

GLOBAL WARMING AND THE PARIS AGREEMENT



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Delegates to the 2015 United Nations Climate Change Conference, from which the Paris Agreement emerged.

There is little doubt that the Earth is warming. But there is considerable controversy over global warming's future impact on the world's climate and what we should do about it.

Researchers at the University of Alaska, University of Washington, and the U.S. Geological Survey reported in 2015 that Alaskan glaciers had been sending 75 billion tons of water into the sea every year for 19 years. A consensus of the world's scientists (almost all scientists) has concluded that changes in the environment like this one provide convincing evidence of a gradual heating up of the Earth's surface. Scientists refer to this as "global warming."

For over 100 years, scientists have known about the physical mechanism that causes the Earth to warm. Today, they call it the "greenhouse effect." Generally, it works like this:

1. Radiation from the Sun in short wavelengths easily passes through the Earth's atmosphere and strikes the surface, which reflects much of it back as longer wavelengths.
2. Instead of going back into space, the longer wavelengths are absorbed by gases in the atmosphere.
3. The atmosphere reflects back to the Earth's surface a significant amount of the trapped radiation, which becomes heat.

Thus, the Earth warms much like a greenhouse or automobile does when the Sun's rays penetrate the glass, but are trapped inside as heat.

Water vapor and other gases in the atmosphere capture and return to Earth about 50 percent of the Sun's incoming radiation. The warming that results is necessary to prevent our planet from becoming extremely cold and hostile to life. But over the past few centuries, human activities on Earth have increased the concentration of some gases in the atmosphere that intensify heating. These gases include carbon dioxide, methane, nitrous oxide, and others, the so-called "greenhouse gases."

The Evidence of Climate Change

To be sure, there are a number of ways that the Earth can become warmer naturally. Periods of global warming in the past were caused by changes in the Earth's orbit, volcanic eruptions, and variations in the Sun's radiation output. But natural causes apparently cannot explain the current warming of the Earth.

In 1988, the United Nations established the Intergovernmental Panel on Climate Change (IPCC). The purpose of the IPCC is to review the work of scientists around the world to assess the evidence of climate change that results from global warming.

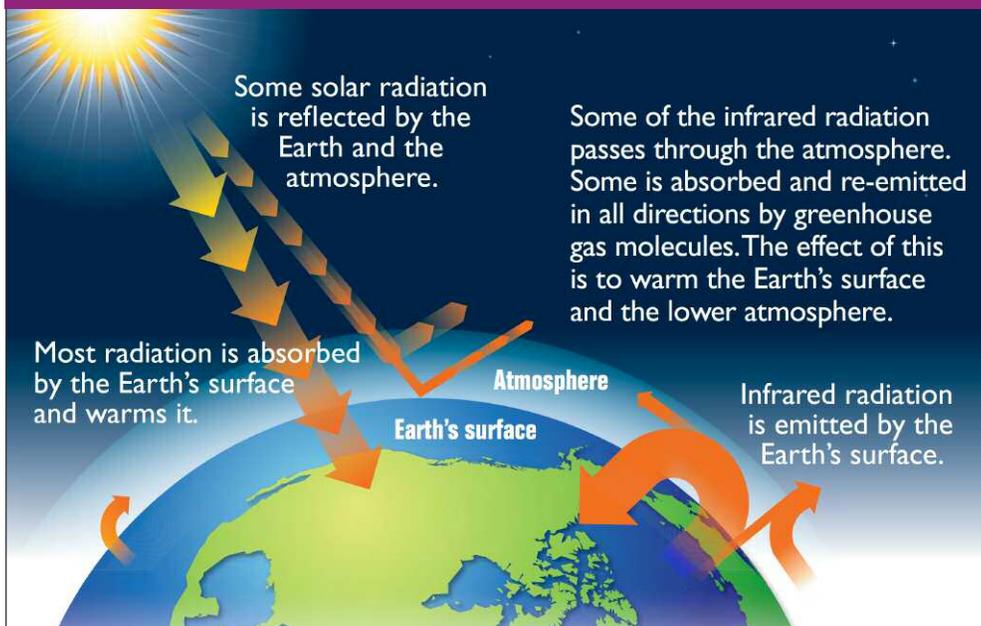
The IPCC found that during the 20th century, the Earth warmed by about one degree Fahrenheit. One degree does not seem like a lot. But scientists know that at various times in Earth's history, shifts of just a few degrees had a dramatic impact on the planet's climate and environment.

In 2014, the IPCC issued its fifth report. The IPCC found that the concentration of carbon dioxide in the atmosphere rose by about 30 percent during the last 200 years, the period of the Industrial Revolution. Carbon dioxide is the most important greenhouse gas that traps heat from the sun.

