

A Warm-up to Global Climate Change

AIM

To give students background and context in which to discuss the relationship of greenhouse gas levels and negative global climate changes and to recognize how lifestyles—including their own personal choices—can impact greenhouse gas creation. Students will learn pertinent vocabulary while practicing listening, reading, speaking and writing skills as well as developing their fluency and grammatical accuracy in English.

OBJECTIVES

At the end of this session, students will be able to:

- Describe the relationship between global warming and greenhouse gases.
- Identify some sources of greenhouse gases.
- Describe some negative effects of global warming.
- Explore ways to reduce greenhouse gases.
- Identify how student habits, both past and present, decrease or increase effects on global climate.
- Identify current efforts around the world to protect against global climate change.
- Create a plan to personally affect reduction in greenhouse gases.
- Use conditional “if” sentences denoting past, present and future, with content related to global climate change.

TARGET GROUP

Intermediate- to high-level ESL students (For the purpose of this lesson, the target group levels range from 1 through 8, with the following guidelines: 1 = beginning, 5 = intermediate, 8 = advanced.)

LENGTH

Three 90-minute class periods

OVERVIEW

In this lesson, students develop a perspective on global climate change by viewing charts, graphs, pictures and video clips to understand some basic causes and effects of global warming. They discuss what can be done to slow global climate change and reflect on whether lifestyles in their native countries and in the United States have increased or decreased the likelihood of global climate change. Finally, students sign personal action plans for curbing their own carbon footprint.

NOTE: If students are working in a computer lab, they can visit the websites listed in the activities below. If multiple computers are not available, project the website onto a screen in the classroom. If there is no Internet access in the classroom, conduct the activities which don't contain streaming video and make transparencies of the pertinent images for projection.

DAY ONE

Exploring the Effect of Carbon on Global Climate Change

1. Warm-Up Activity

Show students some nature pictures from magazines, Google images or <http://www.flickr.com/groups/earthnature/pool>. Ask students to describe some of their favorite spots in the natural world and how they would feel if some of those places were lost. To contrast these scenes of natural beauty, view the opening images at <http://www.kqed.org/quest/television/earth-day-tv-special-where-weve-been-where-were-headed> which depict scenes of pollution and degradation of the natural environment.

2. Reading Graphs and Charts

Ask students to visit <http://www.pbs.org/wgbh/warming/etc/graphs.html> and respond to the following questions.

Graph 1:

- What is represented by the horizontal axis? by the vertical axis?
- When did the temperature start to rise consistently?
- How much did the temperature change from 1860 to 2000?

MATERIALS

- Nature pictures from magazines, Google or <http://www.flickr.com/groups/earthnature/pool>.
- “Where We’ve Been, Where We’re Headed,” a video clip about the San Francisco Bay Area’s environmental movement, from the website of **QUEST**, a KQED multimedia series exploring Northern California science, environment and nature; available at <http://www.kqed.org/quest/television/earth-day-tv-special-where-weve-been-where-were-headed>.
- Various websites and Web pages on the subject of **global warming**:
<http://www.pbs.org/wgbh/warming/etc/graphs.html>
<http://www.pbs.org/wgbh/pages/frontline/heat>
http://www.pewclimate.org/global-warming-basics/facts_and_figures/climate_science_basics
http://www.pewclimate.org/global-warming-basics/facts_and_figures/impacts
<http://www.climatecrisis.net/trailer>
<http://www.earthweek.com>
- **Green for All** – a national nonprofit organization working to build an inclusive green economy that is strong enough to lift poor Americans out of poverty; their website provides information on what a green economy is, what the organization is doing and how to help; available at <http://www.greenforall.org>.
- Various websites and Web pages that provide **additional background**:
<http://www.goldmanprize.org>
<http://www.kqed.org/news/climatewatch>
<http://www.KQED.org/w/youdecide>
<http://www.video.nationalgeographic.com/video/player/environmental/global-warming>
<http://www.KQED.org/quest/television/topics/9>

Graph 2:

- What is the range of time on this graph?
- This graph does not represent the whole planet. What area does it represent?
- How much did the temperature change from the year 1000 to the year 1850?
- What do you notice about 1920? What could be a reason for this?
- What are some possible reasons for the increase in temperature of the Northern Hemisphere being greater than the increase in temperature of the rest of the planet?

Graph 3:

- What does the vertical axis represent?
- What is the direction of the graph line over time? Does the direction change significantly?

Graph 4:

- What time period is represented in this graph?
- What does the zero on the horizontal axis represent?
- What happened to the graph line near this zero point?
- How large is this change in relation to other changes?

Ask students to describe and discuss their reactions to the information on these graphs.

Ask the class to visit the Web site <http://www.pbs.org/wgbh/pages/frontline/heat> and click on “Sources of CO2 emissions?” in the How Well Do You Know section.

