

Pro & Con Arguments: "Is Human Activity a Substantial Cause of Global Climate Change?"

PRO Human Causation

1. 75% of the 20th century increase in the atmospheric greenhouse gas CO₂ is directly caused by human actions like burning fossil fuels. CO₂ levels were 389ppm (parts per million) as of Apr. 2010 - the highest they have been in the past 650,000 years. [6] This increase in CO₂ was a substantial contributor to the 1°F to 1.4°F warming over the 20th century. [1][43]
2. Human-produced CO₂ is warming the earth, not natural CO₂ released from the ocean and other "carbon sinks." CO₂ from fossil fuel combustion has a specific isotopic ratio [48] that is different from CO₂ released by natural "carbon sinks." 20th century measurements of CO₂ isotope ratios in the atmosphere confirm that the rise results from human activities, not natural processes. [3]
3. Human produced greenhouse gases will continue to accumulate in the atmosphere causing climate change because the earth's forests, oceans, and other "carbon sinks" cannot adequately absorb them all. As of 2009, these carbon sinks were only absorbing about 50% of human-produced CO₂. The other 50% is accumulating in the atmosphere. [3]
4. Human greenhouse gas emissions, not changes in the sun's radiation, are causing global climate change. Measurements in the upper atmosphere from 1979 - 2009, show the sun's energy has gone **up and down in cycles**, with no net increase. While warming is occurring in the troposphere (lower atmosphere), the stratosphere (upper atmosphere) is cooling. If the sun was driving the temperature change there would be warming in the stratosphere also, not cooling. [7]
5. Computer models show that increased levels of human produced greenhouse gases will cause global warming and other climate changes. Although these climate models are uncertain [8] about how much future warming will occur and how it will affect the climate, they all agree that, to some degree, these changes will happen. The reality of climate change is not contradicted by this uncertainty.
6. Although the amount of human-produced greenhouse gases may seem small to some people, their warming potential is amplified by the water

CON Human Causation

1. The 20th century warming of 1-1.4°F is within the +/- 5°F range of the past 3,000 years. [19] A 2003 study by researchers at the Harvard-Smithsonian Center for Astrophysics [44] shows temperatures from 1000-1100 AD (before fossil fuel use) that are comparable to those from 1900-1990. [45]
2. Rising CO₂ levels are a result of global warming, not a cause of it. As temperatures increase, CO₂ is released from "carbon sinks" such as the oceans or the Arctic tundra. [20] Measurements of ice core samples show that over the last four climactic cycles (past 240,000 years) periods of global warming preceded global increases in CO₂. [57]
3. Human releases of CO₂ cannot cause climate change as any increases in CO₂ are eventually balanced by nature. CO₂ gets absorbed by oceans, forests, and other "carbon sinks" that increase their biological activity to absorb excess CO₂ from the atmosphere. 50% of the CO₂ released by the burning of fossil fuels and other human activities, has already been absorbed.[21]
4. Global warming and cooling are caused by fluctuations in the sun's heat (solar forcing), not by the minor greenhouse effect of human-produced gases such as CO₂ and methane (CH₄). [17] Between 1900 and 2000 solar irradiance increased .19%. [19] This increase correlates with the rise in surface temperatures in the US.
5. Due to the inherent unpredictability of climate systems it is impossible to accurately use models to determine future weather. Climate models have been unable to simulate major known features of past climate [58] such as the ice ages or the very warm climates of the Miocene, Eocene, and Cretaceous periods. If models cannot replicate past climate changes they should not be trusted to predict future climate changes.
6. Rising temperatures are caused primarily by water vapor, the most abundant greenhouse gas in the atmosphere, not by CO₂. Water vapor concentrations in the atmosphere are driven by natural storm systems and ocean currents. According to a Mar. 5, 2010 study by researchers at NOAA, water vapor in