In addition, the IPCC discovered "new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." About 75 percent of carbon dioxide emissions come from burning fossil fuels.

China is the largest producer of carbon dioxide emissions. In 2015, China emitted over 10 million kilotons of carbon dioxide, or 29 percent of global emissions. The United States is the second largest producer, emitting about half the amount of carbon dioxide that China emits. Americans are responsible for 35 percent of all greenhouse gases ever produced by humans. ▶

The Greenhouse Effect



'Climategate'

In 2009, hackers leaked emails from the Climatic Research Unit (CRU) at a university in Great Britain. The IPCC partly relied on information from the CRU. Of the more than 1,000 emails, one mentioned that “we can’t account for the lack of warming at the moment.” Another referred to a “trick” to “hide the decline” in temperatures in one particular data set. In several emails, scientists debated with each other about technical aspects of interpreting data.

The leaking of the emails was dubbed “Climategate” in

the press. Many people including a few scientists responded by calling global warming a “hoax.” S. Fred Singer criticized the CRU and the IPCC due to allegedly “distorted raw data” revealed in the emails. U.S. Senator James Inhofe (R-OK) argued that the emails revealed “a fractured consensus on the state of climate science.”

Analyses in news sources such as *The Guardian* and *The New York Times* demonstrated that the questionable emails were taken out of context. The word “trick,” for example, was just a colloquial word for a technical way of compiling data. But the persistent minority had found evidence to be skeptical of the data used by most climate scientists.

What If We Do Nothing?

What is likely to happen over the next 100 years if we do nothing about global warming? The IPCC’s fifth assessment report in 2014 includes the best available projections of likely impacts on the world’s environment.

According to the IPCC:

- Global temperature will rise 4°C (Celsius) by the year 2100 if carbon emissions into the atmosphere continue at their present rate. Climate changes in the 21st century are very likely to be larger than those in the 20th century.
- Increasing temperatures will mean more droughts in many areas of the world, including parts of the United States, such as the Southwest. In these areas, crop yields will decline and more forest fires will occur. The decreased food supply will especially affect the urban poor, creating “hotspots of hunger.”
- While some parts of the world will suffer from heat and dryness, other regions will experience extreme

Most of the remaining carbon dioxide emissions result from the destruction of forests. Since 1855, humans have destroyed up to 20 percent of the world’s rain forests in places like Brazil. Burning forests to clear land for farming, roads, and settlement injects large amounts of carbon dioxide into the atmosphere. Also, trees convert carbon dioxide into oxygen through photosynthesis. With the destruction of trees, however, less carbon dioxide is converted.

The Persistent Minority

About 97-98 percent of climate scientists – a scientific consensus – agree with the IPCC that today’s global climate change is happening and is primarily human-caused. A small but persistent minority of the world’s scientists, however, disagree with the consensus around the IPCC’s findings.

These dissenting scientists deny the IPCC’s findings in a variety of ways. Most of them doubt that global warming is primarily human-caused. Others believe the cause of global warming cannot be known. Still others simply doubt that the effects of global warming will be catastrophic.

Physicist S. Fred Singer is skeptical of anthropogenic (human-caused) climate change. In 2013, he said, “The Sun . . . and other natural forces are much more important than any human influence on climate.” He has also pointed out that scientists are not sure how much carbon dioxide is absorbed by the world’s oceans.

Singer has also identified global warming’s potential benefits, if temperatures rise. He foresees more food from longer growing seasons, an increase in timber, more water in some dry regions, and a decrease in the use of fossil fuels for heating as winters become more moderate.

- rainfall along with floods, landslides, and soil erosion. Violent storms will threaten human life, health, and property, driving up insurance rates.
- Anthropogenic influence has contributed to the melting of the Greenland ice sheet since 1993. Global sea level rise will very likely increase at a faster rate than what scientists observed between 1971 and 2010. Rising seas will cause major flooding and loss of land in the coastal regions in the world, affecting tens of millions of people.
 - Ecosystems unable to cope with the climate changes will be at risk. While some animal, bird, and fish species will successfully expand their ranges, those unable to adapt will become extinct.
 - Climate-change impacts will slow economic growth. This will, in turn, increase poverty, especially in developing countries in Africa. But when the Earth's surface temperature increases more than a few degrees, even industrialized countries like the United States will experience economic hardships.
 - Climate change's impacts can lead indirectly to increased inequality and even violent conflict, such as civil war.

Scientists have also provided evidence that glacier and icecap melting will accelerate in the Northern Hemisphere in the 21st century. For example, the Arctic Bay's summer "melt season" is now up to 11 days longer than it was 40 years ago. It is possible that the entire Greenland

ice sheet could melt away entirely, adding to the projected three-foot rise in sea level by 2100.

