



Carbon Dioxide

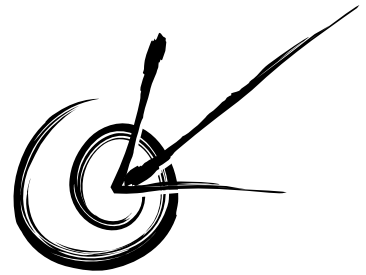
Activity courtesy of



Department of
Environment
& Conservation

Lesson aims

To demonstrate the greenhouse effect by showing how CO₂ in the atmosphere traps heat and insulates the Earth. To show that human activities affect the concentration of greenhouse gases in the atmosphere.



Learning outcomes

As outlined in the National Profiles:

Studies of Society	Resources	Use of resources. Management and enterprise.	✓
	Natural & Social Systems	Natural systems. Economic systems.	
Science	Life & living	Living together; structure and function; biodiversity, change and continuity.	



Background information

Climate is one of the most influential factors on our planet. But studying climate and climate change presents unique challenges to educators: How to bring the concept of climate change, which is a vast and multifaceted topic, down to a level where students explore it in a hands-on interactive way? How to address in a positive way the role that humans play in climate change? By the time they reach middle school, most students have heard of global warming and the 'Greenhouse Effect'. They have some idea that rising global temperatures are attributed to human activities which have dramatically increased the levels of heat trapping gases in the atmosphere. However, it is important that students also understand that the Greenhouse Effect is a positive process by which the atmosphere keeps the planet at a relatively uniform temperature.



Sources & further information

Climate Change Education Package

Mr. Tim Grant, Green Teacher Magazine
Toronto, Canada

*Adapted with permission from
Green Teacher #70, Spring 2003.*

www.greenteacher.com

CSIRO. Articles and information about carbon dioxide and the environment

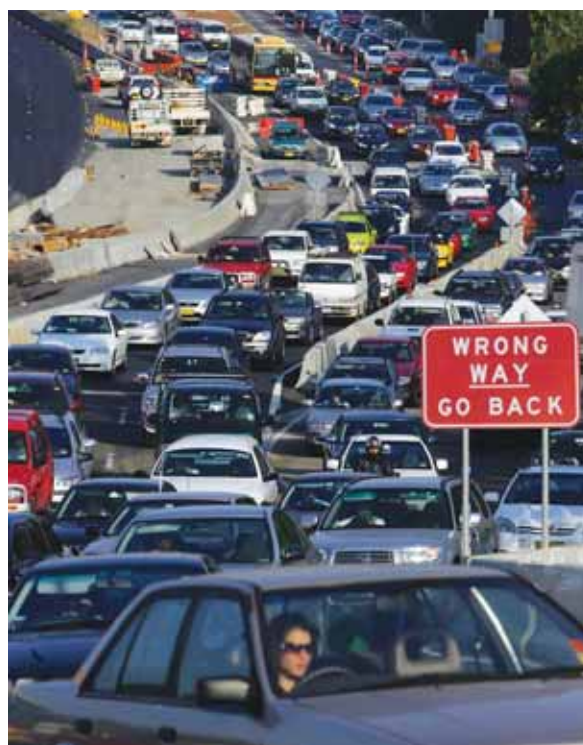
www.csiro.au

Carbon Neutral. Learn about effective ways in which we can reduce greenhouse gas emissions.

www.carbonneutral.com.au

Carbon Reduction Institute. Learn more about how we can reduce our carbon footprint.

www.noco2.com.au



Classroom activities

The **Carbon Dioxide Game** is a fun,

active way to explain the Greenhouse Effect and human contribution to global Climate Change. The game can be played with groups of up to 30 students.

Materials:

An open area, chalk, a small bag with the words "What did humans do?" written on it, and action cards representing human actions that affect CO₂ levels in the atmosphere. (Download sample Action Cards from page 3 of the activities PDF on this lesson plan.)

Procedure:

Draw two concentric circles on the ground, one about 70cm in diameter, and a larger one about 4.5m in diameter. The smaller circle represents the Earth and the larger one represents Earth's atmosphere. The game is played in several rounds.



Carbon Dioxide

For round one, choose two students to be CO₂ molecules, and place them anywhere in the Earth's 'atmosphere'. Once they are in the atmosphere they cannot move their feet.

The rest of the students are sunbeams representing energy from the sun. The object of the game is for the sunbeams to enter the atmosphere, tag the Earth (by touching the inner circle with a foot or a hand) and then escape the atmosphere without getting tagged by a CO₂ molecule. Sunbeams who are tagged must stay standing still in the atmosphere. Those who avoid being tagged bounce back out of the atmosphere into space. Each round lasts approximately 30 seconds and during that time the sunbeams try to tag the Earth only once.

This simulation recreates the greenhouse effect: energy from the sun is trapped as heat by CO₂ and other gases and particles in the atmosphere. After the first round, have the escaped sunbeams form a circle around the atmosphere to check how much energy has been trapped.

Discuss how this may affect the temperature of the planet. Remind students that a certain amount of CO₂ is necessary to keep the planet consistently warm enough to support life. During the first round, most of the energy will have escaped because CO₂ levels are low. Before continuing the game, clear all the trapped sunbeams out of the atmosphere.

For the second round, increase the number of CO₂ molecules in the atmosphere. (You'll need to download the sample Action Cards from page 3 of the Activities PDF on this lesson plan.)

Reach into the 'What did humans do?' bag and pull out an action card (for this round, include only cards that add CO₂ to the atmosphere). After a student reads the card, increase the number of CO₂ molecules in the game (dictated by the card) and play again.

For the third and subsequent rounds, put all of the action cards in the bag so that CO₂ levels will go up and down depending upon which card is drawn. Discuss what happens each time.

The game will demonstrate that when you increase the amount of CO₂, more heat gets trapped (illustrated by the student sunbeams standing in the atmosphere) and the Earth warms up. The action cards demonstrate how even small-scale actions can decrease the amount of Greenhouse Gas that we emit to the atmosphere

Time

20 minutes, including time for debriefing. Without getting tagged by a CO₂ molecule. Sunbeams who are tagged must stay standing still in the atmosphere. Those who avoid being tagged bounce back out of the atmosphere into space. Each round lasts approximately 30 seconds and during that time the sunbeams try to tag the Earth only once.

Wrap up

Review how energy from the sun gets trapped in the Earth's atmosphere. Discuss how human actions, particularly burning fossil fuels, can enhance the greenhouse effect by putting more CO₂ into the atmosphere. The game can be a springboard into a variety of other explorations such as researching alternative energy sources, discussing sustainable lifestyles, and examining the different choices humans can make in relation to the environment.

Visit the activities link to download further education materials which focus on climate change.

Activities courtesy of the Western Australia Department of Environment and Conservation.