

# Climate



## Fact:

## Fiction:

## More info:

<p><b>The greenhouse gas effect is natural and keeps the Earth from being freezing cold.</b></p>	<p>The greenhouse gas effect is caused solely by man and detrimental to life.</p>	<p>The natural levels of water, carbon dioxide, and other greenhouse gases in the atmosphere cause the greenhouse effect to influence the temperatures on the earth's surface substantially. Without this natural greenhouse effect, the Earth would be much colder than it is today (~0°F), and life forms on the planet would be very different.</p>
<p><b>Almost everything we do directly or indirectly releases greenhouse gases into the environment.</b></p>	<p>Our personal carbon footprint is comprised only of the carbon dioxide that you emit directly through activities such as driving.</p>	<p>Your carbon footprint – the amount of carbon dioxide and other greenhouse gases emitted into the atmosphere due to your activities – includes both not only what you directly emit through your activities (e.g., driving a car), but also the emissions made during the creation, transportation, sale, and disposal of the products you purchase (e.g., the emissions of the factory that created your T-shirt, the emissions from the tractor trailer that carried the T-shirt to the mall, etc.). Calculation is difficult; e.g., would you add the emissions of transporting your t-shirt to the mall to the driver's footprint or yours?</p>
<p><b>Man-made greenhouse gases have been and still are building up in the Earth's atmosphere.</b></p>	<p>The environment naturally removes greenhouse gases from the atmosphere, and so greenhouse gas emissions aren't a problem.</p>	<p>The Earth's atmosphere is like a bathtub. There is a faucet (manmade and natural processes) putting water (greenhouse gases) into the bathtub (the atmosphere). There is also a drain (natural processes) removing the water. Currently, mankind's activities are putting more water in the bathtub than the drain can handle, thus filling the bathtub.</p>
<p><b>Man-made greenhouse gases cause man-made climate change, which is a serious problem that harms everyone on the planet.</b></p>	<p>Climate change is not a serious problem because we will be able to turn on our air conditioners.</p>	<p>We have already seen the effects of increased water in the bathtub - there is clear evidence that the sky-rocketing levels of greenhouse gases in the atmosphere do harm. Over the last century, man-made climate change has warmed our planet 1-2°C. This seemingly small temperature increase has already contributed to worldwide problems including more severe storms, sea level rise, droughts, increased heat-related deaths, and changes in the growing season. Scientists expect another 4-8°C by the end of the century, leading to changes including severe natural hazards, widespread crop failure, drinking water shortages, significant changes in ecosystem regimes and related industries, and new health problems. If the water spills over the bathtub's edge - the Earth will be so hot that the natural balance between the atmospheric conditions and today's forms of life would be destroyed. In that case, there will be radical changes to life as we know it. It is impossible to know what such a world would look like.</p>

