Climate Change Factsheet

Compiled by Emily Anderson
Personal Aide to Chairman Don Parsons

Introduction

Climate change has been an evolving issue since the 1980s when the issue became more mainstream among the American public. 97 percent of active climate scientists agree that climate warming trends are likely due to human activities, but there is dissonance in opinion among the public.[1] Congressman Buddy Carter, who was recently appointed to the House Select Committee on the Climate Crisis, said of the issue: "Climate change is real and the need to protect our environment is real. We must find solutions to address this problem."[2]

Global warming refers to the long-term warming of the planet since the early 20th century. The average worldwide surface temperature has gone up by about 2 °F since 1880.[3] Climate change refers to a broad range of global phenomena created predominantly by burning fossil fuels, which add heat-trapping gases to the earth's atmosphere. These phenomena include the increased temperature trends described by global warming, but also encompass changes such as sea level rise and ice mass loss in Greenland, Antarctica, the Arctic and mountain glaciers worldwide.[4]

Anthropogenic greenhouse gases are gases released from human driven activity like agriculture and industry. This includes carbon dioxide, methane, nitrous oxide, and fluorinated gases like chlorofluorocarbons which have significantly damaged the ozone layer. These gases trap energy from the sun within the atmosphere and increase the greenhouse effect that warms the planet to a temperature that can accommodate human life.

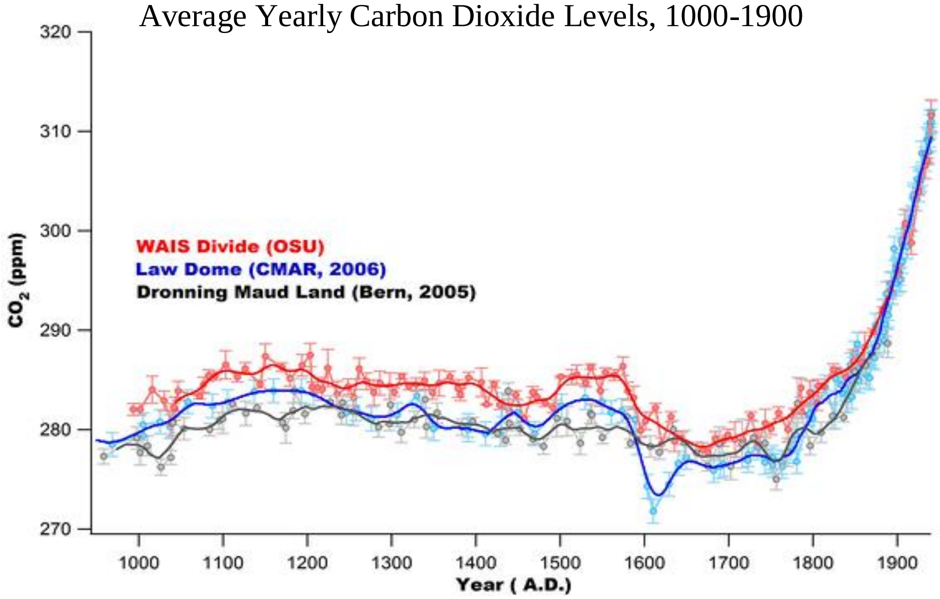
---

[1] NASA Earth Science Communications Team, "Scientific consensus", https://climate.nasa.gov/scientific-consensus/
[2] Press Release, https://buddycarter.house.gov/news/documentsingle.aspx?DocumentID=3844#Comments
[3] NASA Earth Science Communications Team, "What's in a name?", https://climate.nasa.gov/resources/global-warming/
[4] Ibid.

