

# Global Warming; The World's Biggest Problem

by Robert Jawitz

**This assessment of the situation regarding Global Warming, according to the US Department of Environmental Protection, is:**

“For over the past 200 years, the burning of fossil fuels, such as coal and oil, and deforestation have caused the concentrations of heat-trapping "greenhouse gases" to increase significantly in our atmosphere.

These gases prevent heat from escaping to space, somewhat like the glass panels of a greenhouse.

Greenhouse gases are necessary to life as we know it, because they keep the planet's surface warmer than it otherwise would be. But, as the concentrations of these gases continue to increase in the atmosphere, the Earth's temperature is climbing above past levels. According to NOAA and NASA data, the Earth's average surface temperature has increased by about 1.2 to 1.4°F since 1900. The warmest global average temperatures on record have all occurred within the past 15 years, with the warmest two years being 1998 and 2005. Most of the warming in recent decades is likely the result of human activities. Other aspects of the climate are also changing such as rainfall patterns, snow and ice cover, and sea level.

If greenhouse gases continue to increase, climate models predict that the average temperature at the Earth's surface could increase from 2.5 to 10.4°F above 1990 levels by the end of this century. Scientists are certain that human activities are changing the composition of the atmosphere, and that increasing the concentration of greenhouse gases will change the planet's climate. “

“Scientists know with virtual certainty that:

- Human activities are changing the composition of Earth's atmosphere. Increasing levels of greenhouse gases like carbon dioxide (CO<sub>2</sub>) in the atmosphere since pre-industrial times are well-documented and understood.
- The atmospheric buildup of CO<sub>2</sub> and other greenhouse gases is largely the result of human activities such as the burning of fossil fuels.

- An “unequivocal” warming trend of about 1.0 to 1.7°F occurred from 1906-2005. Warming occurred in both the Northern and Southern Hemispheres, and over the oceans (IPCC, 2007).
- The major greenhouse gases emitted by human activities remain in the atmosphere for periods ranging from decades to centuries. It is therefore virtually certain that atmospheric concentrations of greenhouse gases will continue to rise over the next few decades.
- Increasing greenhouse gas concentrations tend to warm the planet.

Gases that trap heat in the atmosphere are often called greenhouse gases. Some greenhouse gases such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities. Other greenhouse gases (e.g., fluorinated gases) are created and emitted solely through human activities. The principal greenhouse gases that enter the atmosphere because of human activities are:

- **Carbon Dioxide (CO<sub>2</sub>):** Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). Carbon dioxide is also removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH<sub>4</sub>):** Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.
- **Nitrous Oxide (N<sub>2</sub>O):** Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- **Fluorinated Gases:** Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (i.e., CFCs, HCFCs, and halons). These gases are typically emitted in smaller quantities, but because they are potent

greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (“High GWP gases”). “

**The institution most trusted with evaluating Global Warming and its effects is The Intergovernmental Panel on Climate Change (IPCC). This was established by the World Meteorological Organization (WMO) and the United Nations Environmental Programme (UNEP) in 1988. Since then it has made periodic assessments of the situation. In its Fourth Assessment Report (2007), Group 1 “The Physical Science Basis” reports:**

- “Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.”
- “Eleven of the last twelve years (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature”
- “The ocean has been absorbing more than 80% of the heat added to the climate system. Such warming causes salt water to expand, contributing to sea level rise.”
- “Mountain glaciers and snow cover have declined on average in both hemispheres. Widespread decreases in glaciers and ice caps have contributed to sea level rise.”
- “Losses from the ice sheets of Greenland and Antarctica have very likely contributed to sea level rise over 1993 to 2003. Flow speed has increased for some Greenland and Antarctic outlet glaciers, which drain ice from the interior of the ice sheets. The corresponding increased ice sheet mass loss has often followed thinning, reduction or loss of ice shelves or loss of floating glacier tongues. Such dynamic ice loss is sufficient to explain most of the Antarctic net mass loss and approximately half of the Greenland net mass loss. The remainder of the ice loss from Greenland has occurred because losses due to melting have exceeded accumulation due to snowfall.”
- “Global average sea level rose at an average rate of 1.8mm per year over 1961 to 2003. The rate was faster over 1993 to 2003: about 3.1 mm per year.”

- Model based projections of global average sea level rise at the end of the 21<sup>st</sup> century (according to the A1F1 2007 scenario) would be 260 to 590 mm per year.
- The A1F1 scenario, according to table SPM.3, shows a projected global average surface warming between 2090 and 2099 to be between 2.4 and 6.4 degrees C.
- “Global average sea level in the last interglacial period was likely 4-6 m higher than the 20<sup>th</sup> century due to the retreat of polar ice. Ice core data indicate that the average polar temperatures at that time were 3 degrees C to 5 degrees higher than present, because of differences in the Earth’s orbit. The Greenland Ice Sheet and other arctic ice fields likely contributed no more than 4 m of the observed sea level rise (the remainder probably contributed from Antarctica).”

