

Mitigating Climate Change

Climate change is real. The data are incontrovertible. Scientists around the world have been collecting detailed climate information since 1890. Indicators such as the level of atmospheric carbon dioxide, the average yearly global temperature and the average extent of Arctic sea ice exhibit clear trends indicating long-term change in our environment. For example, 13 of the 15 warmest years on record have happened since 2000. The data have convinced the vast majority of relevant scientists, a clear majority of the general public and even the major energy companies. Counter arguments depend on selective use of partial data and misuse of accepted science.

Climate change does not mean that everywhere every year the current year is warmer than the last or that all areas of the globe are experiencing the same changes. But it does mean that many areas of the Earth are experiencing changes that are potentially dangerous to humankind, whether in the form of severe droughts, damaging floods or rising sea levels. Rising temperatures affect wind and ocean currents, changing the distribution of moisture and contributing to droughts in the American west and severe winter weather in the US northeast and Russia.

Greenhouse gases put into the air by human activities are the primary source of climate change. They have overloaded a natural system that has existed for millions of years. The rise of greenhouse gases in the atmosphere has accelerated since the Industrial Revolution. In particular, the emission of carbon dioxide (CO₂) due to industrialization has contributed to a steady increase in the average temperature of the earth over the last century and a quarter. In addition to rising temperatures, overloading the atmosphere with CO₂ and other gases has created an imbalance in the atmosphere-ocean system causing acidification of the ocean, a noticeable disruption in some ocean systems that cause weather changes, and more.

The Paris Conference

On December 12, 2015, in Paris, parties to the U.N. Framework Convention on Climate Change (UNFCCC) reached a landmark agreement charting a fundamentally new course in the two-decade-old global climate effort. In broad structure, the Paris Agreement reflects a “hybrid” approach blending bottom-up flexibility, to achieve broad participation, with top-down rules, to promote accountability and ambition. While the Paris Agreement is a treaty under international law, only certain provisions are legally binding.

The agreement reaffirms the goal of keeping average warming below 2 degrees Celsius, while also urging parties to “pursue efforts” to limit it to 1.5 degrees, a top priority for developing countries highly vulnerable to climate impacts. The Paris Agreement articulates two long-term emission goals: first, a peaking of emissions as soon as possible (with a recognition that it will take longer for developing countries); then, a goal of net greenhouse gas neutrality (expressed as “a balance between anthropogenic emissions by sources and removals by sinks”) in the second half of this century.

With respect to countries’ individual mitigation efforts, the agreement prescribes a set of binding procedural commitments: to “prepare, communicate and maintain” a *nationally determined contribution* (NDC); to provide information necessary for clarity and transparency; and to communicate a new NDC every five years. The agreement commits parties to pursue domestic measures with the aim of achieving the objectives, but does not make the implementation or achievement a binding obligation.

The core mitigation commitments are common to all parties, but there is some differentiation in the expectations set: developed countries “should” undertake absolute economy-wide reduction targets, while developing countries “are encouraged” to move toward economy-wide targets over time. In addition, developing countries are to receive support to implement their commitments.

The Paris Agreement rests heavily on transparency as a means of holding countries accountable. All countries are required to submit emissions inventories and the information necessary to track progress. In addition, developed countries “shall” report on support provided; developing countries “should” report on support received; and all “should” report on their adaptation efforts. Reports by countries will undergo “expert

technical review," and each party must participate in "a facilitative, multilateral consideration of progress" in implementing and achieving its goals (a form of peer review).

In a victory for Small Island countries and other countries highly vulnerable to climate impacts, the agreement includes developing approaches to help vulnerable countries cope with unavoidable impacts, including extreme weather events and slow-onset events such as sea-level rise. Potential approaches include early warning systems and risk insurance.

Many national governments offered new financial pledges. New and strengthened initiatives also came from "non-state actors," including cities, states and regions, companies and investors. Microsoft founder Bill Gates and 27 other major investors in 10 countries launched the Breakthrough Energy Coalition to steer more private capital into clean energy deployment. And at a side summit hosted by Paris Mayor Anne Hidalgo and former New York mayor Mike Bloomberg, the Compact of Mayors declared that the collective commitments of more than 360 cities would deliver over half of the world's potential urban emission reductions by 2020.

The climate conference shows that the world's nations want to address climate change, but the key issue is how? There are several potential approaches to mitigating climate change. The answer may be different for developed nations compared to those who are in the early stages of development.

Steps Towards Mitigation

Carbon Dioxide (CO₂) at 82% is the dominant greenhouse gas. Other greenhouse gasses include Methane (CH₄) at 10%, Nitrous Oxide (N₂O) at 5% and Fluorinated Gases at 3%. CO₂ enters the atmosphere via the burning of fossil fuels and some chemical processes. Its lifetime in the atmosphere is effectively thousands of years as part of a complex process of recycling through the ocean, atmosphere and land. Reducing CO₂ has become the focus of climate change mitigation.

