# BEFORE YOU VISIT

grades 9-12

These discussion starters and activities are designed to spark your students' interest in the exhibition and to prepare them for the concepts they'll encounter.

## Discussion Starters

### CLIMATE CHANGE

- What are some recent news stories about climate change?
- What conditions—such as the average temperature or the amount of rainfall—change as climate changes?
- Describe how organisms might respond to these changes.
- How would a rise in sea level affect where we live (e.g., housing, transportation)?

### ENERGY USE

- Where does the energy that we use come from?
- What are some recent news stories about energy use—locally, nationally, or globally?

## Activities

### HOW GREENHOUSE GASES ABSORB HEAT

**Objective:** To understand that $CO_2$ absorbs heat in the atmosphere.

**Description:** In this experiment, student teams will compare the way two "atmospheres," one higher in $CO_2$, trap heat. Materials include jars, thermometers, baking soda, vinegar, tubing, and stoppers.

**Download activity at:**
amnh.org/resources/rfl/web/climatechangeguide/activities/gasestrapheat.html

### SCIENCE BULLETINS: CLIMATE CHANGE STORIES

**Objective:** To explore current research related to climate change.

**Description:** Students can choose from an array of videos, interactives, and essays that explore cutting-edge scientific research on climate change. Stories include "Bio Snapshot: Climate Change Affects Ecosystems," "Earth Feature: Melting Glaciers, Clues to Climate Change," "Human Snapshot: Did Climate Change Guide Early Migrations?," and "Earth Viz: Sea Ice 2000-2008."

**Videos, Interactives, and Essays available at:**
sciencebulletins.amnh.org
Click on the "Climate Change" tab at the top right. Select a video or interactive and press "play." In the lower left column, you'll find supporting resources such as essays, interactives, data, and/or educator resources.

## Tips on Using the Student Worksheet

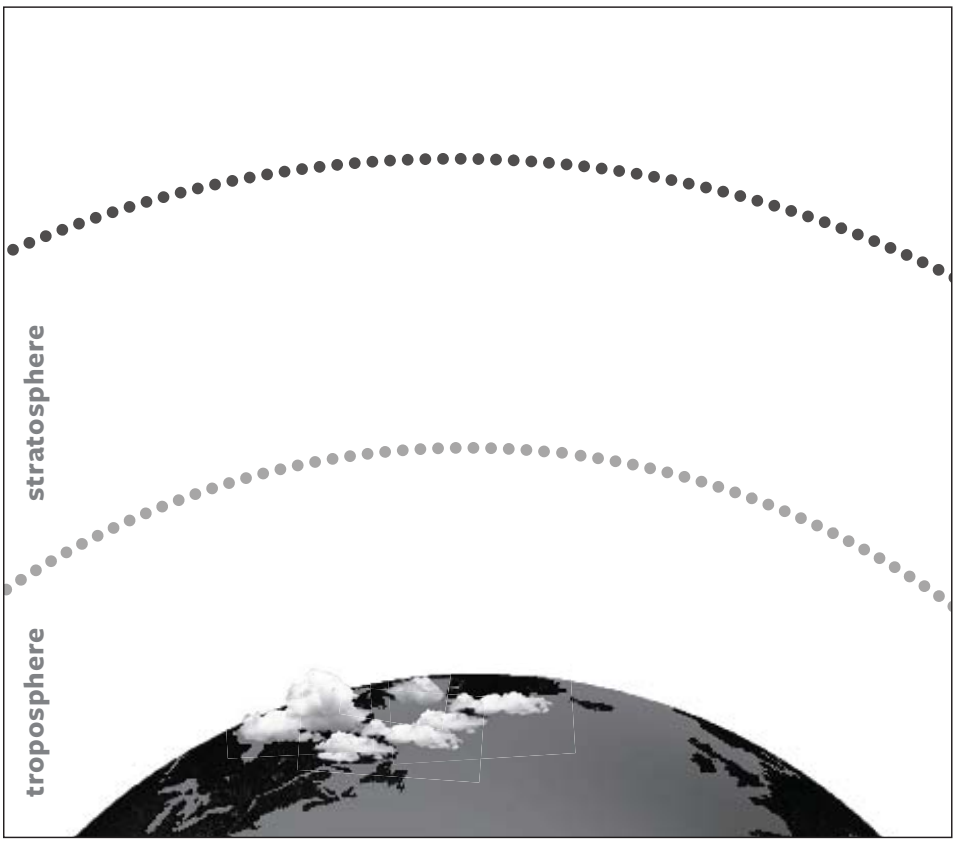
On the other side of this insert, you'll find a worksheet that your students can use to explore the *Climate Change* exhibition independently.

Before coming to the Museum, you may wish to distribute copies of the **Map of the Exhibition** and point out the areas that students will be exploring.

# STUDENT WORKSHEET grades 9-12

## 1. Investigate How Climate Works

Find the Greenhouse Effect wall in the **Climate Change Today** area. On the diagram, add arrows that show energy flow.




Next, find the animated globe in each of these four areas:

- **Changing Atmosphere**
- **Changing Ice**
- **Changing Ocean**
- **Changing Land**

For each globe, choose and watch an animation. Record your responses to the questions below on the back of this page.

- Describe the phenomenon that you see in the animation.
- How is it connected to the climate system?

