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A Skeptic's Guide to *An Inconvenient Truth*

CEI WORKING PAPER

By Marlo Lewis*

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Executive Summary**

An Inconvenient Truth (AIT), Vice President Al Gore's book on "The planetary emergency of global warming and what can be done about it," purports to be a non-partisan, non-ideological exposition of climate science and moral common-sense. In reality, AIT is a colorfully illustrated lawyer's brief for global warming alarmism and energy rationing. It is a *J'Accuse* hurled at fossil-energy-based civilization, especially the USA, and above all the Bush Administration and its allies in the U.S. oil and auto industries.

We do not expect lawyers to argue both for and against their clients, nor do we expect balance from party men. However, although Gore reminds us (in the film version of AIT) that he "used to be the next President of the United States," and concludes the book and movie with a call for "political action," he presents AIT as the work of a long-time student of climate science, a product of meditation on "what matters." He thus asks us to expect more from him than the mere cleverness that can sway juries or win elections.

This reasonable expectation is unmet. In AIT, the only facts and studies considered are those convenient to Gore's scare-them-green agenda. And in many instances, Gore distorts the evidence he cites.

* Marlo Lewis is a Senior Fellow in Environmental Policy at the Competitive Enterprise Institute. The author is grateful to CEI Research Interns Jonathan Burns and Elias Dayoub for their help in analyzing economic and environmental data, and to Paul C. Knappenberger of New Hope Environmental Services and Willie Soon of the Center for Science and Public Policy for their comments on an earlier draft of this paper.

The present paper, a running commentary on AIT, finds that nearly every significant statement Gore makes regarding climate science and climate policy is either one sided, misleading, exaggerated, speculative, or wrong. An extensive summary of AIT's many distortions is provided in Appendix A. Below is a list of 25 of egregious examples. AIT:

One Sided

- Never acknowledges the indispensable role of fossil fuels in ending serfdom and slavery, alleviating hunger and poverty, extending human life spans, and democratizing consumer goods, literacy, leisure, and personal mobility.
- Never acknowledges the environmental, health, and economic benefits of climatic warmth and the ongoing rise in the air's CO₂ content.
- Neglects to mention that aggregate mortality and mortality rates due to extreme weather events declined dramatically (by 95 percent or more) during the 20th century.
- Neglects to mention the circumstances that make it reasonable rather than blameworthy for America to be the biggest CO₂ emitter: the world's largest economy, abundant fossil energy resources, markets integrated across continental distances, the world's most mobile population.
- Impugns the motives of so-called global warming skeptics but never acknowledges the special-interest motivations of those whose research grants, direct mail income, industrial policy privileges, regulatory power, prosecutorial plunder, or political careers depend on keeping the public in a state of fear about global warming.
- Never addresses the obvious criticism that the Kyoto Protocol is all economic pain for no environmental gain and that regulations stringent enough to measurably cool the planet would be a "cure" worse than the alleged disease.

Misleading

- Implies that, throughout the past 650,000 years, changes in CO₂ levels preceded and largely caused changes in global temperature, whereas the causality mostly runs the other way: CO₂ changes followed global temperature changes by hundreds to thousands of years.
- Ignores the societal factors that typically overwhelm climatic factors in determining people's risk of damage or death from hurricanes, floods, drought, tornadoes, wildfires, and disease.
- Implies that a study, which found that none of 928 science articles (actually abstracts) denied a CO₂-global warming link, shows that Gore's apocalyptic view of global warming is the "consensus" view among scientists.
- Reports that 48 Nobel Prize-winning scientists accused Bush of distorting science, without mentioning that the scientists acted as members of a 527 group set up to promote the Kerry for President Campaign.

Exaggerated

- Hypes the importance and exaggerates the certainty of the alleged link between global warming and the frequency and severity of tropical storms.
- Claims polar bears “have been drowning in significant numbers,” based on a report that found four drowned polar bears in one month of one year, following an abrupt storm.
- Portrays the collapse in 2002 of the Larson-B ice shelf—a formation the “size of Rhode Island”—as harbinger of doom. For perspective, the Larson-B was 180th the size of Texas and 1/246th the size of the West Antarctic Ice Sheet (WAIS).
- Presents a graph suggesting that China’s new fuel economy standards are almost 30% more stringent than the current U.S. standards. In fact, the Chinese standards are only about 5% more stringent.

Speculative

- Blames global warming for the record-breaking 37-inch downpour in Mumbai, India, in July 2005, even there has been no trend in Mumbai rainfall for the month of July in 45 years.
- Blames global warming for recent floods in China’s Sichuan and Shandong provinces, even though far more damaging floods struck those areas in the 19th and early 20th centuries.
- Blames global warming for the disappearance of Lake Chad, a disaster more likely stemming from a combination of regional climate variability and societal factors such as population increase and overgrazing.
- Warns that a doubling of pre-industrial CO₂ levels to 560 ppm will so acidify seawater that all optimal areas for coral reef construction will disappear by 2050—implausible because coral calcification rates have increased as ocean temperatures and CO₂ levels have risen, and today’s main reef builders evolved and thrived during the Mesozoic Period, when atmospheric CO₂ levels hovered above 1,000 ppm for 150 million years and exceeded 2,000 ppm for several million years.
- Warns of “significant and alarming structural changes” in the submarine base of the WAIS, but does not tell us what those changes are or why they are “significant and alarming.” The melting and retreat of the WAIS “grounding line” has been going on since the early Holocene. At the rate of retreat observed in the late 1990s, the WAIS should disappear in about 7,000 years.
- Warns that half the Greenland Ice Sheet could “slide” into the sea, even though the ice sheet sits in a bowl-like depression surrounded by mountains that restrict glacial outflow to the sea.

Wrong

- Claims glaciologist Lonnie Thompson’s reconstruction of climate history proves the Medieval Warm Period was “tiny” compared to the warming observed in recent decades. It doesn’t. Four of Thompson’s six ice cores indicate the Medieval Warm Period was as warm as or warmer than any recent decade.

- Claims the rate of global warming is accelerating, whereas the rate has been remarkably constant for the past 30 years—roughly $0.17^{\circ}\text{C}/\text{decade}$.
- Attributes Europe's killer heat wave of 2003 to global warming—it was due to an atmospheric circulation anomaly.
- Claims that 2004 set an all-time record for the number of tornadoes in the United States. Tornado frequency has not increased; rather, the detection of smaller tornadoes has increased. If we consider the tornadoes that have been detectable for many decades (F-3 or greater), there is actually a downward trend since 1950.
- Blames global warming for a “mass extinction crisis” that is not, in fact, occurring.

In light of these and other distortions, AIT is ill-suited to serve as a guide to climate science and climate policy for the American people.

Introduction

More people will see the movie, *An Inconvenient Truth* (AIT), than will read the book. However, the two are so close in verbal content and visual imagery that, if you've seen the movie, you've practically read the book, and vice versa. Because it is much easier to reference pages in a book than scenes from a movie, the present paper comments on the book version of AIT.

To minimize redundancy, the paper skips over introductory material that Vice President Gore develops in greater detail later in AIT. In most cases, passages from AIT are reproduced verbatim. In cases where passages are summarized, this will be clear from the context.

AIT does not have distinct chapters. To help the reader follow the sequence of topics under discussion, I divide the commentary into several sections. The commentary mostly follows the running order of Gore's presentation. However, to keep each section of the commentary focused on the same or similar topics, I have in some instances grouped together thematically similar but non-consecutive passages from AIT.

I. Greenhouse Basics

AIT: The atmosphere is thin enough that we are capable of changing its composition... In particular, we have vastly increased the amount of carbon dioxide—the most important of the so-called greenhouse gases. (25)

Comment: Water vapor, not carbon dioxide (CO₂), is the most important greenhouse gas. Computing the exact contribution of each type of greenhouse gas to the overall greenhouse effect is complicated, because the gases “overlap” in some of the spectra in which they absorb infrared radiation. Taking the overlaps into account, RealClimate.Org concludes that “water vapor is the single most important absorber (between 36% and 66% of the greenhouse effect), and together with clouds makes up between 66% and 85%. CO₂ alone makes up between 9 and 26%, while the O₃ and the other minor GHG absorbers consist of up to 7 and 8% of the effect, respectively.”¹

Gore editorializes when he says that we have “vastly” increased the amount of CO₂. Over the past century and a half, atmospheric CO₂ levels have risen from about 280 parts per million (ppm) to about 380 ppm—roughly a 35% increase.

The two-page photograph (pp. 24-25) accompanying Gore's first mention of CO₂ shows an electric power plant belching what appears to be thick black smoke. The “smoke” is probably steam, but it looks dark and ominous against the inferno colors of a fading sunset. Thus, the reader (and film viewer) is set up to believe he is literally seeing CO₂ spew out of smokestacks, even though CO₂ is as invisible as oxygen. Pictorially, AIT presents CO₂ as an air pollutant, anticipating Gore's later oft-repeated description of

CO₂ as “global warming pollution.” This iconic and rhetorical depiction of CO₂ as pollution is inaccurate and manipulative.

Carbon dioxide is a climate “forcing” agent, but so is water vapor—the atmosphere’s main greenhouse gas.² Anybody who called water vapor “pollution” would be laughed out of court, yet CO₂ is equally innocent of adverse effects on air quality. That is why a central goal of the Clean Air Act for more than 30 years has been to make cars so clean burning that, ultimately, nothing comes out of the tailpipe except water vapor and CO₂. The phrase “global warming pollution” has no scientific meaning. It is designed to prejudice people against fossil energy use by conflating CO₂ with substances that degrade air quality.

AIT: The greenhouse gases on Venus are so thick that its temperatures are far too hot for humans. The greenhouse gases surrounding Mars are almost nonexistent, so the temperature there is far too cold. (26)

Comment: This passage exaggerates CO₂’s importance as a climate driver. Carbon dioxide makes up about 95% of the atmospheres of both Venus and Mars. In contrast, CO₂ makes up only few hundredths of 1% of the Earth’s atmosphere. What makes Mars so cold is that it is about 44 million miles farther than the Earth from the Sun, and its *entire* atmosphere is only about 1% as dense as Earth’s atmosphere.³ By the same token, Venus, some 26 million miles closer than the Earth to the Sun, is very hot—hotter even than Mercury—because its atmosphere is so dense. “Per unit of surface area,” comments RealClimate.Org, “the atmosphere of Venus has as much mass as about 100 Earth atmospheres, and it is almost pure CO₂.”⁴

II. Mountain Glaciers

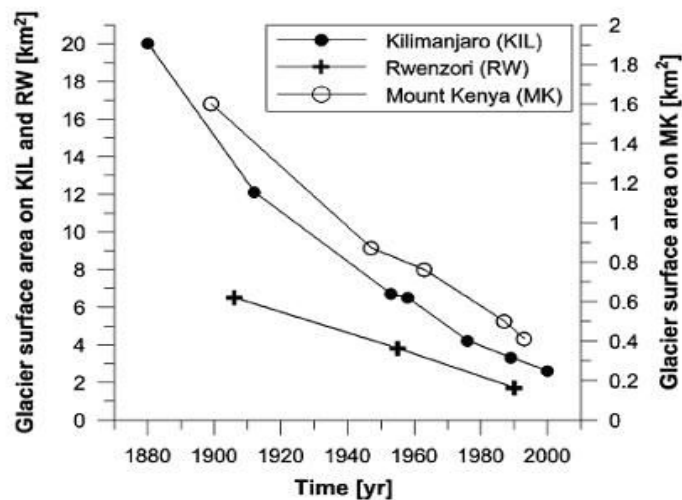
AIT: It is evident in the world around us that very dramatic changes are taking place. This is Mount Kilimanjaro in 1970 with its fabled snows and glaciers. Here it is just 30 years later—with far less ice and snow....He [glaciologist Lonnie Thompson of Ohio State University] predicts that within 10 years there will be no more “Snows of Kilimanjaro.” (42-45)

Comment: The shrinking Snows of Kilimanjaro make an ideal poster child for the alleged ravages of global warming. Hardly anything is as picturesque as a snow-capped mountain, Kilimanjaro’s glacier is vanishing, and warmth melts ice. So global warming must be to blame, right? Wrong.

Molg et al. (2003a) note that Kilimanjaro’s glacier began to recede around 1880—well before the modern era of greenhouse warming. They found “no evidence of a sudden change in temperature at the end of the 19th century (Hastenrath, 2001).” They also note that, “East African long-term temperature records of the 20th century show diverse trends and do not exhibit a uniform warming signal (King’uyu *et al.*, 2000; Hay *et al.*, 2002).”⁵ Moreover, monthly mean air temperatures at the Kilimanjaro glacier “only vary slightly around the annual mean of -7.1°C, and air temperatures [measured by ventilated sensors,

e.g., Georges and Kaser (2002)] never rise above the freezing point.” The glacier is shrinking but it is not melting.

What then is causing the ice cap to disappear? Kaser et al. (2004) examined glacial retreat on three East African massifs, Rwenzori, Mount Kenya, and Kilimanjaro.⁶ They found that a “drastic dislocation” occurred around 1880, when the region shifted from a “very humid” to a dry climate. This meant less cloud cover, exposing the glacier to more direct sunlight, and less snowfall to replace the sublimating ice. In Kaser et al.’s words: “The dominant reasons for this strong recession [of all glaciers in equatorial East Africa] in modern times are reduced precipitation and increased availability of shortwave radiation due to decreases in cloudiness.” They emphasize: “In contrast to the ‘switch’ in moisture conditions, there is no evidence of an abrupt change in air temperature...the glaciers of Mount Kenya and in the Rwenzori Mountains seem to have responded clearly to this change in moisture by retreating drastically and in spatially differential patterns.” The Figure below shows the decline in glacier surface area due to the regional “switch” in moisture conditions.



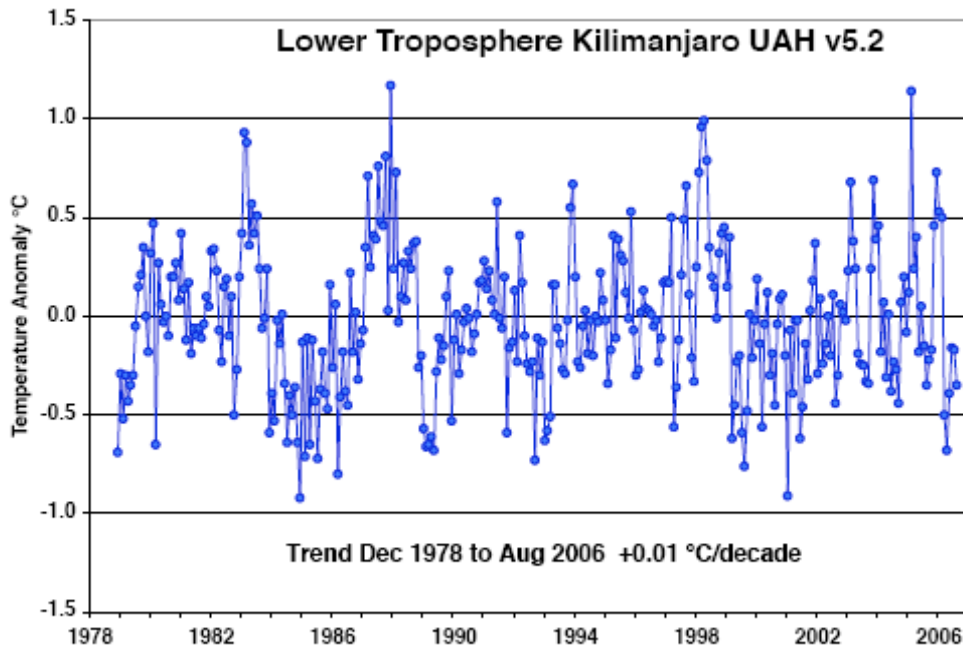
Time series of glacier surface areas on Mt. Kenya (open circles), Mt. Kilimanjaro (closed circles), and in the Rwenzori Mountains (crosses). Figure from Kaser et al. (2004).

Interestingly, by the mid-1930s, when Hemmingway wrote *The Snows of Kilimanjaro*, the ice cap had already lost more than 10 km² of surface area since the late 1800s—a greater loss of glacial ice than occurred after Hemingway penned the story!

Analyzing the Kaser et al. study, University of Virginia climatologist Patrick Michaels observes that the Kilimanjaro glacier retreated in periods of both global warming and cooling—and even in a period of regional cooling. During the warming of the first part of the 20th century, Kilimanjaro lost 45% of its cap. During 1953 to 1976, when the planet was cooling, Kilimanjaro lost another 21%. Since 1976, in the era of significantly

elevated CO₂ levels, the glacier lost another 12%—“the slowest melt rate of the last 100 years.”

Satellite data show a minuscule trend of +0.01 C/decade since 1978, essentially zero, which may account for the slower rate of glacial retreat in recent decades (see Figure below). Nonetheless, the glacier continued to disappear even as no detectable warming occurred.



Satellite-sensed temperatures in Kilimanjaro's neighborhood show no detectable warming since records began in late 1978.

Two key conclusions emerge. First, the Snows of Kilimanjaro would still be disappearing even in the absence of anthropogenic global warming. Second, no change in energy policy can alter the glacier's fate.⁷

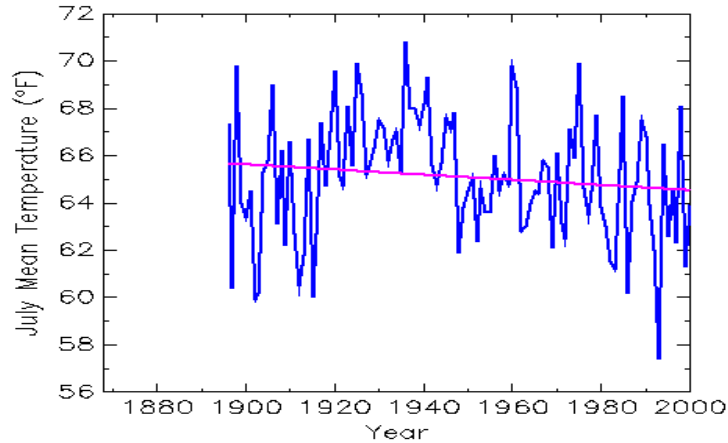
Gore: Our own Glacier National Park will soon need to be renamed “the park formerly known as Glacier.” (46)

Comment: Glacier Park's glaciers mostly melt in the summer months, and from 1888-2000, temperatures in the vicinity of Glacier Park show no trend in June, a slight cooling trend in July, and a slight warming trend in August. See the Figures for July and August, below.

1868-2000 Mean July Temperature Time Series

Station: KALISPELL, MT

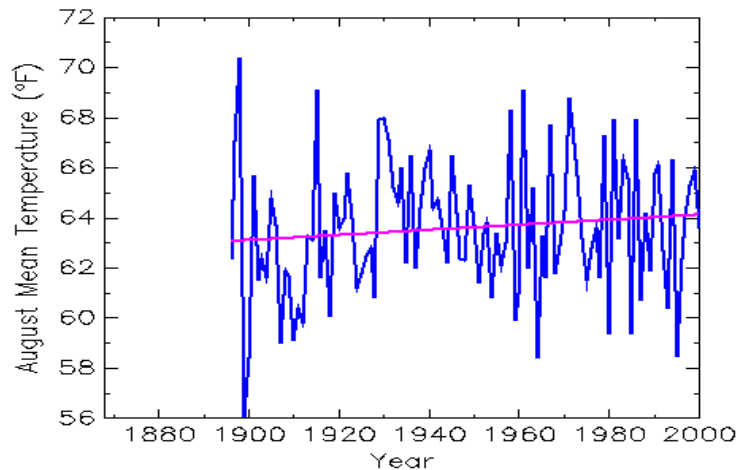
(from the United States Historical Climatology Network dataset)



1868-2000 Mean August Temperature Time Series

Station: KALISPELL, MT

(from the United States Historical Climatology Network dataset)



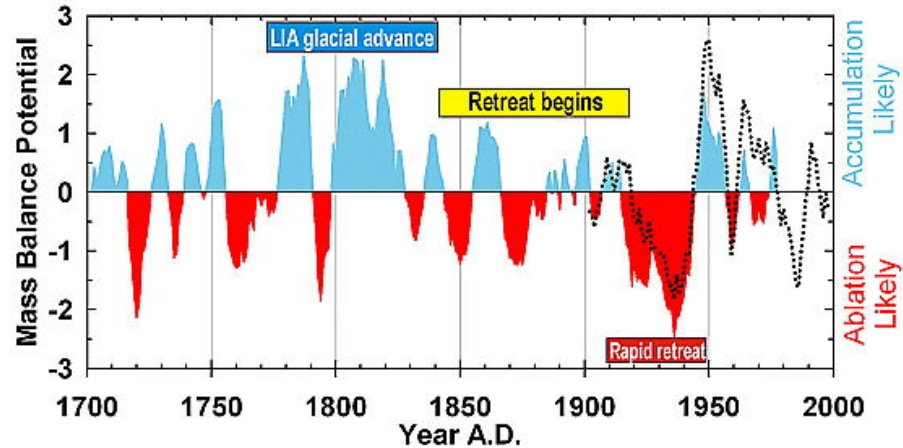
As in the case of Kilimanjaro, Glacier Park's glaciers have been retreating long before anthropogenic global warming could have had much of an impact on them. Writing in 1952, more than a half-century ago, Dightman and Beatty report on the results of a program of aerial mapping initiated in 1950 that compared the new photographs with earlier glacial mapping efforts.⁸ Here are a few highlights:

- “Grinnell Glacier appears to have followed very well the pattern of decrease in glacier size observed over the world in general for the last 70 to 80 years.”

- “Dr. William C. Alden, of the United States Geological Survey, made the first comprehensive study of the geology and the glaciers during the summers of 1911-13 and estimated that there were about 90 small glaciers...several of these individual glaciers at that time apparently had surface areas exceeding 1 square mile.”
- “Of the 50 small glaciers existing today [1952] in the park, only 1 has a surface area of nearly-one-half square mile and not more than 7 others are over one-fourth square mile in area.”
- “During the 60-year period following the first written or photographic records of the these glaciers, all have been rapidly depleted in both area and volume.”
- “Many of the glaciers on the topographic map of the park (completed in 1914) are no longer in existence and others are either inactive or too small to be considered true glaciers.”
- “All glaciers lost at least 50 percent of their surface area in the 50-year period following the turn of the present [20th] century; some lost as much as 80 percent, and several disappeared entirely.”

A few years prior to Dightman and Beatty’s 1952 report, the climate of western Montana turned cooler and wetter and the glaciers in Glacier National Park stopped receding and began to grow again—until about the mid-1970s. Studying the phenomenon of the ebb and flow of Glacier National Park’s glaciers, Pederson et al. (2004) attribute the current phase of glacial retreat to a combination of decreased winter snowpack and decreased summer precipitation.⁹ They write:

These records show that the 1850’s glacial maximum was likely produced by ~70 yrs of cool/wet summers coupled with high snowpack. Post 1850, glacial retreat coincides with an extended period (>50 yr) of summer drought and low snowpack culminating in the exceptional events of 1917 to 1941 when retreat rates for some glaciers exceeded 100 m/yr. This research highlights potential local and ocean-based drivers of glacial dynamics, and difficulties in separating the effects of global climate change from regional expressions of decadal-scale climate variability.



Index of glacial mass balance potential for Glacier National Park. Mass balance potential based on proxy data (red and blue fill) and instrumental data (dotted black line), which are shown. Source: Pedersen, et al. (2004)

AIT: Almost all of the mountain glaciers in the world are now melting, many of them quite rapidly. There is a message in this. (48)

Comment: Gore illustrates this statement with a two-page photograph of the Perito Moreno Glacier, in Patagonia, Argentina, similar to the image immediately below.¹⁰



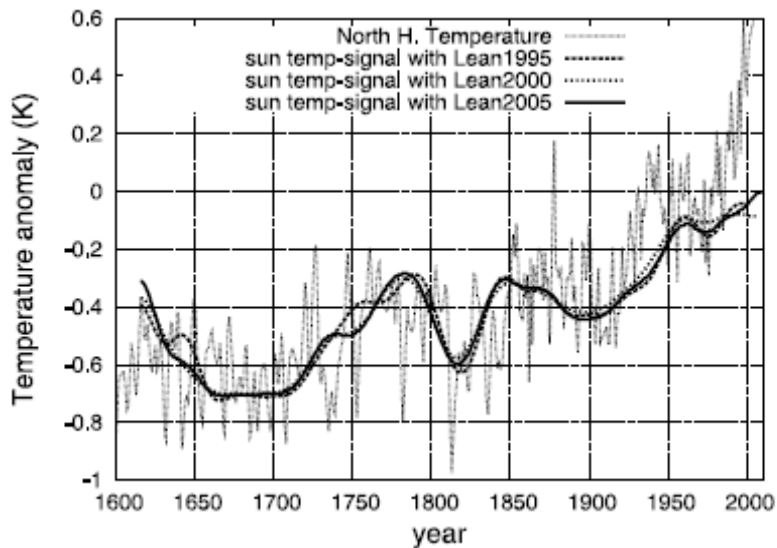
The photograph shows where the giant glacier terminates and flows into Lake Argentino, creating the impression—thanks to Gore’s caption—that Perito Moreno is literally melting away. But the picture does not show what Gore says it shows, because the glacier is not shrinking! Perito Moreno “advances at a speed of up to 2 m per day (around 700 m per year), although it loses mass at approximately the same rate [via calving], meaning

that aside from small variations, its terminus has not advanced or receded in the past 90 years.”¹¹

AIT: The red lines show how quickly the Columbia Glacier in Alaska has receded since 1980. (50)

Comment: It is unclear to what extent, or whether, CO₂-induced warming is responsible for the Columbia Glacier’s recession.

First, like the Snows of Kilimanjaro and Glacier Park’s glaciers, the Columbia Glacier has been in retreat since the late 19th century—well before the rapid buildup in CO₂ levels. Ice core data obtained by Etheridge *et al.* (1998) at Law Dome, Antarctica indicate that atmospheric CO₂ levels fluctuated around 280 ppm from 1006 A.D. until the late 18th century, rising gradually to 297 ppm in 1899 and 309 ppm in 1939.¹² This and other evidence suggest that some—perhaps much—of the early 20th century warming was due to natural causes. For example, Scafetta and West (2006) find a strong correlation between Northern Hemisphere temperature over the past 400 years and three reconstructions of total solar irradiance (TSI) during the same period.¹³ See the Figure below.



Source: Scafetta and West (2006)

The authors note that there is “good agreement between the patterns [of temperature and solar irradiance] for the three pre-industrial era centuries,” and that during the 20th century “one continues to observe a significant correlation between the solar and temperature patterns: both records show an increase from 1900 to 1950, a decrease from 1950 to 1970, and again an increase from 1970 to 2000.” They are careful to point out that TSI variation alone is not a strong enough “forcing” mechanism to account for the associated temperature changes. Accordingly, they use TSI variation as a proxy for the entire suite of direct and indirect solar climate effects, which presently are not well

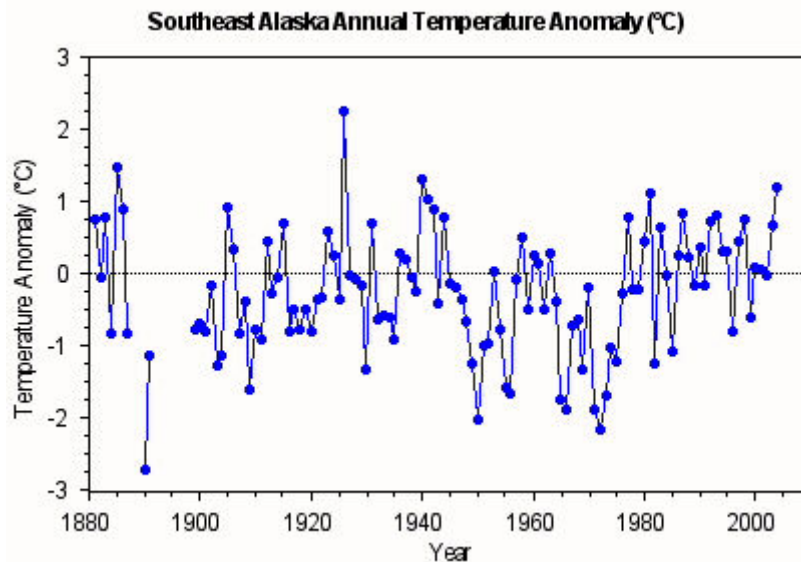
understood. Scafetta and West find that since 1975, global warming “has occurred much faster than could reasonably be expected from the sun alone.” However, they conclude, “the sun might have contributed approximately 50% of the total global surface warming since 1900.”

In contrast, Foukal et al. (2006) conclude that solar luminosity variation “is unlikely to have had a significant influence on global warming since the 17th century,” although the authors acknowledge that, “Additional climate forcing by changes in the Sun’s output of ultraviolet light, and of magnetized plasmas, cannot be ruled out.”¹⁴

In short, there is a bona fide scientific debate over the Sun’s contribution to climate change during the Earth’s recovery from the Little Ice Age in the late 19th century and the pre-1950 warming of the 20th century. AIT hides this from the reader.

According to Pelto and Hartzell (2003), Columbia Glacier lost 57 meters of ice thickness from 1911 to 1984, 11 meters from 1965 to 2002, and 8 meters from 1980 to 2002.¹⁵ In other words, most of the loss in ice thickness occurred before the recent period of “human” global warming. Pelto and Hartzell also note that the Columbia Glacier lost ice even during 1950-1976, “when conditions became cooler and precipitation increased.”

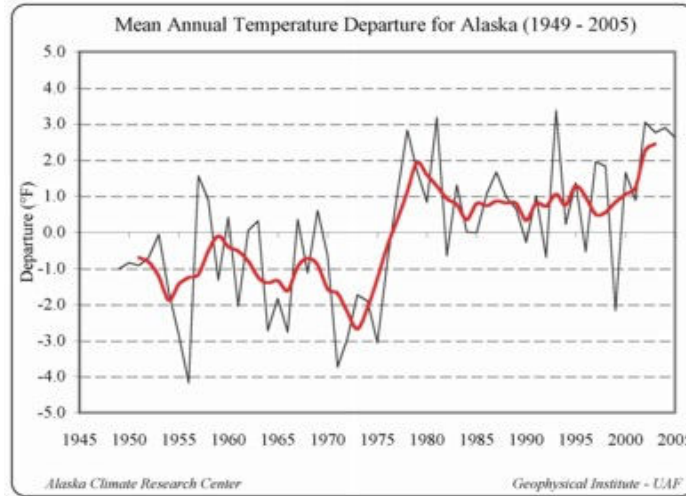
Second, during the past 55 years, there has been no overall temperature trend in the Prince William Sound area, where the Columbia Glacier resides.¹⁶



The annual temperature history of Southeastern Alaska (the average of observations taken at Annette Island, Sitka, Juneau, and Yakutat, whenever available) shows no long-term trend.

Third, AIT laments the decline in the Columbia Glacier since 1980. But all of Alaska warmed suddenly in 1976 when a natural cycle known as the Pacific Decadal Oscillation (PDO) shifted from its cooler negative to its warmer positive phase. The Alaska Climate

Research Center (ACRC) shows that there is no linear trend in Alaska temperatures from 1949 to 2005, as might be expected from the fairly steady increase in CO₂ levels during this period. Rather, there were two slight cooling trends—the first from 1949 to 1975, the second from 1977 to 2001—interrupted by an overriding step-like warming in 1976 corresponding to the PDO phase shift.¹⁷ See the Figure below.



Could man-made global warming be the underlying cause of the 1976 PDO regime shift? If it is, then all climate model projections of global warming are suspect, as Patrick Michaels explains:

The 1976 temperature jump is the subject of so many scientific papers that it has attained a lofty moniker: “The Great Pacific Climate Shift.” If you are tempted to believe that global warming may be to blame, keep in mind that climate models produce rather smooth temperature increases—not sudden jumps—when increasing levels of greenhouse gases are fed into them. So if you choose to believe that greenhouse gases are to blame for the Pacific Climate Shift, then you’ve just undermined the computer models upon which predictions of apocalypse rely. You can’t believe in both.¹⁸

Fourth, Alaska was as warm as it is today at least twice during the past two millennia, long before mankind had the potential to affect global temperatures. Consider this excerpt from CO₂Science.Org’s review¹⁹ of Hu et al (2001):²⁰

Noting that “20th-century climate is a major societal concern in the context of greenhouse warming,” Hu *et al.* conclude by reiterating that their record “reveals three time intervals of comparable warmth: AD 0-300, 850-1200, and post-1800,” and they say that “these data agree with tree-ring evidence from Fennoscandia, indicating that the recent warmth is not atypical of the past 1000 years,” in *unmistakable contradiction* of those who claim that it is.

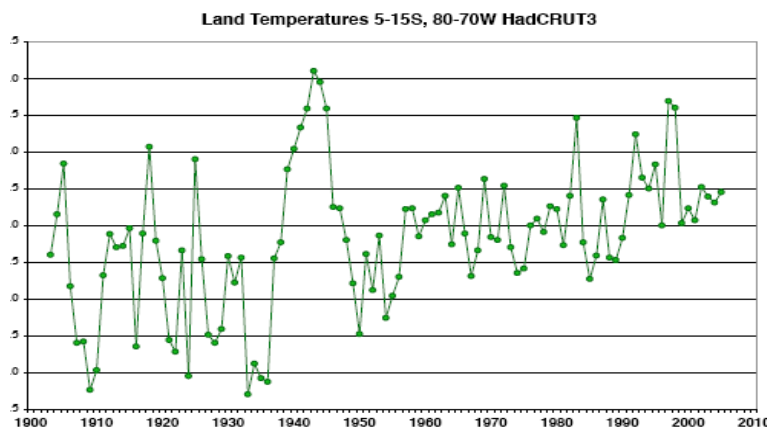
In a study going back even further in time, Kaufmann et al. (2004) found that Alaska was as much as 2°C warmer than the present during the early Holocene, about 11,000-9,000 years ago.²¹ The early Holocene warming occurred even though it was to some extent “counteracted” by the residual Laurentide Ice Sheet, which “chilled” Northeast Canada and the Labrador Sea. To summarize: (1) Alaska has been as warm as or warmer than it is today without any help from CO2 emissions; (2) the Columbia Glacier began its retreat in the early 20th century; and (3) the recent warmth in Alaska is largely attributable to the 1976 PDO shift. How then can Gore be sure that the glacier’s retreat is entirely or mainly due to rising CO2 levels?