The role of anthropogenic greenhouse gases

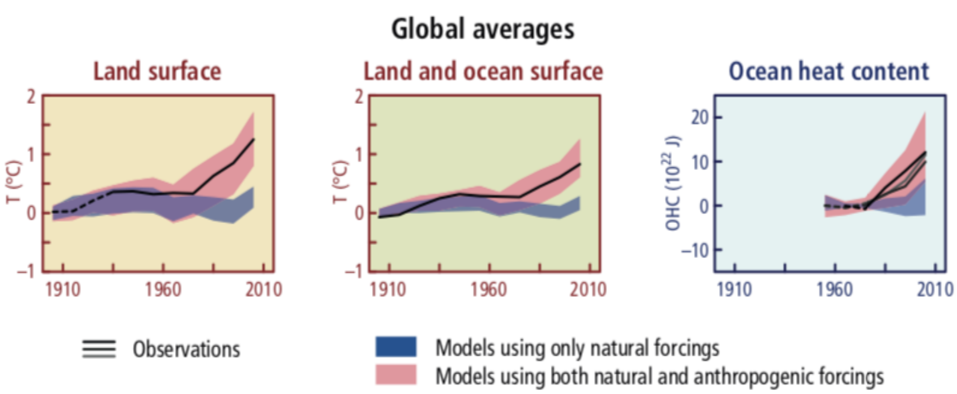
There is high confidence among scientists across the globe that greenhouse gas (GHG) emissions have been increasing at an increasing rate since 1970. Annual GHG emissions grew on average by 2.2 percent per year from 2000 to 2010 compared to 1.3 percent per year from 1970 to 2000.

Average Yearly Carbon Dioxide Levels, 1000-1900



The chart above, based on three studies that analyzed climate data from extracted ice cores, shows the increasing rate at which carbon dioxide concentrations rose from 1000 A.D. to 1900 A.D. The curve increases sharply with the Industrial Revolution in the mid 1700s. Carbon dioxide remains the major anthropogenic GHG accounting for 76 % of total anthropogenic GHG emissions in 2010.

The figure below from the Intergovernmental Panel on Climate Change's Fifth Assessment Report, published in 2014, illustrates how the observed global temperature change since 1910 aligns with models using both natural and anthropogenic forces rather than solely natural forces.[5]



[5] IPCC Assessment Report 5 Summary for Policymakers, 2014, available online at: https://www.ipcc.ch/report/ar5/syr/

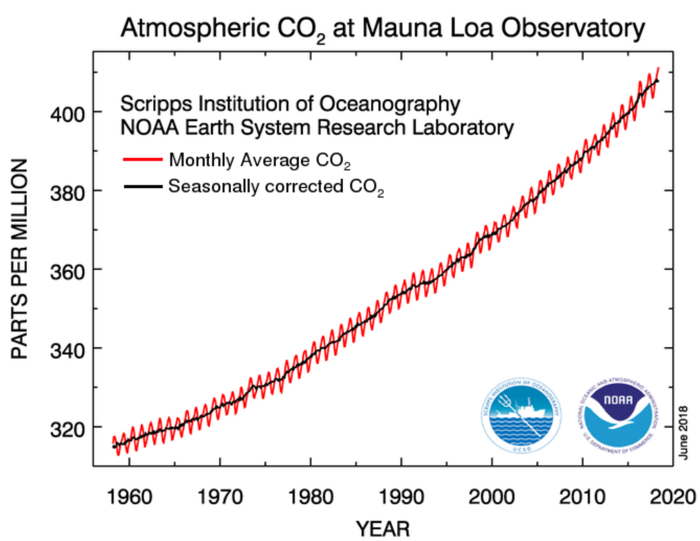
Natural contributors to climate change

Scientists have pieced together a record of Earth's climate, dating back hundreds of thousands of years by analyzing a number of indirect measures of climate including ice cores, tree rings, glacier lengths, pollen remains, and ocean sediments, and by studying changes in Earth's orbit around the sun. This record shows that the climate system varies naturally over a wide range of time scales. In general, climate changes prior to the Industrial Revolution can be explained by natural causes, such as changes in solar energy, volcanic eruptions, and natural changes in GHG concentrations. Factors such as variations in the sun's energy reaching Earth, changes in the reflectivity of Earth's atmosphere and surface, and changes in the greenhouse effect, which affects the amount of heat retained by Earth's atmosphere, have caused Earth's climate to change many times.

