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Al Gore's Science Fiction



A Skeptic's Guide
to *An Inconvenient Truth*
by Marlo Lewis, Jr.



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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 film with a call for "political action," he presents *AIT* as the work of a long-time student of climate science—and 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.

The present paper, a running commentary on *AIT*, finds that most of Gore's claims regarding climate science and climate policy are either one sided, misleading, exaggerated, speculative, or wrong. An extensive summary of *AIT*'s distortions is provided in Appendix A. Below is a list of 25 of egregious examples.

One-sided statements

- *AIT* never acknowledges the indispensable role of fossil fuels in alleviating hunger and poverty, extending human life spans, and democratizing consumer goods, literacy, leisure, and personal mobility.
- It never acknowledges the environmental, health, and economic benefits of climatic warmth and the ongoing rise in the air's CO₂ content.
- It neglects to mention that aggregate mortality and mortality rates due to extreme weather events declined dramatically during the 20th century.
- It 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, and the world's most mobile population.
- The book 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, carbon trading commissions, regulatory power, prosecutorial plunder, or political careers depend on keeping the public in a state of fear about global warming.

- *AIT* 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 statements

- *AIT* 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.
- It 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.
- It erroneously 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.
- It reports that 48 Nobel Prize-winning scientists accused Bush of distorting science, without mentioning that the scientists acted as members of a 527 political group set up to promote the Kerry for President Campaign.

Exaggerated statements

- *AIT* hypes the importance and exaggerates the certainty of the alleged link between global warming and the frequency and severity of tropical storms.
- It claims polar bears “have been drowning in significant numbers,” based on a single report that four polar bears drowned in one month of one year, following an abrupt storm.
- It 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 220th the size of Texas and 1/246th the size of the West Antarctic Ice Sheet (WAIS).
- *AIT* 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 statements

- *AIT* 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.
- It blames global warming for recent floods in China’s Sichuan and Shandong provinces, even though more damaging floods struck those areas in the 19th and early 20th centuries.
- It blames global warming for the disappearance of Lake Chad, a disaster more likely stemming from a combination of natural regional climate variability and societal factors such as population increase and overgrazing.
- *AIT* 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.
- It 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 WAIS has been retreating since the early Holocene. At the rate of retreat observed in the 1990s, the WAIS should disappear in about 7,000 years.

- It warns that “moulins”—vertical water tunnels formed from surface melt water—could cause half the Greenland Ice Sheet to break off and “slide” into the sea, even though the scientific study to which Gore alludes found that moulins increase glacial flow by only a few meters a year.

Wrong statements

- *AIT* 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.
- It claims the rate of global warming is accelerating, when it has been remarkably constant for the past 30 years—roughly 0.17°C/decade.
- It attributes Europe’s killer heat wave of 2003 to global warming; it was actually due to an atmospheric circulation anomaly.
- It 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.
- It 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 *Skeptic's Guide* comments on the book version of *AIT*.

To minimize redundancy, the *Skeptic's Guide* 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 *Skeptic's Guide* into several sections. My 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*.

Some readers may wonder why I comment on almost every substantive statement Gore makes rather than just the key points or the dozen or so most egregious distortions. Why cover so many seemingly minor details?

Two considerations impelled me to take a comprehensive approach. First, anything less than a point-by-point examination of *AIT* is too easy to dismiss as cherry picking. After all, any non-technical treatment of complex scientific and economic issues is bound to be distorting to some degree. Confronted with a list of a dozen errors, or even two dozen, critics could accuse me of quibbling and plausibly claim that Gore's most important points (whichever ones I did not comment on) were correct.

Second, *AIT* makes a powerful impression on audiences chiefly by the sheer number of assertions it makes and images it presents. A typical audience reaction is to conclude that if even half of what Gore says is true, then the planet is in serious trouble. So I decided to take a leaf out of Gore's playbook. By the sheer number of errors and distortions I have uncovered, I hope to foster a healthy skepticism about global warming alarmism and the energy suppression agenda it allegedly justifies.

Chapter 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.” (*AIT*, p. 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. The amount of carbon dioxide in the atmosphere is so small that CO₂ is referred to as a “trace gas.” Over the past century and a half, atmospheric CO₂ levels have risen from about 280 parts per million (ppm) to about 380 ppm—from roughly 3/100ths to roughly 4/100ths of one percent of the atmosphere.

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. A similar picture appears below.



The “smoke” is probably steam, but it looks dark and ominous against the inferno colors of a fading sunset. Thus, readers (and film viewers) are set up to believe they are literally seeing CO₂ spew out of smokestacks, even though CO₂ is as invisible as oxygen. Pictorially, *AIT* presents CO₂ as an air pollutant, reinforcing Gore’s 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 having 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 CO₂.³ 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 dirty the air and impair respiratory function.

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.” (*AIT*, p. 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.⁴ 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.”⁵

If *AIT* were a balanced presentation rather than a lawyer’s brief for alarm, it would have at least acknowledged the environmental and health benefits of CO₂ emissions. Carbon dioxide is not only a greenhouse gas; it is also plant food, an aerial fertilizer. Literally hundreds of scientific studies show that rising CO₂ levels help trees, crops, and green things generally grow faster and larger, produce more fruit, use water more efficiently, and resist stress from air pollution—the real stuff.

Based on experimental data, the Center for the Study of Carbon Dioxide and Global Change estimates that the 100-ppm increase in CO₂ levels since pre-industrial times has increased average crop yields by 60% for wheat, 33% for fruits and melons, 62% for legumes, 67% for root and tuber crops, and 51% for vegetables.⁶ An extraordinary positive externality, courtesy of the Industrial Revolution!

CO₂ aerial fertilization not only makes more of a good thing, it also makes good things better. More CO₂ boosts (a) the protein content of wheat, rice, and legumes, and (b) the antioxidant content of citrus and other fruit.⁷

In short, we find error, rhetorical manipulation, exaggeration, and rank selectivity in what should be a straightforward overview of greenhouse basics. This does not inspire confidence that subsequent, more complex topics will receive a balanced treatment.

Chapter 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.’” (*AIT*, pp. 42-45)



Mount Kilimanjaro: 1970, 2004

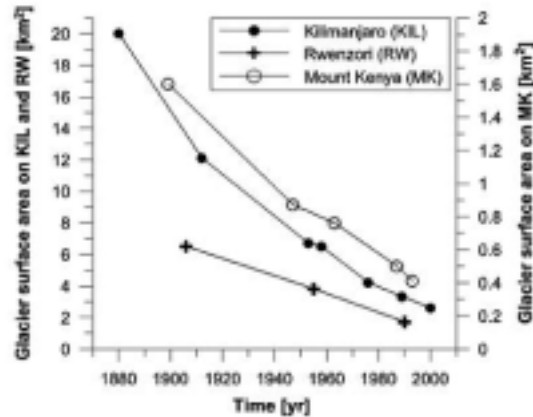
Comment: There is no question that “dramatic changes” are taking place in *mountain glaciers*. But it does not necessarily follow that dramatic changes are occurring in *global climate*. Small changes in temperature can produce rather large changes in mountain glaciers. So can changes in regional precipitation that have nothing to do with CO₂ emissions.

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. (2003) note that Kilimanjaro’s glacier began to recede around 1880.⁸ They found “no evidence of a sudden change in temperature at the end of the 19th century.” 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.” Moreover, monthly mean air temperatures at the Kilimanjaro glacier “only vary slightly around the annual mean of -7.1°C, and air temperatures never rise above the freezing point.” The glacier is shrinking but it is not melting.

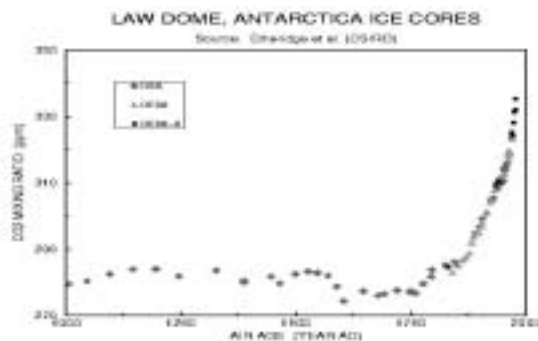
What then is causing the ice cap to disappear? Kaser et al. (2004) examined glacial retreat on three East African massifs, Rwenzori, Mount Kenya, and Kilimanjaro.⁹ They found that a “drastic dislocation” occurred around 1880, when the region shifted from a “very humid” to a dry climate. This meant less

cloud cover, exposing the glacier to more direct sunlight, and less snowfall to replace the sublimating (evaporating) ice. In the words of Kaser and colleagues: “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)
 Source: Kaser et al. (2004)

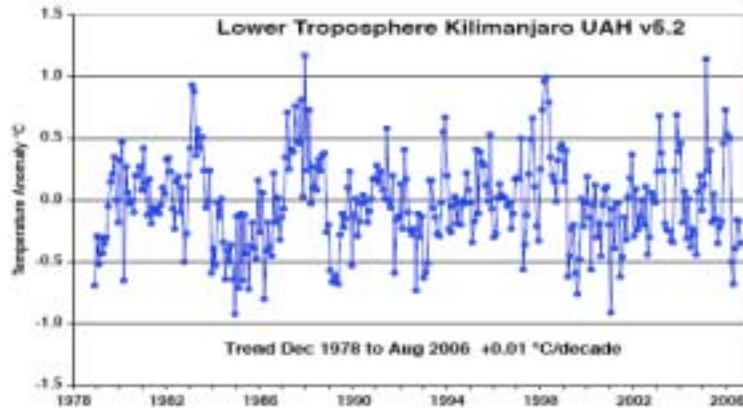
It is worth emphasizing that 1880 is decades before industrial CO₂ emissions could have had much impact on global climate. Carbon dioxide levels at that time were approximately 290 parts per million (ppm), only slightly above pre-industrial levels (280 ppm).¹⁰ See the Figure below.



CO₂ levels over the past millennium
 Source: Center for the Study of Carbon Dioxide and Global Change, derived from Ethridge et al. (1998)

Analyzing the Kaser et al. study, climatologist Patrick Michaels observes that the Kilimanjaro glacier retreated in periods of both global warming and 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.”¹¹

Since 1978, satellite measurements of Kilimanjaro air temperatures show a minuscule trend of +0.01 C/decade, essentially zero. See the Figure below.

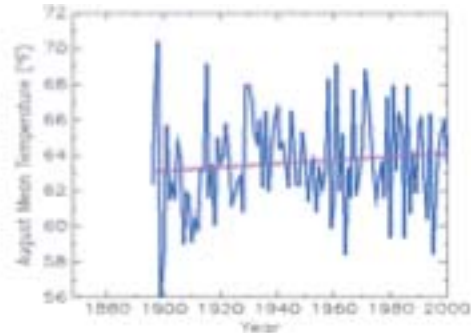
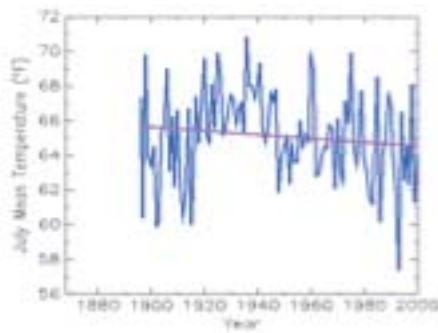


Satellite-sensed temperatures in Kilimanjaro's neighborhood show no detectable warming since records began in late 1978.
Source: John Christy

Two key conclusions emerge. First, the Snows of Kilimanjaro would still be disappearing even in the absence of anthropogenic global warming. As one recent study concluded, “Rather than changes in 20th century climate being responsible for their demise, glaciers on Kilimanjaro appear to be remnants of a past climate that was once able to sustain them.”¹² Second, no change in energy policy can save the glacier or could have saved it even if implemented decades ago.

AIT: “Our own Glacier National Park will soon need to be renamed ‘the park formerly known as Glacier.’” (*AIT*, p. 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, August Temperatures in the vicinity of Glacier National Park
 Source of data: Kalispell, Station, MT (from the United States Historical Climatology Network dataset)

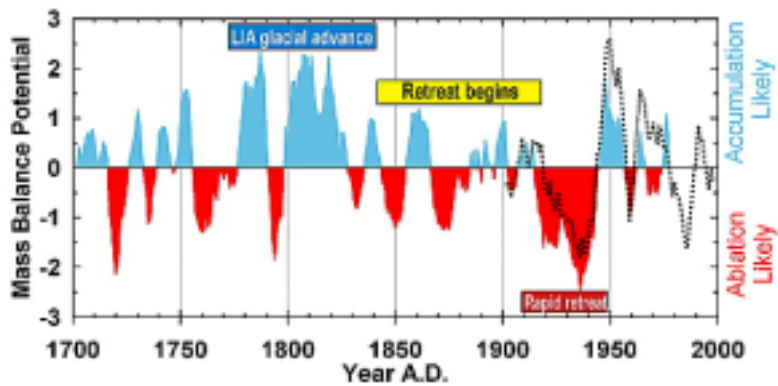
As in the case of Kilimanjaro, Glacier Park’s glaciers have been retreating long before anthropogenic global warming could have had much of an impact on them. Writing in 1952, more than a half-century ago, Dightman and Beatty report on the results of an aerial mapping program initiated in 1950 that compared the new photographs with earlier glacial mapping efforts.¹³ 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 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.¹⁴ 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.” (*AIT*, p. 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.¹⁵



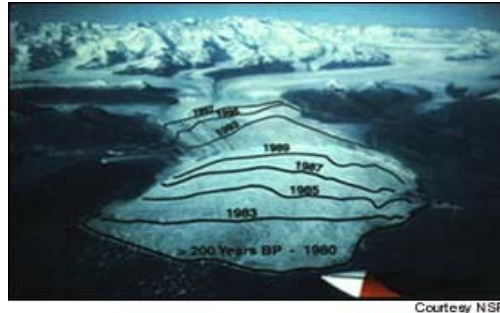
Perito Moreno Glacier

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 is famous for

being in a state of dynamic equilibrium, continually advancing and then unpredictably shedding ice via spectacular calving events.¹⁶

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

AIT presents a picture similar to the one below.