- vapor positive feedback loop [49], allowing them to cause significant warming and climate change. As greenhouse gases heat the planet, increased humidity (water vapor in the atmosphere) results. Since water vapor is itself a greenhouse gas, it can double the warming effect of greenhouse gases such as CO₂. [9]
7. Human greenhouse gas emissions are heating the planet, and climate models [50] consistently show that this warming causes an increase in the frequency and intensity of tropical cyclones. [10] The fact that 1975-1989 had 171 category 4 and 5 hurricanes while 1990-2004 had 269 [51] of them (a 57% increase) validates these climate models and the reality of human-induced climate change.
 8. Human-produced CO₂ is changing the climate of the world's oceans. As excess CO₂ is absorbed, oceanic acidity levels increase. Oceans have absorbed 48% of the total CO₂ [52] released by human activities and acidity levels are 25-30% higher [53] than prior to human fossil fuel use. [11]
 9. An 8" rise in the ocean level has occurred (1961-2003) due to human-induced global warming. Global sea levels rose an average of 1.8 mm (.07 in) per year between 1961 and 2003 and at an average rate of about 3.1 mm (.1 in) per year from 1993 to 2003. [3] This sea level rise is the result of warming waters and the melting of glaciers, ice caps, and polar ice sheets. From 1870-2004, a "significant acceleration" of sea-level rise occurred, an important confirmation of climate change models. [12]
 10. Warming caused by human-produced greenhouse gases is changing the earth's hydrologic climate. Rainfall is increasing in many areas due to increased evaporation stemming from global warming. Higher temperatures are also causing some mountainous areas to receive rain rather than snow. According to researchers at the Scripps Institution of Oceanography, up to 60% of the changes in river flow, winter air temperature, and snow pack in the western US (1950-1999) were human-induced. [13]
 11. Warming caused by human-produced greenhouse gases is changing the rate of glacial melt and altering the local climate of many regions. Since 1850, records show a "strong increase" in the rate of glacial retreat.[54] From 1961-2004 glaciers retreated about .5mm per year in sea level equivalent. [3] According to the stratosphere was responsible for increasing the rate of warming during the 1990s by 30%. [22] [23]
 7. The increased hurricane activity over the past decade (1995-2005), including hurricane Katrina, is not the result of human-induced climate change; it is the result of cyclical tropical cyclone patterns, driven primarily by natural ocean currents, according to the National Oceanic and Atmospheric Administration's (NOAA) testimony in the US Senate on Sep. 20, 2005. [59]
 8. Deep ocean currents cause climate warming and cooling in long term cycles. The minor greenhouse effect of human produced CO₂ pales in comparison. [18] Global cooling from 1940 to the 1970s, and warming from the 1970s to 2008, coincided with fluctuations in ocean currents and cloud cover driven by the Pacific Decadal Oscillation (PDO) - a naturally occurring rearrangement in atmospheric and oceanic circulation patterns. [39]
 9. Ocean acidity levels have risen over the 20th century, but they are not out of the ordinary considering the fluctuations of the past 7,000 years. [24] Average ocean surface water pH is 8.1 and has only decreased 0.1 [60] since the beginning of the industrial revolution (neutral is pH 7, acid is below pH7).
 10. Changes in ocean currents are primarily responsible for the melting Greenland ice sheet, Arctic sea ice, and Arctic permafrost. Over the 20th century there have been two Arctic warming periods with a cooling period (1940-1970) in between. According to a peer-reviewed Apr. 19, 2009 study [61] in *Geophysical Research Letters*, natural shifts in the ocean currents are the major cause of these climate changes, not human generated greenhouse gases.
 11. The general consensus that the earth has warmed during the 20th century is based upon flawed temperature measurements. These measurements, taken from surface monitoring stations set up by the National Weather Service (NWS), are often contaminated by the "heat island effect." According to a Mar. 2009 study published by the Heartland Institute, 89% of NWS monitoring stations are too close to artificial heat sources [62] such as large asphalt parking lots, air conditioners, heaters and other sources of artificial heat.

- to the World Glacier Monitoring Service, since 1980, glaciers worldwide have lost nearly 40 feet (12 meters) in average thickness (measured in average mass balance in water equivalent). [14]
12. Warming caused by human-produced greenhouse gases and soot (black carbon) produced from burning of fossil fuels and deforestation, [16] is reducing the size of the Arctic ice cap. A smaller ice cap reflects less of the sun's energy away from the earth. This energy is absorbed instead, causing air and water temperatures to rise. From 1953–2006, Arctic sea ice declined 7.8% per decade. Between 1979 and 2006, the decline was 9.1% each decade. Climate models predict that Arctic sea ice will continue to retreat through the 21st century further disrupting the global climate. [15]
 13. Many organizations believe that human activity is a substantial cause of global climate change. These groups include: the World Meteorological Organization (WMO), the Intergovernmental Panel on Climate Change (IPCC), the InterAcademy Council, the Network of African Science Academies, the European Science Foundation (ESF), the European Space Agency (ESA), the Royal Society (UK national academy of science), the US National Academies of Science, the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the US Environmental Protection Agency (EPA).
 14. Nearly all climate change studies show humans as the main cause, and studies which contradict this claim are often funded by petroleum companies, making their conclusions suspect given the obvious conflict of interest. From 2004-2005, ExxonMobil gave \$2.2 million[55] in grants for climate change research to organizations that deny human caused climate change. In 2006 US Senators Olympia Snowe (R-ME), and Jay Rockefeller (D-WV) chastised ExxonMobil [56] for providing more than \$19 million in funding to over 29 "climate change denial front groups."
 12. Many organizations believe that nature, not human activity, is primarily responsible for climate change. These groups include: the Heartland Institute, the Heritage Foundation, the Competitive Enterprise Institute, the George C. Marshall Institute, the CATO Institute, the American Enterprise Institute, the Institute for Energy Research, the National Center for Policy Analysis, the American Association of Petroleum Geologists, and the Oregon Institute of Science and Medicine.
 13. Theories of naturally caused climate change are often ignored by "mainstream" scientists and organizations because many research scientists are more interested in maintaining the flow of federal grant money for climate change research than in questioning the basic theory of human causation. From 1998-2009, nearly \$25 billion [46] in federal funds was allocated for climate science research. Researchers who question human-induced climate change often do not receive grant money for research projects. [41]

Adapted from procon.org

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