AIT: Everywhere in the world the story is the same, including in the Andes in South America. (52)

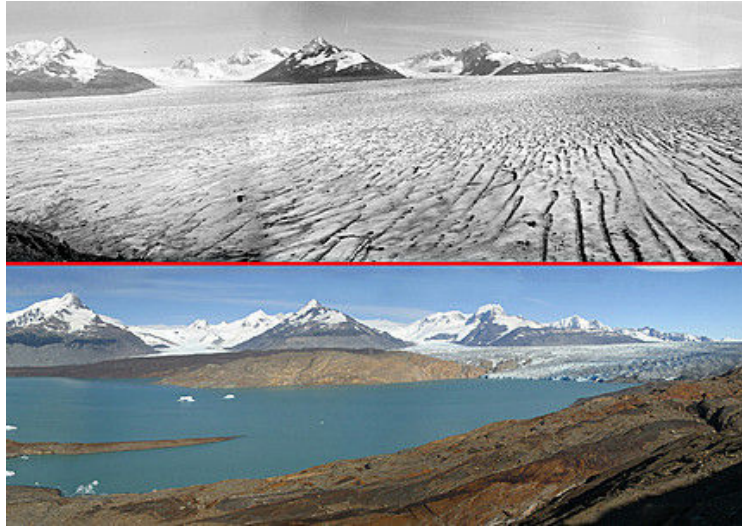
Comment: Andean glaciers have been in retreat for 150 years, ever since the world emerged from the Little Ice Age (LIA) cold period.²² The LIA was probably the coldest period of the last 3,000 years.²³ Many glaciers advanced and reached their maximum size during the LIA. Therefore, many were bound to recede during the natural recovery from the LIA—including the tropical glaciers of the Peruvian Andes.

Polissar et al. (2006) found evidence of four LIA glacial advances in the tropical Andes during A.D. 1250-1810.²⁴ Those advances coincided with periods of “solar-activity minima,” indicating a “strong influence” of solar activity on “century-scale tropical climate variability during the late Holocene.” Analyzing three of the Polissar team’s datasets that span the 1,500-year period from A.D. 500 to 2000, CO2Science.Org finds that all three indicate that the pre-LIA period from roughly A.D. 550-1000 was warmer than the current warm period.²⁵

Although a greenhouse “signal” may be detectable in the post-1970 period, the Peruvian Andes were warmer in the mid-1940s than during recent decades. See the Figure below.



AIT: This beautiful image of a magnificent glacier in Patagonia, on the tip of South America, shows how it stood 75 years ago. That vast expanse of ice is now gone. (54)



Upsala Glacier, Patagonia, Argentina, 1928, 2004.

Comment: A quibbler might fault Gore for not mentioning Pio XI, the largest Patagonian glacier, which is advancing and is “larger now than at any time in the last 6,000 years.”²⁶ See the image below.²⁷



However, of 63 large Patagonian glaciers, only Pio XI and Perito Moreno are not retreating, and only Pio XI is growing. The general pattern is one of glacial retreat and thinning. Although other factors, such as decreased precipitation, are also at work, the predominant influence is global warming.²⁸ Gore is correct about that.

But is all or most of the warming due to rising CO₂ levels? That is not as evident as Gore supposes. Various proxy data indicate that Patagonian glaciers have waxed and waned for millennia as the Earth has gone through natural climate oscillations. CO₂Science.Org

summarizes a study²⁹ that identified several alternating periods of glacial advance and retreat in Patagonia:

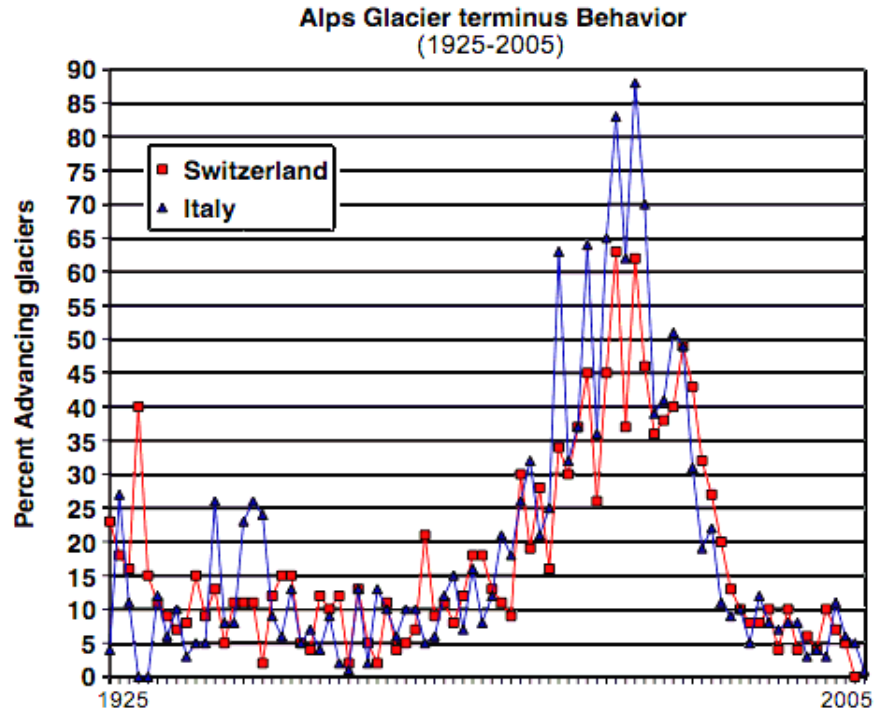
Glasser *et al.* (2004) describe a large body of evidence related to glacier fluctuations in the two major ice fields of Patagonia: the Hielo Patagonico Norte (47°00'S, 73°39'W) and the Hielo Patagonico Sur (between 48°50'S and 51°30'S). This evidence indicates that the most recent glacial advances in Patagonia occurred during the Little Ice Age, out of which serious cold spell the earth has been gradually emerging for the past two centuries, causing many glaciers to retreat. Prior to the Little Ice Age, however, there was an interval of higher temperatures known as the Medieval Warm Period, when glaciers also decreased in size and extent; and this warm interlude was in turn preceded by a still earlier era of pronounced glacial activity that is designated the Dark Ages Cold Period, which was also preceded by a period of higher temperatures and retreating glaciers that is denoted the Roman Warm Period.

Prior to the Roman Warm Period, Glasser *et al.*'s presentation of the pertinent evidence suggests there was another period of significant glacial advance that also lasted several hundred years, which was preceded by a several-century interval when glaciers once again lost ground, which was preceded by yet another multi-century period of glacial advance, which was preceded by yet another long interval of glacier retrenchment, which was preceded by still another *full cycle* of such temperature-related glacial activity, which at this point brings us all the way back to sometime between 6000 and 5000 ¹⁴C years before the present (BP).³⁰

AIT allows or encourages the reader to assume that the 1928 photo shows the Upsala Glacier in its “normal” condition—its baseline state. Too bad there are no photographs of Upsala from earlier warm periods such as the Medieval Warm Period, the Roman Warm Period, and the early Holocene Climate Optimum. We might then find that what we see in Gore’s 2004 photo is nothing new under the Sun.

AIT: Throughout the Alps we are witnessing a similar story [of disappearing glaciers]. (56)

Comment: That is correct, as the Figure below shows.

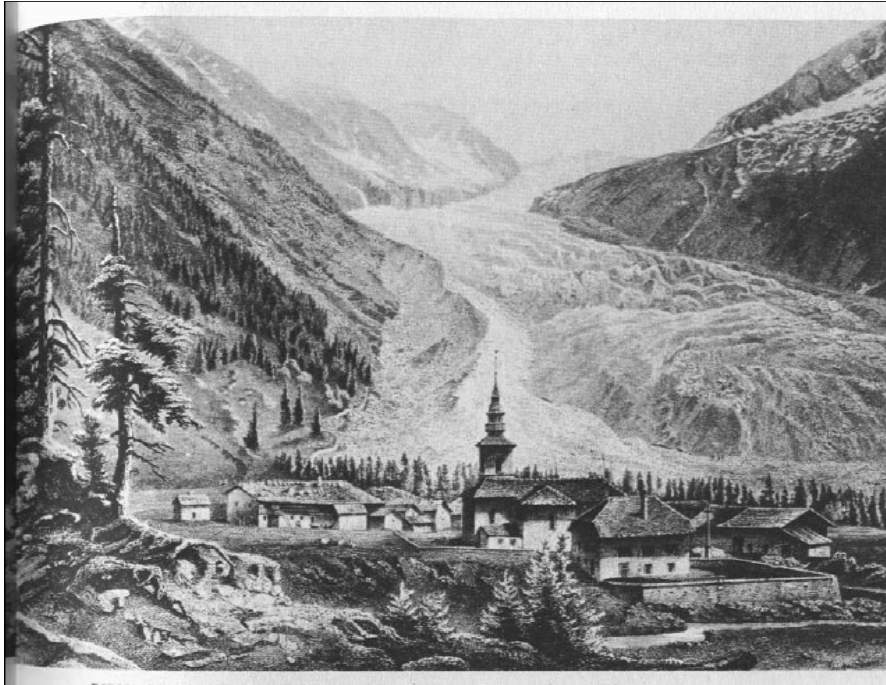


This chart from the annual Glacier Commission surveys in Italy and Switzerland shows the percentage of advancing glaciers in the Alps. Source: Wikipedia³¹

The Figure also shows something else: Glaciers are dynamic systems. They never stay the same. They are either advancing or retreating. Is glacial advance always good and glacial retreat always bad? Here is a photograph of the Swiss Argentièrè glacier in 1966:



Here is an illustration of the same glacier in 1850:



As Patrick Michaels likes to ask about the 1850 illustration, “What are these people praying for in this church? They’re praying that this glacier does not destroy their town.”³²

The Wikipedia chart above shows that most Alpine glaciers advanced during the 1950s and 1960s—a period of global cooling. If the cooling had continued, the glaciers likely would have continued to grow. Cooling is “good” for glaciers. But is it good for people?

AIT never faces the possibility that retreating glaciers are a price we must pay to avoid a more perilous condition—global cooling. In a recent study, a research team led by William Ruddiman, former chairman of the University of Virginia environmental sciences department, concludes: “Without any anthropogenic warming, Earth’s climate would no longer be in a full-interglacial state but be well on its way toward the colder temperatures typical of glaciations.”³³

The Ruddiman team estimates that, were it not for rising greenhouse gas levels—due to fossil fuel combustion plus centuries of deforestation in Eurasia, irrigation for rice farming in Southeast Asia, biomass burning, and livestock production—the global average temperature would be about 2°C lower than it is now and “roughly one-third of the way toward full-glacial temperatures.” Patrick Michaels’s commentary³⁴ is worth quoting at length:

This result puts global warmers in a difficult position. Their bedrock belief is that the earth’s climate was merrily chugging along the way Nature

intended prior to the Industrial Revolution. Then all sorts of pernicious human activity started interfering with how the climate should “naturally” behave, ultimately leading to where we are now—on the brink of environmental catastrophe....

The message from the Ruddiman paper is basically the opposite: anthropogenic climate change to date has saved us from what would have been the most serious and far-reaching challenge facing humankind in the twenty-first century, namely dealing with a climate rapidly deteriorating into an ice age. After all, no matter what scary scenarios the global warming enthusiasts can dream up, they all pale in comparison to the actual conditions that ice ages have served up in the past—for instance, 21,000 years ago, an ice sheet covered all of North America north of a curve stretching from about Seattle to Indianapolis to New York City....

Considering that the earth has spent about 90 percent of its time during the past 1.8 million years in ice age conditions, and only about 10 percent of the time in warm conditions, we should consider ourselves lucky to be living when we do. Actually, luck has little to do with it: that the last 10,000 years have been warm is more than likely the reason that humanity has flourished. [For documentation of the thesis that, in general, humanity thrives in warm periods and suffers in cold periods, see Thomas Gale Moore’s *Climate of Fear*.³⁵]

All this optimistic talk puts the alarmists in a bind. Now, they either have to admit that the “natural” climate is an undesirable one and the human influence on the climate should be applauded, or they must dismiss the Ruddiman results. The problem with the latter solution is that the Ruddiman results were derived from a complex climate model that incorporates not only atmospheric and oceanic components, but also vegetation, soils, snow, and sea ice models. Similar kinds of models are used by modelers to project the future course of climate....So, obviously, climate model results can’t simply be dismissed by the very people who rely on them the most.

The only escape from the horns of this dilemma is equally unpalatable to climate alarmists—the hypothesis that glacial retreat is largely a consequence of natural climate oscillations. S. Fred Singer and Dennis Avery have assembled an abundance of proxy data showing that, throughout the Holocene, the Earth has alternately warmed and cooled at $1,500 \pm 500$ -year intervals.³⁶ The current warming coincides with the upswing of this “unstoppable” millennial-scale oscillation. The cause of these oscillations is unknown, although Braun et al. (2005) found that the combination of two solar cycles, the ~ 210 -year DeVries-Suess cycle and the ~ 87 -year Gleissberg cycle, could produce rapid climate shifts occurring at $\sim 1,470 \pm 500$ -year intervals.³⁷

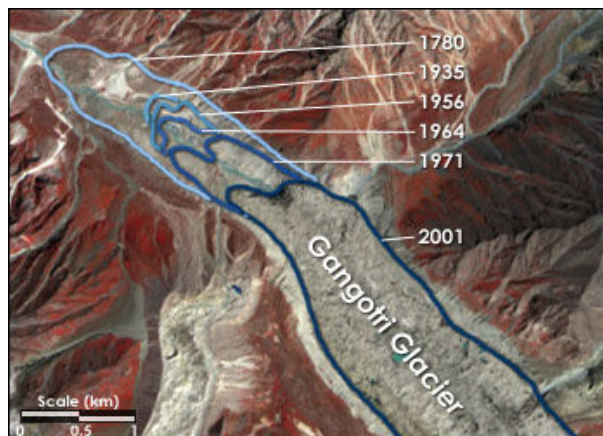
Consistent with the Singer-Avery hypothesis of ~1,500-year warming-cooling cycle, Holzhauser et al. (2005) found that the Great Aletsch glacier, the largest of all glaciers located in the European Alps, was approximately 1,000 meters shorter than it is today during the late Bronze Age Optimum from 1350 to 1250 BC, a period of exceptional warmth. The glacier grew in both mass and length after an intervening unnamed cold period, and then “reached today’s extent or was even somewhat shorter than today” during the “Iron/Roman Age Optimum between c. 200 BC and AD 50,” otherwise known as the Roman Warm Period. The glacier grew again during the Dark Ages Cold Period, shrank back during the Medieval Warm Period, and expanded once more during the Little Ice Age, after which the glacier began its latest and continuing retreat in 1865.³⁸

In its review of this study, CO2Science.Org notes that, “Data pertaining to the Gorner glacier (the second largest of the Swiss Alps) and the Lower Grindelwald glacier of the Bernese Alps tell much the same story, as Holzhauser *et al.* report that these glaciers and the Great Aletsch glacier ‘experienced nearly synchronous advances’ throughout the study period.”³⁹

This remarkable 3,500-year history of West Central European glaciers raises an obvious question. If the Great Aletsch glacier was shorter in the Bronze Age Optimum and the Roman Warm Period than it is today, how can we be sure that anthropogenic global warming rather than natural climate variability is the principal cause of Alpine glacier retreat today?

AIT: The Himalayan Glaciers on the Tibetan Plateau ... contain 100 times as much ice as the Alps and provide more than half of the drinking water for 40% of the world’s population—through seven Asian river systems that all originate on the same plateau. Within the next half-century, that 40% of the world’s people may well face a very serious drinking water shortage, unless the world acts boldly and quickly to mitigate global warming. (58)

Comment: Again, to what extent is glacial retreat in the Himalayas due to rising CO2 levels versus natural climate variability? The image below shows that glacial retreat has been occurring since 1870, long before the rapid buildup in atmospheric CO2 levels.



Composite ASTER image showing retreat of the Gangotri Glacier terminus in the Garhwal Himalaya since 1780. Glacier retreat boundaries courtesy of the Land Processes Distributed Active Archive Center⁴⁰

As regards Gore's claim that global warming will cause water shortages, the water that feeds Asia's river systems comes from melting snow, not from melting glacial ice. Data going back four decades show no trend in Eurasian snow cover for the months of November, December, January, February, and March.⁴¹

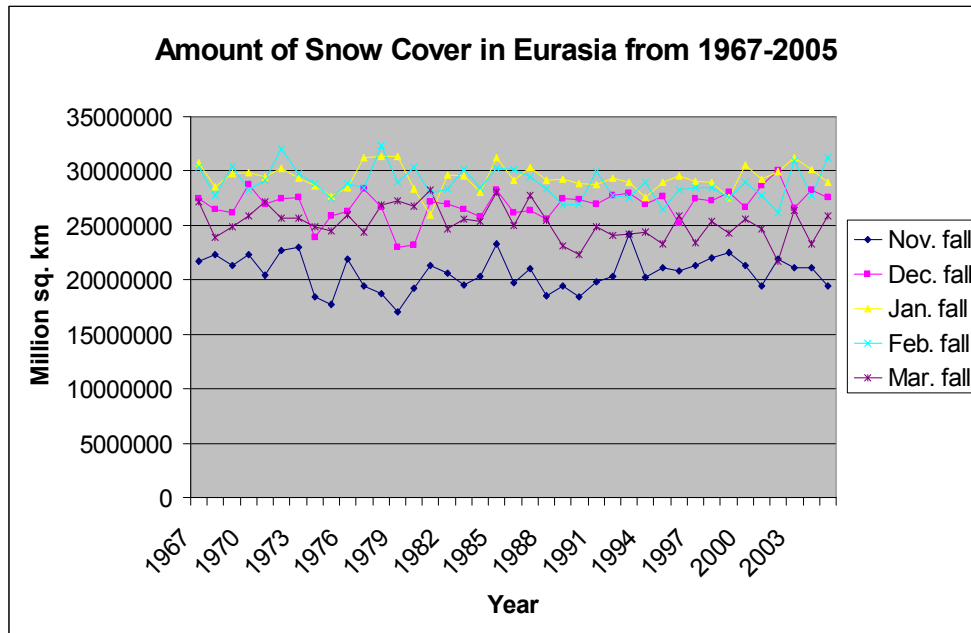


Figure is based on data from Rutgers University Global Snow Lab

Suppose for the sake of argument that Asian water supplies come from the glaciers. Wouldn't accelerated ice melt from global warming alleviate water shortages in the coming decades?⁴² Alternatively, suppose global warming would diminish annual Tibetan snow pack and, thus, Asian water supplies. Could policymakers, by acting "boldly and quickly to mitigate global warming," avert a "serious drinking water shortage" over the "next half-century," as Gore contends? No.

The world is "already committed to a certain amount of warming" beyond what we have already experienced, because the extra CO₂ currently in the atmosphere will warm the planet for decades to come.⁴³ Moreover, atmospheric CO₂ levels are bound to increase for decades, regardless of the mitigation policies governments adopt.⁴⁴ Therefore, CO₂ regulations would provide little if any protection from potential water shortages in Asia during the next half-century. Such policies might even be counter-productive, not only by diverting attention and resources from more effective water management options, but also by suppressing the economic growth required to sustain investment in critical infrastructure generally.

III. Climate Reconstructions from Proxy Data

AIT: ...the so-called global warming skeptics often say that global warming is really an illusion reflecting nature's cyclical fluctuations.

Comment: Some so-called skeptics doubt that the current warming is entirely or mainly driven by rising CO₂ levels. That does not mean they view global warming as an "illusion."⁴⁵

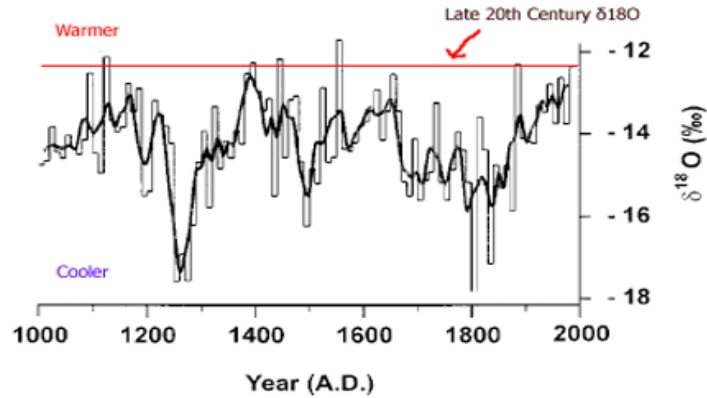
AIT: To support their view, they [the skeptics] frequently refer to the Medieval Warm Period. But as Dr. [Lonnie] Thompson's thermometer [analysis of the ratio of oxygen-16 to oxygen-18 in ice cores] shows, the vaunted Medieval Warm Period (the little red blip from the left, below) was tiny compared to the enormous increase in temperatures of the last half-century (the red peaks at the far right of the chart). (64)

Comment: Thompson analyzed the isotopic oxygen ratios in three Andean and three Tibetan ice cores.⁴⁶ The graph Gore presents on page 63, and again on pages 64-65, appears in Thompson's study but it is not the graph of Thompson's composite ice core data. Rather, Gore's graph (Figure 7d of Thompson's paper) is the Hockey Stick reconstruction of Northern Hemisphere climate history (about which, more presently), which Thompson included for purposes of comparison.⁴⁷

More importantly, contrary to Gore's assertion, Thompson's study does prove that the Medieval Warm Period was "tiny" compared to the late 20th century warming.

To begin with, not all scientists accept Gore's characterization of Thompson's "thermometer" as "highly accurate." Ramirez et al. (2003) argue that, "in low latitudes empirical evidence linking temperature and the stable water isotopes in modern precipitation breaks down and instead, precipitation amount dominates the signal."⁴⁸ In other words, isotopic oxygen records from the tropical Andes may chiefly reflect changes in precipitation rather than changes in temperature.⁴⁹

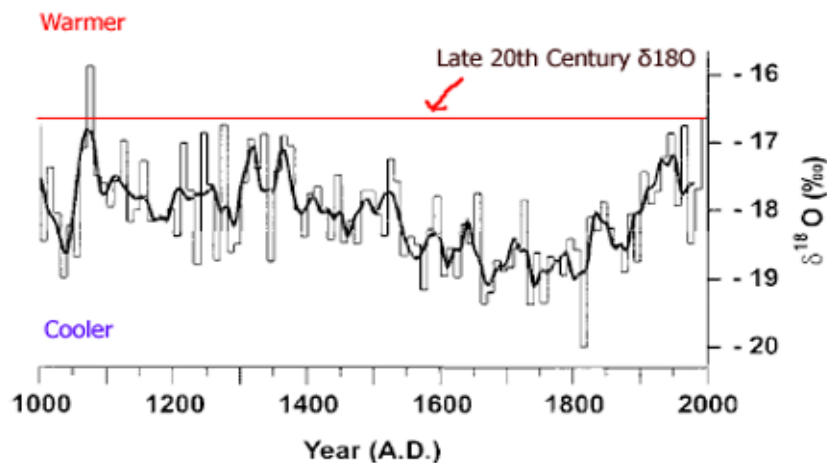
Even if Thompson's thermometer is accurate, the conclusion that Gore draws from it is questionable. Of the three Tibetan ice cores Thompson examined, the Dunde and Guliya sites actually depict several decadal periods of the past that were warmer than the last few decades of the 20th century. See the Figure below on the Guliya ice core.⁵⁰



Decadally-averaged $\delta^{18}\text{O}$ records from the Guliya ice core over the past millennium. The darker, smooth curve is a 3-decade running mean. Adapted from Thompson et al.

Because the Dasuopo site shows a much more dramatic difference in the opposite direction, it rules the average result. This is the correct way to average, but averaging would not be necessary if a reliable reconstruction could be derived from a single site. Without many additional observations, it is impossible to know whether the average is truly representative or is skewed by a single dataset.

Similarly, of the three Andean ice cores Thompson examined, the Quelccaya and Sajema sites show greater warming in past centuries than in the 20th century. See the Figure below on the Quelccaya ice core.



Decadally-averaged $\delta^{18}\text{O}$ records from the Quelccaya ice core over the past millennium. The darker, smooth curve is a 3-decade running mean. Adapted from Thompson et al.

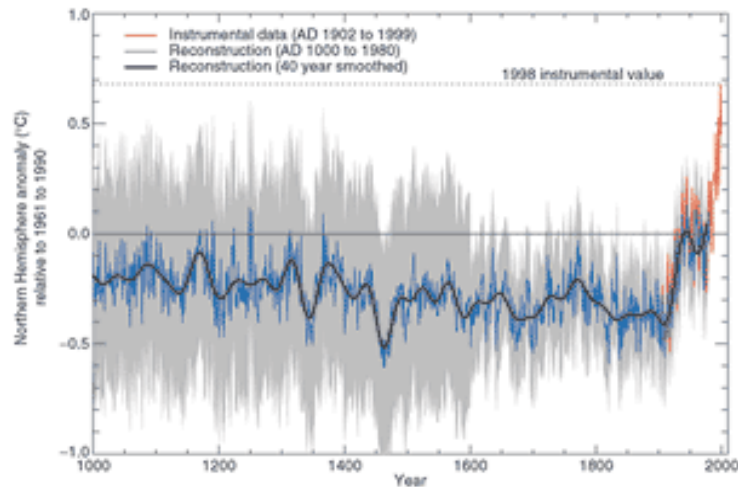
In short, only two of Thompson's six sites show recent temperatures to be greater than earlier temperatures.

Developing an accurate temperature history of past millennia requires many results from all around the world using many types of proxy data. Numerous records indicate that the Medieval Warm Period and the earlier Roman Warm Period were as warm as or warmer

than the current warm period. CO2Science.Org has reviewed literally scores of such studies. As noted earlier, the study by Polissar et al. (2006) indicates that the Andes region was warmer during the Medieval Warm Period than it is today. Bao et al. (2003), analyzing isotopic oxygen ratios and other proxy data, found that each part of the Tibetan Plateau (northeastern, southern, and western) had at least one 50-year period during the last 2000 years when the mean temperature was warmer than it was during the last 50 years.⁵¹

AIT: Those global warming skeptics...launched a fierce attack against another measurement of the 1,000-year correlation between CO2 and temperature known as “the hockey stick,” a graphic image representing the research of climate scientist Michael Mann and his colleagues [Raymond Bradley and Malcolm Hughes]. But in fact, scientists have confirmed the same basic conclusions in multiple ways—with Thompson’s ice core record as one of the most definitive. (65)

Comment: The “fierce attack”—actually nothing more than due diligence to check Mann’s data and methods—was entirely appropriate. In its *Third Assessment Report* (2001), the IPCC presented the hockey stick in the Summary for Policymakers, the Technical Summary, twice in Chapter 2 (“Observed Climate Variability and Change”), and again in the *Synthesis Report*. The hockey stick was the basis for the IPCC’s claim (Summary for Policymakers, p. 3) that “the 1990s [likely] have been the warmest decade and 1998 the warmest year of the millennium.” Unsurprisingly, the hockey stick (see the Figure below) became an instant poster child for global warming alarmism and pro-Kyoto advocacy.



Millennial Northern Hemisphere (NH) temperature reconstruction (blue – tree rings, corals, ice cores, and historical records) and instrumental data (red) from AD 1000 to 1999. Smoother version of NH series (black), and two standard error limits (gray shaded) are shown.

The hockey stick reconstruction depicted a relatively stable climate with a slight cooling trend from 1000 A.D. to 1900, and then a sharp upward spike in the 20th century. Two Canadians, Stephen McIntyre and Ross McKittrick (M&M), published two critiques of the hockey stick in *Energy & Environment* in 2003 and a third critique in *Geophysical*

Research Letters in 2005.⁵² Among other weaknesses, M&M found that Mann, Bradley, and Hughes (MBH) “de-centered” their proxy data, picking a mean that inflates the importance of data generating hockey stick shapes.⁵³

At the request of the House Energy and Commerce Committee, Dr. Edward J. Wegman of George Mason University’s Center for Computational Statistics assembled a team of statisticians to assess M&M’s critique of MBH’s data and methods. The Wegman team found that:

- “The net effect of this decentering using the proxy data in MBH98 and MBH99 is to produce a hockey stick shape.”
- “In general, we found the writings of MBH98 and MBH99 to be somewhat obscure and incomplete and the criticisms of M&M03/03a/05a to be valid.”
- “Overall, our committee believes that the MBH99 assessment that the decade of the 1990s was likely the hottest decade of the millennium and 1998 was likely the hottest year of the millennium cannot be supported by their analysis.”⁵⁴

Gore suggests that MBH’s analytic shortcomings do not matter, because other scientists have confirmed their results. But as M&M pointed out, and as Wegman confirmed, those other scientists often work with Mann, and tend to use the same datasets. Because of these close connections and shared proxies, the other studies might not be as independent as they appear to be.

AIT: At no point in the last 650,000 years before the pre-industrial era did the CO₂ concentration go above 300 parts per million...Here’s where CO₂ is now [380 ppm]—way above anything measured in the prior 650,000-year record. (66)

Comment: Both claims—that CO₂ concentrations “never” rose above 300 ppm in pre-industrial times, and that the current level is “way above anything” measured in the prior 650,000-year record—are questionable. Wagner et al. (1999), analyzing the stomatal frequency of birch tree leaves buried in peat deposits near Denekamp, in the Netherlands, estimate that CO₂ levels during the early Holocene exceeded 330 ppm for centuries,⁵⁵ rising as high as 348 ppm—roughly the CO₂ level for 1987.⁵⁶ CO₂Science.Org summarizes the Wagner team’s research:

Atmospheric CO₂ concentrations 10,000 years ago were determined to be between 260 and 265 ppm. Thereafter, they rose to a value near 330 ppm over the course of a century. Concentrations remained in the 330 ppm range over the next 300 years, whereupon they declined to about 300 ppm. A second sharp increase in atmospheric CO₂ concentration to a maximum value of 348 ppm followed, with concentrations hovering between 333 and 347 ppm for the duration of the record.

This study challenges two assumptions commonly made by climate alarmists—that CO₂ levels during the Holocene were relatively stable until mankind started combusting fossil fuels, and that current CO₂ levels far exceed the range of natural variability.

AIT: “It’s a complicated relationship,” writes Gore, referring to a two-page graph showing CO₂ levels rising and falling along with global temperatures during the past 650,000 years, “but the most important part of it is this: When there is more CO₂ in the atmosphere, the temperature increases because more heat from the Sun is strapped inside.” (67)

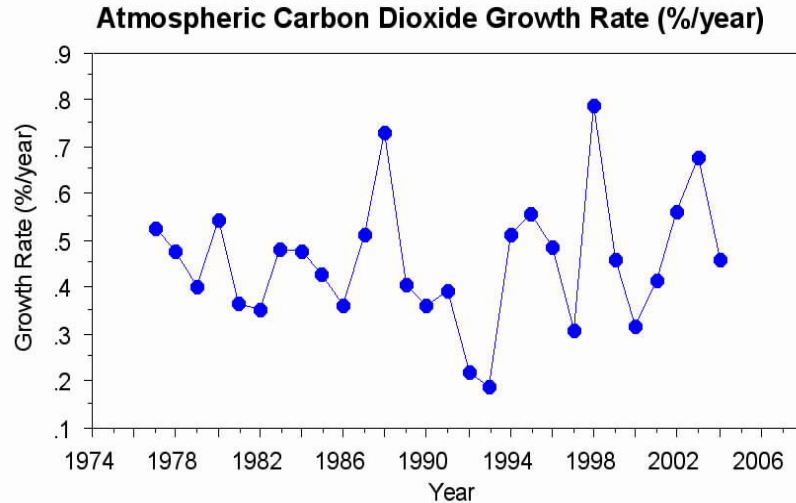
Comment: The foregoing statement is carefully parsed. Gore does not actually say that changes in CO₂ levels caused the alternation between ice ages and warm interglacial periods, but he allows or even encourages readers (or viewers) to draw that conclusion. In reality, global temperature changes preceded changes in CO₂ levels by hundreds to thousands of years.⁵⁷ The causality is very nearly the opposite of what Gore insinuates. When ocean temperatures fall, seawater retains more dissolved CO₂, and the expansion of polar sea ice further limits sea-to-air CO₂ flux. Conversely, when the oceans warm, more dissolved CO₂ outgases into the air.⁵⁸ At most, changes in the air’s CO₂ content had an amplificatory effect on climate changes already under way.⁵⁹

Ironically, Gore’s 650,000-year graph of CO₂ levels and global temperatures shows that each of the previous four interglacial periods was warmer than the one in which we are now living, even though CO₂ levels were lower. Gore makes no mention of this, but it is well established in scientific literature.⁶⁰ For example, during the peak of the last interglacial period, roughly 130,000 to 127,000 years ago, various proxy data indicate that summer surface temperatures in Arctic Canada and Greenland were 4-5°C warmer than the present, and large portions of Siberia were 4-8°C warmer.⁶¹ Multiple ice cores indicate that East Antarctica was 2.5°C-5°C warmer than the present.⁶²

IV. Global Warming Projections

AIT: Here’s where CO₂ is now [roughly 380 ppm]—way above anything measured in the prior 650,000-year record. And within 45 years, this is where the CO₂ levels will be [roughly 620 ppm] if we do not make dramatic changes quickly. (65)

Comment: Gore here tacitly assumes what most climate models assume, namely, that CO₂ concentrations increase at a rate of 1% annually. In reality, as Covey et al. (2003) point out, “The rate of radiative forcing implied by 1% per year increasing CO₂ is nearly a factor of 2 greater than the actual anthropogenic forcing in recent decades, even if non-CO₂-greenhouse gases are added in as part of an ‘equivalent’ CO₂ forcing’ and anthropogenic aerosols [which are assumed to exert a net cooling influence on global temperatures] are ignored...”⁶³ Since 1977, CO₂ levels have been increasing at about 0.45% or 1.5 ppm per year.⁶⁴ If this 30-year trend continues, atmospheric CO₂ levels will be about 446 ppm in 2050—a full 174 ppm lower than what Gore projects.⁶⁵



There has been no significant trend in the annual growth rate of CO₂ concentrations during the past 30 years. The average value has been 0.45%/year (values derived from data available from the Carbon Dioxide Information Analysis Center).⁶⁶ Source: *World Climate Report*.⁶⁷

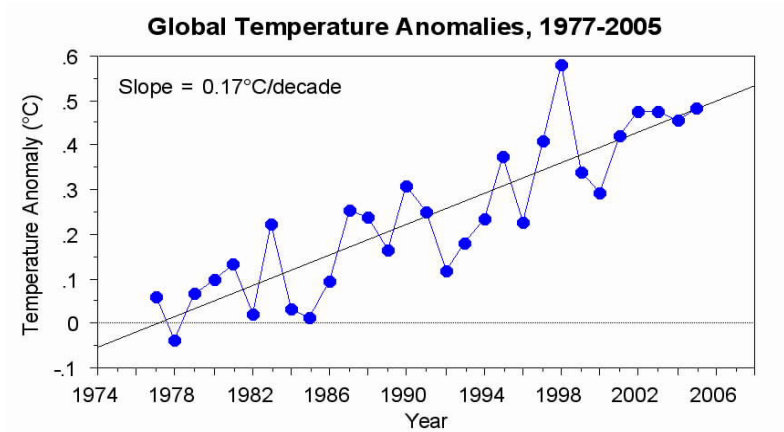
AIT: The top right point of this gray line shows current global temperatures and the bottom point marks the depth of the last ice age. That short distance—about an inch in the graph—represents the difference, in Chicago, between a nice day and a mile of ice over your head. Imagine what three times as much on the warm side would mean.

