

*The Cocktail*  
*Conversation Guide*  
to **Global**  
**Warming**<sup>™</sup>





# Introduction

People discuss all sorts of topics at cocktail parties and sometimes, perhaps when the topics get a little boring, they even discuss global warming and the potential dangers it poses. President Obama and the Congress believe it is a serious threat that justifies severe limits on carbon dioxide (CO<sub>2</sub>) and other greenhouse gas (GHG) emissions.

To understand whether global warming really is a serious threat, it is necessary to understand some basic facts. Here are the answers to commonly asked questions about global warming.



## Isn't there a consensus of scientific opinion on man-made global warming?

No. Human activities, such as the burning of fossil fuels to power our homes and businesses and changes to the land, such as modern cities and expanded agriculture, undoubtedly affect the environment, but just how much they may be changing the climate is the subject of much debate.

The so-called “consensus” typically refers to the climate science assessments done every five years by the United Nations Intergovernmental Panel on Climate Change (IPCC). A large number of scientists participate in the detailed research reviewed by the IPCC, but the summaries interpreting the science are mostly guided and written by government appointees. These summaries leave out the assumptions and uncertainties contained in the longer assessment reports. The media report on the summaries and their dramatic proclamations, omitting the significant uncertainties and caveats.



## Is the world heating up? How would we know?

Not recently and not accurately. Even though GHG emissions increased steadily in the latter half of the 20th century, global surface temperatures have not increased since about 1998. Since the late 1800s, the world's average surface temperature is believed to have warmed about 1°F, which is, in part, a natural recovery from the “Little Ice Age,” a period of global cooling lasting from about 1400 to the 1800s AD. The precise change is unknown because temperature in most parts of the globe has not been measured accurately over a very long period of time. Even in the U.S., the accuracy

of temperature data is suspect due to the location of many temperature gauges that produce a “warm bias” in the surface temperature record, which tends to increase over time as natural vegetation is replaced by buildings and pavement.

Furthermore, surface temperature may not be the best measure of the Earth's temperature. The oceans, which represent 75% of the Earth's surface and well over 99% of the heat content of the climate system, have only recently been monitored systematically. Those measurements show little, if any, warming in recent years. Satellite temperature records also show some warming, but less than reported by the IPCC's surface temperature measurements.



## Hasn't the Earth's climate alternated in the past between ice ages and warming periods?

Yes. Climate is always changing. During the last 10,000 years, the climate has remained relatively stable, but temperature still has fluctuated significantly. A thousand years ago, when Vikings settled Greenland, the climate was warmer than today and agriculture flourished in the north of Scotland and Norway, where it is too cold for farming now. In spite of considerable uncertainty as to how much climate varies on decades-to-centuries time-scales or what causes changes, some scientists have simply assumed that human beings now control the climate system.



## Does man-made carbon dioxide (CO<sub>2</sub>) contribute to global warming?

Yes, but how much is uncertain. Water vapor and clouds account for over 90% of the natural greenhouse effect. A doubling of atmospheric CO<sub>2</sub>, which could be reached late in this century, would increase the greenhouse effect by only 3%. While all scientists agree the direct warming influence of this would be small, the fear is that the climate system will respond by decreasing cloud cover and increasing atmospheric water vapor, thereby greatly amplifying the warming. This amplification is called positive feedback, and today it is exhibited by all 21 climate models the IPCC tracks.

But global satellite measurements of temperature, sunlight reflected from clouds, and infrared heat given off by the Earth all suggest the combined effects of water vapor and clouds may actually reduce the small global warming expected from CO<sub>2</sub>, not amplify it. This is called a negative feedback. Whether feedbacks in the climate system are positive or negative is the most important question in global warming research today.

While humans are believed to be the main source of long-term CO<sub>2</sub> increases, natural flows of CO<sub>2</sub> in and out of the Earth's surface average about 20 times the human contribution. Natural changes in ocean circulation and biological activity on land and in the ocean are known to have just as large an impact on the year-to-year increase as human emissions do. But just as some scientists assume there are no long-term changes in cloud cover causing global warming, they also assume there are no long-term natural increases in CO<sub>2</sub>.



## How do we know what the climate will be in the future?

We don't. Predictions of future climate come from computer models, which are very incomplete approximations of the behavior of the real climate system. Models rely on assumptions about how the climate works and translate those assumptions into mathematical representations of climate processes. But many of these processes, such as clouds and precipitation, ocean circulation and solar effects, are not well understood and so cannot be modeled accurately. The predictions of future climatic changes are hypotheses, not scientific facts.

IPCC scientists have argued that climate models will not reproduce the temperature trends we have seen over the last century unless human effects are included, but that claim is weak. For instance, we do not have accurate long-term measurements of clouds to determine whether natural cloud changes might have caused past episodes of warming and cooling. Also, in order to explain the last 100 years of global average temperatures, the models have to be manipulated so that the cooling effect of man-made aerosols (dust, sulfates, etc. in the air) cancel out the warming effect of man-made carbon dioxide for decades at a time — a peculiar strategy to say the least. Simply put, climate models are research tools and ill-suited for shaping public policy or the future of our economy.



