an ice cube gets warm?
- Is there any frozen water on Earth?  
✓Help them to include such things as glaciers, snow, and ice bergs.
- Why are these things important?
- What might happen if they melted?

## 2. Introduce the ten indicators to the students.

Ask such questions as

- What is *arctic sea ice*? What might be happening to it due to global warming?
- What do you think is meant by *ocean heat content*? What might be happening to it due to global warming?
- What do you think *air temperature over ocean* means? What might be happening to it due to global warming?
- What do you think *sea surface temperature* is? What might be happening to it due to global warming?
- What do you think the term *global sea level* refers to? What might be happening to it due to global warming?
- How might *humidity* be affected by global warming?
- What do you think *air temperature over land* means? What might be happening to it due to global warming?
- How might *snow* be affected by global warming?
- What do you think is meant by *temperature of the lower atmosphere*? What might be happening to it due to global warming?  
✓You may have to establish what the *lower atmosphere* means first.
- What are *glaciers*? How might *glaciers* be affected by global warming?

## 3. Have the students work in pairs, small groups, or individually to select one of the indicators to research and report on. Help them decide on a reporting format.

Have them include such things in their report as

- A description of the indicator.
- Why it is an indicator of global warming.
- What evidence scientists have found of the indicator and how it was measured.
- Observed and other potential effects from the indicator.
- Impacts the indicator may have on their Pacific island environment.

## 4. Have the students present their reports to the class. Have them use SP 4.7 EVIDENCE FOR GLOBAL WARMING or something similar to summarize the class reports.

## 5. Have the students revisit their concept map and add any new information they have found. Have them write a working definition for global warming including its effects on climate.

Ask such questions as

- What are some indicators of global warming?
- How does global warming affect climate?

**EXTENSIONS**

- Invite a speaker to talk about global warming and climate changes that have already affected or may in the future affect the local environment.
- Have the students make a poster display about global warming and climate change.



**EVIDENCE OF  
GLOBAL WARMING  
SP 4.7**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Summarize the information from the reports on each of the indicators of global warming.

<i>arctic sea ice</i>	<i>temperature of the lower atmosphere</i>
<i>air temperature over ocean means</i>	<i>air temperature over land</i>
<i>global sea level</i>	<i>humidity</i>
<i>sea surface temperature</i>	<i>snow</i>
<i>ocean heat content</i>	<i>glaciers</i>