Comment: Gore invites us to imagine “three times” as much warming as has occurred since the “depth of the last ice age,” because the red line in his chart projects CO₂ levels about three times higher than ice-age levels by 2050. This thought experiment is unscientific on several counts. First, as we have just seen, Gore’s projection of CO₂ levels in 2050—roughly 620 ppm—assumes a significantly higher rate of increase than has been observed for the past 30 years. Second, the experiment implies that changes in CO₂ levels precede and thus cause glaciations and de-glaciations. As noted above, the causality largely runs the other way.

Third, AIT tacitly assumes a linear relationship between CO₂ levels and global temperatures, such that every additional part per million of CO₂ “forces” the climate by as much as the previous part per million. In reality, the CO₂-warming effect is roughly logarithmic, meaning that the next 100-ppm increase adds only half as much heat as the previous 100-ppm increase. The reason is that CO₂ absorbs long-wave (infrared) radiation only in certain spectra, and as CO₂ levels rise, more and more of the long-wave radiation that can possibly be absorbed at those frequencies has already been absorbed. As one scientist put it, “It would be analogous to closing more and more shades over the windows of your house on a sunny day—it soon reaches the point where doubling the number of shades can’t make it any darker.”⁶⁸

Gore: And in recent years the rate of increase has been increasing. In fact, if you look at the 21 hottest years measured, 20 of the 21 have occurred within the last 25 years. (72)

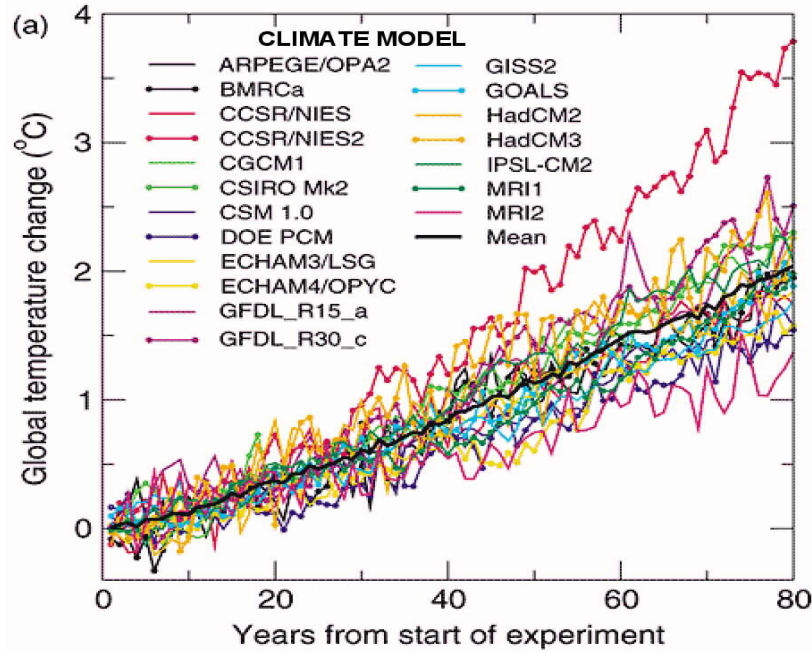
Comment: There has been no increase in the rate of warming since the mid-1970s, when the second 20th century warming period began. For the past 30 years, the planet has warmed at a remarkably constant rate of 0.17°C (or 0.31°F) per decade.⁶⁹



Annual globally averaged temperature anomalies, 1977-2005. Source: Climate Research Unit.⁷⁰

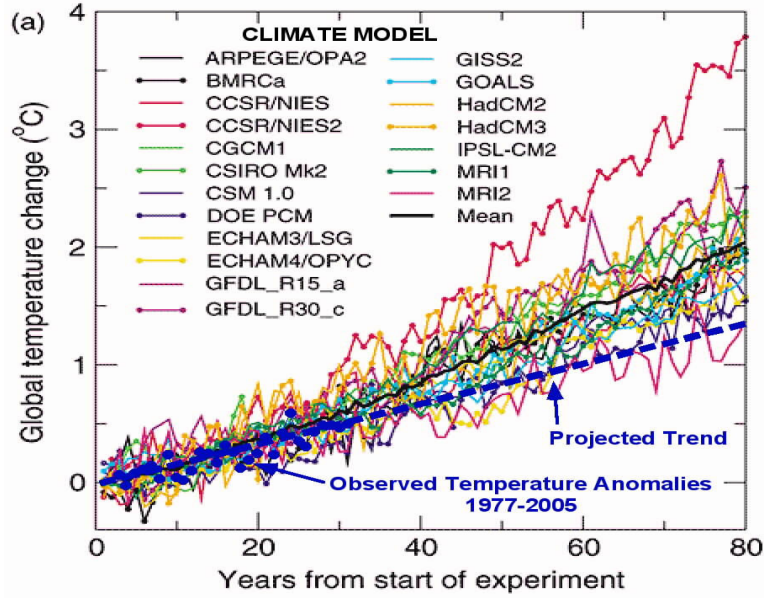
Thus, although 2005 was the second warmest year in the instrumental record,⁷¹ it falls exactly on the 0.17°C per decade trend line of the past 30 years. No surprise at all.

As Patrick Michaels has pointed out on many occasions, the constant, or linear, as opposed to accelerating, or exponential, rate of warming observed over the past three decades is “by and large the same behavior the vast majority of climate models predict the earth’s temperature will display when forced with ever increasing amounts of carbon dioxide.”⁷²



Temperature projections from a host of different climate models all run under a scenario of atmospheric carbon dioxide concentrations increasing at a rate of 1%/year. Source: *Third Assessment Report of the Intergovernmental Panel on Climate Change*, p. 537.⁷³

If the “consensus” among climate models in favor of linear (non-accelerating) warming is correct (and, if it isn’t, climate models are not reliable enough to guide policymakers anyway), then we are probably in store for about 1.7°C of warming in the 21st century. The models do in general predict more than 1.7°C of warming. But the models assume that CO₂ levels will increase by 1% annually, whereas the observed increase, as noted earlier, is only about half that rate—roughly 0.45% per decade. Therefore, we should expect a warming rate that is not only non-accelerating but also lower than what most models project. And that is in fact what we find in the instrumental record. The Figure below shows the observed warming trend, reflecting the actual rate of CO₂ increase, projected into the future.



V. Heat Waves

AIT: We have already begun to see the kind of heat waves that scientists say will become much more common if global warming is not addressed. In the summer of 2003 Europe was hit by a massive heat wave that killed 35,000 people. (75)

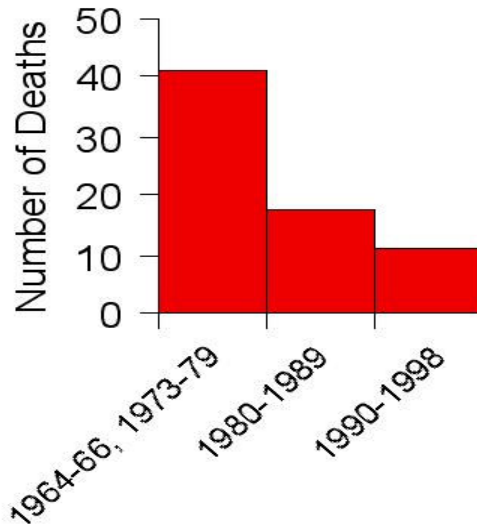
Comment: The European heat wave of 2003 was due to an atmospheric pressure anomaly, not global warming. Here is what the United Nations Environment Program—hardly a bunch of global warming skeptics—had to say:

This extreme weather was caused by an anti-cyclone firmly anchored over the western European land mass holding back the rain-bearing depressions that usually enter the continent from the Atlantic Ocean. This situation was exceptional in the extended length of time (over 20 days) during which it conveyed very hot dry air from south of the Mediterranean.”⁷⁴

Rasool et al. (2003) drew the same conclusion: “This study demonstrates that the summer 2003 heat wave in Europe was not a direct result of a globally averaged warmer lower troposphere, but was primarily associated with large scale circulation changes.”⁷⁵

The death toll in Europe was terrible—but part of the blame falls on the European distaste for air conditioning⁷⁶ and higher electricity costs that discourage use of air conditioning.⁷⁷ In the United States, heat-related mortality has fallen as urban temperatures have risen. See the Figure below.

Average Annual Heat-Related Mortality



Annual population-adjusted heat-related mortality averaged across 28 major U.S. cities. Each bar represents a different decade, beginning in the mid-1960s and ending in the late 1990s. Heat-related mortality has been steadily declining. Source: *World Climate Report*, adapted from Davis et al. (2003).⁷⁸

AIT: In the summer of 2005 many cities in the American West broke all-time records for high temperatures and for the number of consecutive days with temperatures of 100°F or more. In all, more than 200 cities and towns in the West set all-time records. (76)

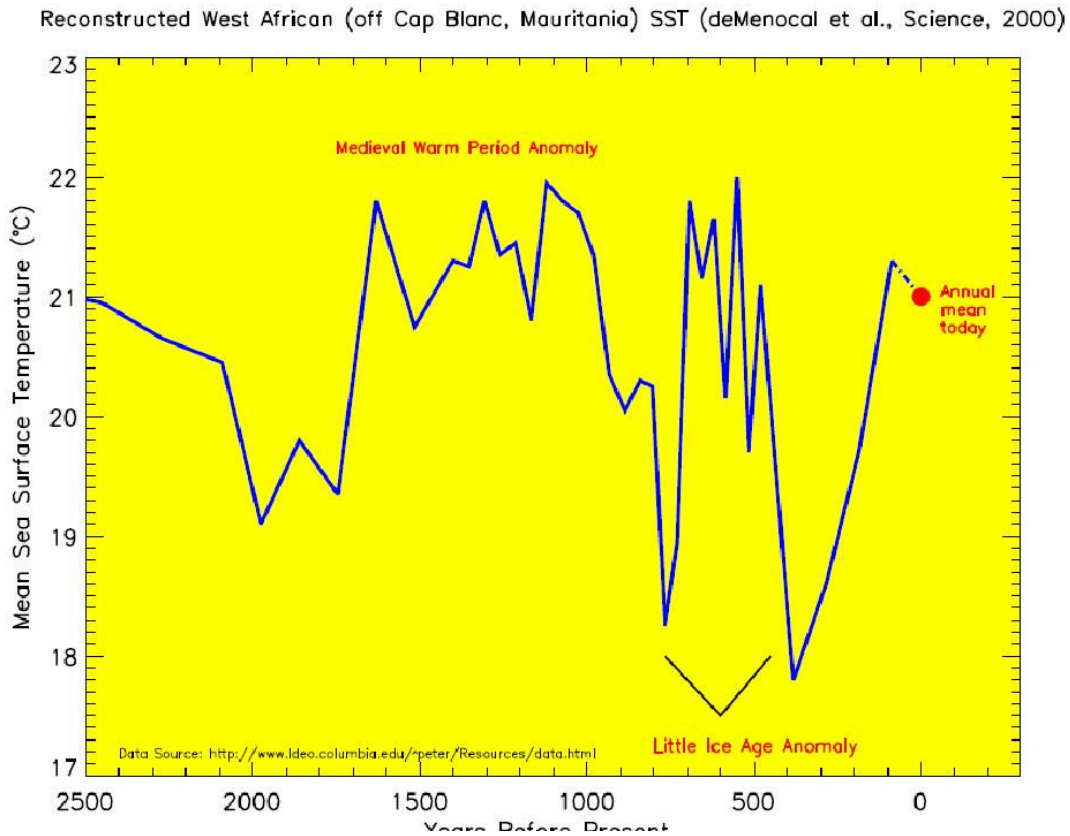
Comment: That is correct, but AIT should mention that cities and towns generate local heat islands that grow over time along with population. For example, a satellite study found that, “over the course of 12 years, between 1987 and 1999, the mean nighttime surface temperature heat island of Houston increased 0.82 ± 0.10 [°C].” The study noted that, “the growth of the UHI [urban heat island], both in magnitude and spatial extent, scales roughly with the increase in population, at approximately 30%.”⁷⁹ One implication of this study is that urban temperature records are apt to be broken continually as cities grow. As CO2Science.Org comments:

In just 12 years, the UHI of Houston grew by more than the IPCC calculates the mean surface air temperature of the earth rose *over the entire past century*, over which period the earth’s population rose by some 280% or *nearly an order of magnitude more* than the 12-year population growth experienced by Houston.⁸⁰

It also bears repeating that, although many U.S. cities posted record-breaking temperatures in 2005, this is not evidence global warming is accelerating, since the global average temperature in 2005 fell exactly on the long-term 0.17°C/decade trend line.

Gore: The actual ocean temperatures are completely consistent with what has been predicted as a result of man-made global warming. And they're way above the range of natural variability. (79)

Comment: Gore refers to a study finding 0.2-0.3°C of warming in the world's ocean basins over the past 40 years.⁸¹ The study does show that actual ocean temperatures are consistent with greenhouse climate models. However, the study does not show that ocean temperatures are "way above the range of natural variability." The Figure below illustrates a reconstruction of the sea surface temperature history off the coast of West Africa.⁸² The reconstruction suggests that sea surface temperatures in the region were higher during the Medieval Warm Period than they were during the past 40 years.



Reconstruction based on deMenocal (2000)

VI. Hurricanes

AIT: As the oceans get warmer, storms get stronger. (81)

Comment: *Some* storms *may* get stronger, but others may get weaker. There are two main types of storms, hurricanes (tropical cyclones) and wintertime (frontal) storms. Global warming is likely to affect each type differently.

Hurricanes draw their energy from the sea, and require warm sea surface temperatures (SSTs) to form. Some hurricanes may get stronger as the oceans warm, and the area of hurricane formation may expand. However, once SSTs reach about 83°F, as routinely happens in the Gulf of Mexico every summer, any hurricane has the potential to become a major (Category 3, 4, or 5) storm, if other conditions are present.⁸³ Such conditions include high humidity (dry air dissipates the hurricane's thunderstorm core) and low wind shear (strong winds in the upper troposphere rip hurricanes apart).⁸⁴ Whether, or to what extent, global warming is actually increasing the strength and/or frequency of hurricanes is an empirical question, discussed below.

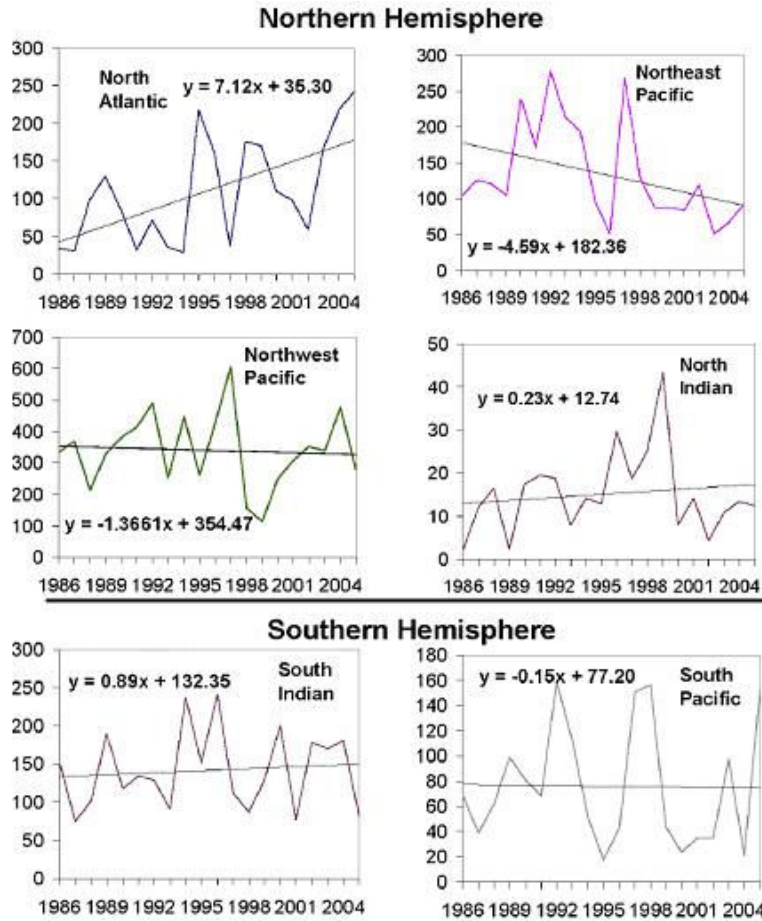
Wintertime storms draw their energy from the collision between cold and warm air fronts. If, as climate models predict, the higher northern latitudes warm more than the lower tropical latitudes, the temperature differential between colliding air masses should decrease, reducing the intensity of some winter storms.⁸⁵

AIT: But there is now a strong, new emerging consensus that global warming is indeed linked to a significant increase in both the duration and intensity of hurricanes. (81)

Comment: The scientific jury is still out on these matters. Kerry Emanuel of MIT found that hurricane strength, a combination of wind speed and storm duration, which he calls the “power dissipation index” (PDI), increased by 50 percent since the mid-1970s, and that the increase is highly correlated with rising SSTs.⁸⁶ However, other experts question these results.

Roger Pielke, Jr. of the University of Colorado finds that once hurricane damage is normalized for changes in population, wealth, and the consumer price index, there is no long-term change in hurricane damage—evidence against the hypothesis that hurricanes are becoming more destructive.⁸⁷ Christopher Landsea of NOAA, noting no trend in the PDI for land-falling U.S. hurricanes, suggests that Emanuel's finding may be an “artifact of the data”—a consequence of advances in satellite technology, which have improved detection, monitoring, and analysis of non-land-falling hurricanes.⁸⁸

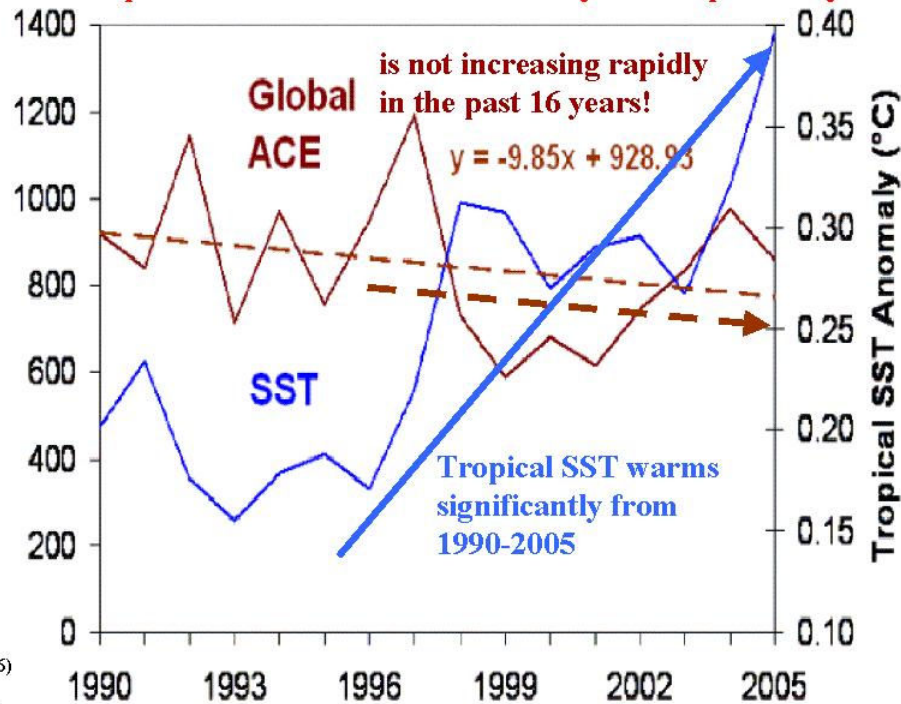
Philip Klotzbach of Colorado State University found “a large increasing trend in tropical cyclone intensity and longevity for the North Atlantic basin and a considerable decreasing trend for the North Pacific,” but essentially no trend in other tropical cyclone-producing ocean basins.⁸⁹ See the Figure below.



Accumulated Cyclone Energy (ACE) index values for six ocean basins. The ACE index is a measure of the energy contained in the tropical cyclone over its lifetime. There has been an increase in the North Atlantic, a decrease in the Northeast Pacific, and not much long-term change anywhere else.⁹⁰
Source: Klotzbach, 2006

Even more problematic for climate alarmists, although there was a slight increase in ACE worldwide during 1986-2005, Klotzbach found a slight downward trend in the 16-year period from 1990 to 2005, even though tropical sea surface temperatures increased by approximately 0.2°C to 0.3°C during this period. See the Figure below.

The global intensity and longevity of tropical cyclones, averaged over all ocean basins (global ACE), is definitely not increasing rapidly as the tropical SST warms dramatically in the past 16 years



Klotzbach (2006)
GRL, vol. 33,
2006GL025881

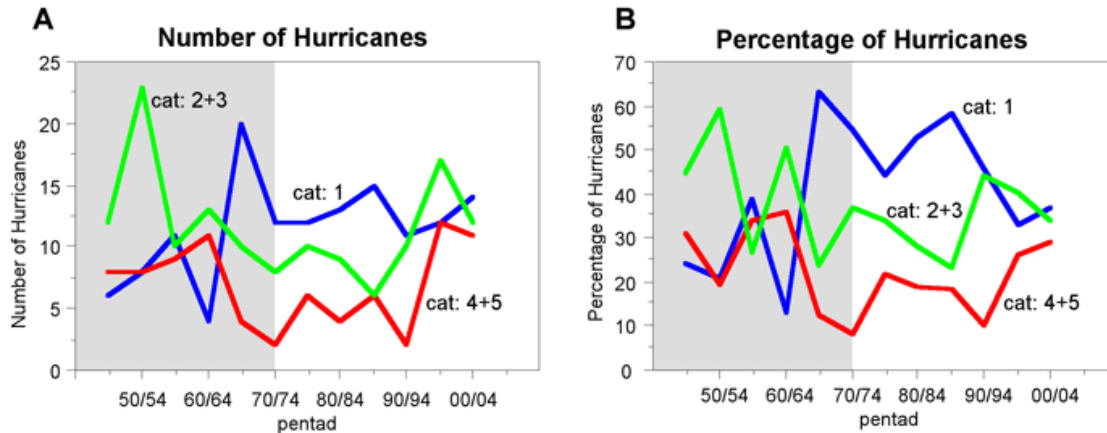
AIT: Brand-new evidence is causing some scientists to assert that global warming is even leading to an increased frequency of hurricanes, overwhelming the variability in frequency long understood to be part of natural deep-current cycles. (81)

Comment: Gore doesn't reference this "evidence," so we are not in a position to evaluate whether it shows an increased frequency of hurricanes. Webster et al. (2005), a study to which Gore alludes on page 89 (see below), found no increase in the overall number of tropical cyclones.⁹¹

AIT: The emerging consensus linking global warming to the increasingly destructive power of hurricanes has been based in part on research showing a significant increase in the number of category 4 and 5 hurricanes. (89)

Comment: Peter Webster and colleagues found a significant increase in the number of major hurricanes during the period 1970-2004. In contrast, Klotzbach found only a "small increase in global Category 4-5 hurricanes from the period 1986-1995 to the period 1996-2005," and considers it likely that "improved observational technology" accounts for the small increase he observed.

Patrick Michaels found that, in the Atlantic basin, the hurricane formation area with the best data over the longest period, the “trend” observed by the Webster team disappears once data going back to 1940 are included.⁹² As the Figure below shows, the number and percentage of intense storms from 1940 to 1970 were about equal to the number and percentage of intense storms from 1970 to 2004. The gray shaded area illustrates the data in the 30-year period prior to the period analyzed by Webster et al. The pre-1970 data comes from the National Hurricane Center.⁹³



Michaels comments: “When taken as a whole, the pattern appears to be better characterized as being dominated by active and inactive periods that oscillate through time, rather than being one that indicates a temporal trend.”

Since hurricanes are heat engines, it is likely that global warming will increase the number, strength, and/or formation area of hurricanes *to some extent*. But by how much is unclear. Thomas Knutson of NOAA and Robert Tuleya of Old Dominion University estimated in a 2004 study that a 2.0°C rise in maximum SSTs would increase hurricane wind speed by about 6 percent over 80 years.⁹⁴ “That means,” Patrick Michaels comments, “global warming is likely to be responsible, right now, for at best, an increase of about 0.6% in hurricane wind speeds—raising a decent hurricane of 120 mph to 120.7 mph, a change too small to measure.”⁹⁵

Knutson and Tuleya came to pretty much the same conclusion: “From our standpoint, the small 0.9 degree Fahrenheit [or about 0.4°C] warming observed in the Atlantic since 1900 implies only a 2-3 miles per hour intensity increase to date. Such a small increase is hard to detect. It is difficult to attribute the upswing in strong hurricane activity this past season to global warming. Season-to-season variability is very large.”⁹⁶

Since the Kyoto Protocol would avert an immeasurably small amount (0.07°C) of global warming by 2050,⁹⁷ Kyoto-style approaches can provide *no protection* from hurricanes in the policy-relevant future. Therefore, it is disingenuous for activists to claim that a hurricane-warming link justifies changes in U.S. energy policy. Indeed, hyping the

hurricane-warming link can be counterproductive. If people seek protection from hurricanes in climate change policy, they are apt to neglect the preparedness measures that can actually save lives.

Ten hurricane scientists, including Kerry Emanuel and Peter Webster, recently issued a “Statement on the U.S. Hurricane Problem.”⁹⁸ The scientists urge policymakers not to let the debate about the “possible influence” of global warming on hurricane activity “detract from the main hurricane problem facing the United States: the ever-growing concentration of population and wealth in vulnerable coastal regions.” Contributing to that problem, they argue, are federal and state insurance and disaster-relief programs that “subsidize” development in high-risk areas. Although optimistic that “continued research will eventually resolve much of the current controversy over the effect of climate change on hurricanes,” they emphasize that, “the more urgent problem of our lemming-like march to the sea requires immediate and sustained attention.” The hurricane experts consequently “call upon leaders of government and industry to undertake a comprehensive evaluation of building practices, and insurance, land use, and disaster relief policies that currently serve to promote an ever-increasing vulnerability to hurricanes.” This science-based perspective on hurricane risk and hurricane policy is absent from AIT.

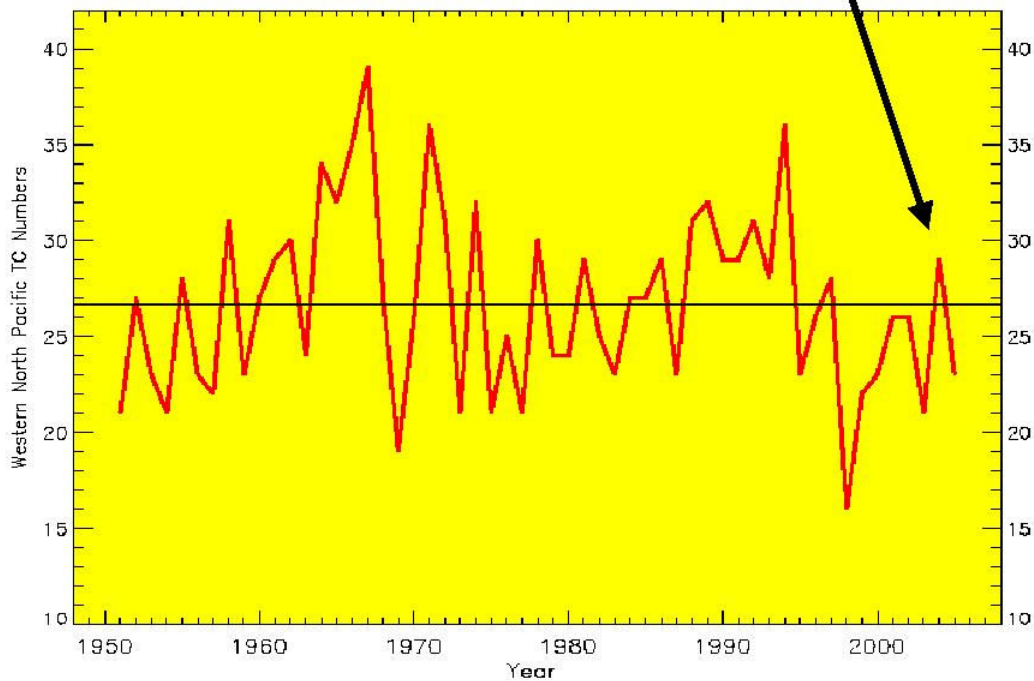
AIT: In 2004, Florida was hit with four unusually powerful hurricanes. (83)

Comment: Yes, but was that due to global warming? Satellite measurements show that, in 2004, the Atlantic hurricane basin had the coolest JJA (season 3) since 2000, and the 8th coolest since 1979.⁹⁹

AIT: ...that same year, Japan set an all-time record for typhoons. The previous record was seven. In 2004, 10 typhoons hit Japan. (83)

Comment: The Figure below shows the number of tropical storms and typhoons (Tropical Cyclones, or TCs) over the Western North Pacific, from 1950 through 2005. The data simply do not reveal a linear trend corresponding to the gradual increase in atmospheric CO₂ levels. Besides, whether a particular storm “hits” Japan—its trajectory—depends on local meteorological factors, not average global temperatures.

Direct TC data from Western North Pacific (1951-2005) do not confirm the impression given by Gore for tropical cyclones and typhoons over WNP/Japan to be extremely active in 2004!



Matsuura et al. (2003) *Climate Dynamics*, vol. 21, 105-112; updated data courtesy from Professor Tomonori Matsuura (February 3, 2006)

AIT: In the spring of 2006, Australia was hit by several unusually strong, Category 5 cyclones, including Cyclone Monica, the strongest cyclone ever measured, off the coast of Australia—stronger than Hurricanes Katrina, Rita, or Wilma.

Comment: Monica attained wind speeds of 180 mph, making it the strongest cyclone of 2006. Whether it was the strongest cyclone ever measured is unclear. At least five U.S. hurricanes had equal or greater wind speeds, including Hurricane Dog, attaining a wind speed of 185 mph on September 6, 1950, and Hurricane Camille, attaining a wind speed of 190 mph on August 17, 1969.¹⁰⁰

More importantly, Australia's hurricane season in 2006 was not exceptional. According to NOAA: "The tropical cyclone season in the Australian region has been near average with the development of 12 storms, two more than average. Although final assessments of tropical cyclone strength are continuing, it is thought that 25 percent of these storms reached Category 5 strength on the Australian scale."¹⁰¹

AIT: Textbooks had to be re-written in 2004. They used to say, "It's impossible to have hurricanes in the South Atlantic. But that year, for the first time ever, a hurricane hit Brazil." (84)

Comment: Gore gives the impression that Hurricane Catarina, the first hurricane on record to make landfall in Brazil, arose from abnormally high SSTs due to global warming. In reality, in 2004, January and February (summer months in Brazil) “were the coldest in 25 years,” according to climatologist Pedro Leite da Silva Dias of the University of Sao Paulo. SSTs were also cooler than normal. However, the air was so much colder than the water that it caused the same kind of heat flux that fuels hurricanes in warmer waters. At the same time, wind shear, which disorganizes hurricanes, was weaker than usual. “Before long,” says Bob Hensen of the University Corporation for Atmospheric Research, “the heat flux and light shear gave birth to a system that bore the satellite earmarks of a hurricane.”¹⁰² To blame rising CO2 levels for Catarina, Gore would have to argue that global warming made the air in the southern Atlantic unusually cold.

AIT: And before Wilma left the scene, something new happened: We ran out of names. For the first time in history, the World Meteorological Organization had to start using the letters of the Greek alphabet to name the hurricanes and tropical storms that continued on into December—well past the end of the 2005 hurricane season. (103)

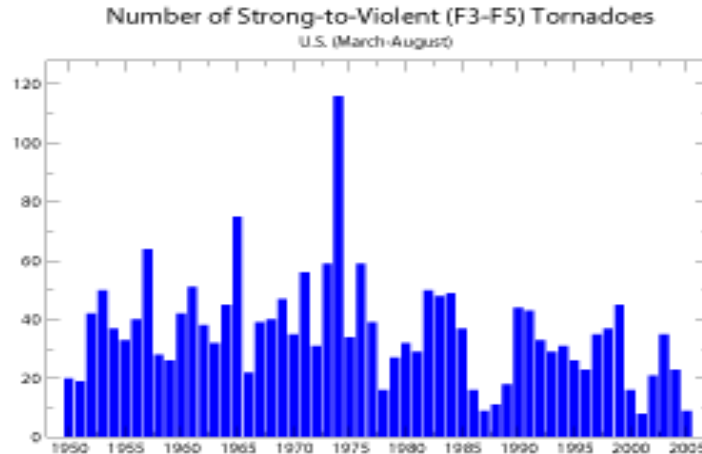
Comment: NOAA’s Web site explains that if there are more than 21 named tropical cyclones in the Atlantic basin in a season, additional storms will be assigned letters from the Greek alphabet.¹⁰³ The use of Greek letters to name storms in 2005 was “the first time in history,” as Gore says, but the practice of naming storms only goes back to 1953. Hurricane detection capabilities have improved dramatically since the 1950s, to say nothing of prior decades and centuries. So although 2005 had a record number of *named* Atlantic basin hurricanes, this does not tell us much beyond the fact that 2005 was a very active hurricane year.

Furthermore, 2005 was not the first year hurricanes and tropical storms continued into December. It also happened in 1878, 1887, 1888, 1925, 1953, 1975, 1984, 1989, 1998, 2001, and 2003.¹⁰⁴

VII. Tornadoes

AIT: Also in 2004, the all-time record for tornadoes in the United States was broken. (87)

Comment: Tornado frequency has not increased; rather, the detection of smaller tornadoes has increased. If we consider the tornadoes that have been detectable for many decades (i.e. F-3 or greater), there is actually a slightly downward trend since 1950. See the Figure below.



Source: National Climate Data Center¹⁰⁵

Oklahoma experienced its longest tornado-free period in 2003-4 (May 17, 2003-January 20, 2004), and the State had only one tornado of F2 strength or greater in all of 2004.¹⁰⁶ As a whole, the United States was not experienced an F5 tornado—the strongest of all tornadoes—in 7 years, the longest F5-free period in recorded U.S. tornado history.¹⁰⁷ Was that in spite of global warming, or because of it?

VIII. Floods, Fire, and Drought

AIT: Over the last three decades, insurance companies have seen a 15-fold increase in the amount of money paid to victims of extreme weather. Hurricanes, floods, drought, tornados, wildfires and other natural disasters have caused these losses. (101)

Comment: Gore makes no mention of whether these loss estimates are adjusted for increases in population, wealth, and the consumer price index. Absent careful adjustment for societal factors, it is impossible and unscientific to infer climate trends from weather-related losses.

Kunkel et al. (1999) examined whether increases in mortality and economic losses due to extreme weather events mirrored changes in the physical magnitude of such events.¹⁰⁸ They found that “trends in most [loss-] related weather and climate extremes do not show comparable increases with time,” leading the researchers to conclude that “increasing losses are primarily due to increasing vulnerability arising from a variety of societal changes, including a growing population in higher risk coastal areas and large cities, more property subject to damage, and lifestyle and demographic changes subjecting lives and property to greater exposure.” Other key findings include:

- Scientists cannot yet quantify the possible contribution of an increase in the frequency of heavy rain events to increases in flood-related damage.