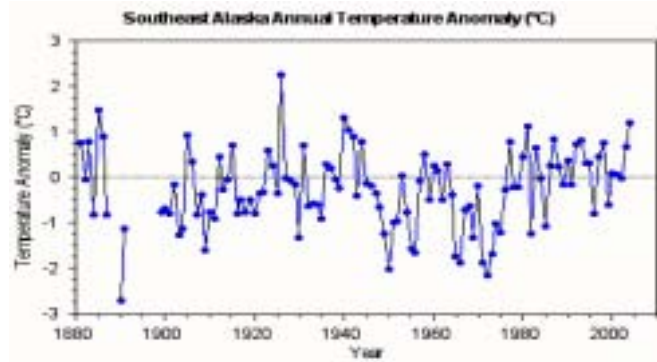


Recession of the Columbia Glacier

Comment: It is unclear to what extent 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 shrinking since the early 20th century or before—prior to the rapid buildup in CO₂ levels. 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 2002.¹⁷ In other words, most of the loss in ice thickness occurred before the major buildup in CO₂ levels. 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.



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.

Source: Patrick Michaels

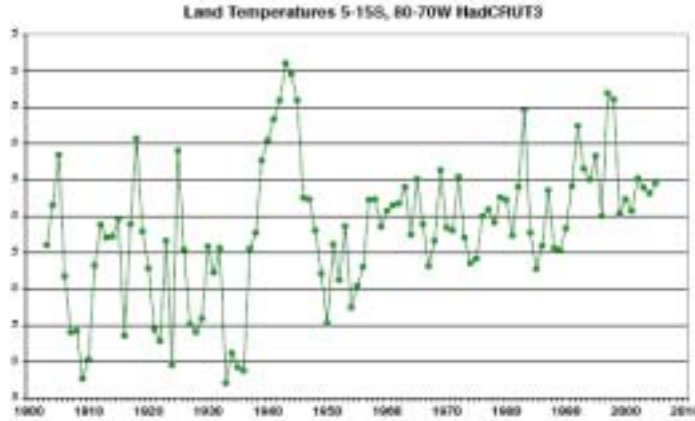
AIT: “Everywhere in the world the story is the same, including in the Andes in South America.” (*AIT*, p. 52)

Comment: Andean glaciers have been in retreat for 150 years, ever since the world emerged from the Little Ice Age (LIA) cold period.¹⁸ The LIA was probably the coldest period of the last two millennia. 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. 1250-1810.¹⁹ 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, the Center for the Study of Carbon Dioxide and Global Change found that all three indicate that the pre-LIA period from roughly A.D. 550-1000 was warmer than the current warm period.

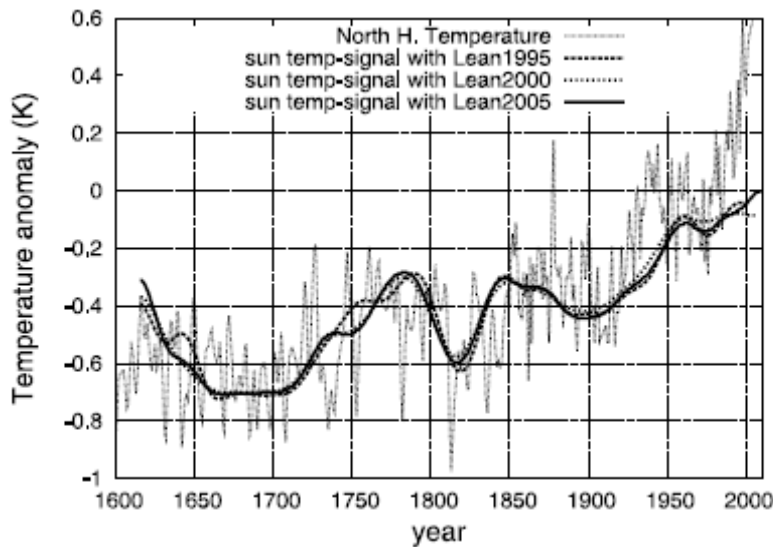
AIT gives the impression that massive glaciers are the norm in Peru. However, the Polissar team found that, “during most of the past 10,000 years, glaciers were absent from all but the highest peaks in the Cordillera de Merida [Peruvian Andes].” What that finding indicates, observes the Center for the Study of Carbon Dioxide and Global Change, is that “warmer-than-present temperatures are the norm for this part of the planet, and that any significant warming that might yet occur in this region (as well as most of the rest of the world) would only mark a *return* to more *typical* Holocene (or current interglacial) temperatures, which have themselves been significantly lower than those of *all four prior interglacials*.”²⁰

Although a greenhouse “signal” may be detectable in the post-1970 period, the Peruvian Andes were warmer during the mid-1940s, when CO₂ levels were lower. See the Figure below.



Land Temperatures, Peruvian Andes
Source: John Christy

AIT should at least mention that changes in solar activity may account for much of the warming of the past century and, thus, for part of the observed changes in mountain glaciers. 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.²¹ See the Figure below.

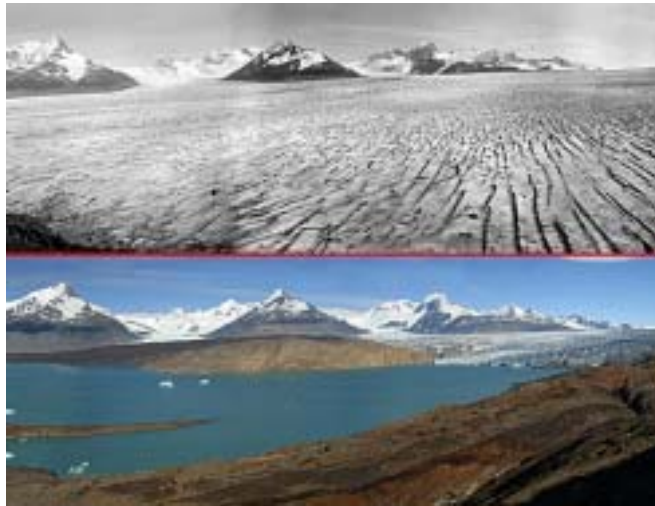


Parallel trends in solar irradiance and Northern Hemisphere temperatures
Scafetta and West (2006)

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.” Although Scafetta and West believe that global warming since 1975 has occurred too quickly to be explained by solar variability, they conclude that “the sun might have contributed approximately 50% of the total global surface warming since 1900.”

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.”
(*AIT*, p. 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.”²² See the image below.



Glacier Pio XI

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.²³ 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. The Center for the Study of Carbon Dioxide and Global Change²⁴ summarizes a study²⁵ 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).

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 the Medieval Warm Period, the Roman Warm Period, and the 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].”
(*AIT*, p. 56)

Comment: That is correct. Alpine glaciers have been in retreat since the world began to emerge from the Little Ice Age, and this process is accelerating. The International Glacier Commission estimates that “the glaciers in the European Alps have lost about half their total volume (roughly -0.5% per year) between 1850 and 1975, another 25% (or -1% per year) of the remaining amount between 1975 and 2000, and additional 10 to 15% (or -2 to -3% per year) in the first five years of this century.”²⁶ Ice loss is accelerating both because Northern hemisphere temperatures increased since the mid-1970s and because

of local positive feedback effects—i.e., shrinking glaciers reflect less sunlight and expose more dark areas to sunlight, warming their surroundings.

Several smaller Alpine glaciers advanced during the 1970s and 1980s—an effect of global cooling, global “dimming” (a decrease in solar radiation reaching the Earth’s surface),²⁷ or both. Similarly, many glaciers in Europe and around the world advanced during the LIA. Global cooling is “good” for glaciers. But is it good for people?

Here is a photograph of the Swiss Argentiere 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 the glacier does not destroy their town.”

Many of the larger Alpine glaciers reached their maximum extent during the Little Ice Age. If the LIA had continued for another 150 years, through the end of the 20th century, those glaciers would likely have

grown beyond the dimensions they reached in 1850. *AIT* never faces the possibility that retreating glaciers may be a price we must pay to avoid a much worse condition: global cooling.

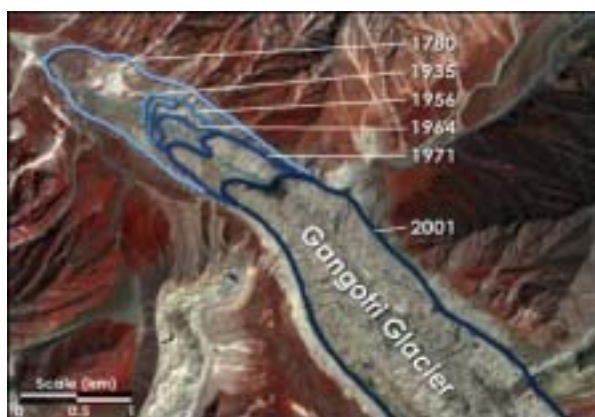
At a minimum, *AIT* should acknowledge the difficulty of assessing the relative contributions of Man and Nature to current Alpine glacier retreat. Holzhauser et al. (2005) found that the Great Aletsch Glacier, the largest of all Alpine glaciers, was approximately 1,000 meters shorter than it is today 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.²⁸

Similarly, data presented by Joerin et al. (2006)²⁹ indicates that Great Aletsch Glacier around 1000 A.D. was slightly shorter than it was in 2002.³⁰

These findings raise obvious questions. If the Great Aletsch glacier receded more in the Age of Achilles and the Reign of the Caesars than it has in recent years, how can we be sure that CO₂ emissions are the chief cause of current Alpine glacier retreat? Is there evidence that people in ancient times suffered as a consequence of the glacier’s retreat or the warming that produced it?

***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.” (*AIT*, p. 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 considerable glacial retreat occurred before 1935.



Composite ASTER image showing retreat of the Gangotri Glacier terminus in the Garhwal Himalaya since 1780
Source: Land Processes Distributed Active Archive Center³¹

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.

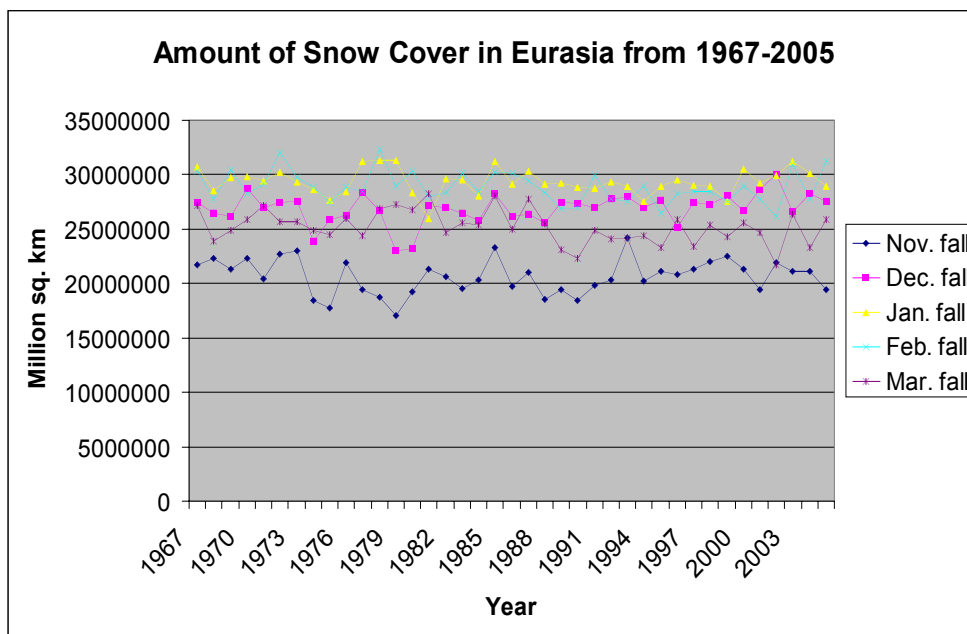


Figure is based on data from Rutgers University Global Snow Lab³²

A recent study of Chinese snow cover found a “generally positive” trend over Western China during 1951 to 1997. Over the southern half of the study area—the Tibetan Plateau—the researchers found that “annual cumulative daily snow depth increased by 2.3% per year.”³³

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?³⁴

Alternatively, suppose global warming diminishes 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.

Let’s assume for the sake of argument that all the recent warming is due to rising CO₂ levels. In that case, 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.³⁵ Moreover, atmospheric CO₂ levels are bound to increase for decades, regardless of the mitigation policies governments adopt. 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.