The National Oceanic and Atmospheric Administration reported that hurricanes, floods, wildfires, and tornadoes have increased alongside record-setting warm temperatures in the United States. The damages cost over \$300 billion in the U.S. in 2017 alone.

As noted by Singer, there could be potential positive benefits from global warming, such as longer crop growing periods. But these benefits will probably not be enough to overcome significant damage to the environment.

What Should the U.S. Do About Global Warming?

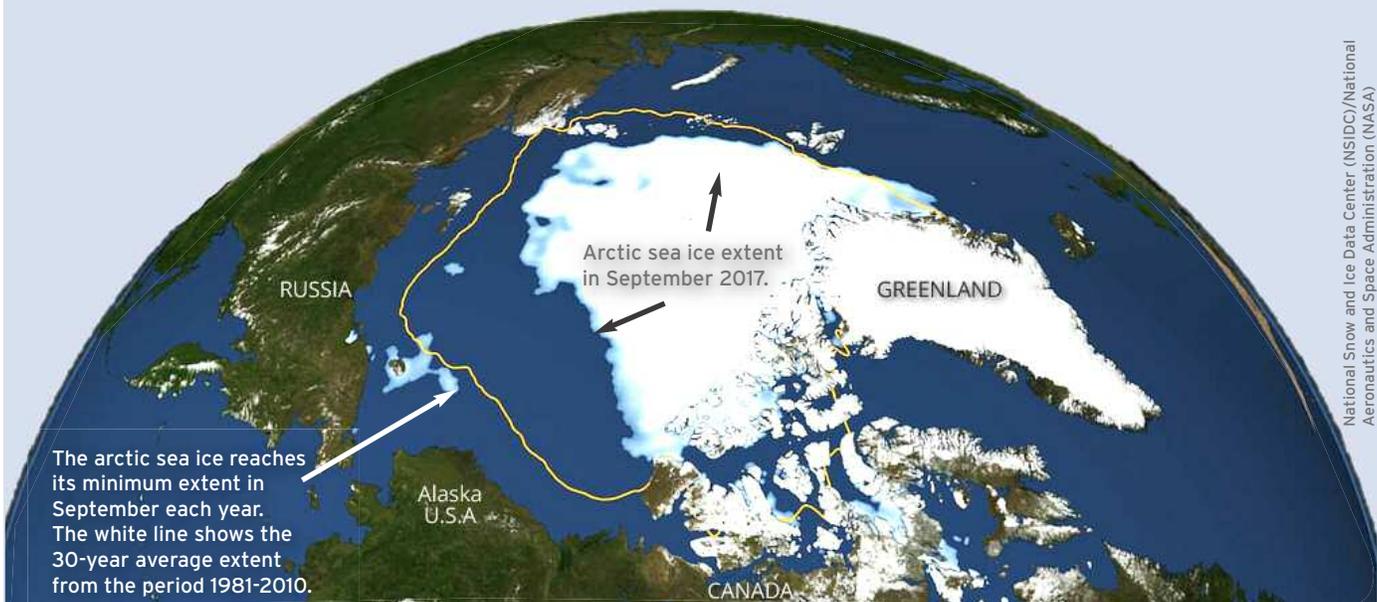
In 1997, more than 160 nations met at Kyoto, Japan, to work out a treaty requiring reductions of greenhouse gas emissions. The Kyoto Treaty included no specific methods that nations had to use to reduce their emissions. Nations would probably have to consider options such as limiting deforestation, requiring more fuel-efficient automobiles, or imposing a "carbon tax" on gasoline and other fossil fuels to discourage usage. Relying more on renewable energy sources, namely solar, wind, and nuclear power, would also reduce greenhouse gas emissions.

President Bill Clinton signed the Kyoto Treaty, but the U.S. Senate refused to ratify it because of an exemption for developing countries and potential harms to the American economy. In 2001, President George W. Bush withdrew the United States' signature from the Kyoto

The Albedo Effect

The scientific consensus is concerned about the albedo effect. Albedo is a measure of the ability of a surface to reflect sunlight and its heat. White surfaces have a high albedo and reflect more light and heat. Dark surfaces have a low albedo and absorb more light and heat.

As ice melts in the Arctic Bay, more of its icy white surface disappears. As heat from the sun is absorbed into the remaining ocean due to its low albedo, the water warms. The chance of the water freezing again greatly lowers, which will, in turn, make a low-albedo surface permanent and cause the water to continually warm. At the same time, the melted ice will cause sea-levels to rise.



Treaty. He argued that its percentage requirements for greenhouse gas reductions would cost Americans millions of jobs.