<p><b>Even if we stabilize emissions now, concentrations will increase and temperatures will get warmer throughout our lifetime before eventually stabilizing.</b></p>	<p>If we stabilize emissions, natural processes will continue to sequester the same amount of carbon dioxide each year. Since our emissions are larger the amount of emissions that are removed from the atmosphere through natural processes, the Earth will continue to warm forever.</p>	<p>The relation between greenhouse gas emissions (water entering the bathtub), greenhouse gas concentrations (water in the bathtub), and sequestered greenhouse gases (water leaving via the drain, a.k.a. sinks) is very complicated. How long the current natural sink will be maintained is a matter of speculation. Some sinks have a fixed size, and will eventually fill up. Other sinks absorb a fixed fraction of atmospheric concentrations, thus absorbing more greenhouse gases as concentrations increase. There are a few processes that may become sinks as concentrations increase. Generally speaking, if we stabilize emissions at current levels, the greenhouse gas concentrations will continue to increase within our lifetime because the current sink capacity is smaller than our emissions. Eventually, long after we are all dead, the Earth will reach a new equilibrium where capacity of sources and sinks will be equal. It is unknown if under that equilibrium, Earth will still be inhabitable.</p>
<p><b>Over a century of man-made emissions are in the atmosphere, and today's emissions will last for another century.</b></p>	<p>If we reduce our emissions of greenhouse gases, we will reduce the atmospheric concentrations by the same percentage.</p>	<p>Emitted carbon dioxide (CO<sub>2</sub>) has a lifetime of (lasts for) longer than a century in the atmosphere. Therefore, we need to reduce CO<sub>2</sub> emissions by a much greater percentage than the reduction in concentration needed. In fact, we need to reduce CO<sub>2</sub> emissions by 80% to stabilize concentrations within our lifetime. While other greenhouse gases may have different lifetimes, the concept remains the same – many greenhouse gases emitted today will be around for many decades to come.</p>
<p><b>Developed countries such as the United States are responsible for most of current carbon dioxide concentrations.</b></p>	<p>Since the greenhouse gas emissions from China now equal those from the US, the amount of greenhouse gases in the atmosphere today that came from China equals the amount that came from the US.</p>	<p>Current concentration levels of carbon dioxide reflect aggregated emissions from the past century. The United States and other developed countries entered the Industrial Revolution and started polluting over a century ago, while developing countries such as China and India are only now beginning to contribute significant emissions. Even though today China emits more greenhouse gases than the United States, only 9% of the current greenhouse gas concentrations are attributable to China compared to 25% that are attributable to the United States.</p>
<p><b>There is no silver bullet; to solve this problem, we need both improved technology and lifestyle changes.</b></p>	<p>We can put more money into research and come up with engineering solutions to climate change without having to change our lifestyles.</p>	<p>We will have to put more money into research to find engineering solutions AND we will have to change our behavior to achieve stability. Unfortunately, these changes can be slow and expensive. To have a significant combined impact in the next few decades, we need to work on BOTH environmentally friendly lifestyles and technologies.</p>
<p><b>While it may be difficult, we can all help reduce climate change.</b></p>	<p>There is nothing we can personally do that will affect carbon emissions, as the emissions are determined by government policies.</p>	<p>There are many things we can do to reduce our carbon footprint! Today, 28% of carbon emissions are created by transportation, while another 18% come from residential emissions. To reduce these, we can use bikes or public transportation, switch to more energy efficient vehicles, reduce our use of electricity, and support local politicians who (1) advocate industrial, commercial, and residential switching to carbon-free power, (2) advocate green buildings that require less energy, and (3) oppose developments on forested and agricultural land.</p>

## Questions:

1. Is the Greenhouse Effect caused by human activities?
2. We emit CO<sub>2</sub> directly from activities such as driving – for each of us, are these direct CO<sub>2</sub> emissions the bulk of our total CO<sub>2</sub> emissions? If not, what is causing the bulk of our total CO<sub>2</sub> emissions?
3. Since natural CO<sub>2</sub> is identical to human-made CO<sub>2</sub>, why doesn't nature simply remove it all? How long does CO<sub>2</sub> last in the atmosphere?
4. Why can't we simply adjust to the higher temperatures associated with climate change?
5. If the Earth is warming now, why won't it simply continue to warm for eternity?
6. If we reduce CO<sub>2</sub> emissions today, what will be the effect on CO<sub>2</sub> concentrations in the atmosphere? For example, if we reduce our CO<sub>2</sub> emissions by 50%, does this mean the concentrations in the atmosphere will be reduced by 50%?
7. Since CO<sub>2</sub> emissions from China now equal the CO<sub>2</sub> emissions from the US, does this mean the amounts of CO<sub>2</sub> in the atmosphere today from China and from the US are roughly equal?
8. Can we rely on engineering solutions alone for solving the climate change problem, or do we really have to change our lifestyles significantly?
9. What can we and our individual families do to reduce CO<sub>2</sub> emissions?