CO₂ Reducing Strategies

Carbon Tax: Policy makers would levy a fee for each ton of CO₂ emitted or for each ton of carbon contained in fossil fuels. The tax provides predictability in cost but the total amount of CO₂ emitted per year would be uncertain, as is the appropriate cost per ton. The CBO and virtually all economists consider a carbon tax the most efficient incentive-based option for reducing emissions and it is relatively easy to implement.

Cap and Trade: Policy makers would set a limit on total emissions over some period and would require regulated entities to hold rights, or allowances, to the emissions permitted under the cap. Entities would be free to buy and sell allowances among themselves. Unlike a tax, cap-and-trade places an upper limit on emissions but the cost is variable. Experience has raised questions about the appropriate "cap."

In addition to adopting methods to reduce carbon pollution, efforts to stop and reverse deforestation around the globe could also have a significant impact. Forests are an important carbon sink in the world ecosystem.

Methane Reducing Strategies

Methane Regulation: Extension of existing EPA regulations via the Clean Air Act to meet emission goals, including landfill air pollution standards and oil and natural gas air pollution standards.

Nitrous Oxide Strategies

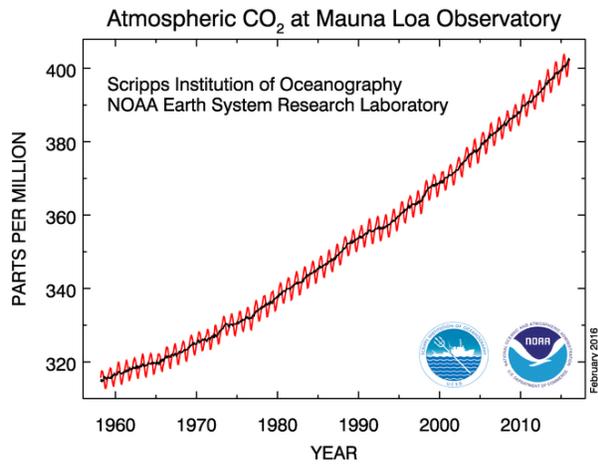
The application of fertilizers accounts for the majority of N₂O emissions. Reducing nitrogen-based fertilizer applications and the use of better manure management practices would result in a significant reduction. Increasing mileage standards on vehicles as well as stricter emission controls would also reduce N₂O.

Fluorinated Gases Reducing Strategies

Mitigation could be achieved primarily through regulation. The EPA is working with industry groups to replace HFC in refrigerants, aerosol propellants, solvents and fire retardants, require fluorinated gas recycling and find replacements for HFC in industrial and household use.

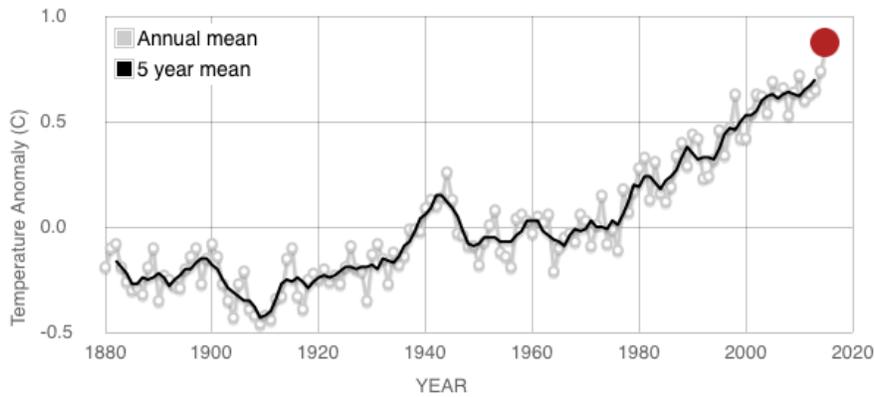
References for this fact sheet are available on the Current Issues Club website on the message board.

Full Mauna Loa CO₂ record



GLOBAL LAND-OCEAN TEMPERATURE INDEX

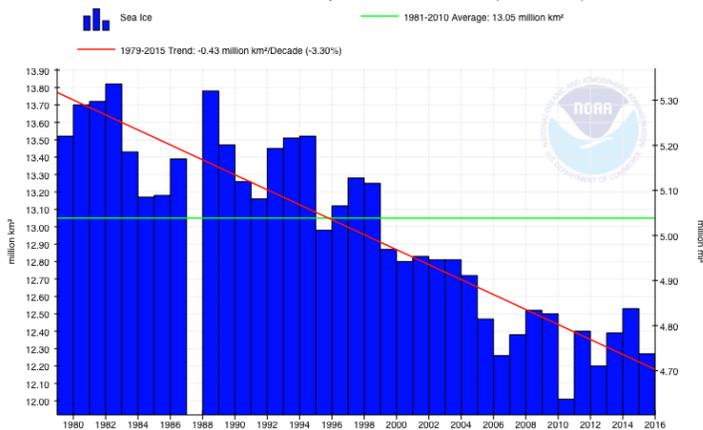
Data source: NASA's Goddard Institute for Space Studies (GISS).
Credit: NASA/GISS



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December Northern Hemisphere Sea Ice Extent (1979-2015)



Source: National Snow and Ice Data Center (NSIDC)