



Common Confusions about Climate Change

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About Climate and Climate Change

Assumption or Confusion about climate	More Adequate Conception
Weather anomalies can be used to prove or disprove climate change.	Weather describes the atmospheric conditions at a specific place at a specific point in time. Weather is related to, but is not the same thing, as climate. Climate is the average weather conditions in a particular location or region at a particular time of the year. Climate is typically measured in long increments of time, at the very least 30 years. Therefore, evidence of climate change is best assessed through long-term alterations to temperature, precipitation, and other climate factors—not through single weather events, such as a heat wave or a blizzard.
Carbon dioxide makes up a small percent of the total gases in our atmosphere. We are not adding enough carbon dioxide to change the climate system.	There are several atmospheric gases, and many do not trap heat. Greenhouse gases, such as carbon dioxide, occur naturally in small amounts, but they are very efficient at absorbing heat energy. This allows a small change in carbon dioxide to have large impacts on the climate system.
The carbon dioxide that humans add to the atmosphere through fossil fuel combustion increases the total amount of carbon on Earth, which is throwing the carbon cycle out of balance.	Carbon naturally cycles through biological, physical, and geological systems over time. The amount of carbon on Earth is stable. Human activities are transferring carbon that is stored in plants or fossil fuels to the atmosphere, at a faster rate than would naturally occur.
The hole in the ozone layer is a large contributor to global warming.	Both the ozone hole and global warming are influenced by human activities. However, the ozone hole and global warming are different issues. The ozone hole is a depletion of the atmosphere's ozone layer, which absorbs high levels of ultraviolet radiation from the sun. The hole is caused by the release of CFCs, or chlorofluorocarbons. Unlike fossil fuels, ultraviolet radiation is not a large contributing factor to the average increase in global surface temperature.
Aerosol spray cans are a large contributor to global warming.	Aerosols are tiny particles in the air that may be produced when we burn different types of fossil fuels. There is a link between aerosols and global warming because aerosols, just like greenhouse gases, are able to control how much energy from the sun reaches the earth's surface by changing the amount that is absorbed in the atmosphere and the amount that is scattered back out to space. However, aerosol spray cans are not a large

	contributor to global warming, greenhouse gases mainly come from burning fossil fuels (NASA, 2013). Spray cans used to contain CFCs but have not since the 1980s.
Stopping rockets from punching holes in the ozone layer would reduce global warming.	The major element for making holes in the ozone layer is a type of chemical called CFCs, chlorofluorocarbons. Rockets do not make holes in the ozone layer and the ozone layer holes are not the cause of global warming.

(Table Rows 1-3 adapted from CIRES, 2012; Table Rows 4-6 adapted from Yale Project on American Teens' Knowledge of Climate Change)

About Climate Future

Assumption or Confusion about the Climate Future	More Adequate Conception
We can completely reverse or solve climate change with the right solutions.	The solutions we implement today can lessen, but not completely stop, climate change and its impacts.
If we can implement climate change mitigation strategies, we don't need to worry about adapting to projected changes. OR If we focus on how to adapt to project climate changes, we don't need to change our behaviors using mitigation strategies.	Solutions should consider both mitigation and adaptation strategies so that we can reduce climate change impacts as much as possible and prepare for projected changes that cannot be avoided.
If climate changes, forests can just move to the right spot.	While migration is a reasonable possibility for some species, others will be constrained by interstates, cities, farms, and changes in the landscape which prevent forests from migrating or growing to maturity in a new location. There are no guarantees that all of the organisms that make a functional forest (fungi, insects, etc.) will migrate together. More likely is that trees on the edge of their range will be stressed, and trees that do well in the new climate will thrive within the areas where they are currently growing.

(Table from PINEMAP Secondary Environmental Education Module, in production, 2013)

About Carbon

Assumption or Confusion about Carbon	More Adequate Conception
Plants either do not release carbon dioxide, or if they do, they only respire in the dark.	Plants constantly break down sugar molecules—even to provide the energy and compounds needed for photosynthesis.
Oxygen is needed for animals, whereas carbon dioxide is needed by plants.	Plants require oxygen to break down sugar molecules, but they generally release more oxygen by photosynthesis than the

	amount they use to respire.
Gases are not matter or they don't have mass.	Anything that has matter has mass. Frozen, compressed carbon dioxide is dry ice and has mass. A gas has mass, too, just a lot less.
Food that is broken down in respiration leaves an animal's body entirely by urine and feces.	The carbon may also leave an animal through sweat and exhalation.
Respiration produces energy, rather than converts energy.	Respiration converts energy from one form to another.
Energy is used up during biological processes.	Energy cycles. "Used" energy becomes waste heat.
Gases such as carbon dioxide lack sufficient mass to lead to the development of dry biomass in plants. Plants get mass from the soil.	By removing carbon from carbon dioxide and gluing carbon atoms together, plants create biomass from a gas and water.

(Table adapted from Hartley, Wilke, Schramm, D'Avanzo, & Anderson, 2011)

Resources

Global Warming: It's All About Carbon

Robert Krulwich, National Public Radio, 2007

<http://www.npr.org/news/specials/climate/video/>

As part of the Climate Connections Special Series, these five short videos teach basic concepts about carbon and its role in climate change.

Skeptical Science: Getting Skeptical about Global Warming Skepticism

John Cook, Global Change Institute at the University of Queensland

www.skepticalscience.com

This website reviews scientific, peer-reviewed literature to help explain climate change and to address common misconceptions about climate change.

Teaching Controversy

Mark McCaffrey, 2012. The Earth Scientist 28(3): 25-29.

<http://www.nestanet.org/cms/sites/default/files/journal/Fall12.pdf>

The author discusses why teachers should not present climate change as a "theory" open for debate, but instead should focus on helping students understand climate change and the supporting scientific research. This article is part of a special issue on climate change education from the journal of the National Earth Science Teachers Association.

Yale Project on Climate Change Communication

Yale University

<http://environment.yale.edu/climate>

This website provides several reports, videos, and other resources that help explain research related to public knowledge and perceptions of climate change.

References

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