To sum up, *AIT* ignores scientific studies that find a large role of natural variability in the shrinking of mountain glaciers, never explains why we should prefer glacial growth (global cooling) to glacial retreat (global warming), warns of an impending global warming-induced water shortages in Asia for which there is no evidence, and hugely exaggerates the ability of energy-rationing schemes to avert or mitigate water shortages in the policy-relevant future.

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." (*AIT*, p. 64)

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."³⁶

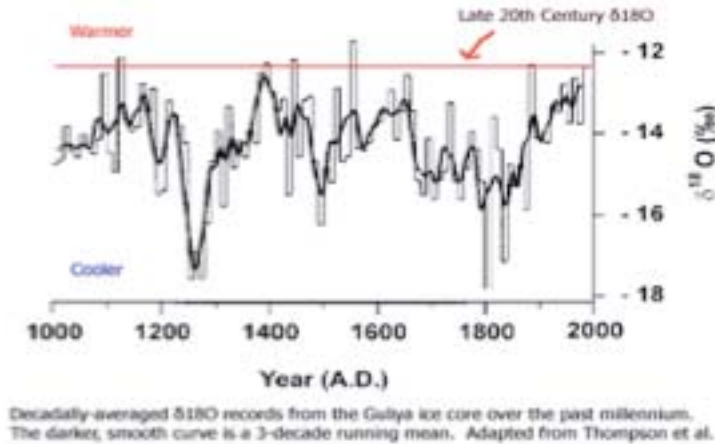
AIT: "To support their view, they [the skeptics] frequently refer to the Medieval Warm Period. But as Dr. [Lonnie] Thompson's thermometer [analysis of the ratio of oxygen-16 to oxygen-18 in ice cores] shows, the vaunted Medieval Warm Period (the little red blip from the left, below) was tiny compared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

Comment: Thompson analyzed the isotopic oxygen ratios in three Andean and three Tibetan ice cores. 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.³⁷

More importantly, contrary to Gore's assertion, Thompson's study does not 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."³⁸ In other words, isotopic oxygen records from the tropical Andes may chiefly reflect changes in precipitation rather than changes in temperature.³⁹

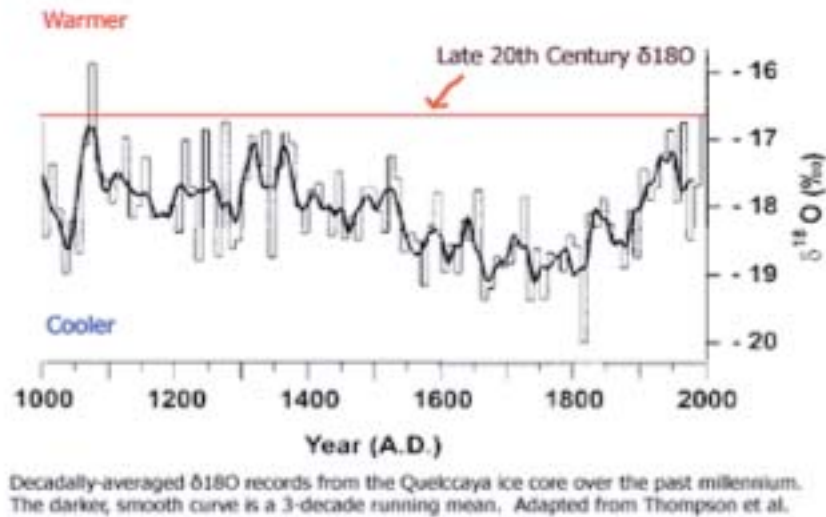
Even if Thompson's "thermometer" is accurate, the conclusion that Gore draws from it is questionable. Of the three Tibetan ice cores Thompson examined, the Dunde and Guliya sites actually depict several decadal periods of the past that were as warm as or warmer than the last few decades of the 20th century. See the Figure below on the Guliya ice core.⁴⁰



Guliya ice core
 Source: Center for the Study of Carbon Dioxide

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 Thompson's 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.



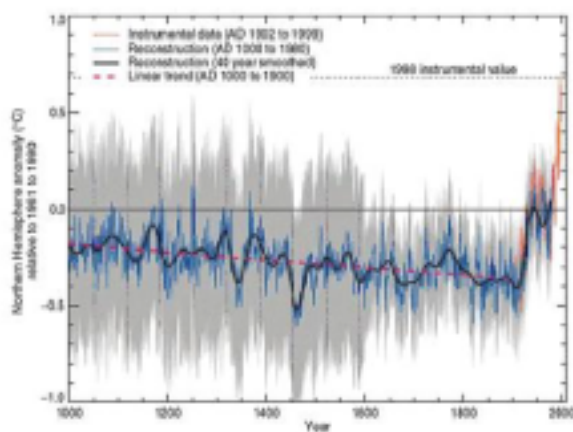
Quelccaya ice core
 Source: Center for the Study of Carbon Dioxide

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. The Center for the Study of Carbon Dioxide and Global Change has reviewed literally scores of such studies. A survey conducted by Sallie Baliunas and Willie Soon of the Harvard-Smithsonian Center for Astrophysics found 79 studies in which proxy data from various locations “show periods of at least 50 years [during the past millennium] which were warmer than any 50 years period of the 20th century.”⁴¹ As noted earlier, a 2006 study by Polissar and colleagues 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.⁴²

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.” (AIT, p. 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.



The Hockey Stick
Source: IPCC

The hockey stick reconstruction depicted a relatively stable climate with a slight cooling trend from 1000 A.D. to 1900 (the shaft), and then a sharp upward spike in the 20th century (the blade). 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 2005.⁴³ Among other

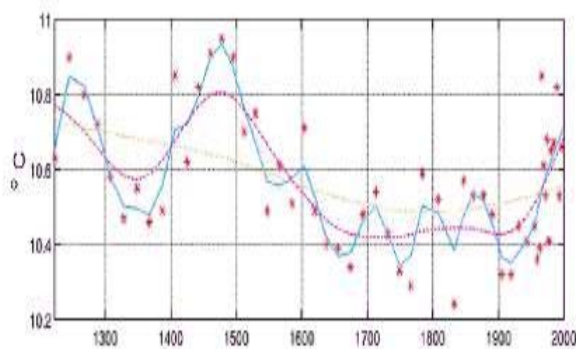
weaknesses, M&M found that Mann, Bradley, and Hughes (MBH) “de-centered” their proxy data, picking a mean that inflates the importance of data generating hockey stick shapes.⁴⁴

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.⁴⁵ 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.”

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 connections and shared proxies, the other studies might not be as independent as they appear to be.

Far from being settled that the Medieval Warm Period was tiny compared to the current warming, a recent reconstruction of Northern Hemisphere climate history shows a pronounced Little Ice Age preceded by a Medieval Warm Period that is warmer than the present.⁴⁶ See the Figure below.



Reconstruction of Northern Hemisphere temperature history from diatoms (plankton sediments)
Source: Weckström et al. (2006)

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...CO₂ is now [380 ppm]—way above anything measured in the prior 650,000-year record.” (*AIT*, p. 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, rising as high as 348 ppm—roughly the CO₂ level for 1987.⁴⁷ The Center for Carbon Dioxide and Global Change 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.

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 trapped inside.” (*AIT*, p. 67)



AIT's graph of CO₂ levels and global temperatures over the past 650,000 years

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.⁴⁸

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.⁴⁹ At most, changes in the air’s CO₂ content had an amplificatory effect on climate changes already under way.⁵⁰

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 the scientific literature.⁵¹ 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.⁵² Multiple ice cores indicate that East Antarctica was 2.5°C-5°C warmer than the present.⁵³

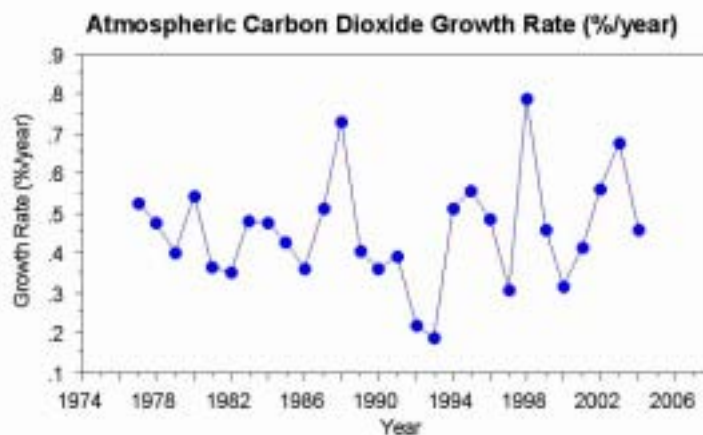
In short, Gore exaggerates CO₂'s importance in Earth's climate history. Over the past several hundred thousand years, changes in CO₂ levels were chiefly the effect rather than the cause of changes in global temperature, the Earth was warmer than it is today during previous interglacial periods when CO₂ levels were lower, and significant evidence indicates that the Medieval Warm Period was as warm as or warmer than the current warm period.

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.” (*AIT*, p. 65)

Comment: Gore here tacitly assumes what many climate models unrealistically 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...”⁵⁴

Since 1977, CO₂ levels have been increasing at about 0.45% or 1.5 ppm per year.⁵⁵ 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.



There has been no significant trend in the annual growth rate of CO₂ concentrations during the past 30 years. The average value has been about 0.45%/year (values derived from data available from the Carbon Dioxide Information Analysis Center).⁵⁶
Source: *World Climate Report*.⁵⁷

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.” (*AIT*, p. 67)

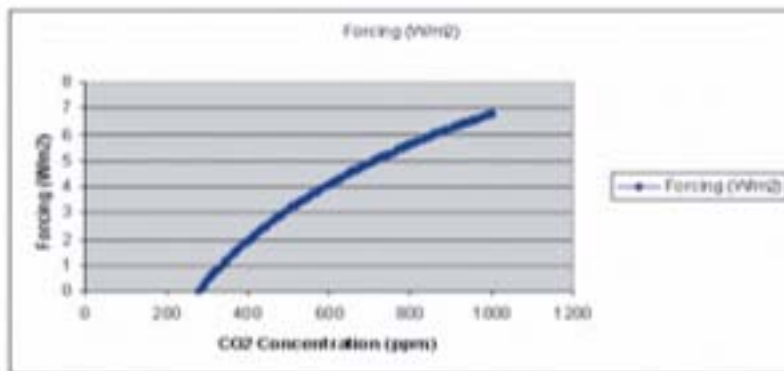
A photograph of Gore’s graph appears below.



AIT's graph of CO₂ levels and global temperatures over the past 650,000 years

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 higher rate of increase than has been observed for the past 30 years. Second, the experiment implies that changes in CO₂ levels preceded and thus caused glaciations and de-glaciations. As noted above, the causality largely runs the other way.

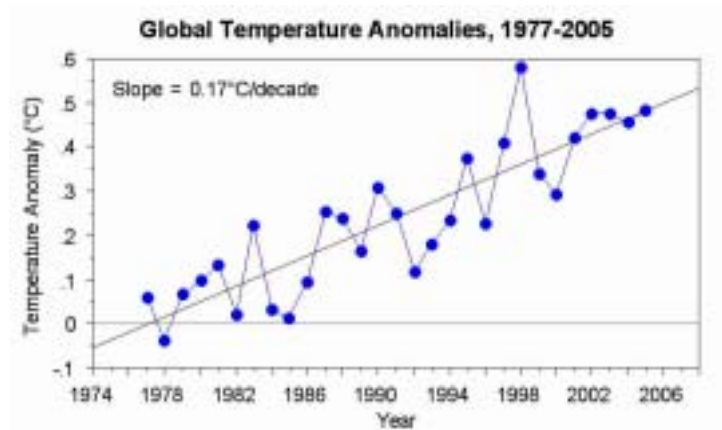
Third, *AIT* tacitly assumes a linear relationship between CO₂ levels and global temperatures, such that every additional increment of CO₂ “forces” the climate by as much as the previous increment. In reality, the CO₂-warming effect is roughly logarithmic, meaning that each 100-ppm increase adds less heat than the previous 100-ppm increase.⁵⁸ See the Figure below.



The CO₂-warming effect—diminishing returns
Figure is derived from IPCC Third Assessment Report, Table 6.2, p. 358.

AIT: “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.” (*AIT*, p. 72)

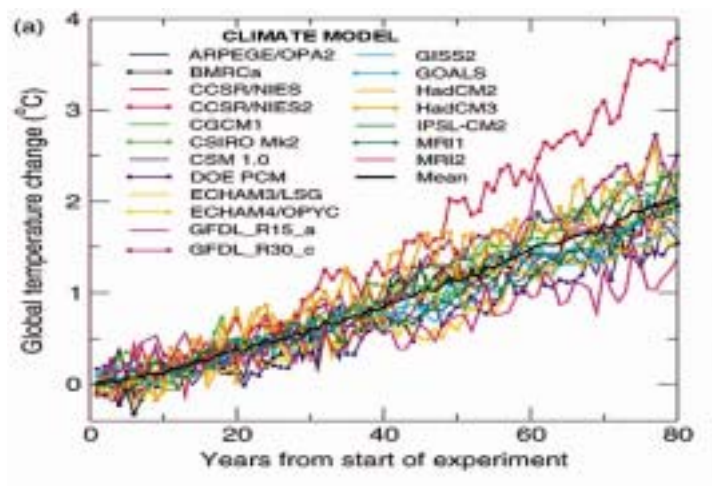
Comment: There has been no increase in the rate of warming since the mid-1970s, when the second 20th century warming period began. For the past 30 years, the planet has warmed at a remarkably constant rate of 0.17°C (or 0.31°F) per decade.