- When hurricane losses are adjusted for changes in population, inflation, and wealth, “there is instead a downward trend.”
- “Increasing property losses due to thunderstorm related phenomena (winds, hail, tornadoes) are explained entirely by changes in societal factors, consistent with the observed trends in the thunderstorm phenomena.”
- “There is no evidence of changes in drought-related losses (although data are poor) and no apparent trend in climatic drought frequency.”
- “There is also no evidence of changes in the frequency of intense heat or cold waves.”

The issue of primary concern to most people is whether mortality from extreme weather events is increasing or declining. The good news is that, despite the increase of population in high-risk areas, “aggregate mortality and mortality rates due to extreme weather events are generally lower than they used to be,” finds climate economist Indur Goklany. He continues:

Globally, mortality and mortality rates have declined by 95 percent or more since the 1920s. The largest improvements came from declines in mortality due to droughts and floods, which apparently were responsible for 95 percent of all deaths caused by extreme events during the 20th century. For windstorms, which contributed most of the remaining 5 percent of fatalities, mortality rates were also lower today but there are no clear trends for mortality. Cumulatively, the declines more than compensated for increases due to the 2003 [European] heat wave. With regard to the U.S., current mortality and mortality rates due to extreme temperatures, tornadoes, lightning, floods and hurricanes are also below their peak levels of a few decades ago. The declines for the last four categories range from 55 to 95 percent.¹⁰⁹

AIT: “Warmer water increases the moisture content of storms, and warmer air holds more moisture. When storm conditions trigger a downpour, more of it falls in the form of big, one-time rainfalls and snowfalls. Partly as a result, the number of large flood events has increased by decade by decade, on every continent.” Gore illustrates the last point with a chart titled, “Number of Major Flood Events by Continent and Decade.” (106)

Comment: Gore’s chart is based on Figure 16.5 (page 448) of the Millennium Ecosystem Assessment (MEA) report, *EcoSystems & Human Well-Being*.¹¹⁰ As presented in AIT, the chart appears to chronicle changes in the number of “major” floods, i.e., events of a certain physical magnitude. In fact, as a glance at the MEA report reveals, what the chart measures are changes in the number of “damaging” floods. Whether or not a flood is classified as “damaging” is heavily influenced by socioeconomic factors. As the MEA report explains: “Only events that are classified as disasters are reported in this database. (An event is declared a disaster if it meets at least one of the following criteria: 10 or more people reported killed; 100 or more people reported affected; international assistance was called; or a state of emergency was declared (OFDA/CRED 2002).”

Obviously, the database is going to be skewed toward more events in later decades, simply because of better reporting, more declared states of emergency, and more calls for international assistance. As the MEA report observes: “Figure 16.5 shows a clear increase in the number of floods since the 1940s for every continent and a roughly constant rate of increase for each decade. However, it should be noted that although the number has been increasing, the actual reporting and recording of floods have also increased since 1940, due to the improvements in telecommunications and improved coverage of global information.”

The MEA report further states: “Flood processes are controlled by many factors, climate being one of them. Other non-climatic factors include changes in terrestrial systems (that is, hydrological and ecological systems [such as wetlands loss and deforestation]) and socioeconomic systems. In Germany, for instance, flood hazards have increased (Van der Plog et al. 2002) partly as a result of changes in engineering practices, agricultural intensification, and urbanization (direct and indirect drivers).” Two other non-climatic factors that massively affect the degree of damage from a particular flood are population growth and economic development in coastal areas and flood plains.

Teasing out a greenhouse warming signal from flood damages affected by both natural climate variability and a host of societal factors may well be beyond human capability. Yet AIT presents flood damage data as clear evidence of a global-warming ravaged planet.

CO2Science.Org summarizes the literature on floods and climate variability in every continent. **Asia:** “The results of these [five] studies from Asia provide no support for the climate-alarmist claim that global warming leads to more frequent and severe flooding. If anything, they hint at an *opposite* effect.”¹¹¹ **Europe:** “In light of this body of evidence [17 studies], it is clear that for most of Europe, as well as many other parts of the world, there are simply no compelling real-world data to support the climate-alarmist claim that global warming leads to more frequent and severe flooding.”¹¹² **North America:** “Taken together, the research described in this Summary [21 studies] suggests that, if anything, North American flooding tends to become both *less* frequent and *less* severe when the planet warms, although there have been some exceptions to this general rule.”¹¹³

AIT: In many areas of the world, global warming also increases the percentage of annual precipitation that falls as rain instead of snow, which has led to more flooding in spring and early summer. In 2005 Europe had a year of unusual catastrophes similar to the one in the United States. (106).

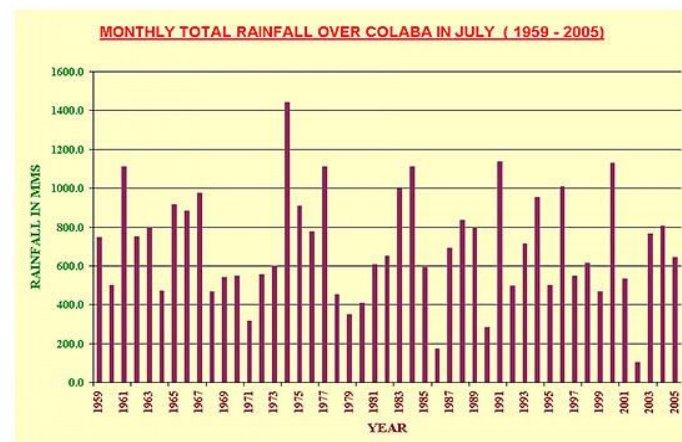
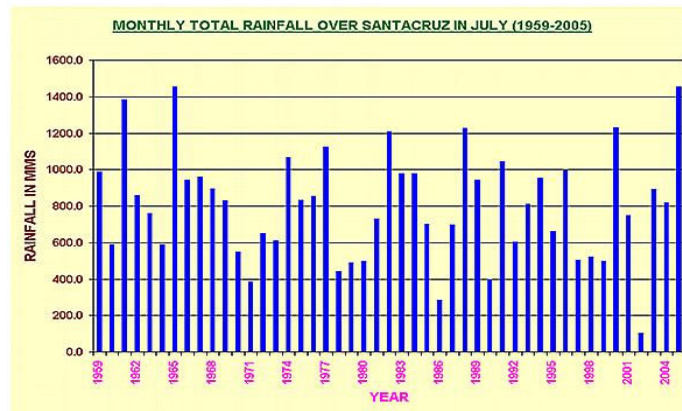
Comment: In other words, we had Katrina; they had disastrous floods. But we did not only have Katrina; we also had a record 668 inches of snowfall on Mammoth Mountain in California during 2005-06—the most in 38 years.¹¹⁴ Many other ski resorts in California, the Pacific Northwest, Canadian Rockies and Vancouver, U.S. Northern Rockies, Utah, and Colorado posted above-average snowfalls in 2005-2006, and many

had “high” snowfalls in 2004-05, including three “record high” snowfalls.¹¹⁵ Again, was this in spite of global warming, or because of it?

AIT: July 2005, Mumbai [Bombay], India, received 37 inches of rain in 24 hours—the largest downpour any Indian city has received in one day. (110)

Comment: Mumbai is in Meghalaya state, “one of the rainiest places on Earth,” according to R.V. Sharma, director of the city’s meteorology department.¹¹⁶ So although a record breaker, the 37-inch rainfall that occurred in July 2005 is not evidence of climate *change*. The previous Meghalaya record—33 inches of rainfall in one day—was set on July 12, 1910, decades before the major buildup in greenhouse gas levels. So at most, man-made global warming contributed four inches to the record-breaking downpour. A 33-inch downpour would still have created one heck of a mess. And it’s also possible the old record was broken just because it happened to rain really hard.

It is scientifically illegitimate to attribute any particular precipitation event to a gradual increase in average atmospheric temperatures. If global warming were influencing rainfall in Mumbai, we would expect to see it in long-term precipitation records. But the data for Mumbai rainfall in July shows no trend over the past 45 years.¹¹⁷ See the Figures below.



AIT: There has also been record flooding in China, which, as one of the planet's oldest civilizations, keeps the best flood records of any nation in the world. Recently, for example, there were huge floods in Sichuan and Shandong provinces (112).

Comment: Catastrophic floods have hit those provinces repeatedly from time immemorial. Consider this excerpt from Wikipedia's discussion of the Yellow River, which runs through Shandong Province:

During the long [history of China](#), the Yellow River has been considered a blessing as well as a curse and has been [nicknamed](#) both "China's Pride" (*Zhōngguó de Jiāoào*) and "China's Sorrow" (*Zhōngguó de Tòng*). Records indicate that, from [602 BC](#) to present, the river's course made at least 5 major large-scale changes in direction and its levees were breached more than 1,500 times. A major course change that took place in 1194 took over the [Huai River](#) drainage system throughout the next 700 years. The mud in the Yellow River literally blocked the mouth of the Huai River and left thousands homeless....Flooding of the Yellow River has created some of the highest [death tolls](#) in recent history, with the [1887 Huang He flood](#) killing 900,000-2,000,000 and the [1931 Huang He flood](#) killing 1,000,000-3,700,000. In 1938, during the [Second Sino-Japanese War](#), the [Nationalist](#) troops under [Chiang Kai-Shek](#) broke the levees holding back the Yellow River in order to stop the advancing [Japanese](#) troops. The river at that time flooded a huge area and the floodwaters took some 500,000-900,000 lives.¹¹⁸

Now consider this excerpt from Wikipedia's discussion of the Yangtze River, which runs through Sichuan Province:

Flooding along the river has been a major problem. The rainy season in China is May and June in areas south of Yangtze River, and July and August in areas north of river. The huge river system receives water both from southern and northern flanks, which causes its flood season to extend from May to August. Meanwhile, the relatively dense population and rich cities along the river make the floods more deadly and costly. The most recent major floods were the [1998 Yangtze River Floods](#), but more disastrous were the [1954 Yangtze river floods](#), killing around 30,000 people. Other severe floods included those of [1911](#) which killed around 100,000, [1931](#) (145,000 dead), and [1935](#) (142,000 dead).¹¹⁹

Predictably, AIT does not mention the non-climatic factors that contribute to flood damage in Shandong and Sichuan Provinces, particularly population growth, agriculture, and the resulting deforestation.¹²⁰

AIT: Wildfires are becoming much more common as hotter temperatures dry out the soil and the leaves. In addition, warmer air produces more lightning. The

graph below shows the steady increase in major wildfires in North and South America over the last five decades; the same pattern is found on every other continent as well. (229)

Comment: Gore's graph is based on Figure 16.3 (page 449) of the Millennium Ecosystem Assessment (MEA) report, *Ecosystems & Human Well-Being*.¹²¹ Just as Gore earlier re-labeled "damaging" floods as "major" floods, obscuring the upward bias in the number of events *recorded* due to changes in data collection and reporting, so here he re-labels "Number of Recorded Wildfires" as "Number of Major Wildfires." As the MEA report indicates, satellite monitoring of wildfires is a fairly recent development. The big jumps in the number of "recorded" wildfires since 1980 and 1990 are likely to some extent an artifact of the data.

The MEA report confirms that hotter, drier climates tend to produce more wildfires, and hence that global warming will increase wildfire risk in some areas. However, just as Gore ignored societal factors (e.g., population growth in flood plains) affecting the number of "damaging floods," he similarly ignores societal factors affecting the number of "recorded" wildfires. In developing countries, many "wildfires" start as fires people deliberately set to clear land for agriculture, highways, and logging. Gore surely knows this, since only two pages earlier he lamented the fact that "much of the forest destruction" around the world comes from "the burning of brushland for subsistence agriculture and wood for cooking."

Although the number of "recorded" wildfires is increasing, the MEA report finds "a general long-term reduction in the area burned." In the United States, for example, "the area burned has declined more than 90% since 1930." AIT fosters the opposite impression—that more and more of the United States is literally going up in smoke.

AIT: The nearby Anhui province [in China] was continuing to suffer a severe drought at the same time the neighboring areas were flooding. One of the reasons for this paradox has to do with the fact that global warming not only increases precipitation world wide but at the same time causes some of it to relocate. (113)

Comment: This is a little too convenient. If there's a downpour, that's global warming. If there's a drought, that's global warming. Global warming can only intensify droughts and floods—never make wet places drier or dry places moister. Floods and droughts were less frequent and less severe in the good old days before SUVs and coal-fired power plants. This is the stuff of fairy tales, not science.

AIT: Gore blames global warming for the disappearance of Lake Chad, which in turn contributed to famine and genocide in the region. Lake Chad's "fate is sadly emblematic of a part of the world where climate change can be measured not just in temperature increases but in lives lost." The "more we understand about climate change," he writes, "the more it looks as if we [the United States, which emits a quarter of the world's greenhouse gases] may be the real culprit." He concludes: "It is time to take a hard honest look at our role in this escalating

disaster. We helped manufacture the suffering in Africa, and we have a moral obligation to try to fix it.” (117)

Comment: A study by Jonathon Foley and Michael Coe of the University of Wisconsin concluded that Lake Chad’s decline probably has nothing to global warming.¹²² The two scientists based their findings on computer models and satellite imagery made available by NASA. They attribute the Lake’s condition to a combination of regional climate variability and societal factors such as population increase and overgrazing. *National Geographic* interviewed the researchers and summarized their study:

Historically, Lake Chad received most of its water from the monsoon rains that fell annually from June to August. But beginning in the late 1960s, the region experienced a series of devastating droughts. As the rains increasingly failed to come, the region began undergoing desertification. At the same time, local people became more and more dependent on the lake as a source of water to replace the water they had previously obtained from the monsoons.

Note that the change from a wet to a dry climate began in the late 1960s, when global temperatures were still in a cooling trend. The article continues:

Overgrazing of the savanna is one of the biggest factors in the shrinking of the lake, according to Coe and Foley. “As the climate became drier, the vegetation that supported grazing livestock began to disappear. Vegetation has a big influence, especially in semi-arid regions, in determining weather patterns,” said Foley. “The loss of vegetation in itself contributed to a drier climate.” The situation is a “domino effect,” the researchers say. Overgrazing reduces vegetation, which in turn reduces the ecosystem's ability to recycle moisture back into the atmosphere. That contributes to the retreat of the monsoons. The consequent drought conditions have triggered a huge increase in the use of lake water for irrigation, while the Sahara has gradually edged southward.

In short, the Lake Chad disaster was one part local climate variation, one part local tragedy of the commons. Yet Gore blames the USA. He calls global warming a “moral issue,” but for him it is actually a *moralizing* issue. Global warming allows Gore to discover moral agency and guilt in the workings of inanimate nature. It allows him to “blame America first” for misfortunes around the world that may be entirely due to local actions and/or climatic factors beyond human control.

AIT: Global warming also sucks more moisture out of the soil. Partly as a consequence, desertification has been increasing in the world decade by decade. (118)

Comment: Several studies, such as Roderick and Farquhar (2004),¹²³ indicate that evaporation from soils is decreasing. CO2Science.Org comments:

The first published report on the subject revealed just the *opposite* of what the IPCC had suggested, indicating, in the words of Roderick and Farquhar, that “on average, pan evaporation had decreased over the USA, Former Soviet Union and Eurasia for the period 1950 until the early 1990s (Peterson *et al.*, 1995).” In addition, they say that “subsequent reports have confirmed this to be a general trend throughout the Northern Hemisphere,” citing in support of this statement the studies of Chattopadhyay and Hulme (1997) with respect to India, Thomas (2000) pertaining to China, and Moonen *et al.* (2002) for Italy.

In their own investigation of the subject in the much-less-studied Southern Hemisphere, Roderick and Farquhar used data for the period 1970-2002 from 31 sites in Australia, plus data for the period 1975-2002 from 61 Australian sites, to look for trends in pan evaporation and annual rainfall. In doing so, they could find no statistically significant change in precipitation, but they detected a statistically significant “decrease in pan evaporation rate over the last 30 years across Australia of the same magnitude as the Northern Hemisphere trends.”

In describing this happy situation, Roderick and Farquhar say “it is now clear that many places in the Northern Hemisphere, and in Australia, have become less arid,” and that “in these places, the terrestrial surface is both warmer and effectively wetter.” In fact, they say in their concluding sentence that “a good analogy to describe the changes in these places is that the terrestrial surface is literally becoming more like a gardener's ‘greenhouse’.”¹²⁴

Although intuitively plausible, a link between global warming and drought is more difficult to establish than Gore seems to think. No U.S. drought in recent decades was as severe as the drought of the 1930s. Nor was the 1930s drought outside the range of natural variability. Consider this excerpt from NOAA’s Paleoclimatology Program:

Longer records show strong evidence for a drought [in the 16th century—the depths of the Little Ice Age] that appears to have been more severe in some areas of central North America than anything we have experienced in the 20th century, including the 1930s drought. Tree-ring records from around North America document episodes of severe drought during the last half of the 16th century. Drought is reconstructed as far east as Jamestown, Virginia, where tree rings reflect several extended periods of drought that coincided with the disappearance of the Roanoke Colonists, and difficult times for the Jamestown colony. These droughts were extremely severe and lasted for three to six years, a long time for such severe drought conditions to persist in this region of North America. Coincident droughts, or the same droughts, are apparent in tree-ring records from Mexico to British Columbia, and from California to the East Coast ...¹²⁵

AIT: The map to the left shows what is projected to happen to soil moisture in the United States with the doubling of CO₂, which would happen in less than 50 years if we continue business as usual. According to scientists, it will lead, among other things to a loss in soil moisture of up to 35% in vast growing areas of our country. (121)

Comment: The map shows what one climate model (the Princeton Geophysical Fluid Dynamics Laboratory R15 model) projects would happen to U.S. soil moisture with a doubling of CO₂. Many variables affect soil moisture, not least of which is the amount of precipitation. Climate models are not good at replicating actual precipitation patterns. Consider, for example, the two models—Canadian Climate Center and Hadley Center—underpinning the Clinton-Gore Administration’s major global warming report, the *U.S. National Assessment of the Potential Consequences of Climate Variability and Change*.¹²⁶ Each model both over-estimates (by as much as 6 millimeters per day) and under-estimates (by as much as 15 millimeters per day) the actual rainfall amounts over large areas of North America.¹²⁷ If climate models cannot replicate current precipitation patterns, why should we trust their projections of future changes in U.S. hydrology?

The GFDL model cited by Gore predicts increased dryness over the next several decades. So does the Canadian model. But the Hadley model predicts increased wetness. In a report commissioned by the Pew Center on Global Climate Change, Kenneth Frederick and Peter Gleick used the two main National Assessment models to forecast global warming impacts on U.S. water resources. They found that the two models generate conflicting results:

The Canadian model suggests runoff would decline in all regions except California. In 12 of the 18 regions, runoff declines by more than 20 percent, an outcome that would have serious adverse impacts. In contrast, the Hadley model projects increases in average runoff in most regions; the majority of the nation’s arid and semiarid regions would have significantly more water, reducing problems of water scarcity but perhaps increasing the threat of floods.¹²⁸

The future effects of warming on U.S. soil moisture are less predictable than Gore seems to believe. Faced with conflicting model results, it makes sense to look at real-world data. Andreadis and Letternmaier (2006) constructed a time series of soil moisture and runoff over the continental United States for the period from 1925-2003.¹²⁹ They found that drought duration, severity, and frequency had increased in the Southwest and parts of the interior of the West, but that most of the country had become wetter:

Over much of the country, there has been a wetting trend which is reflected in a predominance of upward trends in both model-derived soil moisture and runoff. These trends are generally consistent with increases in precipitation during the latter half of the 20th century observed over most of the U.S....Furthermore, trends in the simulated runoff are similar

to those in observed records of streamflow at a set of index stations that have been minimally affected by anthropogenic activities. Trends in drought characteristics (duration, frequency, severity, and extent) are similar to those in soil moisture and runoff, i.e., droughts have, for the most part, become shorter, less frequent, less severe, and cover a smaller portion of the country over the last century.

AIT: In 2005 the Amazon suffered the longest and worst drought in recorded history—with devastating effects. (141)

Comment: RealClimate.Org, a Web site set up to debunk global warming “skeptics,” concludes in a lengthy post that it is not possible to link the Brazilian draught to global warming or, more specifically, the warm seas that spawned so many Atlantic hurricanes in 2005:

A quick statistical analysis suggests that SST variability cannot account for all of the precipitation anomaly over the Amazon ($R^2 \sim 20\%$ over the Amazon region, e.g. [Carauar](#), [Manaus](#), & [S.Gab. do Cachoeira](#) for the January-November rainfall). Furthermore, the present SST-based regression models do not give a large reduction in rainfall for 2005. It is important to keep in mind that more than one factor (e.g. ENSO, local effects) may affect the rainfall, and extreme events can arise when several conditions coincide in time and space (e.g. a combination of favorable SST anomalies, atmospheric circulation, local effects, etc)... In summary, it does not appear possible to say that this single event is attributable to climate change as the noise in the rainfall statistics is large.¹³⁰

If there is a warming-related trend in the Amazon, it appears to be the observed increase in plant productivity. Nemani et al. (2003), analyzing satellite data from 1982 to 1999, found that “global changes in climate have eased several critical climatic constraints to plant growth, such that net primary production increased 6%... globally.” The Amazon rain forests accounted for 42% of the observed increase in plant growth.¹³¹ Cao et al. (2004) found similar results.¹³² As one commentator put it, “In general, where temperatures restricted plant growth, it got warmer; where sunlight was needed, clouds dissipated; and where it was too dry, it rained more.”¹³³

IX. Arctic Climate

AIT: “There are two places on Earth that serve as canaries in the coal mine—regions that are especially sensitive to the effects of global warming,” i.e. the Arctic and the Antarctic. In the Arctic, “Temperatures are shooting upward there faster than at any other place on the planet.” (126)

Comment: We would expect the Arctic to warm more rapidly than most other places during a period of global warming, regardless of whether the warming is due to rising greenhouse gas concentrations or natural variability. As Gore explains later on (pages

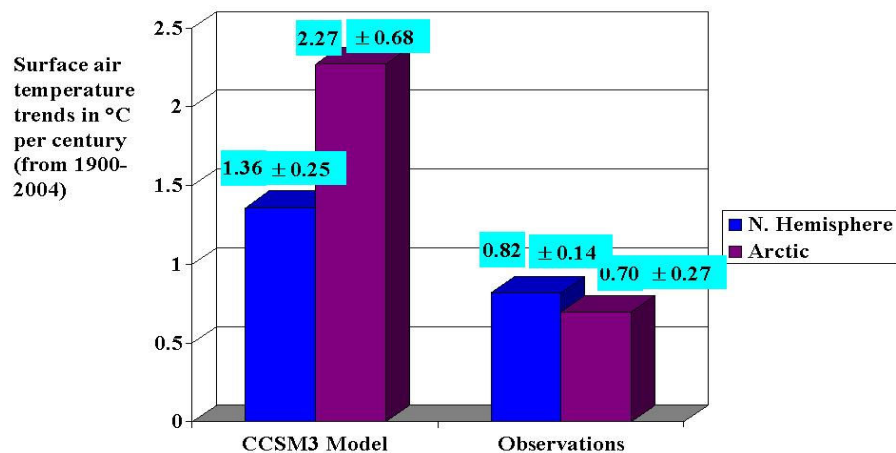
144-145), polar ice is white and reflects incoming short-wave radiation from the sun whereas sea water is dark and absorbs it; consequently, when sea ice melts, the Arctic ocean absorbs more radiant energy, amplifying the initial warming.

NASA satellites using microwave sounding units to measure air temperatures in the middle atmosphere (troposphere) indicate that the Arctic is warming faster than any other place on the planet. The satellites show that, since November 1978, the Arctic warmed at a rate of $0.45^{\circ}\text{C}/\text{decade}$, compared to $0.21^{\circ}\text{C}/\text{decade}$ for the Northern Hemisphere and $0.14^{\circ}\text{C}/\text{decade}$ for the world as a whole.¹³⁴

On the other hand, Pielke et al. (2001) found that troposphere temperature and wind speed are related such that an increase in high latitude temperature relative to lower latitude temperature would result in a decrease in high latitude wind speed. However, from 1953 to 1997, Arctic troposphere wind speed increased, indicating a decrease in Arctic troposphere temperature.¹³⁵

In addition, during the 20th century, surface air temperature data do not show accelerated warming in the Arctic compared to the Northern Hemisphere. Rather, the long-term temperature record (1875-2000) developed by Polyakov et al. (2003) shows that, “The arctic temperature trend for the twentieth century ($0.05\text{C}/\text{decade}$) was close to the Northern Hemispheric trend ($0.06\text{C}/\text{decade}$).”¹³⁶ Similarly, in a forthcoming paper, Cecilia Bitz and Hughes Goosse find that surface temperature data do not show amplified polar warming, such as predicted by the National Center for Atmospheric Research’s CCSM3 climate model, though they anticipate polar amplification to begin by 2020.¹³⁷

**Predicted large Arctic warming trend relative to the Northern-hemispheric trend
IS NOT confirmed by observations: Latest results from NCAR’s CCSM3**



Bitz and Goosse (2006) Geophysical Research Letters, submitted

Chart adapted from Bitz and Goosse (2006).

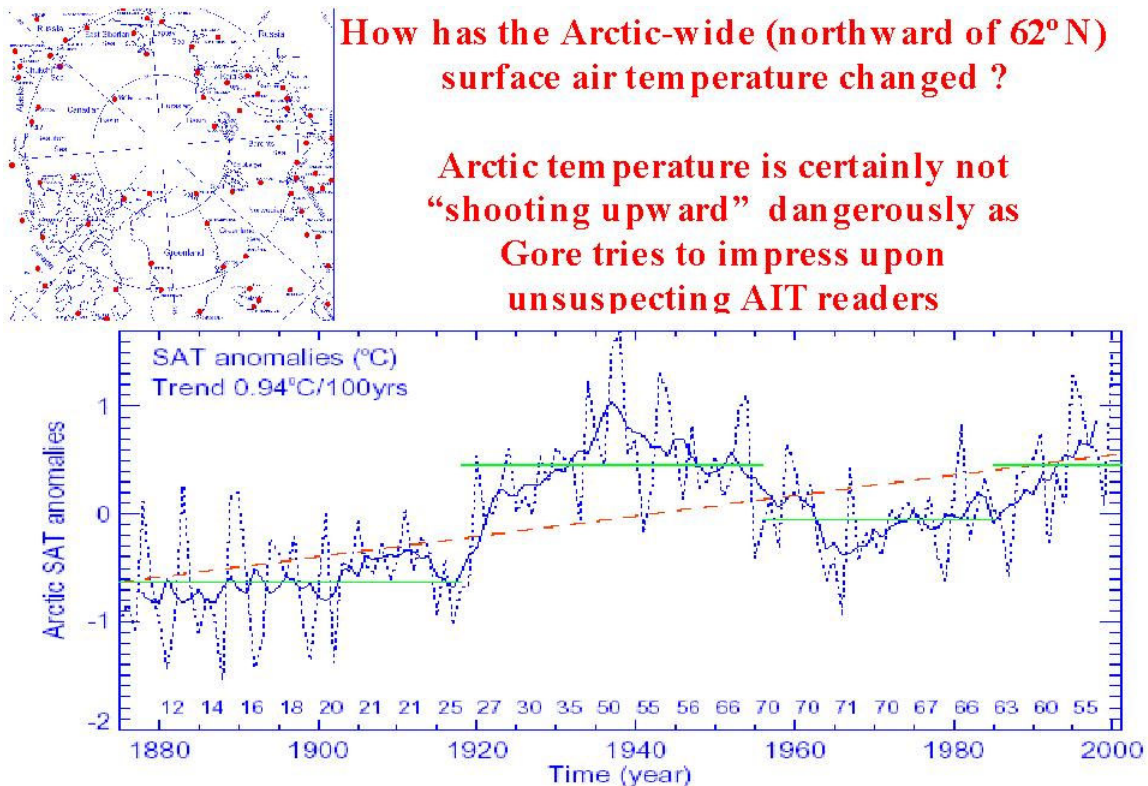
Gore assumes that all or most of the recent Arctic warming is due to greenhouse gas emissions, but this is unclear. Arctic natural variability is large. Polyakov’s record shows

that Arctic temperatures in the 1930s equaled or exceeded those of the late 20th century. CO2Science.Org comments:

Polyakov *et al.* (2003) ... derived a surface air temperature history that stretches from 1875 to 2000 based on measurements carried out at 75 land stations and a number of drifting buoys located poleward of 62°N latitude. Here's what the team of eight U.S. and Russian scientists found.

From 1875 to about 1917, the surface air temperature of the huge northern region rose hardly at all; but then it took off like a rocket, climbing 1.7°C in just 20 years to reach a peak in 1937 that has yet to be eclipsed. During this 20-year period of rapidly rising air temperature, the atmosphere's CO2 concentration rose by a mere 8 ppm. But then, over the next six decades, when the air's CO2 concentration rose by approximately 55 ppm, *or nearly seven times more than it did throughout the 20-year period of dramatic warming that preceded it*, the surface air temperature of the region poleward of 62°N experienced *no net warming* and, in fact, may have actually *cooled* a bit.¹³⁸

Polyakov's Arctic-wide surface air temperature record is shown in the Figure below.



Polyakov *et al.* (2003) *Journal of Climate*, vol. 16, 2067-2077 (figures courtesy of Igor Polyakov, International Arctic Research Center)
[p. 2068 of Polyakov *et al.* (2003) specifically noted that their composite Arctic temperature used data from stations northward of 62°N only and Polyakov's Arctic-wide temperature contains data from coastal land stations, Russian drifting stations around North Pole and drifting buoys from International Arctic Buoy Programme]

Consistent with Polyakov's record, Chylek et al. (2006) found that Greenland was as warm during 1920-1930 as it was during 1995-2005, but that the rate of warming during the earlier decade was "50% higher."¹³⁹

Going back further in time, three studies reviewed by Patrick Michaels found greater-than-present Arctic warmth in the early Holocene.¹⁴⁰ Briner et al. (2006) found that, 10,000 to 8,500 years ago, Canada's Baffin Bay was ~ 5°C warmer than it is today.¹⁴¹ Kaufman et al. (2004) found that, 9,000-7,000 years ago, northern Russia (including Siberia) was 2-7.5°C warmer than it is today.¹⁴² McDonald et al. (2000) found 120 sites out of 140 in the Arctic Western hemisphere where proxy data indicate warmer-than-present conditions during the early Holocene.¹⁴³

Darby et al. (2001), reviewed by CO2science.Org,¹⁴⁴ found that during the middle Holocene (about 5,000 years ago), Western Arctic sea surface temperature in August was 3-7°C warmer than it is today.¹⁴⁵ Similarly, a forthcoming study by Caseldine et al. (2006) finds that from ~ 8,000 to 6,700 years ago, July surface air temperatures in northern Iceland were at least 1.5°C warmer than the 1961-1990 average and possibly 2-3°C warmer.¹⁴⁶

To sum up, the Arctic warming of the 1930s was comparable to the warming of recent decades, and both Arctic air and sea surface temperatures were significantly warmer than the present during the early Holocene. Gore never mentions these non-trivial and clearly relevant climate facts.

The Arctic warming of recent decades may largely be due to natural variability—or it may be mostly due to rising CO2 concentrations. There is no definitive explanation at this point. Bitz and Goosse predict that they'll be able to say for certain in another 10-15 years—if the temperature change difference between the Arctic and the lower latitudes grows larger than natural variability can explain.

AIT: Three years ago the Ward Hunt shelf cracked in half, to the astonishment of scientists. This had never happened before. (128)

Comment: Gore makes this sound like a portent of doom. CO2Science.Org, in a review of Mueller et al. (2003), observes that changes of the same kind have been under way since the early 20th century, when CO2 concentrations were still fairly close to pre-industrial levels.¹⁴⁷

As noted by Mueller *et al.* ... the Ward Hunt Ice Shelf was merely "a 443 km² remnant of a much larger feature that extended along the northern coast of Ellsmere Island at the beginning of the last century (Peary, 1907)." They report, for example, that the original ice shelf had already "contracted 90% during the period 1906-1982 by calving from its northern edge (Vincent *et al.*, 2001)." ... So what do we say about the ice shelf's demise? We say what Mueller *et al.* say: "The cumulative effects of a long-term warming trend since the Little Ice Age (Overpeck *et al.*, 1997) likely

caused the ongoing changes in the Ward Hunt Ice Shelf,” including “the abrupt break-up and loss of integrity that we observed over the period 2000-2002.”

AIT: In Alaska these are called “drunken trees” because they are leaning every which way. And this is caused neither by wind damage nor alcohol consumption. These trees put their roots deep into the frozen tundra decades—even centuries—ago and now as the tundra melts they lose their anchor, causing them to sway in all directions. (130-131)

Comment: As noted earlier, there has been no net warming in Alaska during the past three decades. Rather, as Brian Hartman and Gerd Wendler of the Alaska-taxpayer-funded Alaska Climate Research Center found, statewide average temperature cooled slightly from 1977 to 2001. The State also cooled from 1951 to 1975. Nonetheless, Alaska is significantly warmer today than it was during 1951-1975 because of the single-year (1976) shift in the PDO from negative to positive phase.¹⁴⁸ No greenhouse warming computer model has ever been able to simulate that shift. Drunken trees may largely be a consequence of the PDO shift.

AIT: In Siberia, approximately 1 million square km of land frozen since the last ice age is expected to thaw. This tundra contains 70 billion tons of stored carbon, which is becoming unstable as the permafrost melts. The carbon in these Siberian soils is 10 times the amount emitted annually from man-made sources. (132)

Comment: A positive feedback effect, whereby warming releases more CO₂ from soils, which leads to more warming, is a possibility. Another possibility is that the range of carbon-storing vegetating will expand as the tundra thaws. CO₂Science.Org’s extensive literature review (51 studies) concludes:

In summary, a profusion of scientific evidence indicates that increases in air temperature, CO₂ concentration and nutrient deposition all act to enhance tundra productivity, which leads to greater rates of ecosystem carbon sequestration and a slower rate-of-rise in the air's CO₂ content, which in turn reduces the potential for CO₂-induced global warming.

AIT: The graph below shows the number of days each year that the tundra in Alaska is frozen solidly enough to drive on [more than 200 winter travel days in 1970 down to fewer than 80 in 2002]. (135)

Comment: The small decline in winter travel days from 1970 to 1975 is hard to explain in terms of global warming, since Alaska was still in a cooling period in those years. The 1976 PDO shift may account for much of the remaining trend depicted in Gore’s graph.