6 meters is the equivalent of 19.8 feet of sea level rise. If the global average temperature at the end of the century is 6.4 degrees C greater than 2000 levels, proportionally to 5 degrees C, the average sea level rise would be 25.4 feet. This does not represent all the ice from the Greenland Ice Sheet and the Western Antarctic Ice Sheets. All the ice from those would represent a sea level rise of 12 m or almost 40’.

### **The Fourth Assessment Report, Group 2 “Impacts, Adaptation and Vulnerability” reports:**

#### **Africa**

- “By 2020, between 75 and 250 million people are projected to be exposed to an increase of water stress due to climate change. If coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems.”
- “Agricultural production, including access to food, in many African countries and regions is projected to be severely compromised by climate variability and change. In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020.”

- “Local food supplies are projected to be negatively affected by decreasing fisheries resources in large lakes due to rising temperatures, which may be exacerbated by continued over-fishing.”
- “Mangroves and coral reefs are projected to be further degraded, with additional consequences for fisheries and tourism.”

## **Asia**

- “Glacier melt in the Himalayas is projected to increase flooding, and rock avalanches from destabilized slopes, and to affect water resources within the next two or three decades. This will be followed by decreased river flows as the glaciers recede.”
- “Freshwater availability in Central, South, East and Southeast Asia, particularly in large river basins, is projected to decrease due to climate change which, along with population growth and increasing demand arising from higher standards of living, could adversely affect more than a billion people by the 2050’s.”
- “Coastal areas, especially heavily populated mega-delta regions in the South, East and Southeast Asia, will be at greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers.”
- “Climate change is projected to impinge on sustainable development of most developing countries of Asia, as it compounds the pressures on natural resources and the environment associated with rapid urbanization, industrialization and economic development.”
- “Endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts are expected to rise in East, South and Southeast Asia due to projected changes in the hydrological cycle associated with global warming. Increases in

coastal water temperature would exacerbate the abundance and/or toxicity of cholera in South Asia.”

### **Australia and New Zealand**

- “As a result of reduced precipitation and increased evaporation, water security problems are projected to intensify by 2030 in southern and eastern Australia and, in New Zealand, in Northland and some eastern regions.”
- “Significant loss of biodiversity is projected to occur by 2020 in some ecologically-rich sites including the Great Barrier Reef and Queensland Wet Tropics. Other sites at risk include Kakadu wetlands, southwest Australia, sub-Antarctic islands and the alpine areas of both countries.”
- “Ongoing coastal development and population growth in areas such as Cairns and Southeast Queensland (Australia) and Northland to Bay of Plenty (New Zealand) are expected to exacerbate risks from sea-level rise and increases in the severity and frequency of storms and coastal flooding by 2050.”

### **Europe**

- “Nearly all European regions are anticipated to be negatively affected by some future impacts of climate change and these will pose challenges to many economic sectors. Climate change is expected to magnify regional differences in Europe’s natural resources and assets. Negative impacts will include increased risk of inland flash floods, and more frequent coastal flooding and increased erosion (due to storminess and sea-level rise). The great majority of organisms and ecosystems will have difficulty adapting to climate change. Mountainous areas will face glacier retreat, reduced snow cover and winter

tourism, and extensive species losses (in some areas up to 60% under high emission scenarios by 2080).”

- “In Southern Europe, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability, and to reduce water availability, hydropower potential, summer tourism and, in general, crop productivity. It is projected to increase health risks due to heat waves and frequency of wildfires.”
- “In Central and Eastern Europe, summer precipitation is projected to decrease, causing higher water stress. Health risks due to heat waves are projected to increase. Forest productivity is expected to decline and frequency of peatland fires to increase.”

### **Latin America**

- “By mid-century, increases in temperature and associated decreases in soil water are projected to lead to gradual replacement of tropical forest by savanna in eastern Amazonia. Semi-arid vegetation will tend to be replaced by arid-land vegetation. There is a risk of significant biodiversity loss through species extinction in many areas of tropical Latin America.”
- “In drier areas, climate change is expected to lead to salinisation and desertification of agricultural land. Productivity of some important crops is projected to decrease and livestock productivity to decline, with adverse consequences for food security. In temperate zones, soybean yields are projected to increase.”
- “Sea-level rise is projected to cause increased risk of flooding in low-lying areas. Increases in sea surface temperature due to climate change are projected to have adverse effects on Mesoamerican coral reefs, and cause shifts in the location of south-east Pacific fish stocks.”

- “Changes in precipitation patterns and a disappearance of glaciers are projected to significantly affect water availability for human consumption, agriculture and energy generation.”

### **North America**

- “Warming in western mountains is projected to cause decreased snowpack, more winter flooding, and reduced summer flows, exacerbating competition for over-allocated water resources.”
- “Disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in area burned.”
- “Cities that currently experience heat waves are expected to be further challenged by an increased number and intensity and duration of heat waves during the course of the century, with potential for adverse health impacts. Elderly populations are most at risk.”
- “Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution. Population growth and rising value of infrastructure in coastal areas increase vulnerability to climate variability and future climate change, with losses projected to increase if the intensity of tropical storms increases. Current adaptation is uneven and readiness for increased exposure is low.”

**Global warming is clearly the world’s biggest problem.**