Annual globally averaged temperature anomalies, 1977-2005
 Data Source: Climate Research Unit⁵⁹
 Figure Source: World Climate Report⁶⁰

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

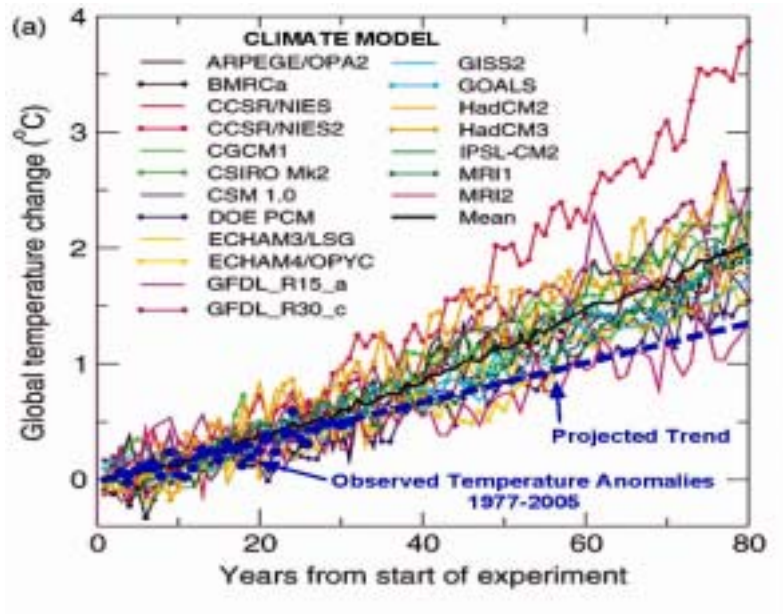
As Patrick Michaels has pointed out on many occasions, the constant, or linear, as opposed to accelerating, or exponential, rate of warming observed over the past three decades is “by and large the same behavior the vast majority of climate models predict the earth’s temperature will display when forced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



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. All but one project constant warming rates.

Source: IPCC 2001, p. 537

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. Several models in the Figure 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.



Reasonable forecast of global warming based on 30 years of data and the linear form of most model projections
 Source: World Climate Report

Gore does not explicitly say how much warming he expects to occur by mid-century. But in asking us to imagine “three times as much” warming as has occurred since the last ice age, he clearly implies that dramatic increases in average global temperature are in the offing. Both theory (the linear form of most model projections) and observation (temperature data of the past 30 years) suggest that the warming of the next several decades will be constant and moderate.

V. Heat

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.” (*AIT*, p. 75)

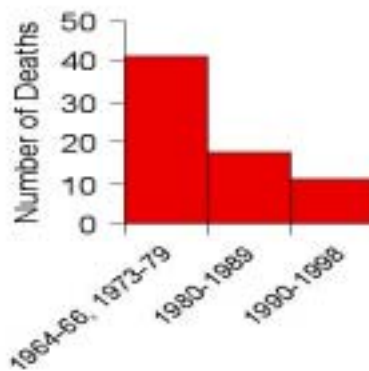
Comment: The European heat wave of 2003 was due to an atmospheric pressure anomaly, not global warming. Here is what the United Nations Environment Program—hardly a bunch of global warming skeptics—had to say:

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.⁶¹

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.”⁶²

The death toll in Europe was terrible—but part of the blame falls on the European distaste for air conditioning⁶³ and higher electricity costs that discourage use of air conditioning.⁶⁴ In the United States, heat-related mortality has fallen as urban temperatures have risen. See the Figure below.

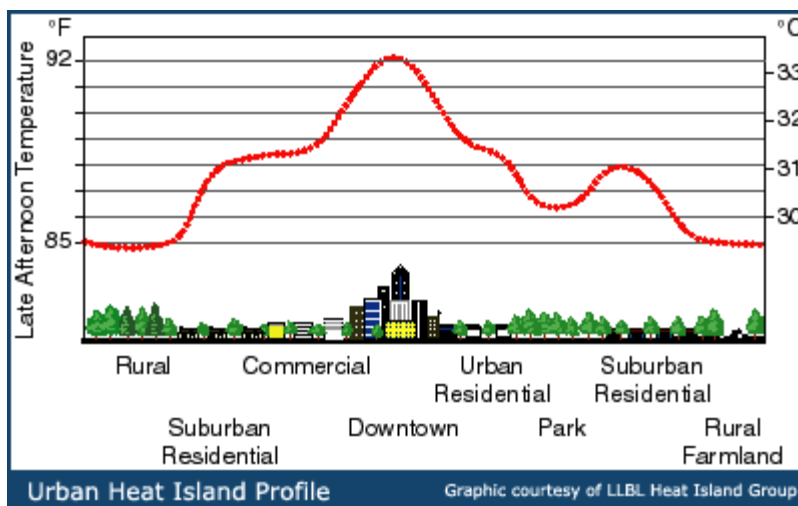
Average Annual Heat-Related Mortality



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)⁶⁵

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.” (*AIT*, p. 76)

Comment: That may be correct, but *AIT* should mention that cities and towns generate local heat islands that grow over time along with population.

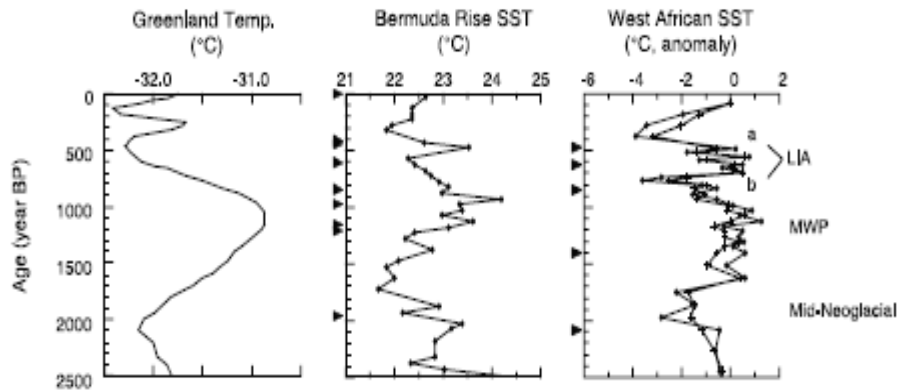


For example, a satellite study found that, “over the course of 12 years, between 1987 and 1999, the mean nighttime surface temperature heat island of Houston increased 0.82 ± 0.10 [°C].” The study noted that, “the growth of the UHI [urban heat island], both in magnitude and spatial extent, scales roughly with the increase in population, at approximately 30%.”⁶⁶ One implication of this study is that urban temperature records are apt to be broken continually as cities grow. As the Center for the Study of Carbon Dioxide and Global Change 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.

AIT: “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.” (*AIT*, p. 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.⁶⁷ The study shows 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.” For example, deMenocal et al. (2000) found warming and cooling events in the Atlantic Ocean off the coast of West Africa that appear to be synchronous with temperature changes in both Greenland and the Bermuda Rise.⁶⁸ All three reconstructions indicate greater warmth during the Medieval Warm Period than the present. See the Figure below.



Three data sets show a synchronous warming during the Medieval Warm Period. Sea surface temperatures off the West Coast of Africa and the Bermuda Rise were warmer than the present.
 Source: deMenocal et al. (2000)

A recent update on global ocean temperatures found that a cooling between 2003 and 2005 eliminated one-fifth of the long-term upper ocean heat gain believed to have occurred over the previous 48 years.⁶⁹ This cooling event is a phenomenon no greenhouse climate model can replicate—a reminder that much remains unknown about natural climate variability.⁷⁰

VI. Hurricanes

AIT: “As the oceans get warmer, storms get stronger.” (*AIT*, p. 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.⁷¹ 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).⁷² Whether, or to what extent, global warming is actually increasing the strength and/or frequency of hurricanes is an empirical question, discussed below.

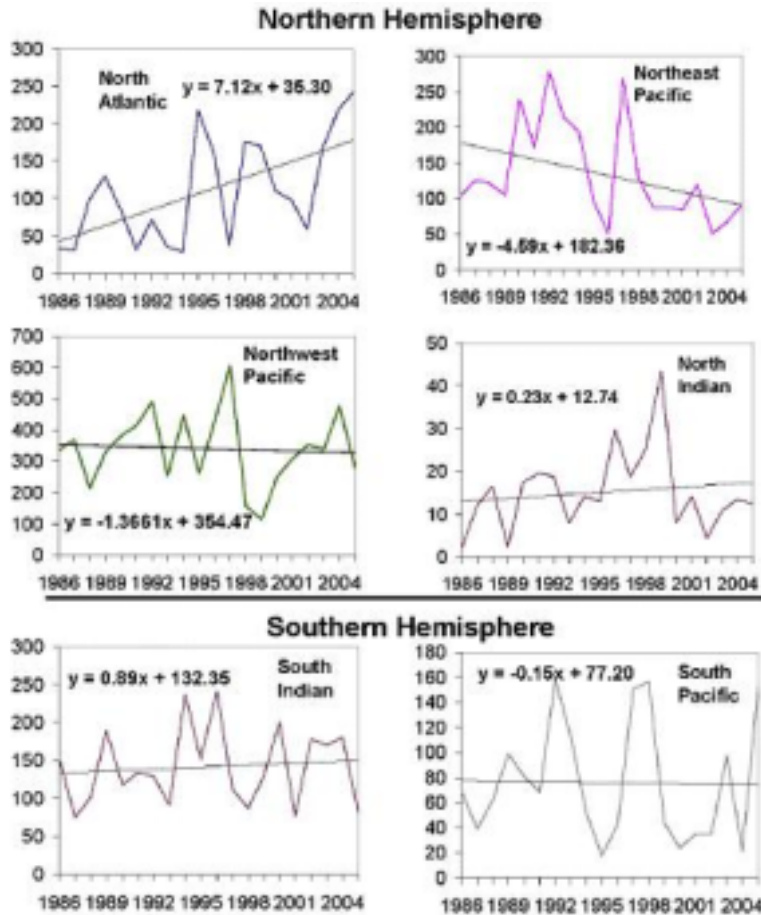
Wintertime storms draw their energy from the collision between cold and warm air fronts. If, as climate models predict, the higher northern latitudes warm more than the lower tropical latitudes, the temperature differential between colliding air masses should decrease, potentially reducing the intensity of some winter storms.⁷³

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.” (*AIT*, p. 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.⁷⁴ 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.⁷⁵ 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.⁷⁶

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.⁷⁷ 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.

Source: Klotzbach (2006)

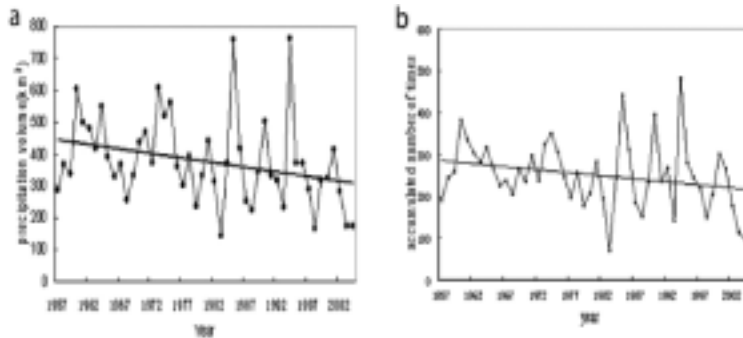
In reality, the “consensus” of the scientific community is that there is as yet “no consensus” about the claim that global warming has significantly increased the severity of major storms. Consider this conclusion reached by 120 scientists at a meeting of the World Meteorological Organization:

The possibility that greenhouse gas induced global warming may have already caused a substantial increase in some tropical cyclone indices has been raised (e.g. Mann and Emanuel, 2006), but no consensus has been reached on this issue.⁷⁸

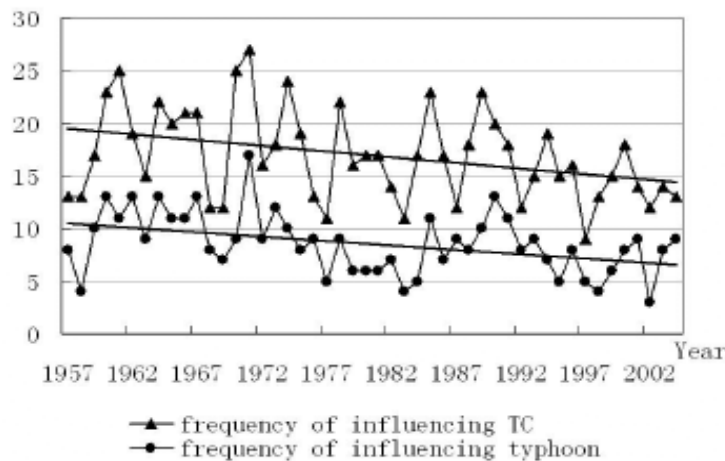
AIT: “Brand-new evidence is causing some scientists to assert that global warming is even leading to an increased frequency of hurricanes, overwhelming the variability in frequency long understood to be part of natural deep-current cycles.” (AIT, p. 81)

Comment: Gore doesn’t reference this “evidence,” so we are not in a position to evaluate whether it shows an increased frequency of hurricanes. Emanuel (2005), a study Gore cited on page 81, reports that

ongoing research finds “no trend” in hurricane frequency. Webster et al. (2005), a study to which Gore alludes on page 89 (see below), also found no increase in the overall number of tropical cyclones. Ren et al. (2006) found a decrease during 1957-2004 in tropical cyclone precipitation and storm activity in China.⁷⁹ See the Figures below.