Phenomena such as El Niño or La Niña, which warm or cool the upper tropical Pacific Ocean and cause corresponding variations in global wind and weather patterns, contribute to short-term variations in global average temperature. Weather dynamics often affect regional temperatures, so not every region on Earth experiences substantial warming. For example, both NASA and the National Oceanic and Atmospheric Administration found the 2016 annual mean temperature for the contiguous 48 United States was the second warmest on record. In contrast, the Arctic experienced its warmest year ever in 2016, consistent with record low sea ice found in that region for most of the year.

Negative effects of increasing GHG emissions

Without additional efforts to reduce GHG emissions beyond those in place today, emissions growth is expected to persist due to global population growth and increasing economic activity. There is high confidence that without additional mitigation, global mean surface temperature may increase in 2100 from 2 °F to 3 °F compared to pre-industrial levels. Baseline scenarios (scenarios without explicit additional efforts to constrain emissions) exceed 450 parts per million CO2 by 2030. Data from the Mauna Loa Observatory in Hawaii shows that atmospheric concentrations of carbon dioxide already exceed 400 parts per million. This means the trendline shown on the graph to the right will continue at the same pace.[6]



The red curve shows monthly average carbon dioxide data from the Mauna Loa Observatory in Hawaii. Data prior to 1974 are from the Scripps Institution of Oceanography. Data since May 1974 are from NOAA. The black curve represents the seasonally corrected data.

[6]Earth System Research Laboratory's Global Monitoring Division https://www.esrl.noaa.gov/gmd/ccgg/trends/full.html

Benefits of mitigating climate change

Adaptation and mitigation can bring substantial co-benefits in areas other than the climate. Examples of actions with co-benefits include enhanced energy security, reduced energy and water consumption in urban areas, and sustainable agriculture and forestry. There is high confidence that strategies and actions can be pursued now that will move towards climate-resilient pathways for sustainable development, while at the same time helping to improve livelihoods, social and economic well-being, and environmental management.

How will climate change affect Georgia?[7]

A 2016 report from the EPA outlines the main effects of climate change in Georgia. Overall some of the greatest risks include increases in coastal flooding, storm surge sizes, and the negative impact on vulnerable populations due to increases in smog and warmer days.

Sea level is rising more rapidly in Georgia than along most coasts because the land is sinking. If the climate continues to warm, sea level is likely to rise one to four feet in the next century along the coast of Georgia.[8] Rising sea levels will submerge wetlands and dry land, erode beaches, and exacerbate coastal flooding. These effects can likely be combatted with various adaptation efforts including sea walls and updated zoning regulations.

Tropical storms and hurricanes have become more intense during the past 20 years, but there is no scientific consensus on the relationship between the recent intensification and long-term climate change. Rising sea level is likely to increase flood insurance rates, while more frequent storms could increase the deductible for wind damage in homeowner insurance policies. Coastal homes and infrastructure will flood more often as sea level rises due to higher storm surges.

High air temperatures can cause heat stroke and dehydration and can have negative effects on the health of vulnerable populations. Seventy years from now, most of Georgia is likely to have 45 to 75 days per year with temperatures above 95°F, compared with about 15 to 30 such days today. Warmer air can also increase the formation of ground-level ozone, a key component of smog. Ozone has a variety of health effects, aggravating lung diseases such as asthma and increasing the risk of premature death from heart or lung disease. The EPA and the Georgia Environmental Protection Division have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will likely become more difficult.

Agriculture in Georgia will be affected by climate change, but there is no consensus on whether the net impact will be positive or negative. Although hotter temperatures alone would tend to depress crop yields, higher concentrations of atmospheric carbon dioxide increase yields, and that fertilizing effect is likely to offset the harmful effects of heat on cotton, peanuts, soybeans, and wheat if adequate water is available. More severe droughts, however, could cause crop failures. Higher temperatures are also likely to reduce livestock productivity, because heat stress disrupts the animals' metabolism.

---

[7] All information in this section from EPA "What Climate Change Means for Georgia", available at https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ga.pdf

Information compiled and interpreted from the Intergovernmental Panel on Climate Change Report Summaries for Policymakers, NASA's Goddard Institute for Space Studies, and the EPA impact report "What Climate Change Means for Georgia".