They should look at the pie chart and identify the top four sources of carbon dioxide. Brainstorm what contributes to these carbon dioxide producers and then discuss how the emissions could be reduced. Practice future real conditional.

- If I _____, carbon emissions from my transportation will be lower.
- If I _____, carbon emissions from factories will be lower.
- If I _____, carbon emissions from power plants will be lower.
- If I _____, carbon emissions from forestry will be lower.

Also practice using “unless” by changing “if” to “unless” and making the independent clause negative.

Discussion Option: Ask students if their personal action plan could include working in the new “green economy.” Brainstorm possible employment opportunities created by lowering greenhouse gas emissions, such as assembling electric cars, weatherizing homes, manufacturing solar panels and providing local food sources. For information on green jobs, visit the website of the PBS program *NOW*, <http://www.pbs.org/now/shows/522/index.html>

3. Direct the students' attention to "1A. The Greenhouse Effect,"

then to the text beneath the picture at http://www.pewclimate.org/global-warming-basics/facts_and_figures/climate_science_basics and working in small groups, respond to the following questions. To help them develop fluency in English, they should then practice asking and answering the questions in pairs.

- What are two paths visible sunlight can take as it gets close to Earth? *(It can either be absorbed or not be absorbed by Earth.)*
- If the light is absorbed, what happens to it? *(It is converted to heat, which warms Earth.)*
- What are two paths of the heat that doesn't get absorbed and bounces away from Earth (infrared radiation)? *(Either it is either absorbed by the atmosphere or it escapes into space.)*
- What determines how much heat from Earth, or infrared radiation, is absorbed by the atmosphere? *(the amount of greenhouse gases)*
- What activities add to greenhouse gases? *(human activities)*
- What effect does an increase in the amount of heat absorbed by the atmosphere have on the warming of Earth? *(It increases Earth's temperature.)*

Next, direct the students' attention to the illustration above the paragraph and initiate a discussion. Some possible questions could include:

- What are the two kinds of greenhouse effects?
(natural and enhanced)
- What does the natural greenhouse effect cause?
(natural warming of Earth)
- What does the enhanced greenhouse effect cause?
(overheating of Earth)
- Which side of the illustration shows our current situation?
(the right side, the enhanced greenhouse effect)

Homework

Ask students to contact family and friends in their native country to find out what they are doing there that decreases / increases global climate change. Encourage them to make a chart like the one below. On Day Three, they will share with the class what they found out.

EXAMPLE

Country	Action	Individual?	Local?	National?	Other?
Mexico	Recycle	Yes	Yes	No	High schools

DAY TWO

The Effects of Global Climate Change

1. Direct students to http://www.pewclimate.org/global-warming-basics/facts_and_figures/impacts drawing their attention to the graphs that depict three major impacts of global warming: the rise in sea levels, the decline in the amount of Arctic ice and the increase in the number of tropical storms in the North Atlantic. Then go to <http://www.climatecrisis.net/trailer> and have students view the trailer for the film *An Inconvenient Truth*.
2. From the Cycle 1 and Cycle 2 charts below ask students to match each cause in the left column with its effect in the right column.

Cycle 1: Sea Levels Rise / Ice Melts

Cause	Effect
Ocean temperatures rise	Coastal water levels rise
Coastal cities and towns flood	Ocean temperatures rise
Ice melts	Coastal cities and towns flood
Coastal water levels rise	Lives of people, animals and plants could end
Earth's temperatures rise	Ice melts

Cycle 2: Storms Increase

Cause	Effect
Ocean temperatures rise	Number of storms increases
Earth's temperatures rise	Severity of storms increases
	Ocean temperatures rise

3. Ask students to make a diagram of the causes and effects. For each cycle, ask them to write a sentence that begins with “If.” Example: If ocean temperatures rise, the number and severity of storms increases.
4. Ask students to think about the effects of changes in weather and to discuss how weather affects people, plants, animals, insects and marine life. They can then interview each other and fill in a self-made chart like the example below.

NOTE: Encourage students to relate examples of weather changes and affected species in their native countries.

Change	Increases	Decreases
More flooding	Insects (mosquitoes)	Human health

5. Give each student a strip of paper. Half the students will have strips of paper with a phrase that begins with a capital letter and has no ending punctuation. The other half will have strips of paper with a phrase that begins with a lowercase letter and ends with a period. (Examples are provided at the end of the lesson plan.) Not only must the students with the capital letter find the students with the period, but also—and more important—they must find the phrase with the meaning that completes their half of the sentence.

After students have found their matches, ask each pair to write their complete sentence on the board. Discuss some of the surprising facts and their implications.