Gore: Since the 1970s, the extent and thickness of the Arctic ice cap has diminished precipitously. There are studies now showing that if we continue with

business as usual, the Arctic ice cap will completely disappear each year during the summertime. (143)

Comment: The graph accompanying these statements shows a decline in Arctic sea-ice area from about 13.7 million km² in 1970 to about 11.8 million km² in 2005—a roughly 15% decrease. Gore should at least mention that oscillatory changes in wind patterns can affect Arctic sea ice extent as much as changes in temperature.¹⁴⁹ “Since the mid-1960s,” states Patrick Michaels, “winds have generally tended away from patterns that support a lot of ice and towards those favoring less ice.”¹⁵⁰

Ice cores, ocean sediment cores, and mammalian bone fragments indicate that, during the early Holocene, the Canadian Arctic Archipelago (CAA) had less summer ice than occurs today, according to an article by 10 scientists in the journal *EOS*.¹⁵¹ For example, for the past 8,900 years, Bearing Sea and Davis Strait stocks of bowhead whales have been unable to intermingle due to a persistent sea ice barrier separating the two populations. The barrier existed during the last glaciation but disappeared during the warmth of the early Holocene. At the height of that warmth, which was about 3°C warmer than now, “the Pacific and Atlantic bowhead whales could visit each other through the Northwest Passage.” This raises obvious questions. What made the Archipelago 3°C warmer during the early Holocene than it is today? Could the same or similar factors cause or contribute to sea ice retreat today? Did the reduction in Arctic sea ice during the early Holocene make the planet less “livable” or was it rather part and parcel of the warmth that enabled humanity to begin the march of civilization?

AIT: At present, it [the Arctic ice cap] plays a crucial role in cooling the Earth. Preventing its disappearance must be one of our highest priorities. (143)

Comment: Again, what evidence is there that humanity or other species suffered from the greater-than-present retreat of Arctic sea ice during the early Holocene?

AIT: A new scientific study shows that, for the first time, polar bears have been drowning in significant numbers. (146)

Comment: “Have been drowning” suggests an ongoing process; “significant numbers” suggests a lot of drowned bears. The study reports that in September 2004, “4 dead bears were seen floating far offshore,” apparently drowned by “an abrupt wind storm.”¹⁵² So the study may have uncovered an unusual case, related to a specific storm, rather than a trend, and the “significant numbers” turns out to be four.

Pat Michaels, analyzing WWF data, found that polar bear populations are increasing in Arctic areas where it is warming and declining in areas where it is cooling.¹⁵³ A leading Canadian bear biologist wrote recently, “Climate change is having an effect on the West Hudson population of polar bears, but really, there is no need to panic. Of the 13 populations of polar bears in Canada, 11 are stable or increasing in number. They are not going extinct, or even appear to be affected at present.”¹⁵⁴

AIT: Gore suggests that even a mid-range warming of 2.7°C (5°F) would be a planetary-scale disaster: “An increase of five degrees [Fahrenheit] actually means an increase of only one or two degrees at the Equator, but more than 12° at the North Pole, and a large increase on the periphery of Antarctica as well.” (149)

Comment: The temperature record of the past three decades suggests that global warming from rising CO₂ levels will be close to the low-end of the IPCC’s projected range, about 1.7°C (3°F). This implies a polar warming comparable to the Arctic warmth of the early Holocene. If our Stone Age ancestors survived (and likely benefited from) that “disaster,” also known as the Holocene Climate Optimum, why should we be worried?

X. Gulf Stream

AIT: Gore describes the functioning of Atlantic branch of the thermohaline circulation (THC), the oceanic “conveyor belt” that, along with the Gulf Stream, keeps Europe relatively warm in the wintertime. The sinking of cold, salty, dense water at the northern end of the belt is the motor that pulls warm surface water up towards Europe from the equator. Gore worries that “the rapid melting of Greenland ice” will decrease the density of North Atlantic surface water to the point where it sinks too slowly to drive the conveyor. According to Gore, such an event happened “10,000 years ago,” and “The Gulf Stream virtually stopped... Consequently, Europe went back into an ice age for another 900 to 1,000 years.” “Some scientists are now seriously worried about the possibility of this phenomenon recurring.” (149)

Comment: Gore refers to a cooling event that occurred 8,200 years ago (not 10,000 years ago). About 8,470 years before the present, a giant ice dam burst, allowing lakes Agassiz and Ojibway to drain swiftly through the Hudson Strait to the Labrador Sea. This released more than 100,000 cubic kilometers of fresh water into the North Labrador Sea, and is believed to have disrupted the THC, triggering a regional cooling that lasted about 400 years.¹⁵⁵ Greenland ice melt injects fresh water into the Atlantic Ocean at a much more gradual pace. According to a recent study in *Science*, in 2005, Greenland was losing ice at a rate of 224±41 cubic kilometers per year.¹⁵⁶

The Northern Hemisphere climate during the last interglacial period (~130,000 to 118,000 years ago) was relatively stable, even though Greenland experienced summertime temperatures 4°C-5°C warmer than the present for several millennia due to an orbitally-driven increase in solar radiation reaching the Northern Hemisphere, and even though sea levels rose to several meters higher than present.¹⁵⁷ These conditions may eventually have produced a “deep-water reorganization” that began the transition to the next ice age—but only after 8,000 years of comparative climate stability.¹⁵⁸

Gore conflates the THC with the Gulf Stream. The THC is a convective system driven chiefly by the sinking of dense (cold and salty) surface water in the high northern latitudes. The Gulf Stream, on the other hand, is a wind-driven system. It is energized

primarily by the Earth's spin and secondarily by the lunar tides, not by salinity levels in the oceans.¹⁵⁹ Thus, even in climate models that project a weakening of the THC in the 21st century, Europe continues to warm, "albeit more slowly than the rest of the world."¹⁶⁰

XI. Birds, Beetles, Extinctions

AIT: "The age-old rhythm of the Earth's seasons—summer, fall, winter, and spring—is also changing, as some parts of the world heat up more rapidly than others." (152) Gore cites a study showing that, in the Netherlands, the height of caterpillar season now arrives two weeks earlier than it did 25 years ago, making it hard for migratory birds ("tits"), which still arrive at about the same time of year, to find food for their chicks. "As a result, the chicks are in trouble." He generalizes: "Global warming is disrupting millions of delicately balanced ecological relationships among species in just this way." (153)

Comment: Gore says the "chicks are in trouble." However, the study found that, "The gap between the schedules of the caterpillars and the birds has had no demonstrable effect so far on tit numbers."¹⁶¹ Could it be that migratory birds are more adaptable than some climate alarmists imagine? Robins today are thriving in areas of Alaska and Canada where no robins were seen only a few decades ago.¹⁶² Climate change has extended their range from the southern tip of Mexico to the top of North America.¹⁶³ In the case of robins, global warming is for the birds.

AIT: Another study in *National Geographic* magazine shows sharp decline in frost days in southern Switzerland and a simultaneous sharp increase in invasive alien species that have rushed in to fill the newly created ecological niches. (154)

Comment: To illustrate this point, Gore reproduces the graph on the left side of the Figure, below.¹⁶⁴ However, he does not include the picture on the right side, nor the text at the bottom. The term "invasive alien species" can conjure up scary images of pests and weeds. In the study to which Gore refers, the "invasive" species are evergreen broad-leaved shrubs.

in coral reefs during periods of warmer than normal sea temperatures. Poised near their upper thermal limits, coral reefs have undergone global mass bleaching events whenever sea temperatures have exceeded long-term summer averages by more than 1.0°C for several weeks^{41,47}. Six periods of mass coral bleaching have occurred

tropical marine ecosystems. Increasing temperatures have reduced the likelihood that Antarctic organisms will be exposed to their lower thermal limits, thereby allowing increases in both numbers and extent of populations previously at the edge of their range while also, in a few instances, increasing the risk of exposure to upper

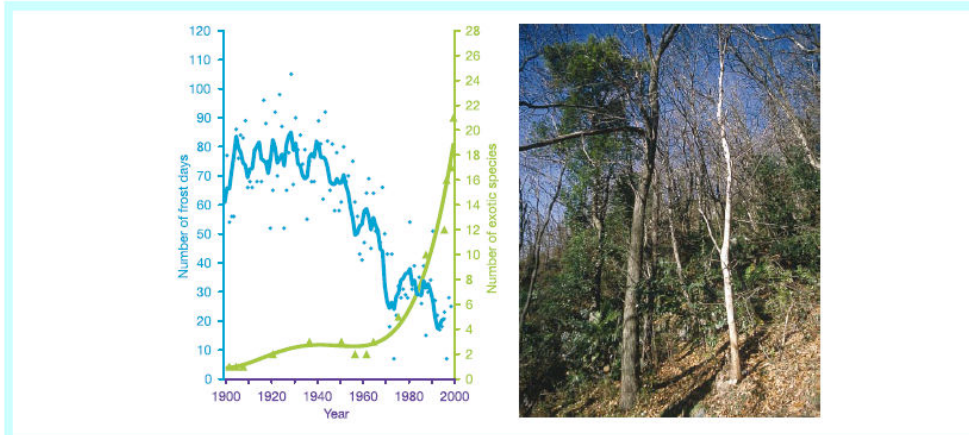


Figure 3 Vegetation shift from indigenous deciduous to exotic evergreen broad-leaved vegetation in southern Switzerland. The shrub layer is dominated by the growing number of spreading exotic evergreen broad-leaved species (see illustration) that

appear to profit from milder winter conditions, indicated here by the decreasing number of days with frost per year (the smoothed curve gives five year averages for the number of frost days per year)²⁹.

In their review of this study (or more precisely, the study on which it is based),¹⁶⁵ Sherwood, Craig, and Keith Idso point out that all of the exotic evergreen trees and shrubs were deliberately introduced by people who took a fancy to “exotic” plants:

The invading species were imported from relatively warmer places such as Africa, the Far East and Australia. For more than 200 years these ornamental woody plants were grown in Swiss gardens and parks. Within the latter half of the 20th century, however, many of them began to spring up in adjacent natural habitat, becoming especially competitive over the last thirty years. The author attributes this phenomenon to concurrent warming. It is clear, however, that were the alien species not introduced to the region by human transplantation in the first place, this particular type of opportunistic ecosystem reorganization would not be occurring.¹⁶⁶

It is also clear, we might add, that the species in question lived in Switzerland decades before the modern era of global warming.

The deliberate and inadvertent human introduction of non-native plants and animals is an “anthropogenic disturbance” associated with trade and tourism. It is reasonable to assume that since 1900, trade and tourism in Europe increased at least as much as the number of frost days decreased.

Also, even if a decline in frost days is creating ecological niches for non-native species, the decline may primarily be due to expanding urban heat islands rather than to rising CO₂ concentrations. Consider these findings from a study of climate change and vegetation in central European cities:

In big cities, the effects of global climate warming since the 1850s have been exacerbated by the heat-island effect. Berlin grew from a city of about 170,000 inhabitants in 1800 to a metropolitan area with 3.7 million inhabitants in 1910. Calculations of the increased warming effect of the urban climate are 0.2°C for 1798–1804, 0.7°C for 1831 to 1837, and 1.4°C for 1886 to 1898 (annual mean temperatures). For the period 1961 to 1980, there was a difference in the annual mean air temperature of more than 2°C between the center of Berlin and the surrounding areas. This warming correlates with a significant reduction of frost days: < 64 days in the center of the city; > 102 days in the surrounding areas ([Stülpnagel et al., 1990](#)). Consequently, in Berlin, an accelerated invasion of nonnative species that tolerate higher temperatures could be expected.¹⁶⁷

To put these numbers in perspective, the IPCC estimates that the world warmed about 0.6°-0.8°C during the 20th century. In contrast, Berlin warmed by roughly the same amount during 1831 to 1837, by roughly twice that amount during 1886 to 1898, and by roughly three times that amount during 1961 to 1980. Whatever ecological niches for invasive species global warming may be opening likely pale in comparison to those created by urbanization and population growth.

AIT: Gore reports that as frost days in the American West have declined, the spread of pine beetles and other pests has increased. (154)

Comment: Gore fails to consider the role of plain old mismanagement or lack of management. Colorado State University's Cooperative Extension program offers this interesting advice: "In general, the MPB [Mountain Pine Beetle] likes forests that are old and dense. Thinning out excess trees reduces forest density, lessens fire hazard and improves individual tree vigor. Most mature Colorado forests have about twice as many trees as forests more resistant to MPB. Get help from a forester with this option."¹⁶⁸ Indeed, compared to increases in forest density, climate change is likely a minor contributor to beetle infestations. According to Kloor (2000), pine forests in the Western United States had an average of 57 trees per hectare in 1876, but now contain as many as 2,100 trees per hectare.¹⁶⁹ This dramatic increase in forest productivity is a good thing. However, if densely packed forests are not prudently managed, they become vulnerable to pests, disease, and catastrophic fires.

AIT: We are facing what biologists are beginning to describe as a mass extinction crisis, with a rate of extinction now 1,000 times higher than the normal background rate. (163)

Comment: Gore does not tell us what the "natural background" extinction rate is, how it is ascertained, or upon what evidence the estimated 1000-fold increase is based. With estimates of the actual number of species ranging from 1.6 million to 80 million, this whole subject is fraught with uncertainty and guesswork.

Claims of a warming-induced “mass extinction crisis” do not survive inspection. Consider the vaunted study in *Nature* by Thomas et al. (2004), who predicted that climate change could wipe out up to a quarter of all terrestrial plant and animals species by 2054.¹⁷⁰ As Patrick Michaels points out, if the relationship that Thomas et al. posit between species extinction and global temperature increases were valid, then the 0.8°C temperature increase that occurred over the past 100 years would already have wiped out hundreds of thousands of species. “Yet nowhere is there evidence for such occurrences.”¹⁷¹

Extinction alarmists assume that the observed relationship between habitat loss and species loss on small islands holds for much larger land areas. Hence they suppose that any reduction in “species area,” whether due to deforestation or climate change, will result in a corresponding number of extinctions.¹⁷² The data tell a different story, as Bjorn Lomborg explains:

If islands get smaller, there is nowhere to escape. If, on the other hand, one tract of rainforest is cut down, many animals and plants can go on living in the surrounding areas. One obvious thing to do would be to look at our own experiment, the one carried out in Europe and North America. In both places, primary forest was reduced by approximately 98-99 percent. In the U.S., the eastern forests were reduced over two centuries to fragments totaling just 1-2 percent of their original area, but nonetheless this resulted in the extinction of one only forest bird.¹⁷³

Similarly, notes Lomborg, not one land animal species perished because Brazil deforested its Atlantic coast:

Brazil’s Atlantic rainforest had been almost entirely cleared in the nineteenth century, with only 12 percent extremely fragmented forest left. According to [biologist E.O.] Wilson’s rule of thumb, one ought to expect half of all species to have become extinct. However, when members of the Brazilian Society of Zoology analyzed all 171 known Atlantic forest animals, the group “could not find a single known animal species which could properly be declared as extinct, in spite of the massive reduction in area and fragmentation of the habitat.”¹⁷⁴

The same issue of *Nature* that carried the Thomas et al. study also featured a study by Alan Pounds and Robert Puschendorf that blames global warming for the extinction of several frog species in Costa Rica.¹⁷⁵ This was a hard case to make, because annual Costa Rican temperatures have remained remarkably flat since 1979. Frogs in Costa Rica were dying not from the heat but from a fungal infection carried by tiny organisms known as chytrids. Pounds and Puschendorf argued that global warming increases cloud cover, thereby limiting the frogs’ exposure to sunlight, a natural disinfectant that “can rid the frogs of this fungus.”

Patrick Michaels identified three problems with this supposed chain of causality.¹⁷⁶ First, there is no established correlation between global warming and cloud cover. Second, there was no observed change in Central American cloud cover from 1987 to 2001. Third, there is evidence that humans—possibly eco-tourists or researchers—introduced the chytrid fungus into the area, exposing the frogs to an unfamiliar pathogen.

Nowhere in AIT does Gore acknowledge the ecological benefits of CO₂ emissions (just as he never acknowledges the linkages between fossil energy, global economic growth, and human welfare). Ecosystem species richness is more highly correlated with ecosystem bio-productivity than with any other single factor. “It readily follows, therefore,” comments CO₂Science.Org, “that anything that enhances ecosystem primary production should also enhance ecosystem biodiversity; and that is precisely what atmospheric CO₂ enrichment does, as has been demonstrated in numerous laboratory and field experiments...”¹⁷⁷ Literally hundreds of laboratory and field observations show that in CO₂-enriched environments, trees, crops, and most plants grow faster and larger, produce more fruit, and utilize water more efficiently. Since all animals depend on plants, directly or indirectly, as a food source, rising CO₂ levels nourish the entire biosphere.

XII. Coral Reefs

AIT: Many factors contribute to the death of coral reefs—pollution from nearby shores, destructive dynamite fishing in less developed regions, and more acidic ocean waters. However, the most deadly cause of the recent, rapid, and unprecedented deterioration of coral reefs is believed by scientists to be higher ocean temperatures due to global warming. (164)

Comment: The deteriorating condition of coral reefs predates by decades any significant warming from greenhouse gases. Pandolfi et al. (2003), a team of a dozen biologists who surveyed 14 of the earth’s major reef systems, found that “most... were substantially degraded before 1900,” and that “all of the reefs in our survey were substantially degraded long before the first observations of mass mortality resulting from bleaching and outbreaks of disease.”¹⁷⁸ Corals could probably survive and even thrive in a warming world if they were not weakened and traumatized by pollution, sediment loading, and a host of other local insults.

As CO₂Science.Org points out, the scleractinian corals, which are today’s main reef builders, emerged in the mid-Triassic Period, when the Earth was “considerably warmer” than today, and thrived “throughout the Cretaceous, even when temperatures were 10-15°C higher than at present.” During the Paleocene/Eocene thermal maximum of ~55 million years ago, Arctic sea surface temperatures reached 24°C (76°F),¹⁷⁹ implying much warmer-than-present SSTs in the tropical oceans. Gore’s own graph on pages 66-67 shows that all four previous interglacial periods were warmer than the one in which we are now living. Analysis of coral skeletal remains from Australia’s Great Barrier Reef indicates that the tropical ocean about 5,350 years ago was 1.2°C warmer than the mean for the early 1990s.¹⁸⁰ In short, today’s coral species have been around for 200 million

years and survived countless changes in the global environment. If global warming were the coral killer Gore makes it out to be, coral would have become extinct long ago.

It is far from clear that warming per se is bad for coral. One study “suggests that ocean warming will foster considerably faster future rates of coral reef growth that will eventually exceed pre-industrial rates by as much as 35 percent in 2100,” according to lead author Ben McNeil, an oceanographer at the University of New South Wales.¹⁸¹ McNeil is not talking about a trivial amount of warming but a hefty 3.2°C increase in annual mean sea temperatures at coral reefs during the period from 1950 to 2100. In addition to more robust coral growth, the study also predicts that warming will expand coral’s habitat range.

AIT: In 2005, to date the hottest year on record, there was a massive loss of coral reefs, including some that were healthy and thriving when Columbus first arrived in the Caribbean.

Comment: Gore lists no source for the claim of massive coral loss in 2005. He neglects to ask whether coral that were healthy and thriving in 1492 were still in good shape before recent increases in SSTs.

AIT: In 1998, the second hottest year on record, the world lost an estimated 16% of all its coral reefs. (164)

Comment: AIT does not mention that 1998 was the year of an unusually strong El Nino, the warm phase of a naturally recurring ocean cycle.¹⁸² Although 16% of the world’s reefs were seriously damaged in 1998, by 2003 about 40% of the damaged reefs were either “recovering well” or had “fully recovered,” according to *Status of Coral Reefs of the World: 2004* (pp. 7-8).¹⁸³ Corals are more resilient than Gore seems to realize.

AIT: The link between global warming and the large-scale bleaching of corals, considered controversial only 10 to 15 years ago, is now universally accepted. (166)

Comment: Corals are communities of tiny organisms—polyps—that live symbiotically with micro-algae that supply them with energy, nutrients, and color. Almost any adverse change in water temperature (too cold as well as too warm), chemistry (not salty enough), or quality (too murky) can cause the polyps to eject their symbiotic algae, “bleaching” the coral. But coral bleaching is not the same as coral death. Bleaching can be an opportunity for polyps to “switch partners,” to recruit new symbionts better adapted to changed environmental conditions. Patrick Michaels reviewed two recent papers on the subject.¹⁸⁴

Now, two new papers in *Science* add further evidence that corals must not be as “fragile” as certain senators might hope. Cynthia Lewis and Mary Coffroth of SUNY-Buffalo bleached Caribbean corals and exposed them to certain *Symbiodinium* genotypes for six weeks. The corals not only re-established symbiotic relationships with the algae, but in some cases they

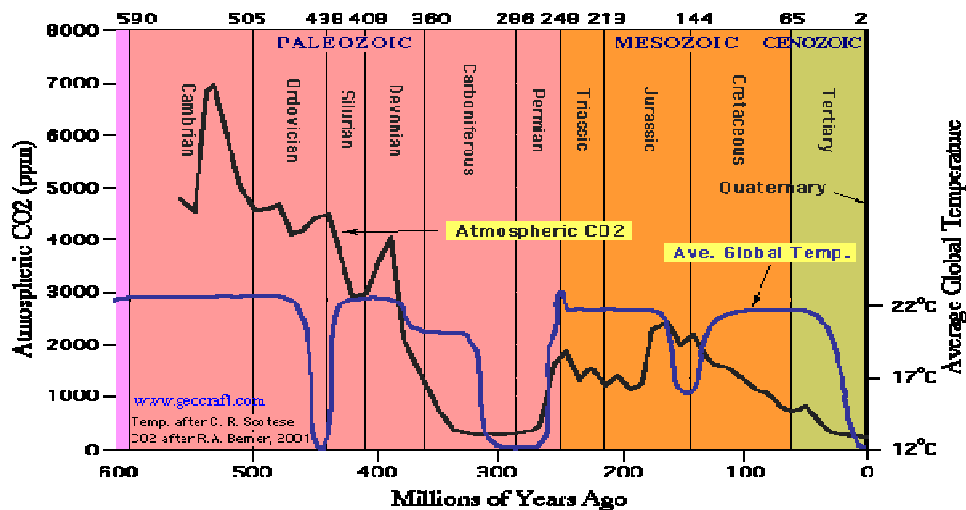
changed algae species, giving the corals a unique opportunity to select symbionts based upon the environmental conditions.

The second *Science* paper, by Angela Little and two coauthors from Townsville, Australia, looked at changing symbiotic relationships over the lifetime of the corals. They found that young juvenile corals tended to interact with different *Symbiodinium* strains than did adults, which “suggests that there maybe ‘active’ selection by the host to maximize symbiont effectiveness that varies with differences in physiological requirements between juvenile and adult corals.”

Michaels concludes: “While coral bleaching appears to be mass suicide to uninformed senators, it could actually be an excellent adaptive strategy that has allowed the species to survive for millions of years.”

AIT: Gore worries that rising CO₂ levels in the air will increase carbonic acid levels in seawater, which in turn will decrease levels of calcium carbonate—the raw material coral polyps use to build reefs. He presents a chart showing that all optimal areas for reef construction will disappear by 2050 “if we allow the doubling of pre-industrial CO₂ levels—which will occur within 45 years unless we do something about it.” (169)

Comment: The claim that all optimal areas for reef construction will disappear if CO₂ concentrations reach a doubling of pre-industrial levels is not plausible. Coral first appeared in the Cambrian Period, about 570 million years ago,¹⁸⁵ when atmospheric CO₂ levels exceeded 6,000 ppm. As noted above, the scleractinian corals emerged during the Mid-Triassic Period and thrived during the Cretaceous Period. During those periods, atmospheric CO₂ levels hovered above 1,000 ppm for roughly 150 million years and exceeded 2,000 ppm for several million years.¹⁸⁶ See the Figure below.



Given this history, how plausible is it that raising CO₂ concentrations to 560 ppm—roughly double pre-industrial levels—would make the oceans almost uninhabitable for corals?

Gore's source for this gloomy forecast is the U.S. Global Change Research Program (USGCRP).¹⁸⁷ The USGCRP cites Kleypas et al. (1999b) as the basis for its projection of declining coral calcification rates from 1880 to 2050. CO₂Science.Org reviewed the literature on CO₂-induced changes in carbonate levels, including Kleypas et al., and found that “none [of the studies] deal with living organisms, and, therefore, that *none* of them deal with the actual calcification process *as driven by life processes*. Rather, they deal exclusively with the lifeless world of chemistry and thermodynamics.”¹⁸⁸

Accordingly, CO₂Science.Org also reviewed the marine *biology* literature on coral calcification. These studies find that coral calcification rates have *increased* as SSTs and CO₂ levels have risen. Three factors appear to be at work: (1) warmth promotes coral calcification; (2) higher CO₂ levels boost coral-symbiont photosynthesis; and (3) CO₂-stimulated bio-productivity raises marine pH levels, mitigating the effects of CO₂-induced increases in carbonic acid.

One excerpt from CO₂Science.Org's long review article must suffice to show that AIT does not take all the relevant science into account:

Another pair of scientists to address the subject was Bessat and Buigues (2001), who worked with a core retrieved from a massive *Porites* coral on the French Polynesian island of Moorea that covered the period 1801-1990, saying they undertook the study because they thought it “may provide information about long-term variability in the performance of coral reefs, allowing unnatural changes to be distinguished from natural variability.” This effort revealed that a 1°C increase in water temperature increased coral calcification rate by 4.5%, and that “instead of a 6-14% decline in calcification over the past 100 years computed by the Kleypas group, the calcification has increased.” They also observed patterns of “jumps or stages” in the record, which were characterized by an increase in the annual rate of calcification, particularly at the beginning of the past century “and in a more marked way around 1940, 1960 and 1976,” stating once again that their results “do not confirm those predicted by the Kleypas *et al.* (1999) model...”

XIII. Algae, Ticks, Mosquitoes, and Germs

AIT: “We are changing the chemistry of our oceans in many ways, all over the world. As a result, there are many new ‘dead zones’ devoid of ocean life. Some are caused by the appearance of algae blooms in warmer waters fed by pollution coming from human activities on the shore. Many of these algae blooms have grown to spectacular and totally unprecedented levels in several places. In the Baltic Sea, for example, many resorts had to be closed in the summer of 2005 as a

result of algae. Florida's red tide represents a similar phenomenon." To illustrate these remarks, Gore presents three photographs, taken in the summer of 2005, of blue-green algae blooms at Gotland, Sweden. He concludes by saying, "Algae is just one of the disease vectors that have been increasing because of global warming." (170-172)

Comment: A global warming link to toxic algae blooms is plausible, because algae-forming bacteria only produce blooms in warm water. But global warming is at most an aggravating factor. Mass fish kills associated with red tide algae blooms have been reported in Florida for hundreds of years. Indeed, reports the Florida Fish and Wildlife Conservation Commission, "There is evidence that red tides have always existed in Florida's waters. Scientists who study red tides globally consider Florida red tides to be unique because they are natural events which existed long before Florida was settled."¹⁸⁹ Similarly, dead zones are naturally occurring phenomena in the Baltic Sea, which has had algae blooms since the last ice age, as shown by sediment cores.¹⁹⁰ In both the Baltic Sea and the Florida coast, sea surface temperatures in late summer are naturally high enough to support algae blooms, with or without global warming.

Moreover, warmth alone does not produce algae blooms. The water must be sufficiently salty, which in turn depends on wind patterns and precipitation levels. The Baltic Sea is the world's largest brackish water body. Whether or not Cyanobacteria produce blue-green algae blooms during the summer depends in part on how much salty water blew in during the winter through the narrow Kattegat Strait.¹⁹¹ Similarly, in Florida, red tide blooms penetrate into bays and estuaries only in drought years with higher-than-normal salinity.¹⁹²

Wind—or its absence—has an even more direct effect on blue-green algae levels in the Baltic. The Cyanobacteria cells have air bladders that allow them to drift slowly to the surface. Strong winds churn the water, inhibiting bacterial reproduction at the surface or breaking up the blooms.¹⁹³ There is no known relationship between global warming and calm weather.

Surprisingly, warmth can sometimes prevent red tide algae blooms. This happens when shallow water heated by the sun forms a layer of less dense, warm surface water that traps the red-tide bacteria (*Karenia brevis*) in the cooler bottom layer.¹⁹⁴

A major cause of blue-green algae blooms in the Baltic (although *not* of red tide blooms in Florida)¹⁹⁵ is nutrient loading, especially phosphorus loading, from agricultural runoff and sewage. In March 2006, an international panel of experts, commissioned by the Swedish Environmental Protection Agency, issued a report, *Eutrophication of the Swedish Seas*.¹⁹⁶ The panel was "extremely concerned and surprised that little or no significant progress has been made by the Baltic countries, in aggregate, to reduce riverine P [phosphorus] loading of the Baltic over the last 30 years." As a consequence, surface water concentrations of dissolved inorganic phosphorus (DIP) have trended upwards since the 1950s and also in the past decade. DIP concentrations were at record levels in 2005—the year of the algae blooms shown in AIT's photographs.

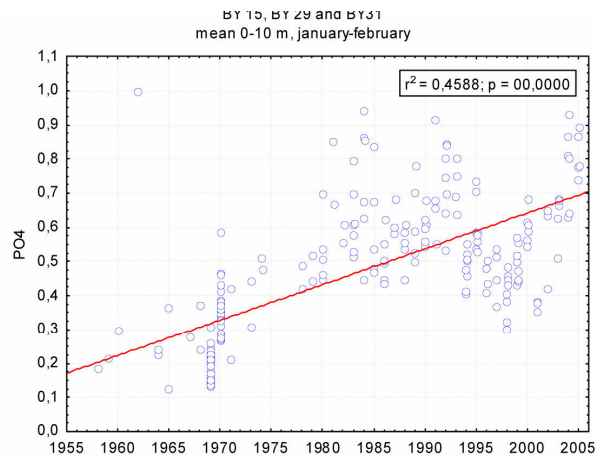


Figure 3.2. Trends in winter surface water dissolved phosphate concentrations for three deep Baltic Proper stations over the past 50 years from Swedish monitoring database SHARK at Sweden Oceanographic Data Center at SMHI (www.smhi.se). Long-term trend is highly significant, but note recent steep increase after the period of decline in the 1990s.

Paradoxically, regulatory controls to reduce atmospheric nitrogen deposition and nitrogen discharges from waste-water-treatment plants also contributed to the increase in algae blooms in recent years. The regulations have reduced the ratio of dissolved inorganic nitrogen (DIN) to DIP. This is significant because the Cyanobacteria, unlike most phytoplankton, are nitrogen fixers, i.e., they obtain nitrogen directly from the air. Consequently, lower levels of DIN allow them to “out-compete” other algae species. The combination of low DIN levels and high DIP levels explains much of the recent increase in algae blooms. In the expert panel’s words:

In the early 1970s DIN:DIP ratios were as low as in 2004 and 2005 (Figure 3.3), but winter DIP concentrations in 2004-05 were approximately double the DIP concentrations in the 1970s so the residual DIP after the spring bloom will be twice as high. Consequently, the historic highs in Cyanobacteria blooms in the last few years are not surprising.

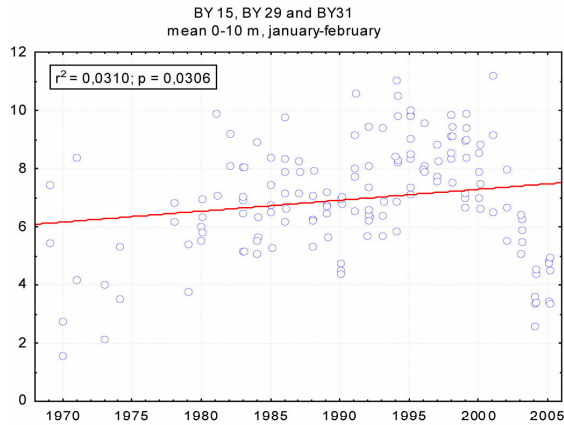


Figure 3.3. Winter surface water nitrate to phosphate ratios (by moles) for three deep stations in the Baltic Proper from Swedish monitoring database SHARK at Sweden Oceanographic Data Center at SMHI (www.smhi.se). Recent (post-2000) rapid decline has reversed a longer term trend towards increasing N:P ratios in winter waters. The decline may be a cause for the recent increases in Cyanobacteria blooms.

Also contributing to the recent increase in algae blooms, according to the expert panel, are “increased inflows of saline water through the Kattegat, which displaces deep water in the Baltic Proper, transporting more saline and phosphorus-rich water to the surface.” See the Figure below.

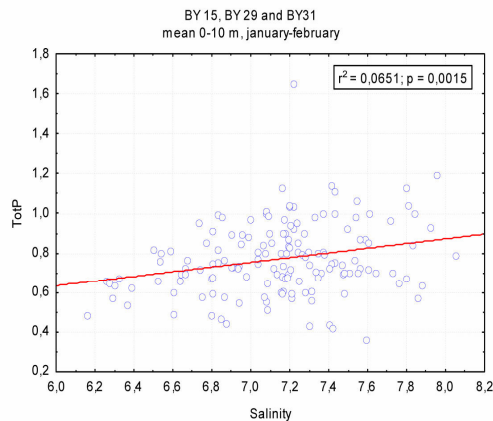


Figure 3.5. Total P and salinity in winter surface waters in the Baltic Proper (1971-2004 SMHI database). Increased inflows of saline water in the Kattegat vertically displace deep water in the Baltic Proper and transport more saline and P-rich deep waters towards the surface.

In short, since Cyanobacteria levels in the Baltic are linked to high DIP levels, low DIN to DIP ratios, and increased influx of salty water, it is unclear what role if any anthropogenic global warming played in producing the algae blooms pictured on pages 170-171 of Gore’s book.

AIT: And when these vectors—whether algae, mosquitoes, ticks, or other germ-carrying life forms—start to show up in new areas and cover a wider range, they are more likely to interact with people, and the diseases they carry become more serious threats. (172)

Comment: Several responses are in order here. First, societal factors typically overwhelm climatic factors in determining people’s risk of exposure to “germ-carrying life forms.” For example, between 1980 and 2003, Florida’s coastal population grew by 75%.¹⁹⁷ Between 1960 and 2010, Florida’s coastal population is projected to grow by 226%.¹⁹⁸ Because of these gigantic population increases, more people are likely to observe, worry about, and even “interact with” red tide algae blooms. Compared to this extraordinary demographic shift, the contribution of global warming to the potential population at risk of exposure is likely to be small. Moreover, whether anybody actually is exposed depends on whether individual bathers heed or ignore red tide advisories and warning signs at the beach.

Second, Gore fosters the impression that global warming can only be good for bad things (algae, ticks) and bad for good things (polar bears, migratory birds).¹⁹⁹ That is nature according to a morality play. A warmer, wetter, more bio-productive world will be good for many species, not just the icky ones. Nor is it always the case that bad things thrive in a warmer world. Estrada-Peña (2003) found that, during 1980 to 2000, temperature increases contributed to a “clear decrease” in the habitat of four tick species that are major vectors of livestock pathogens in South Africa.²⁰⁰

Third, Gore confuses correlation with causation. There are more cases of tick-borne disease (TBD), and the world is getting warmer. However, that is not scientific evidence of a warming-TBD link. Sarah Randolph of Oxford University’s Zoology Department set out to test whether climatic factors account for TBD increases in Europe during the past two decades.²⁰¹ Beginning with methodological issues, she found that current science lacks “fully functional tick population and pathogen transmission models,” leading her to conclude that, “it is not yet possible to predict whether the incidence of any tick-borne disease will increase or decrease at actual levels of climate change in any one place.”

