

GLOBAL WARMING IS MAN-MADE

KEY POINTS IN THE 2007 FOURTH REPORT OF THE INTERNATIONAL PANEL ON CLIMATE CHANGE

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We often have trouble accepting hard truths. Some people are just plain skeptical. Given the nonsense peddled in the daily media and on the Internet you can't blame people. While most of us agree that global temperatures have increased at a very rapid rate in the last century or so, many people don't like to admit that that we caused it. And a small minority have become Global Warming deniers, people who simply refuse to believe global warming is happening, regardless of the evidence. But scientists are people whose job it is to be skeptical. And, since 1990 about 750 of the world's leading scientific experts on climate have studied the evidence for global warming. They have published their findings in the reports of the *International Panel On Climate Change* (or IPCC). The fourth and latest IPCC report came out in 2007. It is 1000 pages long, and often quite technical. So I would like to present its key findings in clear, non-technical language.

THE SCIENTIFIC BASIS

This report represents “the most complete study to date on how increases in carbon dioxide and other greenhouse gases are raising the temperature of the planet at an alarmingly rapid rate.” No other study comes even close to the IPCC report in its impartial assessment of all the relevant data, or its level of technical expertise. *Global warming since 1750, the IPCC says, is “unequivocal, as is now evident from observation of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level”, and we humans are the main cause.*

A few extreme skeptics think that the evidence for current global warming does not rest on science, but claim that it rather represents a ‘new faith-based religion.’ They could not be more wrong. The IPCC reports are examples of careful, extremely well-done scientific work.

GLOBAL CLIMATE CHANGE

Since 1905 the average temperature of the planet, then at 14°C, has increased 2.5%, an unusually rapid rate (a 0.35°C rise). Over the last 25 years, from 1970 to 2005, it went up 4% (or 0.55°C). The total increase in global average temperature represents a rise of 5.4% (or 0.74°C) since 1750. Extreme global warming skeptics claim that a 0.74°C increase in global average temperature is insignificant. On the contrary, “.The warming trend over the last 50 years (1955 to 2005) is nearly twice that for the last 100 years”, the IPCC scientists say. And much of it happened in the last 15 years! True, some cool years do occur. This is not a matter of the normal variability of temperature (see Table 1 below). The key point is that the overall trend since 1850, and especially since 1990, is that of a consistent, increasingly and unusually rapid, increase in global average temperatures.

GREENHOUSE GASES (GHG) INCREASE: 1750-2005

Since 1750 the amount of three main GHGs in the atmosphere have been increasing at extraordinarily rapid rates (see Table 1):

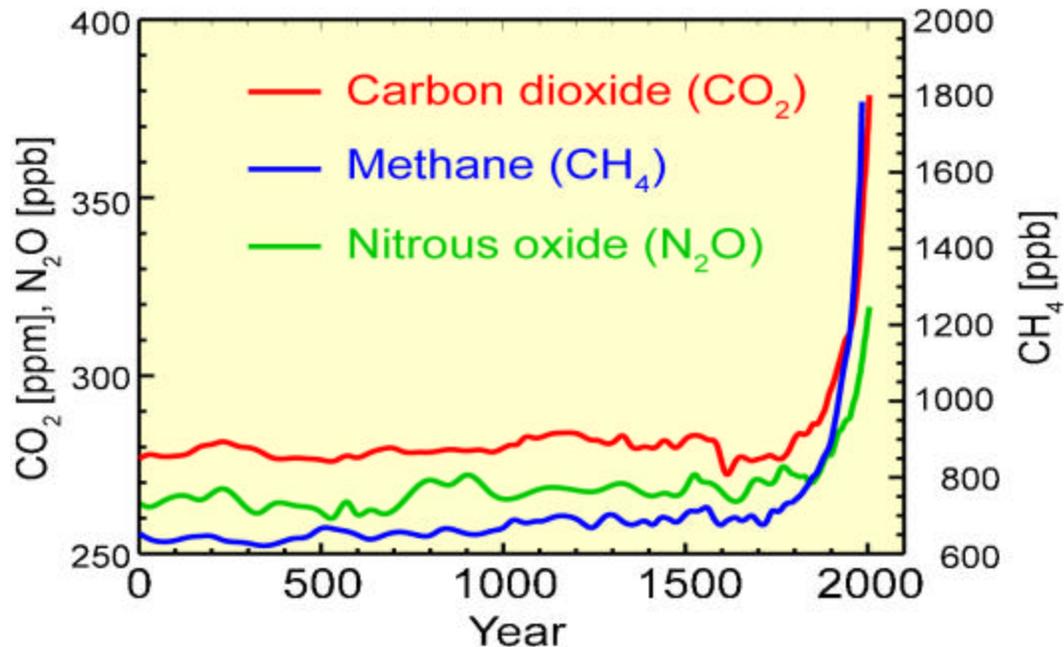
- ? The amount of carbon dioxide (CO₂) has increased by about 35% (from 280 parts per million of the atmosphere [= ppm], to around 380 ppm).
- ? Global atmospheric methane gas increased 142.2% from 1750 to 1990 (from about 715 parts per billion of the atmosphere [= ppb] to 1732 ppb), then by 2.4%, to 1774 ppb, in 2005.
- ? Nitrous oxide concentrations increased 18% from 1750 to 2005 (from about 270 parts per billion to 319 ppb).
- ? All three increases far exceed the natural range of the last 650,000 years, as shown in ice cores and other geological data.