In an attempt to buttress the Kyoto Treaty, President Barack Obama signed the Paris Agreement in 2016. It was a part of a United Nations framework on climate change and was initiated through multi-national collaboration. Over 170 nations have signed the agreement, each obligated to mitigate global warming by reducing greenhouse gases and aiding developing nations. The aim is to keep global temperatures below a 2°C (Celsius) increase by the year 2100.

In June 2017, President Donald Trump announced that the United States would withdraw from the Paris Agreement. He said the Paris agreement would “undermine our economy” by costing the U.S. 6.5 million jobs and \$3 trillion in gross domestic product (GDP). He wanted to renegotiate the agreement. Under the terms of the agreement, however, the earliest the U.S. could withdraw is November 4, 2020, the day after the U.S. presidential election in that year.

Supporters of President Trump’s decision argue that Congress should have decided whether or not to enter the agreement, not the president. U.S. Energy Secretary Rick Perry, a former Texas state legislator and governor, said the agreement “was neither submitted to nor ratified by the U.S. Senate, and is not in the best long term economic interest of the United States.”

Rep. Lamar Smith (R-TN) who was the chair of the House of Representatives science committee agreed with Secretary Perry, saying that President Obama put the nation “at an economic disadvantage” in joining the Paris Agreement.

Opponents of President Trump’s decision argue that the decision would not harm the U.S. economy but would

instead harm the environment. House Democratic leader Nancy Pelosi said, “President Trump’s decision . . . is a stunning abdication of American leadership and a grave threat to our planet’s future.” Bob Ward, a trained geologist at the London School of Economics, called President Trump’s decision “confused nonsense” in a statement. Ward also cited flaws in a report Trump relied on from an economic consulting firm.

Technological entrepreneur Elon Musk, the CEO of Tesla, Inc., resigned from President Trump’s economic advisory and manufacturing advisory councils in protest, tweeting, “Climate change is real.” Robert Iger, the CEO of The Walt Disney Company, also resigned from the president’s policy advisory council.

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Global warming is real. The debate centers on its ultimate long-term impacts and what to do about them. The dilemma is how to reduce greenhouse gas emissions without damaging the world economy.

WRITING & DISCUSSION

1. Define anthropogenic climate change. What evidence is there for anthropogenic climate change?
2. Make a list of five impacts on the world’s environment that are likely to occur in the 21st century if we do nothing about global warming. Rank these changes from most to least important from your point of view. Give reasons for the single most important change on your list.
3. Describe the similarities and differences between the U.S. treatment of the Kyoto Treaty and the U.S. treatment of the Paris Agreement for reducing greenhouse gas emissions.

ACTIVITY: Campaign 2020: Where Do You Stand on the Paris Agreement?

President Trump’s decision to withdraw from the Paris Agreement will not take effect until the day after the next presidential election in 2020. So his decision will be a controversial issue in that election.

- A. You are part of a team of environmental-policy advisors to a presidential candidate in the year 2020. Meet with your team of three to four other advisors and do the following:
 1. Re-read the section “What Should the U.S. Do About Global Warming?.” Underline main points you agree with. Double-underline main points you disagree with. Circle any words that are unfamiliar to you. Share this information with your team.
 2. Deliberate with your fellow advisors about what advice your team will give to your candidate on the Paris Agreement. Decide whether or not your candidate should promise that the United States will re-enter the Paris Agreement.
 3. Provide at least three reasons for your team’s decision, using information from the article.
 4. Choose a spokesperson who will present your team’s decision and reasons to the class. Be prepared to answer questions from other teams.
- B. After all the teams have presented, each advisor will write a 100-word briefing on your team’s advice to the candidate. Imagine that this briefing will be presented to the candidate.

Sources

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Standards Addressed

Global Warming

California History Social Science Standard 12.4. Students analyze the unique roles and responsibilities of the three branches of government as established by the U.S. Constitution. (4) Discuss Article II of the Constitution as it relates to the executive branch, including eligibility for office and length of term, election to and removal from office, the oath of office, and the enumerated executive powers.

National Civics Standard 23. Understands the impact of significant political and non-political developments on the United States and other nations. Middle School: (6) Knows examples of environmental conditions that affect the United States' domestic and foreign policies (e.g., destruction of rain forests and animal habitats, depletion of fishing grounds, air and water pollution). High School: (5) Understands historical and contemporary responses of the American government to demographic and environmental changes that affect the United States.

Common Core State Standards: SL.6-8/11-12.1, SL.6-8/11-12.3, RH.6-8/11-12.1, RH.6-8/11-12.2, RH.6-8/11-12.3, RH.6-8/11-12.4, RH.6-8/11-12.10, WHST.6-8/11-12.1, WHST.6-8/11-12.2, WHST.6-8/11-12.9, WHST.6-8/11-12.10.

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