Looking at real-world data, she found that tick-borne diseases increased markedly in some countries in certain years but fell significantly in other countries in other years, with no apparent correlation to climatic conditions. One factor that did appear to be significant was the increasing population density of the roe deer, a principal host for ticks, across most of Europe. As CO2Science.Org summarizes:

“Data from Denmark,” in Randolph’s words, “offer the best documented evidence for the impact of increasing densities of deer on both temporal and spatial variation in the rise of a tick-borne disease in Europe, this time Lyme borreliosis [LB] (Jensen and Frandsen, 2000; Jensen *et al.*, 2000).” From 1984 to 1998, for example, Randolph notes that “an increase in LB paralleled an increase in deer density,” and that “spatial variation in tick density across 35 sites in 1996, and in LB cases across 12 countries in

1993-95, was also correlated with deer density,” which “accords with the seminal role attributed to white-tailed deer in the emergence of LB in the USA (Spielman *et al.*, 1985; Wilson *et al.*, 1985).”

In other words, the trail of evidence leads to Bambi, not global warming.

Gore: In Kenya, also on the Equator, I heard growing concerns about the increased threat from mosquitoes and the diseases they can transmit in higher altitudes that were formerly too cold for them to inhabit. (141).

Comment: Malaria is primarily a disease of poverty, not of climate. Malaria outbreaks were common in such northerly climes as Minnesota, Canada, Britain, Scandinavia, and Russia during the 19th century, when average global temperatures were cooler than today.²⁰² The resurgence of malaria in some developing countries is due to decreased spraying of homes with DDT, anti-malarial drug resistance,²⁰³ and incompetent public health programs, not to any ascertainable changes in climate.²⁰⁴

Moreover, even if global warming contributes marginally to malaria risk by accelerating mosquito-breeding cycles or expanding mosquito habitat range, this would not justify growth-chilling controls on energy use. It is much more effective—and much less costly—to attack malaria risk directly than to address it indirectly via weather modification. As Indur Goklany of the U.S. Interior Department found, a Kyoto-type approach might reduce the total population at risk for malaria by 2.8% in 2080 at a cost of \$250 billion per year. In contrast, malaria’s current yearly death toll of about 1 million could be cut in half at an annual cost of about \$1.25 billion through a combination of proven measures including spraying with insecticides, window screens, bed nets, better case management, and more comprehensive medical care.²⁰⁵

AIT: Some 30 so-called new diseases have emerged over the last 30 years. And some old diseases that had been under control are now surging again. (174)

Comment: Gore does not even attempt to link these “new” diseases to global warming, although he clearly wants readers to imagine such a nexus. Again, correlation is not causation.

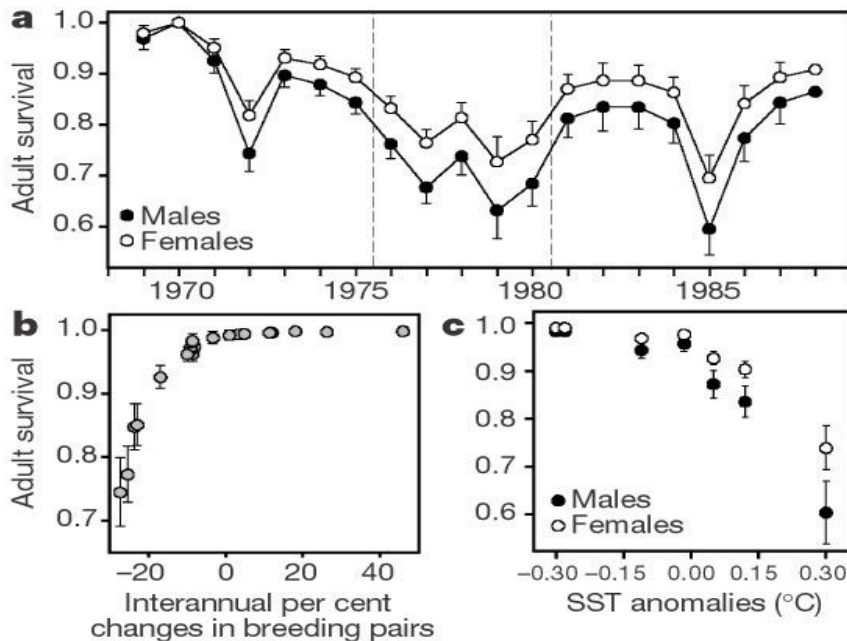
AIT: One example is the West Nile virus, which entered the United States on the eastern shore of Maryland in 1999 and within two years crossed the Mississippi. Two years after that, West Nile spread all the way across the continent. (175)

Comment: West Nile virus spread rapidly because the principal carriers of the disease, birds and mosquitoes, are plentiful in the United States. Ironically, the speed with which West Nile spread is evidence that global warming had nothing to do with its transmission. The North American continent contains nearly all the climate types of the world—from hot, dry deserts, to boreal forests, to frigid tundra—a range that dwarfs any small alteration in temperatures or precipitation that may be related to greenhouse gas emissions. The virus could not have spread so far so fast, if it were climate-sensitive.

XIV. Antarctica: Penguins, Ice Shelves, and Sea-Level Rise

AIT: Gore now turns to Antarctica, the “second canary in the coal mine.” He faults the movie, *March of the Penguins*, for “thinking that the biggest challenge facing Antarctica’s Emperor penguins is their icy cold habitat.” According to Gore, “Scientists studying Emperor Penguins at the colony featured in the film found that their numbers have dropped by 70% since the 1960s. The likely culprit: global climate change.” Global warming, he argues, weakens the ice, making it “more likely to break apart and drift out to sea, taking the penguins’ eggs and chicks with it.” (178)

Comment: This is misleading at best. Gore gives the impression that Emperor penguins are in peril, their numbers falling as the world warms. He provides no reference but his source appears to be a study by Christophe Barbraud and Henri Weimerskirch, published in *Nature*.²⁰⁶ Barbraud and Weimerskirch found that Antarctica’s emperor penguin population “declined abruptly by 50% in the late 1970s and has stabilized since.” Their data indicates that stabilization occurred around 1989 (Figure a, below).



Wikipedia also reports that the “species is considered stable,” with an estimated 150,000-200,000 breeding pairs.²⁰⁷ To say that the population dropped “since the 1960s” is accurate but so imprecise as to convey a false picture. There was a population decline in the 1970s but population has been stable since the late 1980s—a period of rising CO₂ concentrations and generally increasing global temperatures.

Gore attributes the population decline “since the 1960s” to ice breaking off and carrying penguin eggs and chicks out to sea. Barbraud and Weimerskirch say that “complete or

extensive breeding failures in some years resulted from early break-out of the sea-ice holding up the colony,” but their source is a study published in 1974. If this is an ongoing recurrent threat, as Gore suggests, why has the population been stable rather than declining over the past decade and a half?

Whereas Gore presents reduced pack ice as an unmitigated disaster for Emperor penguins, Barbraud and Weimerskirch found a partially offsetting benefit. If there is less ice, penguins do not have to travel as far from the colony to the feeding ground. In a similar vein, Ainley et al. (2003) found that as ice shelves retreat, “extensive coastlines are available to be colonized and even recolonized—about half the Antarctica circumference,” which may be one reason most colonies of Adèlie penguins are increasing.²⁰⁸

Oddly, Gore does not mention what Barbraud and Weimerskirch consider the main cause of the 1970s population decline—a reduction in the birds’ food supply. They reason as follows. The penguins’ diet mostly consists of krill. Krill breed under ice. Sea surface temperatures around Antarctica were anomalously high in the 1970s. Warmer seas meant less ice, hence less krill for the birds to eat. This conclusion is speculative. There is no direct observational evidence that the birds’ food supply declined during this period. Ainley et al. (2003) note that penguin diets consist not only of krill but also of fish and squid, and “the species adjusts its diet based on prey availability.”

Nowhere do Barbraud and Weimerskirch state in their study that global warming caused the high SSTs postulated to have decreased the birds’ food supply. Weimerskirch told *National Geographic* that he “thinks” global warming was “probably” the cause. But as *National Geographic* explains, there is no way to tell: “Whether it was the result of natural climate variability in the Antarctic circumpolar wave cycle or an anomaly related to global warming is not possible to determine because air and sea surface temperature data from many years ago are not available.”²⁰⁹

What else might have reduced the Emperor penguin population in the late 1970s? According to one source, “Human disturbance may have been involved in the *c.* 50% decrease in [Emperor Penguin] breeding populations in the Ross Sea sector.”²¹⁰ Almost any human activity near or around a penguin colony—including tourism, use of motorized vehicles, and scientific research—“has the potential to cause mortality, reduction of reproductive success, and/or degradation of the nesting area.”²¹¹ Patrick Michaels elaborates:

Perhaps it’s worth noting that the period of rapid decline in population coincides with the development of Antarctic “ecotourism,” which means people visiting the rookeries as well as buzzing them in airplanes. Remember, the biggest thing these birds have seen in their tens of millions of years of evolutionary history is an albatross. A large airliner or a gaggle of tourists might cause quite a stir, moving them off their nests long enough to induce increased mortality. It’s easy to freeze an egg at

Antarctic temperatures, and we know which must come first: the egg, not the penguin!²¹²

AIT: Gore presents a map showing the Antarctic Peninsula. “Each orange splotch represents an ice shelf the size of Rhode Island or larger that has broken up since [scientist John] Mercer issued his warning [in 1978]. (181-182)

Comment: “The size of Rhode Island or larger” sounds very big, hence very scary—until you recall that Rhode Island is the smallest State. Since 1978, the Antarctic Peninsula lost ice shelves totaling over 4,825 square miles.²¹³ That represents 1/55th the area of Texas (268,601 square miles), and falls short of the State’s water area (6,687 square miles).²¹⁴ Rhode Island, at 1,214 square miles, is not even 1/220th the size of Texas. Imagine the impact on audiences had Gore said, “Each orange splotch represents an ice shelf 1/220th the size of Texas.”

AIT: Scientists thought this ice shelf [Larson-B] would be stable for another century—even with global warming.... They had thought the meltwater sank into the ice and refroze. Instead, as they now know, the water keeps sinking down and makes the ice mass look like Swiss cheese. (183)

Comment: Again, some perspective is in order. The Larson-B ice shelf that broke up during January 31, 2002 to March 5, 2002 covered an area of 1,460 miles. Scientists overestimated the stability of an ice shelf 1/246th the size of the West Antarctic Ice Sheet (360,000 square miles).

AIT: Once the sea-based ice shelf was gone, the land-based ice behind it that was being held back began to shift and fall into the sea. This, too, was unexpected and carries important implications because ice—whether in the form of a mountain glacier or a land-based ice shelf in Antarctica or Greenland—raises the sea level when it melts or falls into the sea. (184)

Comment: The break-off of floating ice shelves accelerates the flow of the land-based ice behind them; however, this does not mean the larger structure is unraveling or about to do so. A recent literature review in *Science* noted that the collapse of the Larson-B ice shelf “was followed by speedup of its major tributary glaciers, by twofold to eightfold where they entered the former ice shelf,” but also that the speedup was no longer observable beyond about 10 km inland, that “slight decelerations” occurred “only 1 year later,” and hence that “these events may just represent fast adjustments to marginal fluctuations.” The study concludes that, “The recent glacier accelerations are too young... and the observational record is too short to evaluate whether they represent short-term fluctuations or are part of a longer term trend that might scale with future climatic warming.”²¹⁵ The article estimated that the accelerated glacier flow after the Ross-B breakup “contributed about 0.07mm/year to sea-level rise”—equivalent to less than 0.3 inches in a century.

AIT: Many residents of low-lying Pacific Island nations have already had to evacuate their homes because of rising seas. (186)

Comment: The two-page photograph accompanying this statement is titled “High Tide in Funafuti, Tuvalu, Polynesia.” The photo doesn’t jibe with the text. It shows a young boy playing in the water, while his mother, unperturbed by the wave crashing a few feet from her workbench, washes clothes and tends to baby sister. Nobody is fleeing from anything in this picture.

More importantly, tide gauge records show that sea levels at Tuvalu *fell* during the latter half of the 20th century. Altimetry data from the Topex-Poseidon satellite show that Tuvalu sea levels fell even during the 1990s, touted by the IPCC as the warmest decade in a thousand years. Tuvalu, at 179E longitude and 8S latitude, is smack dab in the central blue areas where sea levels fell.

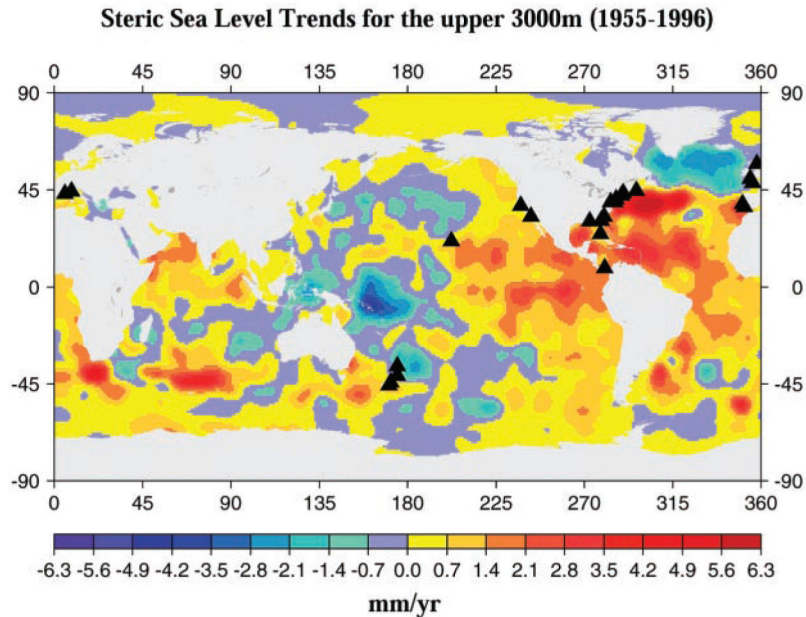
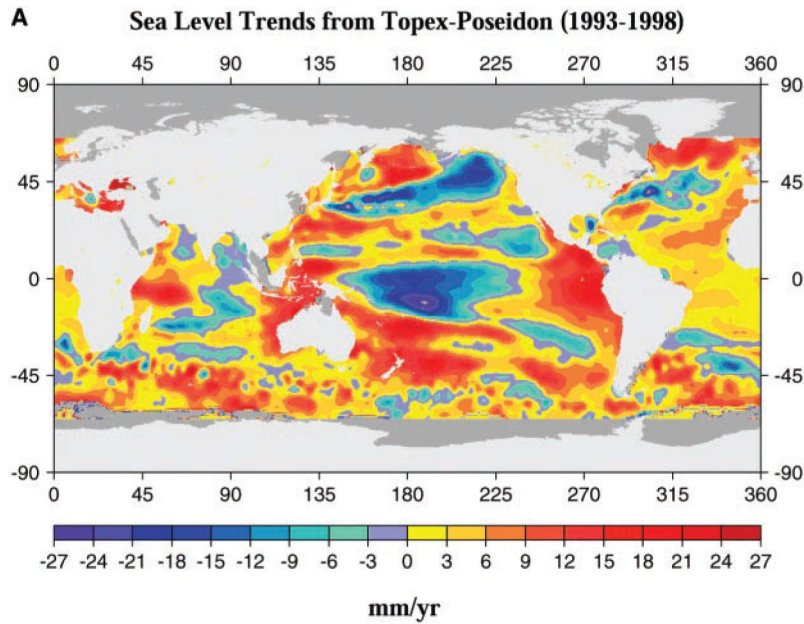


Fig. 4. Map of the geographical distribution of thermosteric sea level trends for 1955–96 computed with temperature data from (3) down to 3000-m depths. Black triangles show the locations of the 25 tide gauges.



Source: Cabanes et al. (2001).²¹⁶

AIT: “The Thames River, which flows through London, is a tidal river. In recent decades, higher sea levels began to cause more damage during storm surges, so a quarter of a century ago, the city built these barricades that can be closed for protection.” Gore presents a graph showing that annual closures of the Thames barriers increased in recent years. (188-189).

Comment: Recent increases in the annual number of Thames barrier closings are not evidence of increased flood risk due to global warming-induced sea-level rise.

To begin with, in recent years authorities have closed the barriers to keep water in the Thames as well as keep tidal surges out. As the U.K. Department of Environment, Food, and Rural Affairs explains:

Because the Thames River Barrier is now subject to different operating rules, it may be less useful as an indicator [of flood defence]. The barrier is now closed to retain water in the Thames River as well as to lessen the risk of flooding. (It was closed on 9 successive tides at the start of 2003.) Thus, the number of closures has increased greatly in recent years. This indicator would only be useful if it were possible to distinguish the number of closures made specifically to lessen flood risk.²¹⁷

Second, quite apart from any global change in sea levels, London is sinking. As the UK Environment Agency explains:

Tide levels are steadily increasing owing to a combination of factors. These include higher mean sea levels, greater storminess, increasing tide amplitude, the tilting of the British Isles (with the south eastern corner

tipping downwards) and the settlement of London on its bed of clay. As a result tide levels are rising in the Thames Estuary, relative to the land, by about 60cm per century. Surge tides are a particular threat and occur under certain meteorological conditions.

To put this in perspective, according to the IPCC, “the rate of average global sea level rise in the 20th century is in the range of 1.0 to 2.0 mm/year.”²¹⁸ That means 1-2 centimeters per decade or 10-20 centimeters per century. So relative to the land, the London tide is rising anywhere from three to six times faster than global sea-level rise.

Third, risk perceptions influence barrier closure decisions. The initial stimulus to build the barrier system was a flood in 1953 that killed 300 people. “Today,” a CBS News feature comments, “such a flood would be far more deadly. One and a quarter-million people now live on the Thames river flood plain. Thanks to a booming economy, more are moving in each month.”²¹⁹ The more people and property at risk, the more risk-averse decision makers are likely to become.

Given the confounding variables—barrier closings for purposes other than flood control, the sinking of London, the post-glacial tilt of the British Isles, the high priority UK authorities place on avoiding the next killer flood, to say nothing of the natural variability of North-Sea weather—it is impossible to discern a global climate signal in the number of annual Thames barrier closings.

Although the Thames barriers were completed in 1982 and officially commenced operations in 1984,²²⁰ Gore’s graph of annual barrier closings (p. 189) goes back to 1930. Perhaps the graph’s pre-1980s portion illustrates the operation of earlier flood control devices—in which case, Gore is comparing apples to oranges. Worse, the graph gives the impression that storm surges on the Thames became a serious threat only recently, in the era of greenhouse warming. Not so. Consider this snippet from the UK Government’s Environment Agency:

"There was last night the greatest tide that was ever remembered in England to have been in this River all Whitehall having been drowned." Thus wrote Samuel Pepys in his diary on 7th December 1663. Even in Pepys’ day the menace of flooding on the Thames had a long established history. In 1236 the river was reported as overflowing “and in the great Palace of Westminster men did row with wherries in the midst of the hall.” (John Stow, *The Chronicles of England*) The last time that central London flooded was in 1928 when 14 people drowned. In 1953 there was disastrous flooding on the East Coast and the Thames Estuary with a toll of over 300 lives. If this flood had reached central London’s highly populated low lying areas the result could have been horrifying beyond measure.²²¹

AIT: Further sea level rise could be many times larger and more rapid depending on what happens in Antarctica and Greenland—and on choices we make or do not make—now concerning global warming. (189)

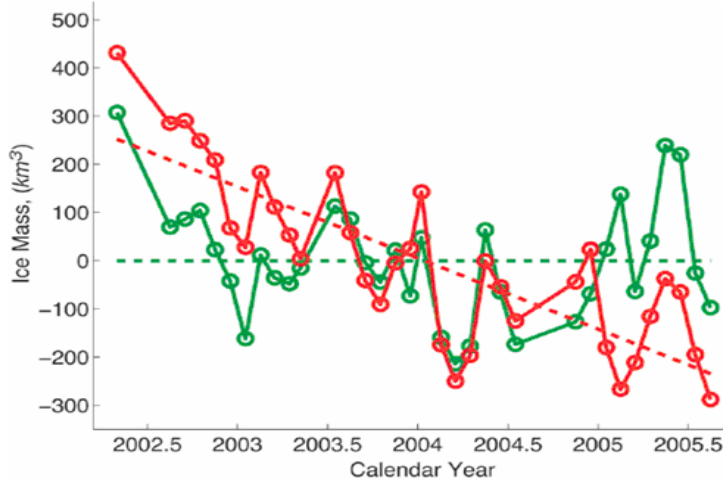
Comment: Almost anything is possible, but how much sea level rise may we reasonably infer from 20th century data? A recent study by Church and White (2006), using TOPEX-Poseidon and Jason-1 satellite altimeters as well as tide gauge data, found a global mean sea level rise of 195 mm (~7.6 inch) from January 1870 to December 2004, a 20th century sea-level rise rate of 1.7 ± 0.3 mm/year, and “a significant acceleration of sea-level rise [during the 135-year period] of 0.013 ± 0.006 mm/year.”²²² Church and White estimate that if this acceleration persists through the 21st century, “sea level in 2100 would be 310 ± 30 mm higher than in 1990”—about 12 inches higher. A foot of sea-level rise is not trivial, but neither is it alarming. Consider that coastal development and property values exploded during the 20th century even though sea levels increased by roughly half that amount.

Gore’s remark that sea level rise could be “many times larger and more rapid depending...on the choices we make or do not make—now concerning global warming,” is just plain wrong. The most aggressive choice America could make “now” would be to join the European Union in implementing the Kyoto Protocol. But according to Tom Wigley of the National Center for Atmospheric Research, Kyoto would avert only 1 cm of sea-level rise by 2050 and 2.5 cm by 2100. That’s because Kyoto would avert only 0.07°C of warming by 2050 and 0.15°C by 2100.²²³ The energy policy choices we make or do not make “now” cannot materially affect the rate of sea-level rise in the 21st century.

AIT: The East Antarctic ice shelf is the largest ice mass on the planet and had been thought to be still increasing in size. However, two new studies in 2006 showed overall volumes of ice in Antarctica appear to be declining, and that 85 percent of the glaciers there appear to be accelerating their flow toward the sea. Second, air temperatures higher above the ice warmed more rapidly than air temperatures anywhere else on earth. This finding was actually a surprise, and scientists have not yet been able to explain why it is occurring. (190)

Comment: Of the three studies to which Gore alludes, I can identify only two: one by Isabella Velicogna and John Wahr, the other by John Turner and colleagues at the British Antarctic Survey.

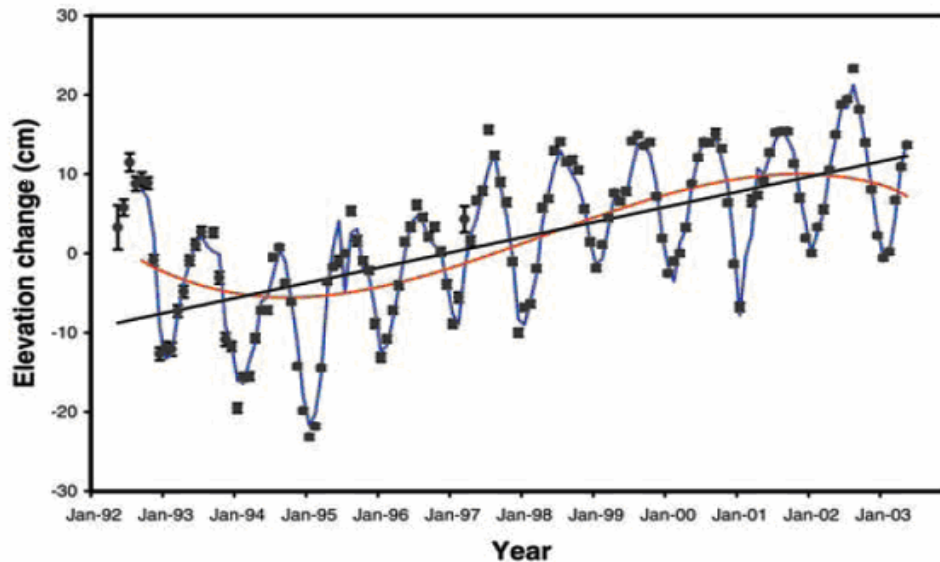
Velicogna and Wahr used satellite measurements of gravity fluctuations to infer ice-mass changes in Antarctica.²²⁴ Gore gives the impression that all of Antarctica, including the East Antarctic ice sheet (EAIS), is losing ice mass. In fact, almost all the ice loss observed by Velicogna and Wahr comes from the smaller West Antarctic ice sheet (WAIS).²²⁵



Source: Velicogna and Wahr (2006). The ice mass variations over the West Antarctic Ice Sheet (red) and the East Antarctic Ice Sheet (green).

A few months earlier, *Science* published a study by Davis et al. (2005), who examined Antarctic ice mass balance changes over a somewhat longer period, from May 1992 to May 2003. The Davis team also found that the WAIS was losing mass. However, the larger EAIS was gaining mass (from snow accumulation) at a faster rate, yielding a net increase in Antarctic ice. The overall effect was to *reduce* sea-level rise by 0.09 mm/year.²²⁶

As Patrick Michaels points out, Velicogna and Wahr begin their analysis at the peak of ice mass accumulation in Davis et al.'s longer record. See the Figure below.



Source: Davis et al. (2005). The ice mass changes (in terms of elevations change) observed over the East Antarctic Ice Sheet from May 1992-May 2003.

“Notice,” says Michaels, “that in mid-2002 (the start of the Velicogna and Wahr analysis) ice mass was at the highest level in the record. This means that the apparent decline in the record of Velicogna and Wahr may simply be the short-term correction to an anomalously high mass gain during a period of long-term mass growth.” He then adds: “But who is to know for sure? It is impossible to tell anything about a trend in a system as vast as Antarctica with less than three years worth of data.”

Turning now to the Antarctic air temperature study, Turner et al. (2006) analyzed weather balloon data over the past 30 years and found a 0.5°C to 0.7°C per decade wintertime warming trend in the mid-troposphere above Antarctica.²²⁷ That is a warming rate about three times faster than the global average.

Lest anyone start to panic, several points should be kept in mind. First, NASA satellites that also measure troposphere temperatures show a 0.12°C per decade Antarctic *cooling trend* since November 1978.²²⁸ Second, as Gore indicates, the Turner team could not reproduce the observed warming pattern using climate models, leading the researchers to state that they “are unable to attribute these changes to increasing greenhouse gas levels at this time.” Third, the 0.5-0.7°C per decade warming observed by Turner et al. is occurring in the middle atmosphere (at 600 hPa), not at the surface, where the ice is. Turner et al. report an Antarctic surface-warming trend of 0.15°C per decade from 1971 to 2003—roughly the global average. Fourth, the Antarctic winter is unimaginably cold; minimum temperatures drop down to –85 °C and –90 °C (–121 °F and –130 °F)” at the South Pole.²²⁹ A *wintertime* warming of 0.15°C per decade or even 0.7°C per decade will not melt any ice even if it continues for centuries.

AIT: East Antarctica is still considered far more stable over long periods of time than the West Antarctic ice shelf, which is propped up against the tops of islands. This peculiar geology is important for two reasons: first, its weight is resting on land and therefore its mass has not displaced seawater as floating ice would. So if it melted or slipped off its moorings into the sea, it would raise sea levels worldwide by 20 feet. Second, the ocean flows underneath large sections of this ice shelf, and as the ocean has warmed, scientists have documented significant and alarming structural changes on the underside of the ice shelf. (190)

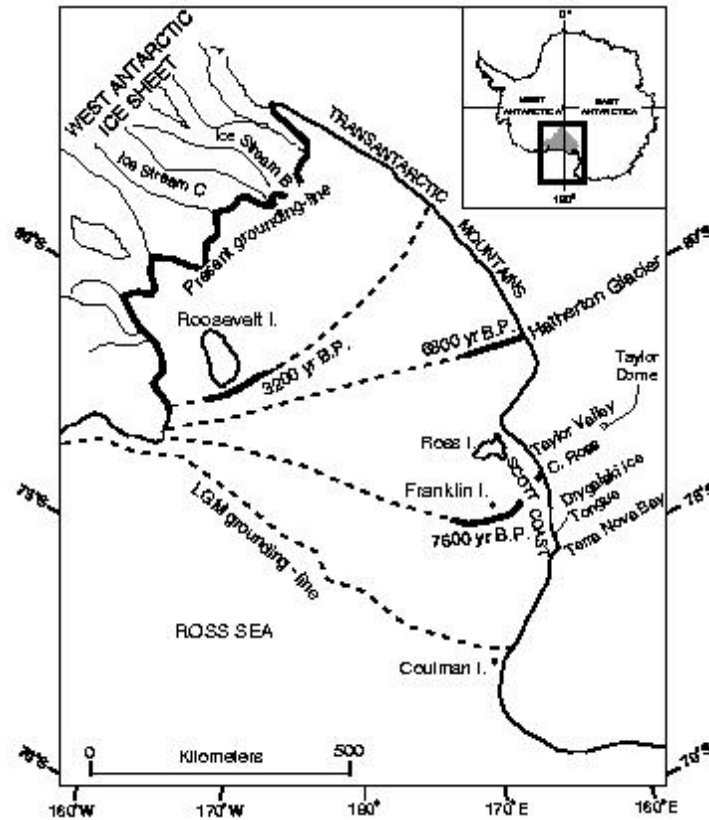
Comment: Gore provides no information allowing the reader to assess whether the “structural changes on the underside of the ice sheet” are “significant” or “alarming.” He probably refers to research by NASA’s Robert Bindshadler and others showing that water from the intermediate depths—the warmest water in polar oceans—is melting the submarine base of the glaciers, accelerating their flow towards the sea.²³⁰

Bindshadler is careful to point out “the absence of any indication of increasing sea surface temperature” in the polar oceans, and he notes that “warmth in the ocean arriving from lower latitudes would raise the temperature of this [comparatively warm] intermediate water a fraction of a degree, hardly enough to initiate a sudden glacier acceleration.” So why are glaciers accelerating?

According to Bindschadler, once the intermediate layer penetrates the moraine, or sill (the barrier-like accumulation of boulders, gravel, and other debris deposited by the glacier as it retreats from its maximum extent), the water reaches the “grounding line,” the boundary of the ice sheet’s base on the sea floor. “Increased pressure at these greater depths lowers the melting point of this ice, increasing the melting efficiency of the warmer water. Rapid melting results.” This explanation suggests a process that would occur with or without global warming! It also suggests a process that cannot be stopped. And that is what Bindschadler concludes:

Retreating glaciers lengthen the distance warmer water must travel from any sill to the grounding line, and eventually tidewater glaciers retreat to beds above sea level. This might limit the retreat in Greenland but will save neither West Antarctica, nor the equally large subglacial basin in East Antarctica where submarine beds extend to the center of the ice sheet.

Conway et al. (1999), in a study mapping the retreat of the Ross Ice Shelf grounding line since the last glacial maximum (see Figure below), found that “most recession occurred in the middle to late Holocene in the absence of substantial sea level or climate forcing.”



Holocene grounding-line recession in the Ross Sea Embayment. Adapted from Conway et al. (1999).²³¹

Conway et al. conclude that the current grounding line retreat is likely natural and will continue even in the absence of greenhouse forcing:

We suggest that modern grounding-line retreat is part of ongoing recession that has been under way since the early to mid-Holocene time. It is not a consequence of anthropogenic warming or recent sea level rise. In other words, the future of the WAIS may have been predetermined when grounding-line retreat was triggered in early Holocene time. Continued recession and perhaps even complete disintegration of the WAIS within the present interglacial period could well be inevitable.

When might the “inevitable” occur? Conway et al. state that “if the grounding line continues to pull back at the present [i.e. late 1990s] rate, complete deglaciation will take about 7,000 years.” Of course, such estimates are uncertain, because ice sheets are dynamic systems that can change in unpredictable ways and global warming could measurably accelerate the ongoing recession of the WAIS.

But this much seems clear. The “significant and alarming structural changes” to which Gore alludes have likely been going on for millennia, with no help from man-made global warming. Gore cites no specific evidence to justify fears of an impending collapse of the WAIS, or large portions of it, within the next several centuries.

XV. Greenland and Sea-Level Rise

AIT: These pools [of meltwater on the top of the Greenland glacier] have always been known to occur, but the difference now is that there are many more of them covering a far larger area of the ice...they are exactly the same kind of meltwater pools that...scientists observed on top of the Larsen-B ice shelf in the period before its sudden and shocking disappearance...this meltwater is now believed to keep sinking all the way down to the bottom, cutting deep crevasses and vertical tunnels that scientists call “moulins.” When the water reaches the bottom of the ice, it lubricates the surface of the bedrock and destabilizes the ice mass, raising fears that the ice mass will slide more quickly toward the ocean. (192)

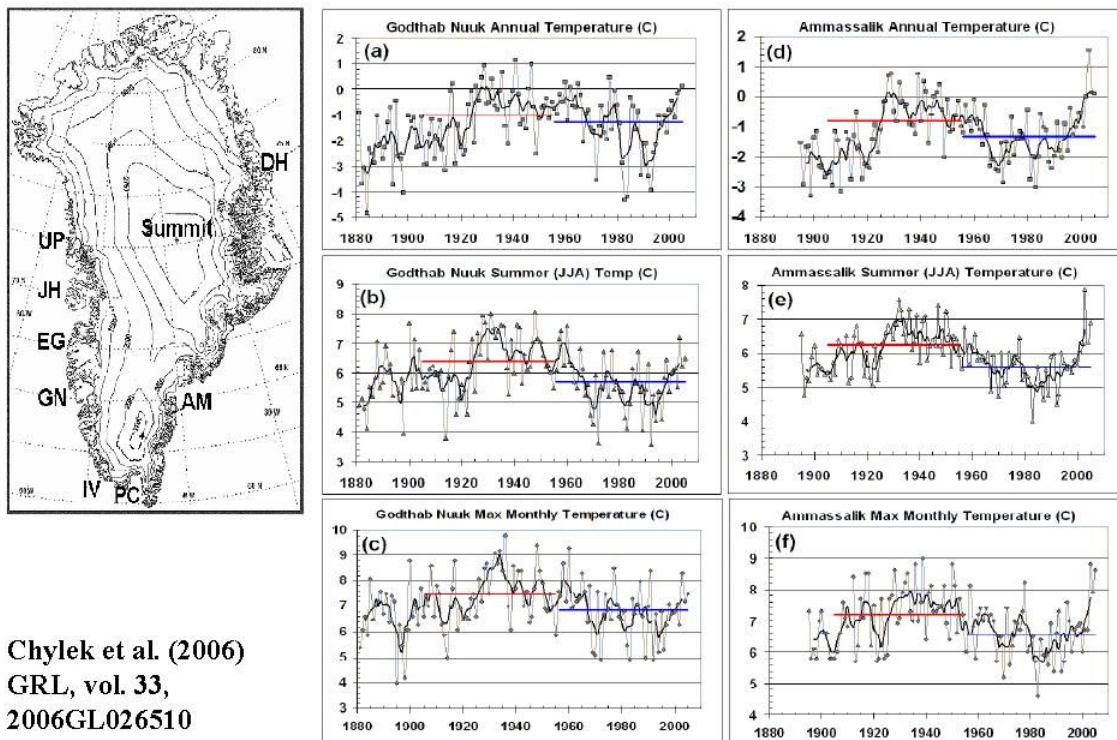
Comment: “Moulins” accelerate glacial movement in Greenland, but not enough to produce anything like a large-scale replay of the Larson-B ice shelf break up. As NASA’s Bindschadler observes:

Penetration of surface meltwater to the glacial bed in Greenland can lead to seasonal flow acceleration, but the annually averaged increase in speed is only a few percent. In the case of the Helheim Glacier, the relative intensities of warm summers were not associated with the observed changes in glacial speed.²³²

Moulins in numbers equal to or surpassing those observed today probably occurred during the first half of the 20th century, with no major loss of grounded ice. Chylek et al.