GHG & GLOBAL TEMPERATURE CORRELATED

As the two graphs below show, the growth curves tracking the increases in CO₂ and global temperature are nearly identical in slope. Each barely moves up for thousands of years. Then in the last quarter-century they each have risen rapidly, forming the vertical hockey stick curve rise shown in the Table below. In addition, the average rate of CO₂ increase from 1990 to 2005 was a 35.7 % greater average increase than from 1960 to 2005 (namely: 1.9 parts per million/year from 1990 to 2005, versus 1.4 ppm/yr from 1960 to 2005).

As Table 1 shows, planetary temperatures are quite variable. No warming period is without its ups and downs. In the distant past there were many episodes of global warming and cooling. Indeed the planet was at times been much warmer than now. Natural global temperature swings, whether up or down, took millennia to work themselves out. But over time the global climate itself is relatively stable and predictable. In contrast, the increase in global average temperatures over the last 50 years, and especially since 1990, has been very rapid, in sharp contrast to much slower earlier rates of global temperature increase.

To note a few years of colder temperatures, therefore does not undermine the strong case for longer term global warming. The claim of some extreme sceptics that global CO₂ increases in the last few decades are minuscule, is decisively refuted by extensive IPCC data, which shows that there has been a 35% increase in planetary CO₂ since 1850. The science has been clear and irrefutable. In addition Table 1 shows that the increase in atmospheric CO₂ is matched by a similar increase in temperature, just as science predicts it would.

Table 1: INCREASES IN GHG & GLOBAL TEMPERATURE OVER THE LAST 2000 YEARS

HUMAN ACTIVITY IS CAUSING RECENT GLOBAL WARMING

The IPCC report shows that natural cycles of sun spot activity and related temperature variability are not significant enough to have caused the recent spike in global warming. Recent rapid GHG and global average temperature increases, the IPCC notes, do not correlate with increases in natural phenomena such as organic methane, volcanic venting or solar activity (eg, the 11 year sun spot cycles). On the contrary, human activities such as increasing fossil fuel use, *have generated over 130 times the amount of CO₂ emitted by volcanoes and solar flares*. Rapid increases in global methane and nitrous oxide, similarly, are mostly due to agriculture and deforestation.

THE PREDICTABLE EFFECTS OF GLOBAL WARMING

The predictable effects of global warming are: more frequent and intense extreme weather events such as heat waves, droughts, floods and hurricanes. They are already happening, as predicted. Category 4 and 5 hurricanes for example have increased 75% since 1970. Mountain glaciers are thinning, snow cover is retreating earlier in the spring, permafrost is melting, sea ice in the Arctic is shrinking faster than expected, and the seas are rising faster, at about 3 millimetres/year (mm/yr). From 1980 to 2008 the Arctic ice pack shrunk from 14 mn km² to 13.2 mn km², a worryingly high 6% decrease in only a quarter century. And the rate of shrinkage may be increasing. The extreme skeptic's claims that some parts of the Arctic or Antarctic ice packs may not be shrinking do not undermine the case made in the IPCC report, namely, *that on the whole both ice packs are melting and shrinking, and at a fast, worrying rate*.

At this rate the polar ice packs are likely to disappear in a few centuries, causing a significant rise in sea levels. Indeed the last time the polar ice regions were significantly warmer or an extended time period the seas rose 4 to 6 meters (9 to 12 feet). such a rise would threaten much of Florida, Chesapeake Bay, Manhattan Island, coastal Bangladesh, and other low lying maritime regions, forcing tens of millions of refugees to flee for higher land.

FUTURE CLIMATE SCENARIOS

IPCC scientists say that even if GHG concentrations remain at constant year 2000 levels (which have already been exceeded), the global average temperature will likely rise from 0.3° Celsius to 0.9°C *per decade*. *Temperature increases would be greater at northern latitudes* (like the Canadian north), and the southern oceans. Sea levels will likely rise from 1.3 to 2.3 mm/yr, and ocean water temperatures and acidity would increase as well. These are major changes. They threaten the survival of numerous temperature-sensitive species and organisms across the planet.

If GHG emissions rise even more above year 2000 rates, further global warming will result and we will see more extreme weather events, more frequent and intense than those observed to date. We need therefore to reduce our GHG emissions drastically, now, both by conservation and by developing cleaner, more efficient technologies, locally, regionally and globally.

For more information you can consult these Websites:

The International Panel on Climate Change (Report) <http://www.ipcc.ch/>
 The Sierra Club : <http://www.sierraclub.org/energy/overview/>
 The David Suzuki Foundation http://www.davidsuzuki.org/print/Climate_Change
 The National Resources Defence Council: <http://www.nrdc.org/>
 NASA on Global Warming: http://www.nasa.gov/worldbook/global_warming_worldbook.html
 and: http://globalchange.nasa.gov/Resources/pointers/glob_warm.html
 The Pembina Institute. <http://www.pembina.org>

And these books:

Joel Cohen. *How many people can the earth support?*
 Paul Harrison. *The Third Revolution*.
 James Lovelock. *The Revenge of Gaia. Gaia*.
 Paul Hawken. *The Ecology of Commerce*.
 Norman Myers, ed. *The Gaia Atlas of Planet management*
 Norman Myers, ed. *The Gaia Atlas of Future Worlds*
 Norman Myers, ed. *The Gaia Atlas of Cities*
 Matt Ridley. *The Origins Of Virtue*.
 Lewis Thomas. *The Fragile Species*.
 E. O. Wilson. *The Diversity of Life*.
 Charles Darwin. *The Descent of Man. Origin of Species. Voyage of the Beagle*.
 UN Brundtland Commission. *Our Common Future*.
 Environmental Journals: *Alternatives. The Ecologist*