Total annual volume of tropical cyclone precipitation (a) and total number of tropical cyclone torrential rain events (b) declined in China during 1957-2004
Source: Ren et al. (2006)



Frequency of rain-influencing tropical cyclones and typhoons in China declined during the same period.
Source: Ren et al. (2006)

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.” (AIT, p. 89)

Comment: Peter Webster and colleagues found a significant increase in the number of major hurricanes during the period 1970-2004.⁸⁰ 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.⁸¹ 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.⁸²

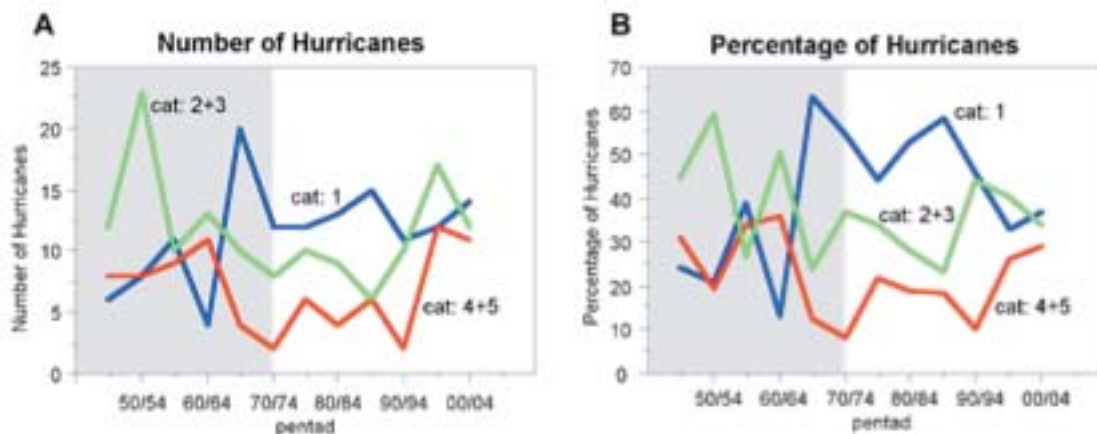


Figure derived from National Hurricane Center data
Source: Patrick Michaels

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.⁸³ “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.”⁸⁴

Knutson and Tuleya came to pretty much the same conclusion: “From our standpoint, the small 0.9 degree Fahrenheit 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.”⁸⁵

Another modeling study, Bengtsson et al. (2006),⁸⁶ projects no increase in tropical storm severity from global warming:

- “There are no changes in the extremes of tropical storms [in our model projection] in spite of increased tropical SST by 2°–3°C.”
- “The Atlantic [tropical] storms are reduced in number, in particular the stronger ones, while the storms in the eastern Pacific are virtually unchanged though there is some indication of fewer extreme

storms. In the western Pacific there is little change. It is interesting to note that the change in SST by between 2° and 3°C *has not had any influence on the numbers and intensities of the more powerful tropical storms.*”

Since the Kyoto Protocol would avert an immeasurably small amount (0.07°C) of global warming by 2050,⁸⁷ 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.”⁸⁸ 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.” They consequently call upon policymakers 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 is absent from *AIT*.

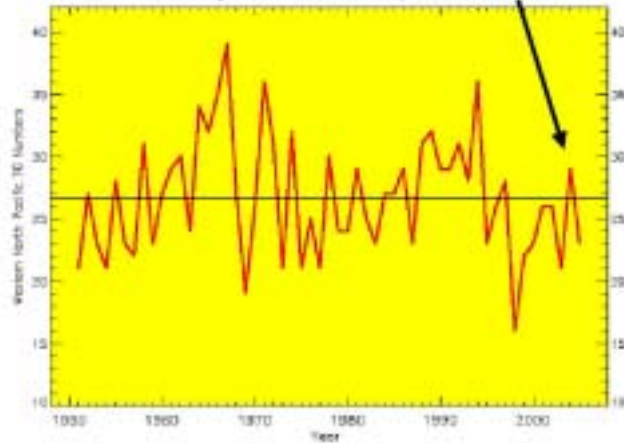
AIT: “In 2004, Florida was hit with four unusually powerful hurricanes.” (*AIT*, p. 83)

Comment: Yes, but was that due to global warming? Satellite measurements show that, in 2004, the Atlantic hurricane basin had the coolest June-July-August (season 3) since 2000, and the 8th coolest since 1979.⁸⁹ No hurricanes made landfall in the United States in 2006. Is that evidence against a link between global warming and hurricanes?

AIT: “...that same year, Japan set an all-time record for typhoons. The previous record was seven. In 2004, 10 typhoons hit Japan.” (*AIT* p. 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!



Tropical cyclones near Japan were more frequent in the 1960s
Source: Matsuura et al. (2003), updated February 2006⁹⁰

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.” (*AIT*, p. 82)

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, 1969.⁹¹

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.”⁹²

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.” (*AIT*, p. 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 (Brazil’s summer months) “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.”⁹³ To blame rising CO₂ levels for Catarina, Gore would have to argue that global warming cooled the water and made the air even colder.

AIT: “And then came Katrina....The consequences were horrendous. There are no words to describe them.” (*AIT*, pp. 94-95)

Comment: The consequences of Katrina were horrendous, but it is sheer demagoguery to blame CO₂ emissions for the devastation. Kerry Emanuel, the very scientist whose work Gore cites to claim a “strong...emerging consensus” that global warming is increasing hurricane duration and intensity, cautioned against attempts to link Katrina or other recent Atlantic storms to global warming. In an interview that occurred while Katrina was still raging, Emanuel stated: “So, of course, it’s tempting. We have had this very active last ten years, along the U.S. and gulf coasts to blame that on global warming, but looking at it statistically, that’s a very difficult connection to make. I think what you are seeing mostly is a natural cycle in this case.”⁹⁴

More importantly, Katrina was the worst natural disaster in U.S. history not because the hurricane was so powerful—it was a category 3 storm by the time it made landfall—but because the federal government had failed to build adequate flood defenses for New Orleans. My colleague, John Berlau, chronicles this sad tale in an important new book.⁹⁵

In a nutshell, policymakers knew for decades that the city’s existing system of canals, dikes, flood walls, and levees was inadequate to protect New Orleans. In the 1960s and 1970s, the Corps of Engineers proposed to build large steel and concrete gates to prevent hurricane force winds from driving storm surges into the Lake Pontchartrain and across into New Orleans. Local politicians and Louisiana’s congressional delegation were on board with this proposal. However, environmental pressure groups sued the Corps under the National Environmental Policy Act (NEPA) to block construction of the flood protection gates. They succeeded.

Katrina devastated New Orleans because the levees, battered by storm surges, broke, allowing the Lake to pour into and inundate the city. The flood control system proposed by the Corps would in all likelihood have prevented the enormous loss of life and record-breaking economic losses. Litigation, not rising CO₂ levels, was the “anthropogenic” factor that turned Katrina into a horrific catastrophe.

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.” (*AIT*, p. 103)

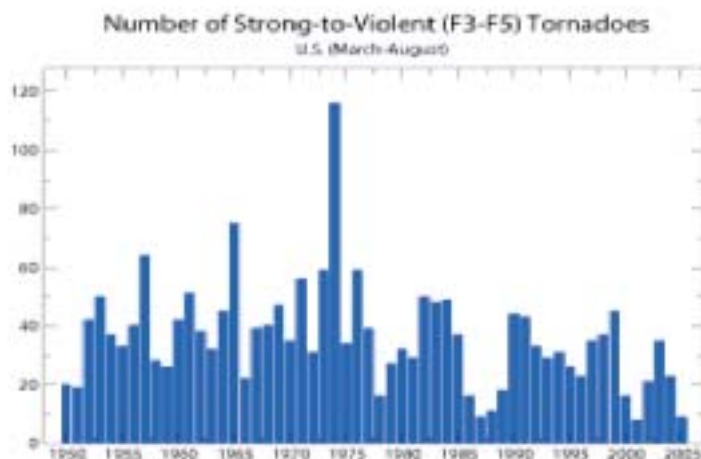
Comment: NOAA’s Web site explains that if there are more than 21 named tropical cyclones in the Atlantic basin in a season, additional storms will be assigned letters from the Greek alphabet. The use of Greek letters to name storms in 2005 was “the first time in history,” as Gore says, but the practice of naming storms only goes back to 1953.⁹⁶ Hurricane detection capabilities have improved dramatically since the 1950s, to say nothing of prior decades. 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 2003.⁹⁷

VII. Tornadoes, Floods, Fire, and Drought

AIT: “Also in 2004, the all-time record for tornadoes in the United States was broken.”
(*AIT*, p. 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.

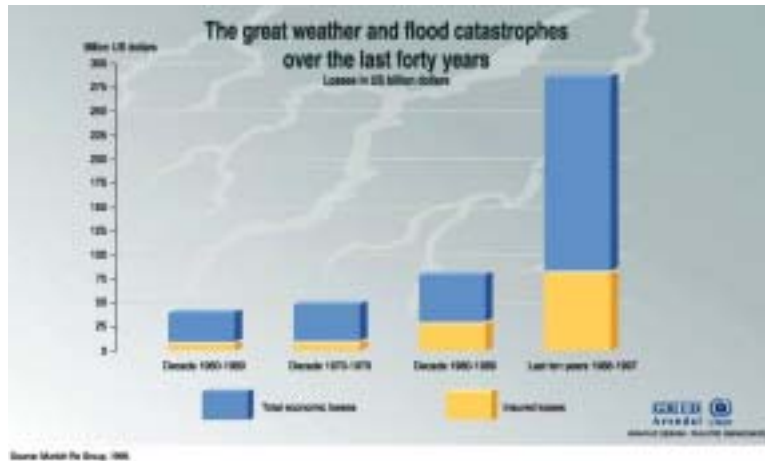


The number of strong tornadoes has declined
Source: National Climate Data Center⁹⁸

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 2004.⁹⁹ As a whole, the United States has not experienced an F5 tornado—the strongest of all tornadoes—in 7 years, the longest F5-free period in recorded U.S. tornado history.¹⁰⁰ Was that in spite of global warming, or because of it?

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, tornadoes, wildfires and other natural disasters have caused these losses.” (*AIT*, p. 101)

Gore presents a graph similar to the Figure below.



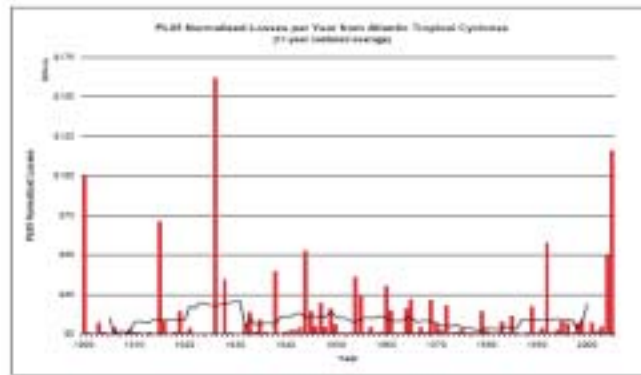
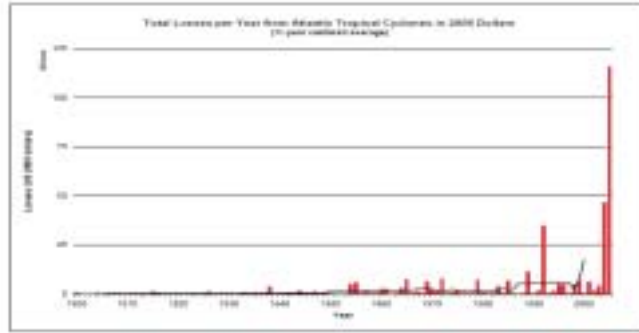
Typical chart of non-adjusted weather-related economic losses

Comment: Gore does not say 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.¹⁰¹ They concluded 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.”

In a paper recently submitted for publication, Roger Pielke, Jr. and five colleagues examine the latest data on U.S. economic losses from hurricanes. They found no trend from 1900 to 2005 once the data are “normalized” for changes in population, wealth, and inflation.¹⁰² The Figures below show non-adjusted and adjusted U.S. losses from hurricanes.



Adjust the weather-related losses for population growth, wealth, and inflation, and the warming signal disappears.
 Source: Pielke, Jr. et al. (submitted, Nov. 2006)

The issue of primary concern to most people is whether mortality from extreme weather events is increasing or declining. The good news, says economist Indur Goklany, 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.”¹⁰³ According to Goklany:

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.

