



CLIMATE CHANGE SCORECARD

*Climate change research actually **is** rocket science, but you don't have to be a rocket scientist to take actions that reduce greenhouse gas pollution!*

OBJECTIVES

The Climate Change Scorecard is a teaching tool to empower students to combat climate change. This activity will help students:

1. Understand the concepts of global warming and climate change;
2. Discover actions they can take to reduce greenhouse gas pollution;
3. Track and measure the results of their actions.



BACKGROUND INFORMATION

What is climate change?

Climate change is a phrase used to describe significant changes in weather patterns on a global scale caused by global warming. Global warming refers to the overall increase in the earth's average temperature (approximately one degree Fahrenheit since the late 1800s). While a one degree increase in the earth's average temperature may sound small, it is causing big changes in our climate. The effects include changes in rainfall patterns, more severe storms, melting glaciers, rising sea levels, heat waves, droughts and habitat loss.

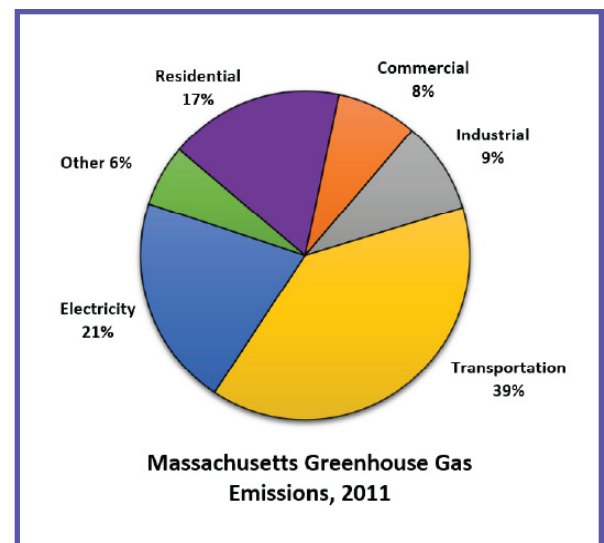
What causes global warming?

Carbon dioxide and other heat-trapping gases in the earth's atmosphere, also called "greenhouse gases," retain heat from the sun like glass on a greenhouse, creating a "greenhouse effect." Greenhouse gases occur naturally and help keep the earth's climate livable – in fact, without them, the earth would be too cold to support life. However, since the Industrial Revolution, ever-increasing amounts of carbon dioxide and other greenhouse gases have been released into the atmosphere as a result of increased burning of fossil fuels such as coal, oil and gas to generate electricity at power plants, heat our buildings and power our cars, trucks and buses. This "greenhouse gas pollution" is believed to be responsible for global warming. The pie chart below shows the major sources of greenhouse gas emissions in Massachusetts and the approximate percentage each contributed in 2011.

Industrialization and development have also resulted in clearing of forests and other plants. Trees and other plants remove carbon dioxide from the atmosphere. Without them, more carbon dioxide builds up in the atmosphere.

What can we do to help slow climate change?

We can reduce our contributions to greenhouse gas pollution by using less fossil fuels. Conserving energy, minimizing vehicle use, eating locally grown foods, and recycling as much as possible are some of the ways we can cut down on the use of fossil fuels. We can help remove carbon dioxide from the atmosphere by planting trees and gardens, and helping to protect forests, undeveloped land, and open space. We can ask our elected officials to make policies and laws that will help slow climate change by reducing greenhouse gas emissions and protecting the natural environment. The Climate Change Scorecard helps students identify and track different actions they can take at home and at school to help slow climate change.





ACTIVITY



Discuss the causes and effects of climate change with your students. Use the Climate Change Scorecard to discuss ways to reduce greenhouse gas pollution at home and at school. Ask students if they can think of other ways to save energy, reduce pollution or remove carbon dioxide from the atmosphere. Add their ideas to the scorecard. Make a copy for each student.

Ask students which activities they currently do. Ask if there are any other activities on the list they could do. Discuss barriers they might face in their efforts and consider ways to overcome them. For things that are beyond their control, let them know that someday they may be in charge of making those decisions.

Ask students to track the actions they take for a week. To keep score, students fill in a point each time an action is taken during the week. At the end of the week, add the students' scores together. Just as the class total is greater than each individual total, our combined efforts do even more to help stop global warming.

Encourage your students to continue these activities after your class project ends, and to continue to think of other conservation opportunities. We need new ideas and inventions that can reduce greenhouse gas pollution and remove more carbon dioxide from the atmosphere – perhaps your students will help discover these new solutions.

OTHER ACTIVITIES

All of THE GREEN TEAM lessons encourage activities that help reduce greenhouse gas pollution.

Recycling and Waste Reduction – Recycling and composting save energy in the manufacturing process and reduce methane production at landfills. Reusing items and reducing waste saves even more energy. Use the Slash Trash Lesson to focus on these actions.



Transportation – Driving less, choosing the most fuel-efficient transportation methods and eliminating unnecessary engine idling all help to reduce greenhouse gas emissions. Walking, biking and using other transportation methods that require no fossil fuels are best! Use the Clean Air Activities to focus on these actions.