## Aren't there serious risks of increasing CO<sub>2</sub> beyond certain levels?

Maybe. The risks of increasing levels of CO<sub>2</sub> in the atmosphere are not well understood, but we do know that the Earth has experienced previous CO<sub>2</sub> levels well beyond those projected. We seldom hear about the

benefits of more CO<sub>2</sub> in the atmosphere, even though it is an element that is necessary for life to exist.

And if feedbacks in the climate system are negative, as satellite data suggest, then any human source of climate change becomes small compared to natural climate variability. Alarmists and the media often cite climate catastrophes that are the result of model-generated temperature increases on the order of 6°–10°F. A temperature rise this great can only be caused by positive feedbacks in response to greenhouse gas emissions. Changes of this magnitude are improbable and merely reflect the unstable nature of trying to model a system as complex as the Earth's climate.

Uncertainty is reason to take prudent actions to manage risk, such as developing new energy technologies and increasing efficiency. Presently, almost one-third of the world's population does not have access to fossil fuel energy. As these people begin to prosper, they will use more energy and emit more greenhouse gases. Achieving a higher standard of living by using energy efficiently and by developing new energy technologies is essential to constraining greenhouse gas growth. But the world will not be able to reduce levels of greenhouse gases to a level that existed more than a century ago, despite the rhetoric of advocacy groups and politicians. Population growth, economic growth, and the limits of available technology all work against it.



## **Can any specific event, such as a drought or a tornado, be tied to global warming?**

No. Specific weather events cannot be linked to global warming. The effect of warming on hurricanes, tornados, and torrential rains is the subject of much speculation, but there is little evidence that a warming world has made — or will make — these events more frequent or more severe.



## **Are sea levels rising? Are Greenland, the Arctic, and the Antarctic melting?**

Yes and yes, but neither can be linked to global warming with any certainty. Sea levels have risen some, and melting is observed, but the causes are the subject of much study. The oceans have not risen rapidly during the past century. In the 20th century, the sea level rose an average of 1.7 mm per year, but the level is still low compared to the last interglacial period, when it was about 6 meters higher than today. Between 1920 and 1940, the Arctic experienced a period of warming equal to recent temperatures. That period of warming did not lead to significant sea level rise from melting of the Greenland ice sheet. The warmest year in Greenland was 1941, and the warmest decades were the 1930s and 1940s. The Greenland Ice Sheet is melting at the edges, but growing inland because of increased precipitation. After a twenty-year period of decline, sea ice in the Arctic Ocean is showing signs of recovery.

Around Antarctica, sea ice increased over the same period of time, contrary to expectations. The net result is that global sea ice area has remained nearly constant. There is a small region around the Antarctic Peninsula where the highly publicized collapse of ice shelves is attributed to global warming, but natural changes in ocean circulation patterns in the area could be an explanation. Like glaciers, ice shelves must ultimately break off and float away naturally. The dynamics of glaciers and ice sheets are too poorly understood to make reasonable projections.

Estimates of significant sea level rise assume that the Greenland and Antarctic ice sheets will melt at increasing rates, resulting from substantial warming, which is possible only if our climate system is dominated by strongly positive feedbacks.

# The Big Picture

While the subject of climate change is complex, there is a common theme that runs throughout the theory of man-made global warming: Nature was in balance before human industrial activity began. But science does not support this naïve and romantic view of nature. The natural climate system is much more complex and dynamic than is represented in model projections. Although we don't know exactly why, climate has both changed significantly over time and varies substantially globally and regionally. Whatever the threat of climate change to humanity, it is most likely to be natural — not man-made. Observation, learning, innovation, and technology represent a human feedback cycle that has led to increased environmental protection and to actions that reduce the energy use and emissions related to human economic activities.

Natural sources of climatic change are poorly understood and inadequately measured. Until science better understands natural climate change, large uncertainties will remain regarding what part of past, current, and future climate change is due to human activities. Until science offers clearer answers to those questions, we are best served by actions to mitigate emissions without sacrificing energy use and by learning how to adapt to changing environmental conditions.

## For More Information:

**Climate Issues and Questions – 3rd Edition**  
[www.marshall.org/article.php?id=577](http://www.marshall.org/article.php?id=577)

**Climate of Extremes:  
Global Warming Science  
They Don't Want You to Know**  
by Patrick J. Michaels, Cato Institute

**Climate Confusion:  
How Global Warming Hysteria  
Leads to Bad Science, Pandering Politicians  
and Misguided Policies that Hurt the Poor**  
by Roy Spencer,  
University of Alabama – Huntsville

**Intergovernmental Panel  
on Climate Change**  
[www.ipcc.ch](http://www.ipcc.ch)

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**George C. Marshall Institute**  
Email: [info@marshall.org](mailto:info@marshall.org)  
[www.marshall.org](http://www.marshall.org)