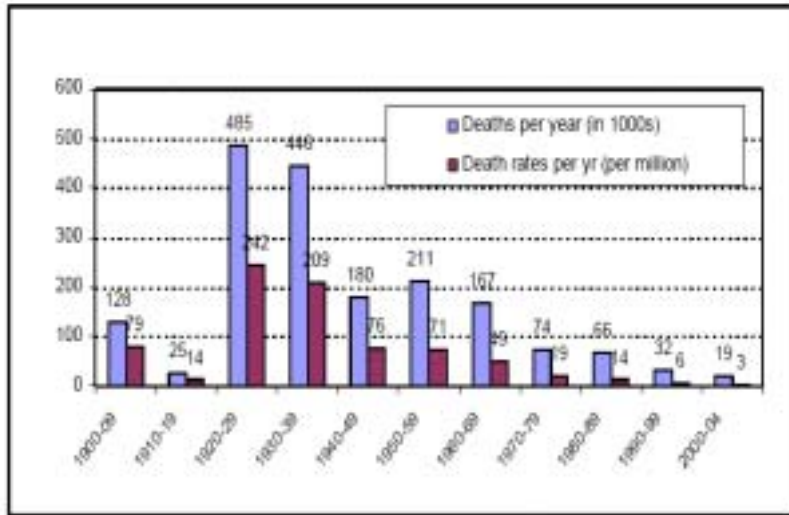


Figure 1: Global Death and Death Rates Due to Extreme Events, 1900-2004. Note that data for the last period are averaged over five years worth of data. Sources: EM-DAT (2005); McEvedy and Jones (1978); WRI (2005).

Weather-related deaths and death rates have declined dramatically.
Source: Goklany

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. (AIT, p. 106)

Comment: This is certainly plausible, but how important global warming might be compared to other meteorological factors affecting the frequency or intensity of “big, one-time” precipitation events is unknown. A recent study of the Iberian Peninsula found that, from 1958 to 1997, there was an increasing trend in the number of days with light rainfall and a decrease in the number of days with moderate, intense, and very intense rainfall.¹⁰⁴

AIT: Partly as a result [of the increase in big downpours], the number of large flood events has increased decade by decade, on every continent.” Gore illustrates the last point with a chart titled, “Number of Major Flood Events by Continent and Decade.” (AIT, p. 106)

Comment: Gore’s chart is based on Figure 16.5 (page 448) of the Millennium Ecosystem Assessment (MEA) report, *EcoSystems & Human Well-Being*.¹⁰⁵ 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 and even political 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 unambiguous evidence of a global-warming ravaged planet.

The Center for the Study of Carbon Dioxide and Global Change summarizes the literature on floods and climate variability:

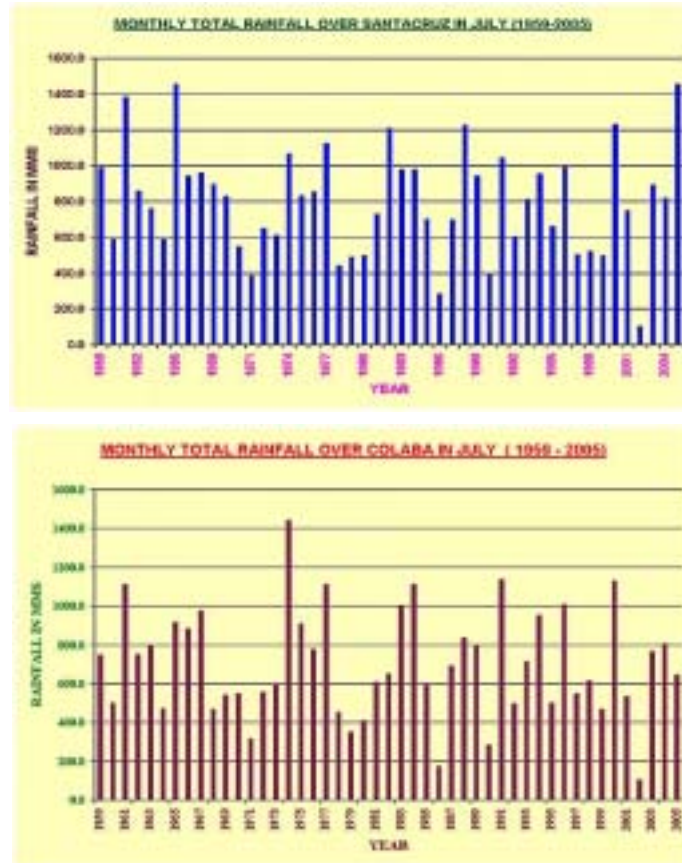
- **Asia:** “The results of these [five] studies from Asia provide no support for the climate-alarmist claim that global warming leads to more frequent and severe flooding. If anything, they hint at an *opposite* effect.”¹⁰⁶
- **Europe:** “In light of this body of evidence [17 studies], it is clear that 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.”¹⁰⁷
- **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.”¹⁰⁸

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.” (*AIT*, p. 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.¹⁰⁹ 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.¹¹⁰ 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.” (*AIT*, p. 110)

Comment: 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. Mumbai has two weather stations that keep detailed records on precipitation.¹¹¹ Neither shows any trend in July rainfall over the past 45 years. See the Figures below.



Mumbai weather stations show no trend in July rainfall over the past 45 years.

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.”
 (AIT, p.112)

Comment: Catastrophic floods have hit those provinces repeatedly from time immemorial. The Yellow River runs through Shandong Province. A PBS report, “Dealing with the Deluge,”¹¹² observed:

Westerners have dubbed it [Yellow River] “China’s Sorrow,” because over the centuries it has killed more people than any other river in the world. In 1887 flooding killed nearly two million people, in 1931 the death toll was almost four million, and in 1938 it was almost one million.

The Yangtze River runs through Sichuan Province. According to Xia Jun of the Chinese Academy of Science and Yongjin Chen of the University of Hong Kong, 23 severe floods occurred in the Yangtze basin from 1843 to 1992—once every seven years on average. The “most disastrous” Yangtze flood in modern times occurred in 1954. “This exceptionally serious flood struck 123 counties and cities and inundated 3.17 million ha of land, forcing 188.8 million people to suffer and taking over 30,000 lives.”¹¹³ By comparison, the Yangtze flood of 1998 killed an estimated 3,000 people.

Predictably, *AIT* never mentions the most important “anthropogenic” influences contributing to flood risk on the Yangtze. In a study of the 1998 flood, two Chinese scholars found that “precipitation over the catchments and the floodwater discharge from the upper basin did not exceed the historical maximum.”¹¹⁴ However, land-use changes—including, paradoxically, flood control projects—“greatly increased” the risk of catastrophic flooding:

Extensive reclamation of the lakes and fluvial islands in the middle basin has considerably reduced the floodwater storage and drainage capacity of these natural landscapes of the Yangtze Basin. Deforestation in the catchment area has induced soil erosion, resulting in a large amount of sediment deposited in reservoirs whose storage capacity is thus reduced. Strengthening the flood defense to protect people living on the floodplain has raised the water level during the flood.

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.” (*AIT*, p. 229)

Comment: Gore’s graph is based on Figure 16.3 (page 449) of the Millennium Ecosystem Assessment (MEA) report, *Ecosystems & Human Well-Being*.¹¹⁵ The figure in the MEA report is titled, “Number of Recorded Wildfires.” Gore re-labels it as “Number of Major Wildfires.” As the MEA report indicates, satellite monitoring of wildfires is a fairly recent development. To what extent are the big jumps in the number of “recorded” wildfires since 1980 and 1990 an artifact of the data? Gore’s re-labeling hides this issue from the reader.

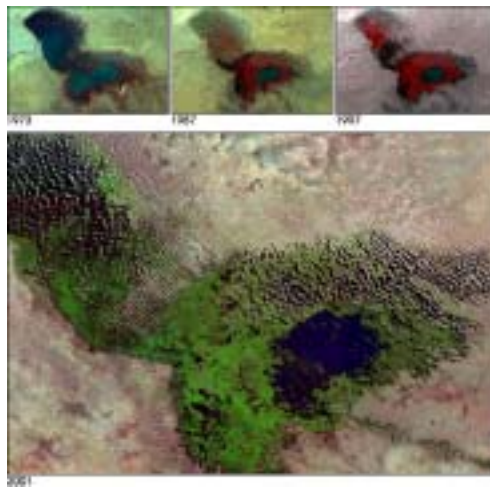
The MEA report confirms that hotter, drier climates tend to produce more wildfires, and hence that global warming will increase wildfire risk in some areas. However, just as Gore ignored societal factors (e.g., population growth in flood plains) affecting the number of “damaging floods,” he similarly 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 on page 227 he laments 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.” (*AIT*, p. 113)

Comment: This is a little too convenient. In Gore’s worldview, 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 (see the images below), which in turn contributed to famine and genocide in the region. He sermonizes: 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, 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.” (*AIT*, p. 117)



Images of Lake Chad
Source: NASA¹¹⁶

Comment: Two responses are in order here, one regarding Africa generally; the other specific to Lake Chad. Since 1950 southern Africa and the Sahel region have experienced significant reductions in rainfall, drying the soil and causing the desert to expand—a process called “desertification.” Climate alarmists often blame desertification on CO₂-induced global warming. However, a recent study challenges this conventional wisdom. Hoerling et al. (2006) compared actual precipitation data with the rainfall simulations of 18 climate models used by the IPCC in its Fourth Assessment Report. The Center for the Study of Carbon Dioxide and Global Change summarizes the Hoerling team’s findings:

In the words of the four researchers, “the ensemble of greenhouse-gas-forced experiments, conducted as part of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, fails to simulate the pattern or amplitude of the twentieth-century African drying, indicating that the drought conditions were likely of natural origin.” In fact, they say that for both of the regions studied, “the observed trend amplitude exceeded that of the greenhouse gas signal by an order of magnitude,” and they state once again that they “therefore concluded that greenhouse gas forcing played little or no role in the 1950-99 observed African drying trends.” What is more, they say there is “considerable spread” among the 18 model projections, making their mean trend so small that they suggest that “natural variability will continue to be the primary driver of [Africa’s] low-frequency rainfall variations during the next century.”

In short, the Center concludes, “there is absolutely *no evidence* that the 20th-century drying of much of Africa was in any way related to CO₂-induced global warming, nor is there any model-based reason for supposing it will be so related over the *next* century.”¹¹⁷

Turning now to the specific case of Lake Chad, a study by Jonathon Foley and Michael Coe of the University of Wisconsin concluded that Lake’s decline probably has nothing to do with global warming. 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.¹¹⁸

Note that the change from a wet to a dry climate began in the late 1960s, when global climate was 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.” (*AIT*, p. 118)

Comment: Why then do pan evaporation studies, such as Roderick and Farquhar (2004),¹¹⁹ indicate that evaporation from soils has been decreasing since the 1950s in the former Soviet Union, Eurasia, Australia, and North America? 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.” Their data suggest that the Earth’s surface is “literally becoming more like a gardener’s ‘greenhouse’.”

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. See the image below.

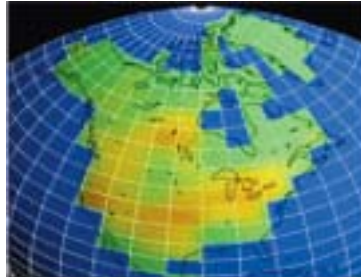


The Dust Bowl

Nor was the 1930s drought outside the range of natural variability. Consider this excerpt from NOAA’s Paleoclimatology Program:

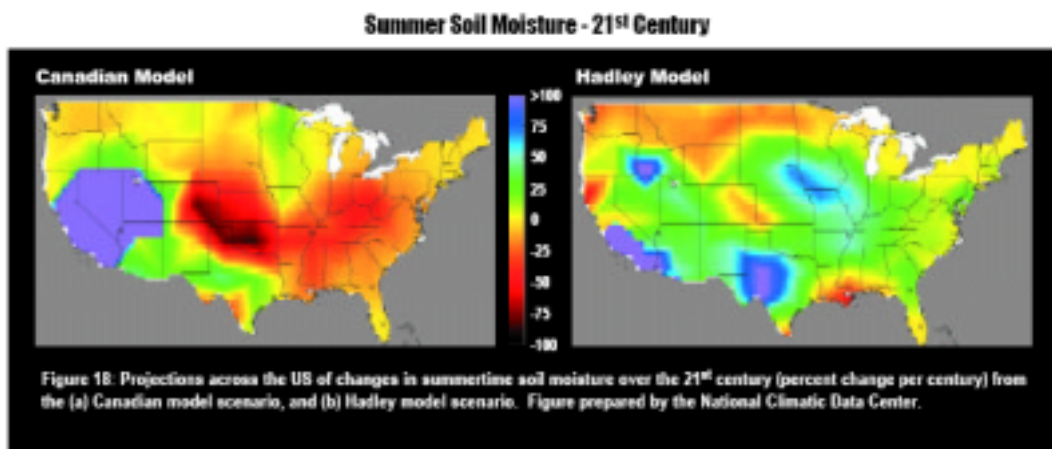
Longer records show strong evidence for a drought [in the 16th century] that appears to have been more severe in some areas of central North America than anything we have experienced in the 20th century, including the 1930s drought. Tree-ring records from around North America document episodes of severe 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 ...¹²⁰

AIT: “The map [below] 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.” (AIT, p. 121)



Source: Princeton GDFL R15 Climate Model

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. Not all models reach this conclusion. The Clinton-Gore Administration used two models—Canadian Climate Center and Hadley Center—to produce its major global warming report, *U.S. National Assessment of the Potential Consequences of Climate Variability and Change*.¹²¹ Like the Princeton model, the Canadian model predicts increased dryness. The Hadley model, on the other hand, predicts increased wetness. See the image below.