(2006) examined temperature data from the only two weather stations in Greenland with a century-long measurement record that also covered the decade from 1995 to 2005, Godthab Nuuk on the west and Ammassalik on the east coast of southern Greenland.²³³ See the Figure below.

The 1995-2005 warming in Greenland is probably natural and unexceptional when compared to the warming of the 1920-1930



Chylek et al. found that, “Almost all decades between 1915 and 1965 were warmer or at least as warm as the 1995 to 2005 decade...suggesting the current warm Greenland climate is not unprecedented and that similar temperatures were a norm in the first half the 20th century.” The researchers also found “no statistically significant difference between the average temperature from the 1905 to the 1955 period and 1955 to 2005 period,” the only difference being that summertime (JJA) average temperatures were *warmer* at both stations during the 1905-1955 period. Further, although the decade 1920-1930 was as warm as the decade 1995-2005, the rate of warming was “50% higher” during the earlier decade.

Chylek et al. conclude that recent glacier acceleration in Greenland, as observed by Rignot and Kanagaratnam (2006),²³⁴ “has probably occurred previously. There should have been the same or more extensive acceleration during the 1920-1930 warming as well as during the Medieval Warm period in Greenland ... when Greenland temperatures were generally higher than today.”

AIT: “If Greenland melted or broke up and slipped into the sea—or if half of Greenland and half of Antarctica melted or broke up and slipped into the sea, sea levels worldwide would increase by between 18 and 20 feet. Tony Blair’s advisor, David King is among the scientists who have been warning about the potential consequences of large changes in these ice shelves. At a 2004 conference in Berlin, he said: ‘The maps of the world will have to be redrawn.’” Gore then presents 10 pages of before-and-after ‘photographs’ showing what 20 feet of sea level rise would do to the world’s major coastal communities.

Comment: “The Greenland ice sheet cannot slip into the sea,” as one reviewer observes, “since it is resting in a bowl-shaped depression produced by its own weight, surrounded by mountains which permit only limited glacier outflow to the sea.”²³⁵ How long would it take to melt half of Greenland? A modeling study reviewed by the IPCC found that a sustained 5.5°C warming of Greenland would melt about half the glacier and increase sea level by 3 meters “over a thousand years.”²³⁶

NASA’s Gavin Schmidt, a co-founder of RealClimate.Org, was hard pressed to defend Gore’s apocalyptic scenario when asked about it by *Salon* magazine. According to *Salon*, Schmidt believes a 20-foot rise in sea level is plausible “in the long run—the very long run.” How long would it take for that to occur, *Salon* asked? “Maybe 1,000 years,” said Schmidt. “There’s some uncertainty about how quickly that could happen,” Schmidt said, “but Gore was very careful not to say this is something that is going to happen tomorrow.” Nice try. Gore failed to say that a 20-foot sea-level rise would *not* happen the *Day After Tomorrow*.²³⁷ Worse, Gore implied that a collapse of the ice sheets could happen in our lifetime when he counted up all the millions of people living in Beijing, Shanghai, Calcutta, and Bangladesh who would be “displaced, “forced to move,” or “have to be evacuated.”

Nobody knows how warm Greenland is going to be over the next thousand years. What we have pretty good data on is the net rate of ice mass loss in Antarctica and Greenland. Greenland’s glaciers are thinning at the edges²³⁸ and thickening in the interior.²³⁹ If the gains are subtracted from the losses, the net volume of ice lost in 2005 was 92 cubic kilometers. At that rate, Greenland is contributing 0.23 mm of sea-level rise per year²⁴⁰—less than one inch per century. Zwally et al. (2005) used satellite altimetry to examine ice mass changes in Greenland, East Antarctica, and West Antarctica during 1992-2002. They found a combined sea-level-rise-ice-loss-equivalent rate of 0.05 mm per year.²⁴¹ At that rate, comments CO2Science.Org, “it would take a full millennium to raise global sea level by just 5 cm, and take fully 20,000 years to raise it a single meter.”²⁴²

XVI. Humanity and Nature

AIT: We are witnessing an unprecedented and massive collision between our civilization and the Earth. (214)

Comment: Gore illustrates this statement with a two-page photograph of a garbage-strewn refuse dump in Mexico City. He implies that mankind is trashing the planet,

literally and figuratively. But is a refuse heap representative of Mexico City, and is Mexico City representative of “our civilization”? There is a touch of misanthropy in Gore’s presentation, as if blight and swill were the hallmarks of mankind’s interaction with nature.

AIT: The first [factor transforming mankind’s relationship with the Earth] is the population explosion, which in many ways is a success story in that death rates and birth rates are going down everywhere in the world, and families on average are getting smaller. But even though these hoped-for developments have been taking place more rapidly than anyone would have anticipated a few decades ago, the momentum in world population has built up so powerfully that the “explosion” is still taking place and continues to transform our relationship to the planet. (216)

Comment: Gore sees “success” in the reduction of population growth rates, not in the fossil-energy-based civilization that has enabled mankind to increase its numbers from roughly 1 billion people at the dawn of the industrial revolution to 6.5 billion people today. Environmental journalist Gregg Easterbrook noticed the negative tone of Gore’s discussion of population growth in the film version of AIT:

The former vice president clicks up a viewgraph showing the human population has grown more during his lifetime than in all previous history combined. He looks at the viewgraph with aversion, as if embarrassed by humanity’s proliferation. Population growth is a fantastic achievement—though one that engenders problems we must fix, including inequality and greenhouse gases.²⁴³

Population growth is not the only “fantastic achievement” of the past two centuries that would be unthinkable in a world without fossil fuels. Others include the alleviation of poverty and hunger, the doubling of human life-spans, and the democratization of consumer goods, literacy, leisure, and personal mobility. AIT depicts fossil fuels solely as sources of “global warming pollution.” It is well to remember that, without abundant, affordable energy, the mass of mankind would still be mired in slavery and serfdom, as Bjorn Lomborg intimates:

If we think for a moment of the energy we use in terms of “servants,” each with the same work power as a human being, each person in Western Europe has access to 150 servants, in the U.S. about 300, and even in India each person has 15 servants to help along. It is indeed unpleasant to imagine what it would be like to live without these helpers.²⁴⁴

AIT: “The way we treat forests is a political issue. This is the border between Haiti and the Dominican Republic. Haiti has one set of policies; the Dominican Republic another.” The accompanying photograph shows a barren, almost treeless landscape in Haiti and lush green forest cover in the Dominican Republic. (222-223)

Comment: The photograph also illustrates Berkeley professor Jack Hollander's thesis that "poverty, not affluence, is the environment's number one enemy."²⁴⁵ The per capita income of the Dominican Republic is more than four times that of Haiti.²⁴⁶ Desperately poor people live too close to the edge of subsistence to care for the health and beauty of their surroundings. There is a serious risk, never acknowledged by AIT, that environmental stewardship would decline in a world made poorer by political constraints on fossil energy use.

AIT: Much of the forest destruction comes from burning. Almost 30% of the CO₂ released into the atmosphere each year is a result of the burning of brushland for subsistence agriculture and wood fires used for cooking. (227)

Comment: Increased access to fossil energy, especially grid-based electricity, would reduce developing countries' use of fuel wood, benefiting both people and the planet. As atmospheric scientist John Christy, a former African missionary, explains:

I always thought that if each home could be fitted with an electric light bulb and a microwave oven electrified by a coal-fired power plant, several good things would happen. The women [who currently spend much of their time gathering and hauling wood from the forests] would be freed to work on other more productive pursuits, the indoor air quality would be much cleaner so health would be improve, food could be prepared more safely, there would be light for reading and advancement, information through television or radio could be received, and the forest with its beautiful ecosystem could be saved.²⁴⁷

The Kyoto "process" aims to suppress fossil energy use, initially in industrialized countries but eventually in all countries. Global restrictions on carbon-based energy would set back developing countries both economically and environmentally.

AIT: But we now have the power to divert giant rivers according to our design instead of nature's. When we divert too much water without regard to nature, rivers sometimes no longer reach the sea. The former Soviet Union diverted water from two mighty rivers in central Asia that fed the Aral Sea (the Amu Darya and Syr Darya)...The entire Aral Sea is now, essentially, gone. (240-245).

Comment: These statements raise questions about how seriously Gore takes his own doomsday scenario. Gore's threat assessment may be summarized as follows:

- The same type of meltwater pools that formed on top of the Larson B ice shelf prior to its collapse are forming in increasing numbers on the top of the Greenland Ice Sheet.
- The meltwater pools and streams tunnel down to the bedrock, fracturing and lubricating the ice mass.

- Half or more of the ice sheet could break apart and slide into the sea, inundating low-lying States like Florida and the world's great coastal cities.

If Gore really believes the Greenland Ice Sheet is on the brink of collapse, why does he call for measures that can have no discernible effect on glacial dynamics for decades to come? Remember, the Kyoto Protocol would not actually cool the planet; it would merely slow—by an undetectably small amount—the projected rate of warming. Over the next quarter century or longer, Gore's "solutions"—emissions trading, energy efficiency standards, renewable energy mandates, carpooling, eating less meat, etc.—would not eliminate or even shrink a single meltwater pool, stream, or tunnel supposedly undermining the glacier's structural integrity *today*.

Structural problems call for engineering solutions. Mankind, as Gore points out, has the power to divert mighty rivers and efface giant water bodies. So why doesn't Gore call for feasibility studies and pilot projects to determine whether engineers could divert some of the meltwater allegedly destabilizing the glacier? I suspect it's because a threat assessment dire enough to justify engineering projects to "Save the Ice Sheet" would not survive public scrutiny.

XVII. America and Climate Change

AIT: As shown in this graphic representation of every nation's relative contribution to global warming, the United States is responsible for more greenhouse gas pollution than South America, Africa, the Middle East, Australia, Japan, and Asia—all put together. (250-251)

Comment: No American should feel guilty about this. Carbon dioxide emissions derive from energy use, which in turn derives from economic activity. The United States is "responsible for" more cumulative CO₂ emissions than South America, Africa, the Middle East, Australia, Japan, and Southeast Asia combined, because the United States has been the world's great economic engine since the turn of the last century. The world would be a much poorer place had the U.S. economy been built on wind turbines, solar panels, and bio-fuels rather than on fossil energy.

AIT: If you compare the per capita carbon emissions in China, India, Africa, Japan, the EU, and Russia to those in the United States, it is obvious, as the chart at top right shows, that we are way, way above everybody else. (252)

Comment: No one should feel guilty about this either. An energy-rich country like the United States naturally has higher per capita carbon emissions than an energy-poor country like China or India. People in those countries emit less CO₂ per capita not because they are more virtuous or care more about the planet but because they produce less.

There are also compelling economic and cultural reasons why U.S. per capita emissions are higher than Japanese and European per capita emissions.

America is endowed with abundant fossil energy resources—coal, oil, and natural gas. Japan has virtually no fossil energy resources. Where energy is scarcer, energy efficiency is more valuable. Heavy investment in energy efficiency was economically efficient in Japan; it would have been wasteful in the United States.

The United States is a continent-sized country. Japan is a tiny island nation. In the United States, the distances from farm and factory to market are much greater, so we must use more fuel per dollar of output to run our economy. The spaciousness of our country also fosters development patterns that would be prohibitively costly in Japan. Real estate in Japan is very scarce, hence very expensive, so most people live in small homes or apartments in densely packed communities. Real estate is plentiful in the United States, so an average family can afford a larger home with more space for more energy-using appliances. Communities are more spread out, contributing to greater automobile use, which in turn fosters low-density development.

Europe is as large as the United States, but Europe was slow to develop an integrated market, limiting commercial demand for motor fuel. Also, the Old World, with its legacy of stratified social classes and authoritarian governments, has never prized personal mobility. EU governments tax gasoline at rates that would not only cripple commuter and commercial transport in the United States, but also fuel taxpayer rebellions.²⁴⁸ Europe is plagued by high unemployment rates and stagnant GDP growth. All of these dubious “advantages” contribute to Europe’s lower per capita emission levels.

A more accurate measure of emissions performance is carbon intensity—emissions per dollar of economic output. This measure is still inappropriate if used as a moral metric, because carbon intensity chiefly reflects geographic and historical “accidents” such as a country’s natural resource base and industrial structure. That said, in a list of 98 countries based on ratio of GDP to CO₂ emissions, the United States in 2005 ranked 39. U.S. carbon intensity (\$2,118 of GDP per metric ton of CO₂) was below the world average (\$1,831 per metric ton of CO₂), roughly the same as Canada’s (\$2,124 per metric ton of CO₂), and significantly less than India’s (\$614 per metric ton of CO₂) and China’s (\$525 per metric ton of CO₂).²⁴⁹

XVIII. Consensus, Science, and Special Interests

AIT: A university of California at San Diego scientist, Dr. Naomi Oreskes, published in *Science* magazine a massive study of every peer-reviewed science journal on global warming from the previous 10 years.²⁵⁰ She and her team selected a large random sample of 928 articles representing almost 10% of the total, and carefully analyzed how many of the articles agreed or disagreed with the prevailing consensus view. About a quarter of the articles in the sample dealt with aspects of global warming that did not involve any discussion of the central elements of the consensus. Of the three quarters that did address these main points, the percentage that disagreed with the consensus? Zero.

Comment: This is misleading. Gore suggests that his view of global warming as a catastrophe-in-the-making is the consensus view. Oreskes simply found that none of the abstracts of the papers her team examined (they read only the abstracts, not the full papers) denied a link between rising global temperatures and rising greenhouse gas concentrations. That is hardly surprising, since basic physics tells us that increasing greenhouse gas concentrations must warm the atmosphere *to some extent*.

Within that consensus there are disagreements about how much of the recent warming is due to natural variability, how fast the atmosphere is likely to warm, and how serious the impacts of global warming are likely to be.²⁵¹ The Oreskes study in no way shows that all or even most climate scientists share Gore’s apocalyptic view of global warming.

Even on its own terms, the study should be taken with several grains of salt. Oreskes and her team obtained abstracts of 928 articles from the UK ISI database by typing the keywords “global climate change.” Their sample would likely have included different papers had they used “climate variability” or “sun and climate” as their keywords.

British scholar Benny Peiser’s reanalysis contradicted Oreskes’s findings and essentially falsified her study.²⁵² Peiser used the term “climate change” to search the UK ISI database. This produced 1,247 documents, of which 1,117 had abstracts. Of the 1,117 abstracts, only 13 (1%) explicitly endorse the “consensus view.” Thirty-four abstracts reject or doubt the view that human activities are the main driving force of the observed warming of the past 50 years. Forty-four abstracts emphasize that natural factors play a major if not the key role in recent climate change.

AIT: The misperception that there is serious disagreement among scientists about global warming is actually an illusion that has been deliberately fostered by a relatively small but extremely well-funded cadre of special interests, including Exxon Mobil and a few other oil, coal, and utilities companies. (263)

Comment: Turnabout is fair play. The misperception that science justifies alarm and the adoption of growth-chilling energy rationing schemes is an illusion deliberately fostered by a large cadre of special interests. Climate alarmism is the *sine qua non* of billions of dollars in government awards to researchers and universities, and millions of dollars in direct mail contributions to eco-activist groups. Insurance companies like Swiss Re profit from spreading alarm, because it gives them a pretext to raise the premiums they charge to cover weather-related damages.²⁵³ “News” magazines like *Time* profit from spreading alarm, because scary stories sell copy.

Many companies view climate policy as an opportunity to rig the market. Carbon taxes or their regulatory equivalent boost the market shares of companies that produce “alternative fuels,”²⁵⁴ generate electricity from low- and non-carbon fuels,²⁵⁵ or manufacture ultra-high-end (ultra-energy efficient) appliances.²⁵⁶

Gore’s preferred policy, a cap-and-trade scheme, is essentially a carbon cartel.²⁵⁷ Such schemes set OPEC-like production quotas—in the form of emission allowances or

credits—for all fossil fuels rather than just oil. By restricting the supply and raising the price of fossil energy, cap-and-trade creates windfalls for the lucky holders of emission credits. That is why companies with a flair of illegal market manipulation²⁵⁸—Enron,²⁵⁹ American Electric Power, Cinergy, Entergy,²⁶⁰ and Calpine—have been among the most aggressive lobbyists for the Kyoto Protocol or kindred emission trading schemes.

Energy-rationing profiteers also include the regulatory bureaucrats and prosecutors whose power, budgets, and staff would grow in a carbon-constrained economy. Consider the State attorneys general who are suing EPA to regulate CO₂ under the Clean Air Act.²⁶¹ Carbon dioxide is the most ubiquitous byproduct of industrial society. In the United States, more than 10,000 firms emit at least 10,000 metric tons of CO₂ per year, more than 186,000 firms emit at least 1,000 metric tons of CO₂ per year,²⁶² and more than 1,000,000 firms emit at least 100 metric tons of CO₂ per year.²⁶³ States have primary responsibility to enforce the Clean Air Act. If the AGs win and EPA classifies CO₂ as a regulated pollutant, tens of thousands of hitherto law-abiding firms would instantly become “polluters” potentially subject to civil and criminal penalties. The scope of the AGs’ prosecutorial domain would grow by orders of magnitude.

Finally, climate alarmism helps politicians like Gore vilify their opponents as greedy shills and promote themselves as planetary saviors. In politics, fear mongering pays, as H.L. Mencken observed long ago: “The whole aim of practical politics is to keep the populace alarmed, and hence clamorous to be led to safety, by menacing it with an endless series of hobgoblins, all of them imaginary.”

AIT: Gore accuses Exxon Mobil and a “few other oil, coal, and utility companies” of running a “disinformation campaign” designed to “reposition global warming as theory, rather than fact.” He compares this “technique” to the tobacco lobby’s attempt to foster public “doubt” about the link between smoking and lung cancer.

Comment: Two clicks of the mouse reveals that Exxon Mobil acknowledges global warming as a fact, takes the potential risks of climate change seriously, and invests considerable sums to improve its energy efficiency and develop low- and non-emitting energy technologies.²⁶⁴ Gore engages in his own brand of disinformation, blurring the distinction between the fact of global warming and his alarmist interpretation of that fact. By comparing non-alarmists to tobacco lobbyists, Gore in effect says that anyone who disagrees with him is either a shill or a dupe.

XIX. Bush and Global Warming

AIT: One prominent source of disinformation on global warming has been the Bush-Cheney White House...At the beginning of 2001, President Bush hired a lawyer/lobbyist named Phillip Cooney to be in charge of environmental policy in the White House. (264)

Comment: Bush “hired” Cooney to be “in charge?” That should come as a surprise to Jim Connaughton, Chairman of the White House Council on Environmental Quality, who hired Cooney and was his boss at the CEQ.

AIT: Even though Cooney has no scientific training whatsoever, he was empowered by the president to edit and censor the official assessments of global warming from the EPA and other parts of the federal government. (264)

Comment: The “assessments” Cooney edited—*Our Changing Planet* and *Climate Action Report 2002*—were not, strictly speaking, science reports but policy documents. *Our Changing Planet* says as part of its subtitle, “A Supplement to the President’s Fiscal Year 2004 and 2005 Budgets.”²⁶⁵ *Climate Action Report 2002* (CAR) was a report submitted to fulfill U.S. treaty obligations under Articles IV and XII of the Framework Convention on Climate Change, which require periodic reporting of information about greenhouse gas inventories and policies.²⁶⁶ It is a White House counsel’s job to vet such reports before they are published and become the official position or policy of the U.S. Government.

The editing Cooney did was largely in the nature of damage control. He sought to temper the alarmist biases built into the CAR by editorial decisions taken by Clinton-Gore officials. Chapter 6 of the CAR summarized the scary climate impact scenarios of the Clinton-Gore Administration’s *National Assessment* report. The Clinton-Gore team picked the “hottest” (Canadian Climate Center) and “wettest” (UK Hadley Center) models to forecast U.S. climate change impacts in the 21st century. They persisted in doing so even though they knew that the Canadian model overestimated U.S. warming during the 20th century by 300%, and that neither model could replicate past U.S. temperatures better than could a table of random numbers.²⁶⁷ Cooney was trying to clean up some of the mess left behind by his predecessors.

AIT: In 2005, a White House memo authorized by Cooney (a portion of which appears below) was leaked to the *New York Times* by a hidden whistleblower inside the administration. Cooney had diligently edited out any mention of the dangers global warming poses to the American people. (264)

Comment: Gore never evaluates Cooney’s editing on the merits. The mere fact that Cooney deleted a portion of the text is sufficient, in Gore’s view, to convict him of distorting science. Here is the portion Cooney deleted:

Warming will also cause reductions in mountain glaciers and advance the timing of the melt of mountain snow peaks in polar regions. In turn, runoff rates will change and flood potential will be altered in ways that are currently not well understood. There will be significant shifts in the seasonality of runoff that will have serious impacts on native populations that rely on fishing and hunting for their livelihood. These changes will be further complicated by shifts in precipitation regimes and a possible intensification and increased frequency of hydrologic events.

In the margins, Cooney explained his reason for deleting the material: “Straying from research strategy into speculative findings from here.” Cooney deleted as “speculative” the claim that warming will reduce mountain snow peaks in polar regions. That editorial decision is justified because there is evidence that warming-induced snowfall is thickening the snow pack on East Antarctica²⁶⁸ and Greenland.²⁶⁹ Cooney deleted as “speculative” the claim that global warming will adversely affect native populations in Alaska. That editorial decision is also justified, because Inuit culture flourished during the Medieval Warm period,²⁷⁰ when Alaska was as warm as or warmer than it is today.²⁷¹

AIT: Gore blows up across two pages the following aphorism by Upton Sinclair: “It is difficult to get a man to understand something when his salary depends on his not understanding it. Upton Sinclair.” (266-67)

Comment: Those who live in glass houses should not throw stones. The greenhouse gravy train feeds many scientists, advocacy groups, energy-rationing profiteers, bureaucrats, and politicians. It is difficult to get a man to question global warming alarmism when his government grant, direct mail income, industrial policy privilege, regulatory power, prosecutorial plunder, or political career depends on his not questioning it.

Gore: “On June 21, 2004, 48 Nobel Prize-winning scientists accused President Bush and his administration of distorting science.” Gore quotes them as criticizing Bush for “ignoring the scientific consensus on critical issues such as global climate change.” (269-270)

Comment: Gore neglects to mention that the scientists in question are members of “Scientists and Engineers for Change,” a 527 group set up to promote the Kerry for President Campaign. Indeed, the June 21, 2004 letter to which Gore refers and from which he quotes is first and foremost an endorsement of John Kerry for President.²⁷²

The group’s leading complaint is that Bush is “reducing funding for scientific research.” Their own fact sheet qualifies this allegation to the point of falsifying it.²⁷³ According to the fact sheet, under Bush’s FY 2005 budget, “government-wide funding for basic research would grow by only 0.6% and funding for applied research would grow by only 0.5%—below the rate of inflation.” So Bush’s FY 2005 budget does not *reduce* science funding, it slows the rate of *increase*.²⁷⁴

But why single out the FY 2005 budget? No trend can be inferred from one budget year. In President Clinton’s last fiscal year (FY 2001), the federal government spent \$6.548 billion on general science and basic research. Under Bush, spending in this category (budget function 251) grew from \$7.294 billion in FY 2002, to \$7.993 billion in FY 2003, to \$8.416 billion in FY 2004, to \$8.896 billion in FY 2005, to an estimated \$9.254 billion in FY 2006.²⁷⁵ So, in the last year of Bush’s first term, federal funding for general science and basic research was \$1.868 billion higher than in the last year of Clinton’s

second term—an increase of 28.5%. Scientists and Engineers for Change accuse Bush of undermining science because they want an even bigger slice of the pie. For Gore to invoke these partisan whiners as moral authorities is ludicrous.

AIT: The image [contained in a pamphlet on “Global Stewardship,” published by the first Bush administration in 1991] features an old-fashioned set of scales. On one side are gold bars, representing wealth and economic success. On the other side is...the entire planet! The implication is that this is not only a choice we have to make, but a difficult one. But, in fact, it’s a false choice for two reasons. First, without a planet, we won’t fully enjoy those gold bars. And second, if we do the right thing, then we’re going to create a lot of wealth, jobs, and opportunity.

Comment: In a famous Jack Benny comedy routine, as retold in Wikipedia, an armed robber accosts Benny and demands, “Your money or your life!”

Benny paused, and the studio audience — knowing his skinflint character — laughed loud and long. The robber then repeated his demand: “Look, pal! I said your money or your life!” And that’s when Benny snapped back without a break, “I’m thinking it over!” This time, the audience laughed louder and longer than they had during the pause.²⁷⁶

Gore would have us believe that what Jack Benny said in jest, the first Bush administration meant in earnest. But the joke is on Gore. He sees no reason to balance environmental concerns against other priorities, all of which compete for finite resources. Gore might as well say that because we cannot fully enjoy gold if we are ill, no amount of health care spending can ever be too much. Come to think of it, that was pretty much the line the Clinton administration took when promoting Hillary Clinton’s health care “reform” package. Clinton officials claimed that a host of new health care spending mandates and regulations would strengthen the economy. The public did not buy it. The claim that Kyoto will make us richer is equally silly.

XX. Climate Policy

AIT: The European Union has adopted this U.S. innovation [emissions trading] and is making it work effectively there. (252)

Comment: What does “effectively” mean in this context? Gore doesn’t say. If “effectively” means effective in reducing CO2 emissions, then the statement is incorrect. EU emissions are rising so rapidly that most EU countries are not on track to meet their Kyoto targets.²⁷⁷ Open Europe, a British think tank, notes several “serious problems” with the EU Emission Trading Scheme (ETS):²⁷⁸

- **Most countries game system for competitive advantage.** The UK chose tough targets based on past emissions as a baseline while other members gave their firms generous allowances based on projected future emissions. During 2005-

2007, the system will transfer nearly £1.5 billion from UK firms to competitors in countries with weaker controls.

- **The ETS is not reducing emissions.** “According to figures released in June 2006, member states handed out permits for 1,829 million tons of CO₂ in 2005, while emissions were only 1,785 million tons... In other words, at present the system is simply not limiting emissions. Only four out of the 25 member states had targets which were lower than their actual emissions.”
- **The ETS enables Big Oil to profit at the expense of hospitals and schools.** Instead of auctioning permits, member states handed out permits “free to individual firms based on a variety of rather sketchy criteria. This attempt at central planning has had all kinds of perverse results. For example NHS hospitals have been forced to spend a total of £1,300,000 buying up permits, and 18 UK universities are also net contributors. Ironically, large oil companies [e.g., British Petroleum] have made substantial profits under the scheme.”
- **Loose targets create an unstable market that discourages technological innovation.** When firms realized in April 2006 that member states had set lax targets, permit prices fell from €30.50 per ton to just €9.25 per ton in one week. This kind of instability undermines firms’ incentive to invest in carbon-reducing technologies.
- **The system is an administrative nightmare.** “Many small plants—for example the main boiler in a hospital—are covered by the scheme, and have to employ staff to conduct monitoring, compliance activities, and pay for official verification... such plants contribute little to total emissions.” Public and private organizations in the UK pay an estimated £62 million per year in administrative expenses.

AIT: Gore reports that a Canadian company has “figured out how to make a new kind of ethanol from plant fiber—meaning that it’s cheaper and cleaner than regular ethanol.” He also reports that, “By one estimate, this new technology means that crop waste could create 25% of the energy needed for transportation. While ethanol from corn creates 29% less greenhouse gas than gasoline, ethanol from cellulose could cut gases by 85%.” (137)

Comment: Ethanol as a motor fuel has been around for a long time. Henry Ford built his first car, the quadricycle, to run on pure ethanol. The federal government first began funding research on ethanol made from cellulose more than 30 years ago. However, reports the U.S. Energy Information Administration, “To this day, there is still not a commercial plant using cellulose as the feedstock.”²⁷⁹ The key question for consumers is whether the Canadian company can make cellulosic ethanol that is more affordable than regular gasoline. AIT sheds no light on this matter.

What we do know is that corn-based ethanol—which has been available as motor fuel for decades—is more expensive than regular unleaded gasoline. For example, in June 2006, the per-gallon “rack” (wholesale) price of ethanol in corn-rich Nebraska was \$3.58 versus \$2.22 for unleaded gasoline—a difference of \$1.36 per gallon.²⁸⁰

Were it not for a 51-cent-per-gallon exemption from the federal motor fuels tax and other policy privileges, a national market for ethanol would not even exist.

AIT: Unfortunately, the false choice posed between our economy and the environment affects our policies in harmful ways. One example is auto mileage standards. Japan has cars that are required by law to get more than 45 miles per gallon. Europe is not far behind, and has passed new laws designed to surpass Japanese standards... Yet the United States is dead last. (272)

Comment: Fuel economy standards restrict, not expand, the numbers and types of cars auto companies may legally produce and sell. A low fuel economy standard does not restrict production of high miles-per-gallon (mpg) vehicles. However, a high fuel economy standard does restrict production of low mpg vehicles. Therefore, to say that the United States is “dead last” in fuel economy regulation is to say that America is first in producer flexibility and consumer choice.

AIT: We’re told that we have to protect our automobile companies from competition in places like China where, it is said, their leaders don’t care about the environment. In fact, Chinese emissions standards have been raised and already far exceed our own. Ironically, we cannot sell cars made in America to China because we don’t meet their environmental standards. (272)

Comment: This is incorrect. The graph on page 272 of AIT indicates that China’s new fuel economy standards are almost 30% more stringent than U.S. fuel economy standards. In fact, as a World Resources Institute (WRI) report explains, “The Chinese fuel economy standards are slightly more stringent than the current fuel economy regulations in the U.S. If the U.S. were to meet Chinese standards, fleet average fuel economy would need to increase by 5% for the Phase I (2005/2006) standards and by 10% for the Phase II (2008) standards.”²⁸¹ Far from it being the case that “we cannot sell cars made in America to China,” WRI finds that “Ford has 100% of its 2003 sales already meeting the Phase I standards (with 72% for Phase II) while GM has only 42% of its 2003 sales meeting Phase I standards (with 32% for Phase II).”

Gore argues as if U.S. companies cannot sell a single car in China unless all U.S.-made cars comply with Beijing’s fuel economy standards—the equivalent of saying U.S. firms won’t be able to sell cars in India’s market until all U.S.-made cars are built to drive on the left side of the road.

Also, for Gore to suggest that America is an environmental or engineering laggard compared to China is outrageous. Six of the world’s most polluted cities are in China.²⁸²

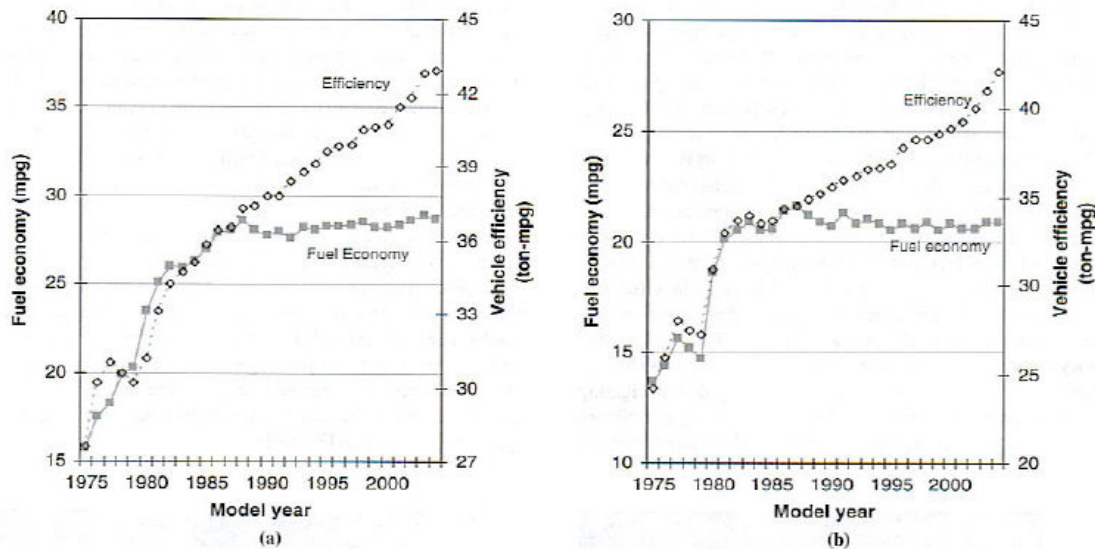
U.S. automakers are way ahead of their Chinese counterparts in developing hybrids, fuel cells, and advanced internal combustion engines.

AIT: But the auto companies are suing California to prevent this state law from going into effect—because it would mean that, *10 years from now*, they would have to manufacture cars for California that are almost as efficient as China is making today. (273)

Comment: Gore misrepresents the auto companies' position. They are suing because the California law, which sets CO₂ emission standards for new cars and trucks, would set de facto fuel economy standards for new vehicles sold in California,²⁸³ and the Energy Policy and Conservation Act prohibits states from adopting laws or regulations "related to" fuel economy.²⁸⁴ Congress enacted the prohibition to prevent states from fragmenting the U.S. auto market.

AIT: Our outdated environmental standards are based on faulty thinking about the relationship between the economy and the environment... as the chart makes clear, it's the companies building more efficient cars that are doing well. The U.S. companies are in deep trouble. (273)

Comment: Gore confuses fuel economy (the number of miles per gallon) with fuel efficiency (the amount of work per unit of fuel). Today's cars and light trucks are much more efficient than their counterparts of 30 years ago. However, consistent with consumer preferences, most of the efficiency gains of the past 20 years have been used to increase vehicle acceleration, towing capacity, size, and weight rather than fuel economy.²⁸⁵ See the Figures below.



Source: Lutsey and Sperling (2005). Chart shows trends in fuel efficiency and fuel economy for passenger cars (a) and light duty trucks (b).

Japanese and European car makers have higher corporate average fuel economy (CAFE) ratings not because their cars are more efficient but because they make a larger proportion of small vehicles.

AIT: And they're [the Big Three] still redoubling their efforts to sell large, inefficient gas-guzzlers even though the marketplace is sending them the same message that the environment is sending them." (273)

Comment: Much of their recent advertising push is for SUV "crossovers," which are smaller than conventional SUVs and get better gas mileage.

AIT: Gore's chart on page 273 shows that, during Feb.-Nov. 2005, market capitalization increased at Toyota (+11.86%) and Honda (+3.28%) and fell dramatically at Ford (-33.20%) and GM (-35.84%).