## 2. What Can We Do?

Explore the **Making a Difference** area. What actions can your school or community take to reduce $CO_2$ emissions?

## 3. Investigate Energy Solutions

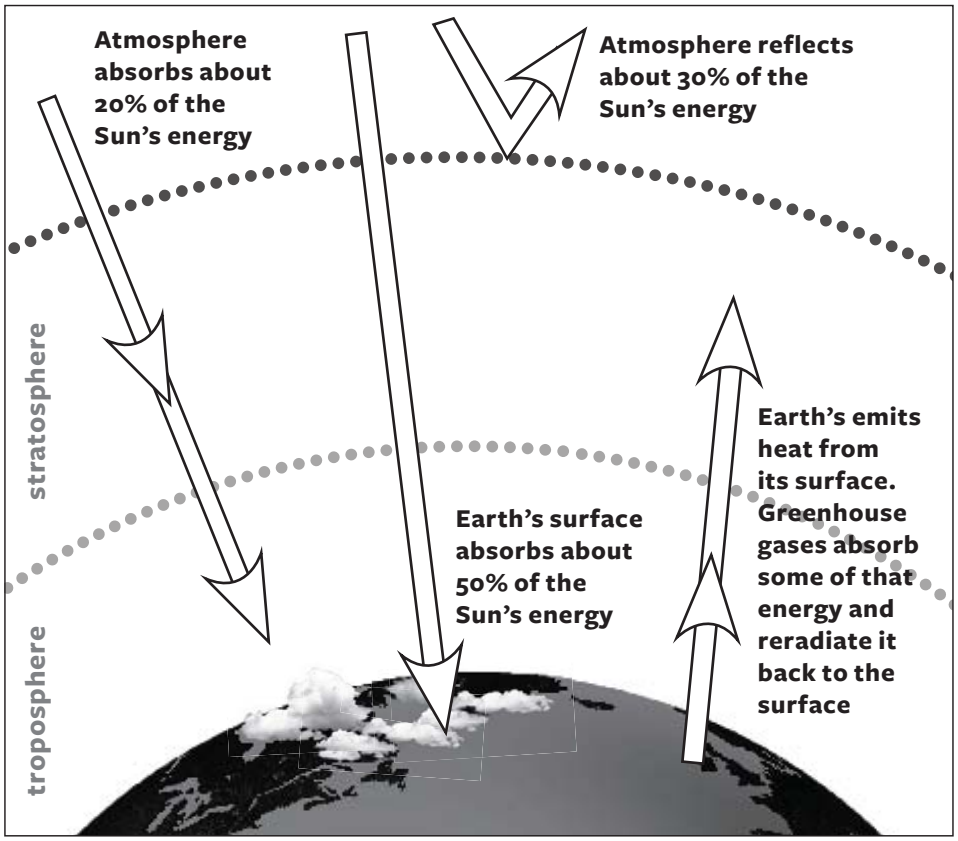
Go to the **A New Energy Future** area and explore the various "clean" energy sources that could meet future needs. Record your responses to the questions below on the back of this page.

- Why is "clean" electricity key to solving climate change?
- What do you think governments like ours should do?

GRADES 9-12

## 1. Investigate How Climate Works

Answers will vary. They may include: Clouds in the atmosphere help control temperatures on Earth by reflecting and absorbing light and heat coming into and leaving our planet. The ice-covered poles reflect the Sun's energy, and the huge temperature difference between the frozen poles and the equator drives wind and ocean currents. Evaporation of ocean waters brings moisture to land areas and transfers energy to the atmosphere where it helps drive weather systems.




## 2. What Can We Do?

What actions can your school or community take to reduce carbon dioxide emissions?
Answers will vary. They may include: Conduct school- or community-wide campaigns (e.g., using leaflets, posters, or announcements in school assemblies) that promote actions that individuals can take to slow climate change. Work with local organizations to promote public transportation, tree-planting, energy-efficient construction, and large-scale recycling programs. Get involved in Earth Day and other renewable-energy or conservation-oriented activities.

## 3. Investigate Energy Solutions

Why is "clean" electricity key to solving climate change?
Plants the produce electricity are responsible for more than 30 percent of global $CO_2$ emissions each year, by far the largest source of those emissions. In addition, $CO_2$ emissions from electricity production are growing much faster than emissions from other sources.

What do you think governments like ours should do?
Answers will vary. They may include: Directly tax carbon emissions. Invest in alternative energy technologies. Raise fuel-efficiency standards for trucks and cars. Build public transportation systems. Give tax breaks to homeowners who use less energy. Support research on renewable energy. Give prizes for innovation in green buildings and sustainable development. Protect forests, plant trees, and work to prevent deforestation worldwide. Work with governments around the world to protect shared resources like the oceans and the atmosphere.

## Explore Climate Change in the Hall of Planet Earth

Answers will vary. They may include: Scientists study a marine sediment core from the tropics to understand seasonal changes in biological activity in the waters from which the sediments were deposited. Light layers, formed during winter, are richer in biologically produced carbonate, while dark layers, formed during summer, contain fewer biologically produced sediments and more silts and clays. The nearly 3,000 years spanned by this sediment core includes the onset of the Younger Dryas, a cold period marked in the core by a general lightening of sediment color, the direct result of increased biological productivity.