Source: U.S. Global Change Research Program, *National Assessment* report, p. 552.

In a report commissioned by the Pew Center on Global Climate Change, Kenneth Frederick and Peter Gleick described the different results predicted by those models:

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.¹²²

Faced with conflicting model results, it makes sense to look at real-world data. Andreadis and Letterman (2006) constructed a time series of soil moisture and runoff over the continental United States for the period from 1925 to 2003. 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.¹²³

AIT: "In 2005 the Amazon suffered the longest and worst drought in recorded history—with devastating effects." (*AIT*, p. 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 drought 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.¹²⁴

Unsurprisingly, *AIT* takes no notice of a beneficial warming-related trend in the Amazon, reported in two studies. 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.¹²⁵ Cao et al. (2004) found similar results.¹²⁶ 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."¹²⁷

AIT fails to make a credible case that global warming is making the weather more dangerous. The frequency of strong tornadoes in the United States has declined slightly since 1950; increased property

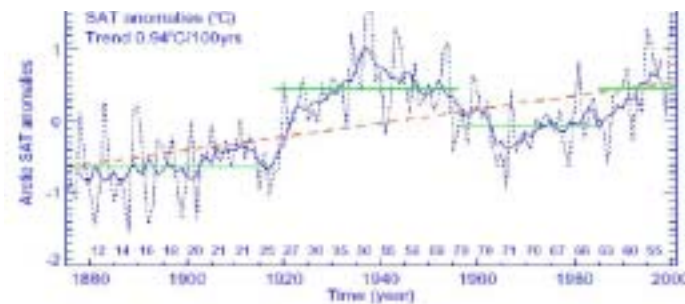
damages due to floods and storms are chiefly due to socio-economic factors such as development in flood plains and coastal areas; globally, deaths from extreme weather events have declined by 95 percent or more since the 1920s; long-term rainfall records for the month of July in Mumbai, India exhibit no greenhouse warming signal; U.S. CO₂ emissions are not to blame for the disappearance of Lake Chad; U.S. droughts were more severe during the 1930s and the latter half of the 16th century than during recent decades; Brazil's 2005 drought has no discernible global warming link; and global warming appears to have increased the bio-productivity of rainforests throughout the world.

VIII. 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.” (*AIT*, p. 126)

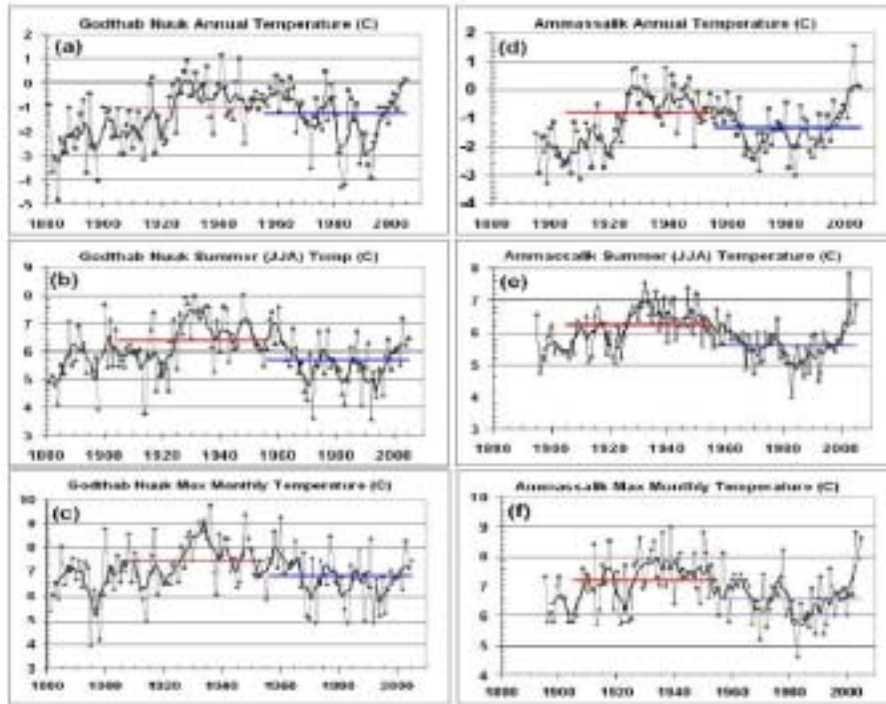
Comment: We would expect the Arctic to warm more rapidly than most other places during a period of global warming, regardless of whether the warming is due to rising greenhouse gas concentrations or natural variability. As Gore explains later on (pages 144-145), polar ice is white and reflects incoming 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. Conversely, cooling expands sea ice, producing more cooling. Arctic climate swings!

For example, Polyakov et al. (2003) found that the Arctic (the area poleward of 62°N) was as warm in the late 1930s as it was at the end of the 20th century.¹²⁸ See the Figure below.



The Arctic in the 1930s was as warm as or warmer than it was in the late 20th century.
Source: Polyakov et al. (2003)

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.”¹²⁹



Greenland in the 1920s-1940s was as warm as or warmer than it was in the past decade.
Source: Chylek et al. (2006)

Going back further in time, three studies reviewed by Patrick Michaels found greater-than-present Arctic warmth in the early Holocene.¹³⁰ Briner et al. (2006) found that, 10,000 to 8,500 years ago, Canada's Baffin Bay was $\sim 5^{\circ}\text{C}$ warmer than it is today.¹³¹ Kaufman et al. (2004) found that, 9,000-7,000 years ago, northern Russia (including Siberia) was $2\text{-}7.5^{\circ}\text{C}$ warmer than it is today.¹³² 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.¹³³ Darby et al. (2001), reviewed by the Center for the Study of Carbon Dioxide and Global Change, found that during the middle Holocene (about 5,000 years ago), Western Arctic sea surface temperature in August was $3\text{-}7^{\circ}\text{C}$ warmer than it is today.¹³⁴ A forthcoming study by Caseldine et al. (2006) finds that from roughly 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 $2\text{-}3^{\circ}\text{C}$ warmer.¹³⁵

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- and mid-Holocene. Arctic climate is naturally variable—a fact *AIT* never acknowledges.

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



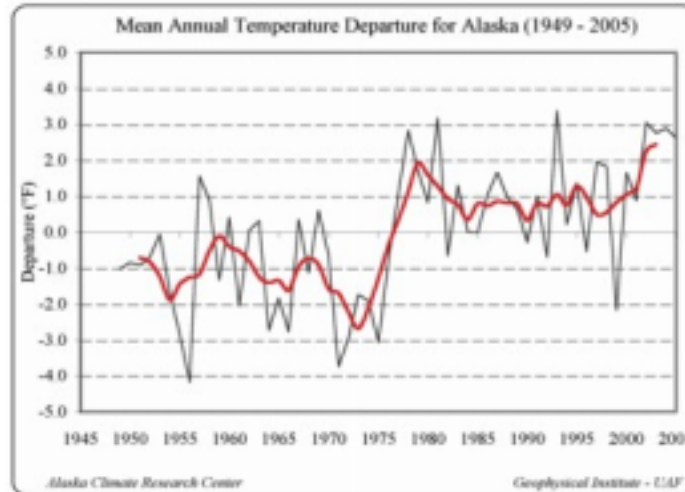
Crack in the Ward Hunt Shelf

Comment: Gore makes this sound like a portent of doom. The Center for the Study of Carbon Dioxide and Global Change, in a review of Mueller *et al.* (2003), observes that changes of the same kind had been under way since the early 20th century, when CO₂ concentrations were still fairly close to pre-industrial levels.¹³⁶

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.” (AIT, p. 130-131)

Comment: 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.¹³⁷ See the Figure below.



The 1976 PDO Shift

Source: Alaska Climate Research Center, Temperature Change in Alaska, 1949-2005¹³⁸

No greenhouse warming computer model has ever been able to simulate the 1976 temperature jump. Drunken trees may partly 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.” (*AIT*, p. 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 vegetation will expand as the tundra thaws. The Center for the Study of Carbon Dioxide and Global Change’s extensive literature review (17 studies) concludes:

In conclusion, it would appear that all of these many observations suggest that Arctic tundra ecosystems tend to sequester much more carbon in warm times than in cold times, and that old fears of runaway global warming fueled by warming-induced increases in CO₂ emissions from Arctic tundra ecosystems are nothing more than that, i.e., *old fears* that have no basis in fact.¹³⁹

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].” (*AIT*, p. 135)

Comment: The 1976 PDO shift may account for part of the trend depicted in Gore’s graph.

AIT: “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.” (*AIT*, p. 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. As usual, Gore breathes not a word about the potential role of natural variability, but changes in wind patterns and ocean currents can produce significant changes in Arctic sea ice extent.¹⁴⁰ A recent study of sea ice extent in the Nordic Seas region, which includes the Iceland, Greenland, Norwegian, and Barents seas, noted that “a similar shrinkage of ice cover was observed in the 1920s–1930s, during the previous warm phase of the low-frequency oscillation, when any anthropogenic influence is believed to have still been negligible.”¹⁴¹

But let’s assume for the sake of argument that the decrease in Arctic sea ice is mainly due to global warming from greenhouse gas emissions. How worried should we be about this?

Ice cores, ocean sediment cores, and mammalian bone fragments indicate that, during the early Holocene, the Canadian Arctic Archipelago had less summer ice than occurs today, according to an article by 10 scientists in the journal *EOS*.¹⁴² 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.”

Again, an obvious question arises. What evidence is there that humanity or other species suffered because of the extra Arctic warmth in the early Holocene and the consequent reduction in Arctic sea ice? Did the loss of sea ice make the planet less habitable? Or did warmth actually help our low-tech ancestors survive and 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.” (*AIT*, p. 143)

Comment: Gore cites no references and offers no explanation for this portentous statement. For example, what harmful effects on weather patterns, global food supplies, or global water supplies can reasonably be traced to the 15% decrease in Arctic summer sea ice observed since 1970?

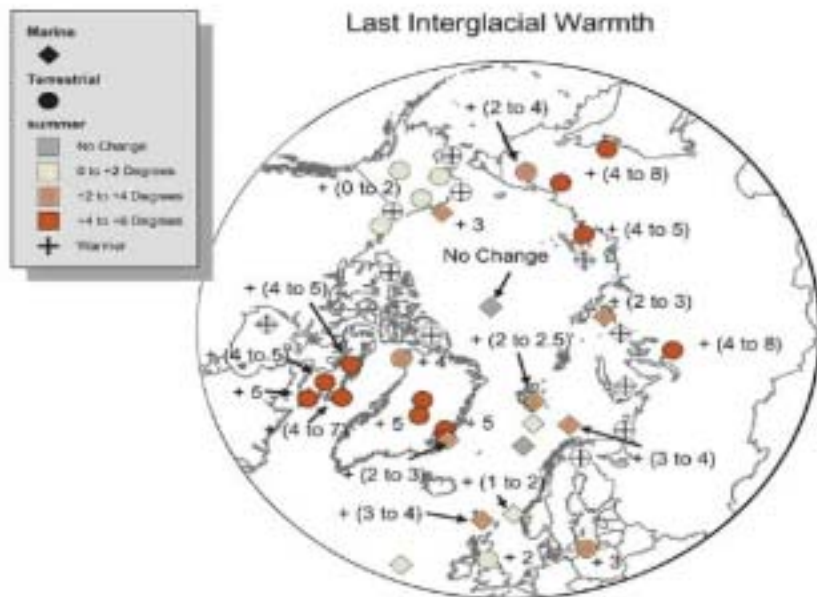
AIT: “A new scientific study shows that, for the first time, polar bears have been drowning in significant numbers.” (*AIT*, p. 146)

Comment: “Have been drowning” suggests an ongoing process; “significant numbers” suggests a lot of drowned bears—enough to affect population dynamics. The study in question reports that in September 2004, “4 dead bears were seen floating far offshore,” apparently drowned by “an abrupt wind storm.”¹⁴³ 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.

Patrick Michaels, analyzing World Wildlife Fund data, found that polar bear populations are increasing in Arctic areas where it is warming and declining in areas where it is cooling.¹⁴⁴ A leading Canadian bear biologist wrote recently, “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.”¹⁴⁵

What about the future—will polar bears survive if global warming melts the pack ice that the bears use as a platform for hunting seals and other prey? That is a serious question, and the U.S. Fish and Wildlife Service has initiated a review to determine whether, due to receding sea ice, the agency should list the polar bear as “threatened” under the Endangered Species Act.¹⁴⁶

But before anyone concludes that polar bears are doomed unless we halt and reverse the ongoing rise in atmospheric CO₂ levels—a feat unattainable absent major technological breakthroughs—a few points should be kept in mind. Arctic summer temperatures in the early Holocene were significantly warmer than the present and there was less sea ice, as already noted. More tellingly, Arctic summer temperatures during the Last Interglacial Period were 4-5°C warmer than the present for thousands of years.¹⁴⁷ See the Figure below. Yet the polar bears managed to survive.



Regional maximum LIG summer Arctic temperature anomalies (°C) relative to present.
 Taken from Cape Project Members (2006).
 Source: *World Climate Report*

Obviously, there was no Endangered Species Act during the Last Interglacial Period or the early Holocene, nor were there any public or private conservation agencies or programs. The polar bears of the 21st century will have “anthropogenic” advantages in the struggle for survival that their remote ancestors lacked.