Comment: Hindsight, as the saying goes, is always 20/20. Anticipating major shifts in consumer preferences is seldom easy, especially when the established product lines have been hugely successful. Gore overlooks two big points. First, U.S. automakers would probably not even exist today had they been "ahead of their time" and emphasized Kyoto-friendly vehicles in the 1990s. Consider this excerpt from the April 2001 edition of *Harper's Magazine*:

By the mid-1990s, the SUV had become among the most lucrative automotive categories in history. The profit margin on each vehicle ranged from \$6,500 for a compact model like Toyota's RAV4 to \$17,000 for a luxury model like the Lincoln Navigator. On average, automakers made \$10,000 for each SUV sold, ten times the margin on a sedan or minivan, which, last year, generated a stunning \$18 billion in profits for the industry. For the first time in decades, the auto industry had a genuine cash cow, and they used it to fund a huge expansion campaign. In 1999, for example, with the profits from a single year's production of Expeditions and Navigators, Ford was able to buy the Swedish company Volvo outright.²⁸⁶

Second, a big part of Detroit's troubles comes from contracts the Big Three negotiated during the 1950s, 1960s, and 1970s with the United Auto Workers. Because of those agreements, GM, Ford, and Chrysler have been providing health care, pension, and "other post-employment benefits" (OPEB) far more generous than those offered by Japanese and European auto makers.²⁸⁷

AIT: To debunk the notion that "we're helpless to do anything" about global warming, Gore provides a chart forecasting increases in U.S. energy production from renewable sources (biomass, wind, solar, geothermal, and hydro). The chart shows U.S. renewable energy production increasing from about 7 quadrillion British thermal units (quads) in 1990 to 10 in 2005 to 22 in 2030. (276)

Comment: Gore's forecast is very bullish, and he cites no source for it. The U.S. Energy Information Administration (EIA) projects an increase in U.S. renewable energy production from 5.88 quads in 2005 to 9.02 quads in 2030—less than half the increase forecast by Gore. Moreover, in EIA's analysis, renewable energy production as a share of total consumption remains flat over the forecast period. Renewable energy contributes about 6% of total U.S. energy consumption in both 2005 (5.88 quads out of 101.27 quads) and 2030 (9.02 quads out of 133.88 quads).²⁸⁸

AIT: Continuing his pep talk about steps “we” can take now to mitigate global warming, Gore lauds Denmark's wind farms, and provides a two-page photograph of an offshore wind farm at Copenhagen. (378-379)

Comment: Gore does not address any of the well-known drawbacks of wind power. These include cost (if wind electricity were competitive, governments would not need to subsidize and mandate it),²⁸⁹ intermittency (the turbines spin and generate power only when the wind blows), avian mortality (the Altamont Pass wind farm in California kills an estimated 300 red tailed hawks and 60 golden eagles per year),²⁹⁰ site depletion (places with suitable wind conditions are a finite resource), and scenic degradation (per kWh of electricity, wind farms consume far more land area than either fossil fuel or nuclear power plants). Gore concedes that 300-foot-tall wind towers “alter our skylines, but many find watching their spinning blades peaceful to look at” (p. 279). He should try telling that to Senator Ted Kennedy.²⁹¹

AIT: Gore quotes from a study by Princeton economists Robert Socolow and Stephen Pacala that, “Humanity already possesses the fundamental scientific, technical, and industrial know how to solve the carbon and climate problems for the next half century.” He claims that the policies Socolow and Pacala recommend, “all of which are based on already-existing, affordable technologies, can bring emissions down to a point below 1970s levels.” (280-281)

Comment: Gore cannot know the solutions are “affordable,” because the authors specifically say they are not going to estimate costs. The study basically shows that if political leaders can somehow coerce everybody to use less energy, and don't care what it costs, they can significantly reduce emissions by 2054. We needed Princeton professors to tell us that? Let's look at some of the strategies Socolow and Pacala (S&P) recommend.

S&P's Strategy No. 1 is to *double the fuel efficiency of 2 billion cars from 30 to 60 mpg*. However, the average passenger car in the U.S. got 21.4 mpg in 1999, and the average light truck 17.1 mpg, so S&P are really proposing to triple fuel economy. It is politically difficult to mandate even small fuel economy increases. Their proposal would drastically curtail production of large SUVs, pickups, and sedans—a declining but still significant portion of the U.S. auto market.

S&P's Strategy No. 2 is to *decrease the number of car miles traveled by half*. But the U.S. population could easily increase 50% or more by 2054. This strategy is tantamount to rationing cars—commuters and soccer moms should just love it.

S&P's Strategy No. 5 is to *replace 1,400 coal electric plants with natural gas-powered facilities*. But America is already facing a multi-billion dollar natural gas supply crunch. This strategy would play havoc with consumer electricity bills and destroy tens of thousands more high-tech jobs in the chemical industry, which uses natural gas as a feedstock.

S&P's Strategy No. 9 is to *add double the current global nuclear capacity to replace coal-based electricity*. This proposal should go over big with the no-nukes environmental establishment. Note that Gore never mentions it in his summary of S&P's recommendations on page 281.

S&P's Strategy No. 10 is to *increase wind capacity by 50 times relative to today, for a total of 2 million large windmills*. The word boondoggle comes to mind, and in case S&P has not heard, there's a growing grassroots backlash against wind farms. Again, check with Sen. Kennedy on this.

S&P's Strategy No. 13 is to *increase ethanol production 50 times by creating biomass plantations with an area equal to 1/6th of world cropland*. This strategy is a prescription for decimating millions of acres of forest and other wildlife habitat.

If AIT were a balanced presentation of issues, instead of a lawyer's brief for energy rationing, Gore would at least have mentioned Hoffert et al. (2002), the study to which S&P's study was a response.²⁹²

Martin Hoffert and his colleagues, a team of 18 energy experts, examined possible technology options that might be used in coming decades to stabilize atmospheric CO₂ concentrations. Such options include wind and solar energy, nuclear fission and fusion, biomass fuels, efficiency improvements, carbon sequestration, and hydrogen fuel cells. Hoffert et al. found that, "All these approaches currently have severe deficiencies that limit their ability to stabilize global climate." They specifically took issue with the U.N. Intergovernmental Panel on Climate Change's claim that, "known technological options could achieve a broad range of atmospheric CO₂ stabilization levels, such as 550 ppm, 450 ppm or below over the next 100 years." World energy demand could easily triple by 2050. Yet, Hoffert et al. point out, "Energy sources that can produce 100 to 300% of present world power consumption without greenhouse emissions do not exist operationally or as pilot plants."

The bottom line: "CO₂ is a combustion product vital to how civilization is powered; it cannot be regulated away." Without "drastic technological breakthroughs," it is not possible to stabilize atmospheric CO₂ concentrations *and* meet current and projected global energy needs.

A report by the Pew Center on Global Climate Change, *U.S. Energy Scenarios for the 21st Century*,²⁹³ implicitly comes to the same conclusion. The Pew report sketches out three scenarios—possible future development paths—of the U.S. energy supply system from 2000 through 2035, and the increase in carbon emissions under each scenario.

Pew’s analysis of one scenario in particular merits our attention. In “Technology Triumphs,” state policy interventions, technology breakthroughs, and changing consumer preferences converge to accelerate commercialization of high-efficiency, low-emission, and zero-emission energy technologies. In this scenario, state governments:

- Set “rigorous” efficiency standards for appliances, enact caps on CO₂ emissions from power plants, and introduce or expand renewable portfolio standards (policies requiring specified percentages of electricity to come from wind, solar, and biomass technologies).
- Enhance electric power generation and transmission efficiencies via tax preferences and other policies promoting investment in “combined heat and power” (on-site electric generating units that harness exhaust heat to support space and water heating, air conditioning, and various industrial processes) and “distributed generation” (small-scale units located at or near customer sites that avoid energy losses incident to long-range transmission).
- Subsidize fuel cell research and effectively raise federal fuel economy standards by requiring new cars, minivans, and light trucks to reduce emissions of CO₂ per mile traveled.

These actions, combined with breakthroughs in solar photovoltaic manufacturing and a shift in consumer preference from “sprawling” to compact residential development, slow the growth of vehicle miles traveled, expand markets for hybrid cars, accelerate power sector fuel switching from coal to natural gas, and lay the building blocks of a hydrogen economy.

“Technology Triumphs” is really a “Politics Triumphs” scenario with state governments implementing a wide array of “technology forcing” schemes to “green” U.S. energy markets. These are the very types of measures S&P advocate in their study and which Gore claims would create wealth while reducing emissions.

But the Pew report inadvertently pours cold water on Gore’s Kyoto-without-tears assessment. In the “Technology Triumphs” scenario, U.S. carbon emissions “rise 15 percent above the year 2000 levels by 2035”—about 35 percent above the U.S. Kyoto target—despite multi-state regulation of CO₂ emissions from vehicles and power plants, mature markets for hybrid cars, widespread efficiency upgrades in the power sector, a successful launch of the hydrogen economy, and the proliferation of “energy smart” communities and houses.

The Pew report concludes that, “In the absence of a mandatory [national] carbon cap, none of the base case scenarios examined in this study achieves a reduction in U.S. carbon dioxide emissions by 2035 relative to current levels.” And it emphasizes, “This is

true even in the scenario with the most optimistic assumptions about the future cost and performance of energy technologies.” In other words, to reduce emissions, it is necessary to force people to use less energy than they need—a lot less. That is a prescription for recession and worse.

But even if it were possible, without wrecking the economy, to dial back U.S. emissions to 1970 levels by 2054, it would produce virtually no mitigation of global warming, because global CO₂ concentrations would continue to rise.

Patrick Michaels, using the results of a recent paper in *Geophysical Research Letters*,²⁹⁴ calculated what CO₂ levels and associated global temperatures would theoretically prevail in 2100 if policymakers had the power to limit *global* CO₂ emissions to the actual or projected amounts produced in 1970 and various other years.²⁹⁵ The Figure below shows what Michaels found.

Year	Percentage reduction from 2002 emissions	Annual increase in CO ₂ concentration (ppm)	Resulting 2100 CO ₂ concentration	Approximate temperature change by 2100 (°C)
1957	67	0.8	455	0.87
1962	61	0.9	465	0.95
1966	53	1	474	1.01
1970	42	1.1	483	1.09
1974	34	1.2	493	1.17
1978	26	1.3	502	1.25
1983	25	1.4	512	1.33
1987	18	1.5	521	1.41
1991	10	1.6	530	1.47
1995	9	1.7	540	1.53
2000	5	1.8	549	1.62
2004	-5	1.9	559	1.69
2008	-10	2	568	1.76

Even if we could dial back global (not just U.S.) emissions to 1970 levels, and do so today (not just by 2054), global CO₂ concentrations would reach 483 parts per million in 2100, and average global temperature would theoretically be 1.09°C warmer than the present. Getting back to the 1970 level would be very expensive (Gore to the contrary notwithstanding), but it would make little discernible difference to people or the planet. As Michaels points out, “a projection based upon the current rate of CO₂ build-up is about 563 ppm by 2100 and a temperature rise of about 1.73°C.” In other words, reducing emissions to 1970 levels, were it feasible, would avert about 0.6°C of global warming.

The main regulatory policies debated in Congress today—the Kyoto Protocol, McCain-Lieberman,²⁹⁶ the Bingaman-Domenici initiative²⁹⁷—would have no discernible impact on global warming but cost tens to hundreds of billions of dollars annually in higher energy prices, reduced GDP, and lost jobs. A reduction to 1970 emission levels

worldwide would have a measurable effect on average global temperatures but could not be achieved without severe economic dislocation. Regulatory climate policies are either all economic pain for no environmental gain or a “cure” worse than the alleged disease.

XXI. Morality

AIT: We can't afford inaction any longer, and frankly, there's just no excuse for it. We all want the same thing: for our children and the generations after them to inherit a clean and beautiful planet capable of supporting a healthy human civilization. That goal should transcend politics....This isn't an ideological debate with two sides, pro and con. There is only one Earth, and all of us who live on it share a common future. (287) And that is what is at stake. Our ability to live on Planet Earth—to have a future as a civilization. I believe this is a moral issue. (298)

Comment: Nothing is more political than the claim to transcend politics, because anyone who actually represents truth (science) and virtue (morality) deserves to rule. From time immemorial, ambitious individuals have appealed to higher (trans-political) goals or authorities to win power and/or legitimize their rule over others. How many turned out to be good men and true? We are entitled to be wary of any politician who, professing to be above partisanship and ideology, denies that his opponents have ideas worth debating or motives worth respecting.

Gore never considers the obvious moral objection to his agenda—a global energy rationing system would doom millions to poverty, misery, and backwardness. Limiting atmospheric CO₂ levels is not even remotely attainable unless China, India, and other developing nations restrict their use of carbon-based energy.²⁹⁸ Accordingly, Kyoto Protocol advocates view the treaty as just a “first step” in a series of agreements, each more stringent and/or inclusive than its predecessor.²⁹⁹ But the global economy is moving in the opposite direction. World demand for carbon-based fuels is growing, especially in developing countries.³⁰⁰ And for billions of people, inadequate energy supply is a key factor limiting both economic development and environmental improvement.³⁰¹ Nobody knows how to eliminate global energy poverty *and* reduce global greenhouse gas emissions.

Even in a wealthy country like the United States, energy taxes or their regulatory equivalent can inflict hardship on low-income households, forcing them to choose between heating and eating, air conditioning and medical care.³⁰² Gore should at least admit that the pursuit of carbon stabilization has the potential to do more harm than good.

Conclusion

An Inconvenient Truth, Vice President Al Gore's book on “The planetary emergency of global warming and what can be done about it,” purports to be a non-ideological exposition of climate science and common sense morality. As this commentary shows,

AIT is a colorfully illustrated lawyer's brief that uses science selectively and often dubiously to advance an agenda of alarm and energy rationing.

Gore calls global warming a "moral issue," but for him it is a *moralizing* issue—a license to castigate political adversaries and blame America first for everything from hurricanes to floods to wildfires to tick-borne disease. Somehow he sees nothing immoral in the attempt to make fossil energy scarcer and more costly in a world where 1.6 billion people still have no access to electricity and billions more are too poor to own a car.

Nearly every significant statement that Vice President Gore makes regarding climate science and climate policy is either one sided, misleading, exaggerated, speculative, or wrong. In light of these numerous distortions, AIT is ill-suited to serve as a guide to climate science and climate policy for the American people.

APPENDIX A: Summary of Distortions

AIT:

One Sided

- Never acknowledges the indispensable role of fossil fuels in ending serfdom and slavery, alleviating hunger and poverty, extending human life-spans, and democratizing consumer goods, literacy, leisure, and personal mobility.
- Never acknowledges the environmental, health, and economic benefits of climatic warmth and the ongoing rise in the air's CO₂ content.
- Never acknowledges the major role of natural variability in shrinking the Snows of Kilimanjaro and other mountain glaciers.
- Never mentions the 1976 regime shift in the Pacific Decadal Oscillation (PDO), a major cause of recent climate change in Alaska.
- Presents a graph tracking CO₂ levels and global temperatures during the past 650,000 years, but never mentions the most significant point: global temperatures were warmer than the present during each of the past four interglacial periods, even though CO₂ levels were lower.
- Never confronts a key implication of its assumption that climate is highly sensitive to CO₂ emissions—left to its own devices, global climate would be rapidly deteriorating into another ice age.
- Neglects to mention that, due to the growth of urban heat islands, U.S. cities and towns will continually break temperature records, with or without help from global warming.
- Neglects to mention that global warming could reduce the severity of wintertime (frontal storms) by decreasing the temperature differential between colliding air masses.
- Highlights London's construction of the Thames River flood barrier as evidence of global-warming induced sea-level rise without mentioning that London is sinking two to six times faster than global sea levels are rising.

- Ignores the large role of natural variability in Arctic climate, never mentioning that Arctic temperatures in the 1930s equaled or exceeded those of the late 20th century, and that the Arctic during the early- to mid-Holocene was significantly warmer than it is today.
- Cites the finding of a study that the number of recorded wildfires in North America has increased in recent decades but not the same study's finding that the total area burned decreased by 90% since the 1930s.
- Fosters the impression that global warming can only be good for bad things (algae, ticks) and bad for good things (polar bears, migratory birds)—nature according to a morality play.
- Cites Velicogna and Wahr (2006), who found an overall loss in Antarctic ice mass during 2002-2005, but ignores Davis et al. (2005), who found an overall ice mass gain during 1992-2003. Three years worth of data is too short to tell anything about a trend in a system as vast and complex as Antarctica.
- Cites Turner et al. (2006), who found a 0.5°C to 0.7°C per decade wintertime warming trend in the mid-troposphere above Antarctica, as measured by weather balloons, but neglects to mention that Turner et al. found much less warming—about 0.15°C/decade—at the Antarctic surface, or that NASA satellites, which also measure troposphere temperatures, show a 0.12°C/decade Antarctic cooling trend since November 1978.
- Shows a picture of a garbage-strewn refuse dump in Mexico City to illustrate the “collision between our civilization and the Earth”—as if blight and swill were the hallmarks of mankind's interaction with nature.
- Sees “success” in the recent reduction of global population growth rates, not in the fossil-energy-based civilization that has enabled mankind to increase its numbers more than six-fold since the dawn of the industrial revolution.
- Compares Haiti (deforestation) and the Dominican Republic (lush forest cover) to illustrate the impact of politics on the environment, but overlooks another key implication of the comparison: Poverty is the environment's number one enemy.
- Notes that “much forest destruction” and “almost 30%” of annual CO₂ emissions come from “the burning of brushland for subsistence agriculture and wood fires used for cooking,” but never considers whether fossil energy restrictions would set back developing countries both economically and environmentally.
- Neglects to mention the circumstances that make it reasonable rather than blameworthy for America to be the biggest CO₂ emitter: the world's largest economy, high per capita incomes, abundant fossil energy resources, markets integrated across continental distances, and the world's most highly mobile population.
- Impugns the motives of so-called global warming skeptics but never acknowledges the special-interest motivations of those whose research grants, direct mail income, industrial policy privileges, regulatory power, prosecutorial plunder, or political careers depend on keeping the public in a state of fear about global warming.
- Castigates former White House official Phil Cooney for editing U.S. Government climate change policy documents, without ever considering the scientific merits of Cooney's editing.

- Waxes enthusiastic about cellulosic ethanol, a product with no commercial application despite 30 years of government-funded research, and neglects to mention that corn-based ethanol, a product in commercial use for a century, is still more costly than regular gasoline despite oil prices exceeding \$70 a barrel.
- Misrepresents the auto companies' position in their lawsuit to overturn California's CO2 emissions law, neglecting to mention that CO2 standards are de facto fuel economy standards and that federal law prohibits states from regulating fuel economy.
- Blames Detroit's financial troubles on the Big Three's high-volume production of SUVs, even though U.S. automakers probably would not even exist today had they been "ahead of their time" and emphasized Kyoto-friendly vehicles in the 1990s. AIT says nothing about the biggest cause of Detroit's falling capitalization—unaffordable payments for employee benefit packages negotiated decades ago.
- Touts Denmark's wind farms without mentioning any of the well-known drawbacks of wind power: cost, intermittency, avian mortality, site depletion, and scenic degradation.
- Never addresses the obvious criticism that the Kyoto Protocol is all pain for no gain and that policies tough enough to measurably cool the planet would be a "cure" worse than the alleged disease.
- Claims a study by Robert Socolow and Stephen Pacala (S&P) shows that "affordable" technologies could reduce U.S. carbon emissions below 1970 levels, even though S&P specifically say their study does not estimate costs, and neglects to mention that S&P's study is a response to Hoffert et al. (2002), a team of 18 energy experts, who concluded that, "CO2 is a combustion product vital to how civilization is powered; it cannot be regulated away."

Misleading

- Implies that a two-page photograph of Perito Moreno Glacier in Argentina shows that the glacier is melting away, even though the glacier's terminal boundary has not changed in 90 years.
- Implies that, throughout the past 650,000 years, changes in CO2 levels preceded and largely caused changes in global temperature, whereas the causality mostly runs the other way, with CO2 changes trailing global temperature changes by hundreds to thousands of years.
- Belittles as ideologically motivated the painstaking and now widely-accepted methodological critiques by Canadians Steve McIntyre and Ross McKittrick of the Hockey Stick reconstruction of Northern Hemisphere climate history.
- Distracts readers from the main hurricane problem facing the United States: the ever-growing, politically-subsidized concentration of population and wealth in vulnerable coastal regions.
- Ignores the societal factors that typically overwhelm climatic factors in determining people's risk of damage or death from hurricanes, floods, drought, tornadoes, wildfires, and disease.

- Implies that the 2006 tropical cyclone season in Australia was unusually active and, thus, symptomatic of global warming. In contrast, NOAA describes the season as “near average.”
- Cites increases in insurance payments to victims of hurricanes, floods, drought, tornadoes, wildfires, and other natural disasters as evidence of a global-warming ravaged planet, even though the increases are chiefly due to socioeconomic factors such as population growth and development in high risk coastal areas and cities.
- Re-labels as “major floods” (a category defined by physical magnitude) a chart of “damaging floods” (a category defined by socioeconomic and political criteria).
- Re-labels as “major wildfires” (a category defined by physical magnitude) a chart of “recorded wildfires” (a category reflecting changes in data collection and reporting, such as increases in the frequency and scope of satellite monitoring).
- Conflates the Thermohaline Circulation (THC), a convective system primarily driven by differences in salinity and sea temperatures, with the Gulf Stream, a wind-driven system energized primarily by the Earth’s spin and the lunar tides, exaggerating the risk of a big chill in Europe from a weakening of the THC.
- Presents a graph showing the number of annual closings of the Thames River tidal barriers from 1930 to the present, even though the modern barrier system was completed in 1982 and became operational in 1984. This apples-to-oranges comparison conveys the false impression that London faced no serious flood risk until recent decades.
- Blames global warming for the decline “since the 1960s” of the Emperor Penguin population in Antarctica, implying that the penguins are in peril, their numbers dwindling as the world warms. In fact, the population declined in the 1970s and has been stable since the late 1980s.
- Implies that a study, which found that none of 928 science articles (actually abstracts) denied a CO₂-global warming link, shows that Gore’s apocalyptic view of global warming is the “consensus” view among scientists.
- Reports that 48 Nobel Prize-winning scientists accused Bush of distorting science, without mentioning that the scientists acted as members of a 527 group set up to promote the Kerry for President Campaign.
- Implies that the United States is an environmental laggard because China has adopted more stringent fuel economy standards, glossing over China’s horrendous air quality problems.
- Confuses fuel efficiency (the amount of useful work per unit of fuel consumed) with fuel economy (miles per gallon), falsely portraying U.S. cars and trucks as inefficient compared to their European and Japanese counterparts.

Exaggerated

- Exaggerates the certainty and hypes importance of the alleged link between global warming and the frequency and severity of tropical storms.
- Hypes the importance of NOAA running out of names (21 per year) for Atlantic hurricanes in 2005, and the fact that some storms continued into December. The practice of naming storms only goes back to 1953, and hurricane detection

capabilities have improved dramatically since the 1950s, so the “record” number of named storms in 2005 may be an artifact of the data. Also, Atlantic hurricanes continued into December in several previous years including 1878, 1887, and 1888.

- Never explains why anyone should be alarmed about the current Arctic warming, considering that our stone-age ancestors survived (and likely benefited from) the much stronger and longer Arctic warming known as the Holocene Climate Optimum.
- Portrays the cracking of the Ward Hunt ice shelf in 2002 as a portent of doom, even though the shelf was merely a remnant of a much larger Arctic ice formation that had already lost 90% of its area during 1906-1982.
- Claims polar bears “have been drowning in significant numbers,” based on a report that found four drowned polar bears in one month in one year, following an abrupt storm.
- Claims global warming is creating “ecological niches” for “invasive alien species,” never mentioning other, more important factors such as increases in trade, tourism, and urban heat islands. For example, due to population growth, Berlin warmed twice as much during 1886-1898 as the IPCC estimates the entire world warmed in the 20th century.
- Blames global warming for pine beetle infestations that likely have more to do with increased forest density and plain old mismanagement.
- Portrays the collapse in 2002 of the Larson-B ice shelf—a formation the “size of Rhode Island”—as harbinger of doom. For perspective, the Larson-B was 180th the size of Texas and 1/246th the size of the West Antarctic Ice Sheet (WAIS).
- Warns that the break-off of floating ice shelves like the Larson B accelerates the flow of land-based ice behind them. However, researchers found that the speedup was not observable beyond about 10 km inland, and that decelerations occurred only one year later.
- Presents a graph suggesting that China’s new fuel economy standards are almost 30% more stringent than the current U.S. standards. In fact, the Chinese standards are only about 5% more stringent.

Speculative

- Warns of impending water shortages in Asia due to global warming but does not check whether there is any correlation between global warming and Eurasian snow cover (there isn’t). Also, if Tibetan glaciers melt, that should increase water availability in the coming decades.
- Claims that CO₂ concentrations in the Holocene never rose above 300 ppm in pre-industrial times, and that the current level (380 ppm) is “way above” the range of natural variability. Proxy data indicate that, in the early Holocene, CO₂ levels exceeded 330 ppm for centuries and reached 348 ppm.
- Claims that a Scripps Oceanography Institute study shows that ocean temperatures during the past 40 years are “way above the range of natural variability.” Proxy data indicate that the Atlantic Ocean off the West Coast of Africa was warmer than present during the Medieval Warm Period.

- Blames global warming for the record number of typhoons hitting Japan in 2004. Local meteorological conditions, not average global temperatures, determine the trajectory of particular storms, and data going back to 1950 show no correlation between North Pacific storm activity and global temperatures.
- Blames global warming for the record-breaking 37-inch downpour in Mumbai, India, in July 2005, even though there has been no trend in Mumbai rainfall for the month of July in 45 years.
- Blames global warming for recent floods in China's Sichuan and Shandong provinces, even though far more damaging floods struck those areas in the 19th and early 20th centuries.
- Blames global warming for the disappearance of Lake Chad, a disaster more likely stemming from a combination of regional climate variability and societal factors such as population increase and overgrazing.
- Claims global warming is drying out soils all over the world, whereas pan evaporation studies indicate that, in general, the Earth's surface is becoming wetter.
- Presents one climate model's projection of increased U.S. drought as authoritative even though another leading model forecasts increased wetness, climate model hydrology forecasts on regional scales are notoriously unreliable, and most of the United States (outside the Southwest) became wetter during 1925-2003.
- Blames global warming for the severe drought that hit the Amazon in 2005. RealClimate.Org, a web site set up to debunk global warming "skeptics," concluded that it is not possible to link the drought to global warming.
- Warns of a positive feedback whereby CO₂-induced warming melts tundra, releasing more CO₂ locked up in frozen soils. An alternative scenario is also plausible: The range of carbon-storing vegetation expands as tundra thaws.
- Claims global warming endangers polar bears even though polar bear populations are increasing in Arctic areas where it is warming and declining in Arctic areas where it is cooling.
- Blames global warming for Alaska's "drunken trees" (trees rooted in previously frozen tundra, which sway in all directions as the ice melts), ignoring the possibly large role of the 1976 PDO shift.
- Blames rising CO₂ levels for recent declines in Arctic sea ice, ignoring the potentially large role of natural variability. AIT never mentions that wind pattern shifts may account for much of the observed changes in sea ice, or that the Canadian Arctic Archipelago had considerably less sea ice during the early Holocene.
- Warns that meltwater from Greenland could disrupt the Atlantic thermohaline circulation based on research indicating that a major disruption occurred 8,200 years ago when a giant ice dam burst in North America, allowing two lakes to drain rapidly into the sea. AIT does not mention that the lakes injected more than 100,000 cubic kilometers of freshwater into the sea, whereas Greenland ice melt contributes a few hundred cubic kilometers a year.
- Claims global warming is "disrupting millions of delicately balanced ecological relationships among species" based on a study showing that, in the Netherlands, caterpillars are hatching two weeks earlier than the peak arrival season of

- caterpillar-eating migratory birds. AIT claims the birds' "chicks are in trouble," yet the researcher found "no demonstrable effect" on the bird population during the past 20 years.
- Warns that global warming is destroying coral reefs, even though today's main reef builders evolved and thrived during periods substantially warmer than the present.
 - Warns that a doubling of pre-industrial CO₂ levels to 560 ppm will so acidify seawater that all optimal areas for coral reef construction will disappear by 2050. This is not plausible. Coral calcification rates have increased as ocean temperatures and CO₂ levels have risen, and today's main reef builders evolved and thrived during the Mesozoic Period, when atmospheric CO₂ levels hovered above 1,000 ppm for 150 million years and exceeded 2,000 ppm for several million years.
 - Links global warming to toxic algae bloom outbreaks in the Baltic Sea that can be entirely explained by record-high phosphorus levels, record-low nitrogen-to-phosphorus levels, and local meteorological conditions.
 - Asserts without evidence that global warming is causing more tick-borne disease (TBD). An Oxford University study found no relationship between climate change and TBD in Europe.
 - Blames global warming for the resurgence of malaria in Kenya, even though several studies found no climate link and attribute the problem to decreased spraying of homes with DDT, anti-malarial drug resistance, and incompetent public health programs.
 - Insinuates that global warming is a factor in the emergence of some 30 "new" diseases over the last three decades, but cites no supporting research or evidence.
 - Blames global warming for the decline "since the 1960s" of the Emperor Penguin population in Antarctica based on a speculative assessment by two researchers that warm sea temperatures in the 1970s reduced the birds' main food source. An equally plausible explanation is that Antarctic ecotourism, which became popular in the 1970s, disturbed the rookeries.
 - Cites the growing number of Thames River barrier closings as evidence of global warming-induced sea level rise, even though UK authorities close the barriers to keep water in as well as to keep tidal surges out.
 - Warns of "significant and alarming structural changes" in the submarine base of WAIS, but does not tell us what those changes are or why they are "significant and alarming." The melting and retreat of the WAIS "grounding line" has been going on since the early Holocene. At the rate of retreat observed in the late 1990s, the WAIS should disappear in about 7,000 years.
 - Warns that vertical water tunnels ("moulins") are lubricating the Greenland Ice Sheet, increasing the risk that it will "slide" into the sea. Summertime glacier flow acceleration associated with moulins is tiny. Moulins in numbers equal to or surpassing those observed today probably occurred in the first half of the 20th century, when Greenland was as warm as or warmer than the past decade, with no major loss of grounded ice.
 - Presents 10 pages of before-and-after "photographs" showing what 20 feet of sea level rise would do to the world's major coastal communities. There is no credible

evidence of an impending collapse of the great ice sheets. We do have fairly good data on ice mass balance changes and their effects on sea level. Zwally et al. (2005) found a combined Greenland/Antarctica ice-loss-sea-level-rise equivalent of 0.05 mm per year during 1992-2002. At that rate, it would take a full millennium to raise sea level by just 5 cm.

- Forecasts an increase in U.S. renewable energy production during 1990-2030 more than twice that projected by the U.S. Energy Information Administration.

Wrong

- Presents as glaciologist Lonnie Thompson's reconstruction of tropical climate history a graph that is in fact the "Hockey Stick" reconstruction of Northern Hemisphere climate history.
- Claims Thompson's reconstruction of climate history proves the Medieval Warm Period was "tiny" compared to the warming observed in recent decades. It doesn't. Four of Thompson's six ice cores indicate the Medieval Warm Period was as warm as or warmer than any recent decade.
- Calls carbon dioxide (CO₂) the "most important greenhouse gas." Water vapor is the leading contributor to the greenhouse effect.
- Claims Venus is too hot and Mars too cold to support life due to differences in atmospheric CO₂ concentrations (they are nearly identical), rather than differences in atmospheric densities and distances from the Sun (both huge).
- Claims scientists have validated the "Hockey Stick" climate reconstruction, according to which the 1990s were likely the warmest decade of the past millennium and 1998 the warmest year. It is now widely acknowledged that the Hockey Stick was built on a flawed methodology and inappropriate data. Scientists continue to debate whether the Medieval Warm period was warmer than recent decades.
- Tacitly assumes that CO₂ levels are increasing at roughly 1 percent annually. The actual rate is half that.
- Tacitly assumes a linear relationship between CO₂ levels and global temperatures, whereas the actual CO₂-warming effect is logarithmic, meaning that the next 100-ppm increase adds only half as much heat as the previous 100-ppm increase.
- Claims the rate of global warming is accelerating, whereas the rate has been constant for the past 30 years—roughly 0.17°C/decade.
- Blames global warming for Europe's killer heat wave of 2003—an event caused by an atmospheric circulation anomaly.
- Blames global warming for Hurricane Catarina, the first South Atlantic hurricane on record, which struck Brazil in 2004. Catarina formed not because the South Atlantic was unusually warm (sea temperatures were cooler than normal), but because the air was so much colder it produced the same kind of heat flux from the ocean that fuels hurricanes in warmer waters.
- Claims that 2004 set an all-time record for the number of tornadoes in the United States. Tornado frequency has not increased; rather, the detection of smaller

- tornadoes has increased. If we consider the tornadoes that have been detectable for many decades (F-3 or greater), there is actually a downward trend since 1950.
- Blames global warming for a “mass extinction crisis” that is not, in fact, occurring.
 - Blames global warming for the rapid coast-to-coast spread of the West Nile virus. North America contains nearly all the climate types in the world—from hot, dry deserts to boreal forests, to frigid tundra—a range that dwarfs any small alteration in temperature or precipitation that may be related to atmospheric CO₂ levels. The virus could not have spread so far so fast, if it were climate-sensitive.
 - Cites Tuvalu, Polynesia, as a place where rising sea levels force residents to evacuate their homes. In reality, sea levels at Tuvalu fell during the latter half of the 20th century and even during the 1990s, allegedly the warmest decade of the millennium.
 - Claims sea level rise could be many times larger and more rapid “depending on the choices we make or do not make now” concerning global warming. Not so. The most aggressive choice America could make now would be to join Europe in implementing the Kyoto Protocol. Assuming the science underpinning Kyoto is correct, the treaty would avert only 1 cm of sea level rise by 2050 and 2.5 cm by 2100.
 - Accuses Exxon Mobil of running a “disinformation campaign” designed to “reposition global warming as theory, rather than fact,” even though two clicks of the mouse reveal that Exxon Mobil acknowledges global warming as a fact.
 - Claims Bush hired Phil Cooney to “be in charge” of White House environmental policy. This must be a surprise to White House Council on Environmental Quality Chairman James Connaughton, who hired Cooney and was his boss at the CEQ.
 - Claims the European Union’s emission trading system (ETS) is working “effectively.” In fact, the ETS is not reducing emissions, will transfer an estimated £1.5 billion from U.K. firms to competitors in countries with weaker controls, has enabled oil companies to profit at the expense of hospitals and schools, and has been an administrative nightmare for small firms.
 - Claims U.S. firms won’t be able to sell American-made cars in China because Beijing has set higher fuel economy standards. This is equivalent to saying U.S. firms won’t be able to sell cars in India until all U.S.-made cars are built to drive on the left side of the road.

Notes

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