Energy Conservation – Using less energy reduces the amount of fossil fuels needed at power plants, reducing greenhouse gas emissions. Replacing incandescent light bulbs with compact fluorescents, and turning off lights and appliances when not in use are simple ways to save energy. Use the Light Bulb Lesson and Energy Reduction Pledge, available at www.thegreenteam.org/library, to focus on these actions.



If you have already completed any of the Green Team activities with your students, you and they have already helped to stop global warming. The additional resources provided at the end may be used to help with additional activities, such as having students:

- Calculate the carbon footprint of their homes and/or school;
- Plant a tree or garden at school;
- Help your school become “greener;”
- Help your community become “greener;”
- Help protect a rainforest or other forested land.



NEW WORDS AND CONCEPTS

Note: Definitions for carbon dioxide, climate change, fossil fuel, global warming, and greenhouse gas can be found in the Clean Air Activities glossary.

Carbon – A nonmetallic element found in all life forms, as well as in fossil fuels, the atmosphere, the earth and oceans.

Carbon Cycle – The movement of carbon through the environment in different forms, such as carbon dioxide and methane (atmosphere, oceans), carbohydrates (plants and animals), and other carbon compounds (fossil fuels, shells, rocks, soil, humus). For example, fossil fuels contain carbon that was once in the tissues of prehistoric plants and animals. When we burn fossil fuels, the carbon is released as carbon dioxide into the atmosphere.

Carbon Sequestration – The process by which carbon dioxide is removed from the atmosphere and stored in another form, such as through photosynthesis, when plants convert carbon dioxide into carbohydrates and plant tissues. Carbon can also be sequestered in soil in the form of carbon compounds such as humus, compost and other organic matter. The oceans sequester carbon in the water as carbonic acid, in marine life, and in deep sea sediments. Fossil fuels sequester carbon until they are burned.

Carbon Sink – An organism, ecosystem, process or place that stores more carbon than it releases into the atmosphere, such as forests, oceans, soil, and rocks.

Greenhouse Gas Pollution – A greater concentration of greenhouse gases in the atmosphere than would naturally occur. Carbon dioxide levels are at their highest in over 400,000 years.

Industrial Revolution - The process of change from an agrarian, manual labor based economy to one dominated by power-driven machinery and industrial manufacturing. This process began in England in the 18th century and from there spread to other parts of the world.

ADDITIONAL RESOURCES

The study of climate change is ongoing and new information is being discovered and reported often. The following organizations and materials provide a wealth of information, with a focus on Massachusetts and the Northeast.



Carbon Calculators – There are many “carbon calculators” available – tools to help calculate greenhouse gas emissions, which can then be used to consider ways to reduce the “carbon footprint” of the household and/or school.

Carbon Calculators for individuals/households:

EPA: <https://www3.epa.gov/carbon-footprint-calculator>

The Nature Conservancy: <https://www.nature.org/greenliving/carboncalculator/?redirect=https-301>

Carbon Calculators for schools:

EPA: <http://www.epa.gov/climatechange/wycd/school.html>

The Sustainability Institute at the Univ. of New Hampshire: <http://www.sustainableunh.unh.edu/calculator>



ADDITIONAL RESOURCES (CONTINUED)



Alliance for Climate Education (ACE) is a nonprofit dedicated to educating America's high school students about the science behind climate change and inspiring them to do something about it—while having fun along the way. ACE provides high school assembly programs and student action programs free of charge. Visit www.acespace.org to schedule an assembly or to learn more about how your students can take action to slow climate change.

Climate Change Backpack®— A comprehensive teaching tool on the science of climate change containing hands-on materials and a comprehensive presenter's guide, produced by the Northeast Science Center Collaborative for grades 5-12. The presenter's guide, activities and backpack of materials is available to borrow from THE GREEN TEAM Library: <http://www.thegreenteam.org/library-curricula>.

Climate Literacy and Energy Awareness Network (CLEAN) is a reviewed collection of educational resources (for grades 3-16) designed to build students' understanding of the core ideas in climate and energy science. Funded through a National Science Foundation grant, CLEAN's primary goal is to steward a broad collection of educational resources and foster a supporting community to help facilitate students, teachers, and citizens becoming climate literate and informed about "the climate's influence on you and society and your influence on climate." Explore CLEAN's resources at www.cleanet.org.

Environmental Protection Agency provides climate change information at www.epa.gov/climatechange and resources for teachers and students at www.epa.gov/climatechange/kids.

Massachusetts Department of Environmental Protection provides information about climate change, state and regional efforts to reduce greenhouse gas emissions, suggestions for actions we can take to slow climate change, and other resources at <https://www.mass.gov/greenhouse-gas-emissions-mitigation>.

National Energy Education Development Project (NEED) creates networks of students, educators, businesses, government and community leaders to design and deliver objective, multi-sided energy education programs. Check out their many resources at <http://www.need.org>.

Sustainability Institute at the University of New Hampshire works with educators, students, policymakers, and researchers on sustainability at the local, regional, and national level. This institution absorbed the resources and expertise of Clean Air-Cool Planet, and provides many other resources at <http://www.sustainableunh.unh.edu/>.

U.S. Department of Energy's Energy Efficiency and Renewable Energy website provides lesson plans and links to education and training resources on energy, particularly energy efficiency and renewable energy: <https://www.energy.gov/eere/education/education-homepage>.