DAY THREE

The Human Connection to Global Climate Change

1. Ask students to think about “mistakes” made in the past that had they not been made, we might have avoided, or at least minimized, global warming. Encourage them to share what they came up with and to write down their ideas.

To build grammar development into the activity, encourage students to practice using the past unreal modals, both with and without “if.”

EXAMPLES:

Question: “What could people have done years ago so that global warming might not be such a problem today?”

Answer: “People could have ...”

Question: “Global warming might not be such a problem today if what had happened?”

Answer: “Global warming might not be such a problem today if people had demanded fuel-efficient cars years ago.”

After students have had time to write down their ideas, list the ideas on the board for the whole class to see.

2. Discuss the environmental benefits of the activities listed in the left column of the chart below.

For grammar practice, ask students to:

- Begin with gerund forms. (*Example: Riding a bicycle reduces the use of fossil fuels.*)
- Interview each other by asking yes / no past-tense questions about the activities in the chart as the activities relate to their native country. (*Example: Did you use a bicycle often?*) They can write the responses in the Native Country column.
- Ask the same yes / no questions in present tense. (*Example: Do you use a bicycle often?*) They can write the responses in the U.S.A. column.

Encourage students to add activities they think of and to share them with the class.

Finally, ask students to share their answers. Then as a class, determine which lifestyle was / is “greener.”

Activity	Native Country	U.S.A.
Use a bicycle weekly	Yes, every day	Maybe on weekends
Reuse containers		
Use less water		
Use less electricity		

3. Share information from Day One’s homework. Discuss past and present customs and measures taken in their native country that decrease / increase global climate change.

To help illustrate the importance of this issue and to give students the opportunity to see the global problems created by climate change, go to <http://www.earthweek.com> and click on the various icons scattered over the map on the home page. Invite student responses. Ask students to create their own map based on the Earthweek.com example. They can illustrate their map with icons of their own design and write summaries describing the beneficial actions being taken globally.

4. Conclude by asking students to discuss what they can do personally to reduce the carbon emissions produced by the following contributors to environmental degradation.
 - Transportation: What forms of travel are least harmful?
 - Use of electricity: How can electricity use be reduced?
 - Deforestation: How can we reduce the production of goods that cause overharvesting of our forests?
 - Purchasing new products: How can we live with less so we can produce fewer greenhouse gases?

Suggest one or two answers to guide students and then invite them to share their action plans and explain why they made their decisions.

Optional

Link to <http://www.goldmanprize.org>. Go to Press Room, Photos / Videos for streams about individual recipients of this prestigious environmental prize for sustained, local efforts to protect the planet’s natural resources.

Possible Extension Activities

1. Suggest that students read weekly updates of fascinating numbers about climate change by visiting <http://www.kqed.org/news/climatewatch>, then discuss the latest “factoid” to keep students engaged in ongoing, if brief, discussions of current environmental issues.
2. Ask students what they know about Earth Day. Use <http://www.kqed.org/quest/television/earth-day-tv-special-where-weve-been-where-were-headed> for background on a local perspective on the origins of Earth Day.
3. Invite students to visit <http://www.KQED.org/w/youdecide>, then discuss the following global warming dilemma:
Should the United States build more nuclear power plants in order to decrease use of fossil fuels?

Try to decide whether minimizing negative environmental impact is more significant than any perceived benefits.

4. For higher level students: Suggest they research, then write about the following people / organizations and their significance to the environmental movement: Rachel Carsen, John Muir, Sierra Club, Greenpeace, Jacques Cousteau, World Wildlife Fund, Al Gore, Wangari Maathai, the Goldman Environmental Award. Feel free to expand the list!

Phrases for Day Two, Activity 5

- Eighty percent of the world's energy comes from fossil fuels.
- The current burning of fossil fuels—oil, coal and natural gas—releases 7 billion tons of carbon per year.
- There is at least 10 times too much carbon if we're going to slow climate change.
- Climate change is more than 3.6 degrees Fahrenheit, or 2 degrees Celsius, of the planet heating up.
- The number one source of carbon dioxide emissions is the huge power stations generating electricity to keep lights on and industry operating.
- Number two in CO₂ emissions—generally 20 to 25 percent in most nations—is transportation, which includes cars, buses, planes, trains and trucks.
- Number three in CO₂ emissions is home heating.
- Number four in CO₂ emissions is agriculture.
- Making cement comprises 5 to 10 percent of global CO₂ emissions.
- China will put the same amount of carbon into the air in 30 years as the United States put into the atmosphere in 100 years.
- Carbon that the United States and Europe put in the air in the last century is causing the climate change we are experiencing now.
- By 2100, we will have used sixteen times the resources that we have used up until now.
- In order to cut world hunger in half we need a doubling of world water use to grow food.

(Source for facts: <http://www.pbs.org/wgbh/pages/frontline/heat>)