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.” (*AIT*, p. 149)

Comment: The temperature record of the past three decades suggests that if global warming continues, average air temperatures will rise about 1.7°C (3°F) during the 21st century. 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 afraid?

IX. 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 dense (cold and salty) water at the northern end of the belt 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.” (*AIT*, p. 149)



An illustration of the THC “conveyor belt”

Comment: Gore assumes that it is the THC that keeps London and Paris 15-20°F warmer than New York City during the winter. Richard Seager of Columbia University’s Lamont-Doherty Earth Observatory and his colleagues contend that oceanic heat transport is simply not strong enough to account for Europe’s milder winters. The key factor, they contend, is a difference in the warmth of the prevailing winds that blow across north-eastern North America and Western Europe. During the winter, “South-westerlies bring warm maritime air into Europe and north-westerlies bring frigid continental air into north-eastern North America.”¹⁴⁸

If this finding is correct, then Europe should continue to enjoy mild winters even if global warming weakens the THC. Seager elaborates on this point in a popular treatment of his research:

...I would expect that any slowdown in thermohaline circulation would have a noticeable but not catastrophic effect on climate. The temperature difference between Europe and Labrador should remain. Temperatures will not drop to ice age levels, not even to the levels of the Little Ice Age, the relatively cold period that Europe suffered a few centuries ago. The North Atlantic will not freeze over, and English Channel ferries will not have to

plow their way through sea ice...Instead of creating catastrophe in the North Atlantic region, a slowdown in thermohaline circulation would serve to mitigate the expected anthropogenic warming!¹⁴⁹

Similarly, Seager questions the theory that a shutdown of the THC triggered the Younger Dryas, the mini-ice age of “10,000 years ago” or so, to which Gore refers. Some scientists have speculated that a sudden release of fresh water into the Labrador Sea, following the collapse of a giant ice dam in North America, shut down the THC and caused the Younger Dryas. “But,” says Seager, “the Younger Dryas was not a purely North Atlantic phenomenon: Manifestations of it also appeared in the tropical and southern Atlantic, in South America, and in Asia.” Moreover, “evidence has emerged that the Younger Dryas began long before the breach that allowed freshwater to flood the North Atlantic.”¹⁵⁰

Even if a freshening of the North Atlantic did shut down THC thousands of years ago, the recurrence of such an event today is highly implausible. The rupture of the Laurentide ice dam allowed more than 100,000 cubic kilometers of fresh water to pour into the North Atlantic.¹⁵¹ The rate of fresh water infusion from Greenland today is a comparative trickle. According to a study in *Science*, in 2005, Greenland is shedding ice at a rate of 224±41 cubic kilometers per year.¹⁵²

Northern Hemisphere climate during the last interglacial period (roughly 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, and even though sea levels rose to several meters higher than present.¹⁵³ 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.¹⁵⁴

Is the THC slowing down? Bryden et al. (2005)¹⁵⁵ found that it is, but Meinen et al. (2006)¹⁵⁶ and Schott et al. (2006)¹⁵⁷ found that it isn't. Latif et al. (2006)¹⁵⁸ observed a “strengthening” of the THC since 1980. There certainly is no indication that Europe is cooling due to any modification of the THC.

Finally, 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. As one scientist put it, the Gulf Stream is safe as long as the Earth turns and the wind blows.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

X. 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.” (*AIT*, 152) Gore cites a study showing that, in the Netherlands, the height of caterpillar hatching 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.” (*AIT*, p. 153)

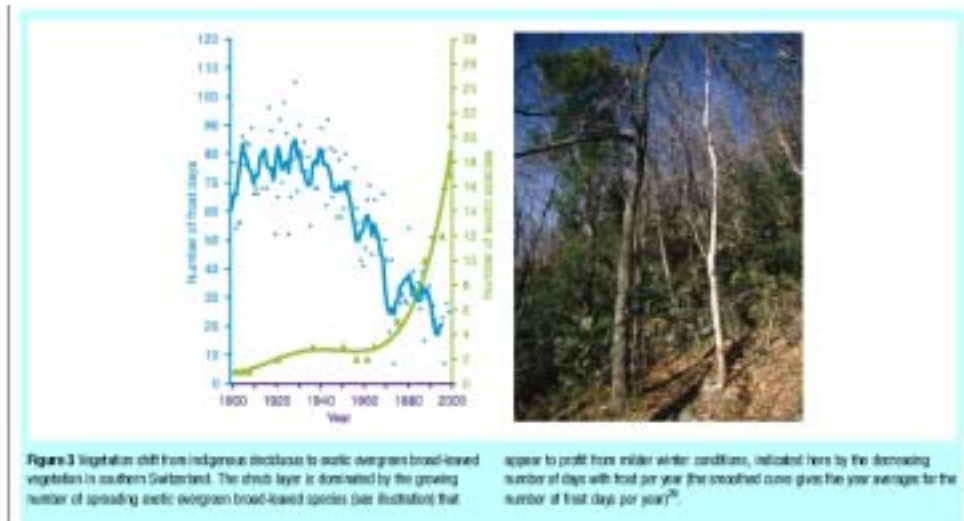
Comment: Gore says the “chicks are in trouble.” However, the study found that, “The gap between the schedules of the caterpillars and the birds has had no demonstrable effect so far on tit numbers.”¹⁶¹ Could it be that migratory birds are more adaptable than Gore imagines? Robins today are thriving in 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. In the case of robins, global warming is for the birds!



Global warming has expanded the Robins' habitat¹⁶³

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.” (*AIT*, p. 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 and trees.



The species “invading” Switzerland are evergreen broad-leaved plants deliberately planted in Swiss parks and gardens as long as 200 years ago.
 Source: Walther et al. (2002)

In their review of this study (or more precisely, the study on which it is based¹⁶⁵), Sherwood, Craig and Keith Idso point out that all of the ‘invaders’ 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

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°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. The 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. (*AIT*, p. 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.

Gore also fails to acknowledge the environmental movement’s responsibility for beetle infestations. Rachel Carson’s 1962 book, *Silent Spring*, warned that use of the pesticide DDT would cause a cancer epidemic. As journalist John Berlau documents, science has never found a link between DDT and cancer, no human being has ever been harmed by using DDT as directed, and DDT has saved millions of human lives.¹⁷⁰ Nonetheless, Carson succeeded in demonizing DDT as an “agent of death.” Her book made chemo-phobia and even techno-phobia respectable, setting the stage for the modern environmental movement. Gore praises *Silent Spring* as one of the seminal influences shaping his development as an environmentalist (*AIT*, p. 124).

In addition to suppressing mosquitoes and malaria, DDT was also highly effective in protecting trees from beetle infestations. As Berlau explains, in the late 1940s and 1950s, DDT rescued American elm trees from Dutch elm disease, a fungus spread by elm bark beetles. But Carson’s book caused U.S. policymakers to restrict and, in late 1972, ban the use of DDT. The ban brought the beetles and Dutch elm disease back with a vengeance, destroying more than half of U.S. elm trees in recent decades. “Other tree species also suffered in the wake of the Government’s DDT restrictions and eventual ban,” Berlau comments, including Douglas fir trees and oaks.¹⁷¹

It is doubtful that Gore’s preferred global warming “solutions”—ratifying the Kyoto Protocol, installing energy-efficient appliances, driving less, buying food grown locally, etc.—would save even one tree from beetle infestations over the next 50 years. In contrast, prudent forest management (including the use of pesticides and fungicides) might save millions of trees—and cost a lot less than Kyoto.

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.”
(AIT, p. 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 2 million to 100 million, this whole subject is fraught with uncertainty and guesswork.¹⁷²

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 2054.¹⁷³ As Patrick Michaels points out, if the relationship that Thomas et al. posit between species extinction and global temperature increases were valid, then the roughly 0.8°C temperature increase that occurred since the late 19th century would already have wiped out hundreds of thousands of species. “Yet nowhere is there evidence for such occurrences.”¹⁷⁴

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. 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.¹⁷⁵

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.”¹⁷⁶

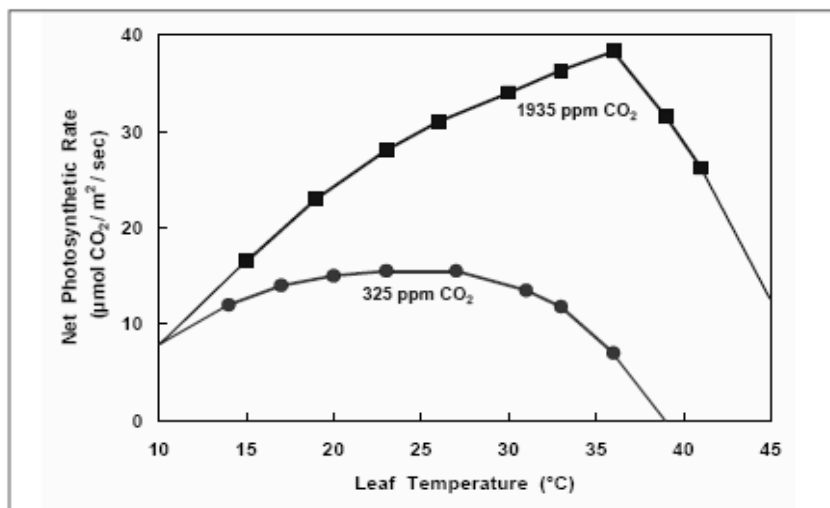
The same issue of *Nature* that carried the Thomas et al. study also featured a study by Alan Pounds and Robert Puschendorf that blames global warming for the extinction of several frog species in Costa Rica. This was a hard case to make, because annual Costa Rican temperatures have remained remarkably 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.”¹⁷⁷

Patrick Michaels identified three problems with this supposed chain of causality. 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 ecotourists or researchers—introduced the chytrid fungus into the area, exposing the frogs to an unfamiliar pathogen.¹⁷⁸

Nowhere in *AIT* does Gore acknowledge the ecological benefits of CO₂ emissions (just as he never acknowledges the linkages between fossil energy, 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 the Center for the Study of Carbon Dioxide and Global Change, “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...”¹⁷⁹

Literally hundreds of studies show that in CO₂-enriched environments, most trees, crops, and other plants grow faster and larger, produce more fruit, and utilize water more efficiently. What is more, elevated CO₂ levels not only boost plant productivity but also raise the optimum temperature of plant productivity.¹⁸⁰ See the Figure below.



Warmth boosts plant productivity in CO₂-enriched environments.
Source: Center for the Study of Carbon Dioxide and Global Change

Since all animals depend on plants, directly or indirectly, as a food source, rising CO₂ levels nourish the entire biosphere.

XI. 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.” (*AIT*, p. 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.”¹⁸¹ 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 the Center for the Study of Carbon Dioxide and Global Change 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.”¹⁸² During the Paleocene/Eocene thermal maximum of ~55 million years ago, Arctic sea surface temperatures reached 24°C (75°F),¹⁸³ 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.¹⁸⁴ 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.¹⁸⁵ 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.” (*AIT*, p. 164)

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.” (*AIT*, p. 164)

Comment: *AIT* does not mention that 1998 was the year of an unusually strong El Niño, the warm phase of a naturally recurring ocean cycle.¹⁸⁶ 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).¹⁸⁷ 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.” (*AIT*, p. 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 comments:¹⁸⁸

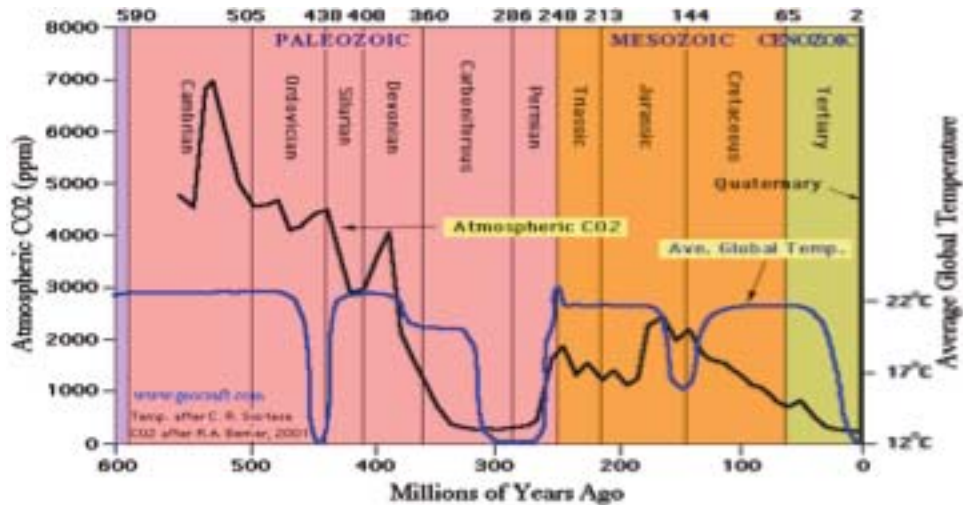
Now, two new papers in *Science* add further evidence that corals must not be as “fragile” as certain senators might hope. Cynthia Lewis and Mary Coffroth of SUNY-Buffalo bleached Caribbean corals and exposed them to certain *Symbiodinium* genotypes for six weeks. The corals not only re-established symbiotic 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.” (*AIT*, p. 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. As noted above, the scleractinian corals emerged during the Mid-Triassic Period and thrived during the Cretaceous Period. During those periods, atmospheric CO₂ levels were several times current concentrations. See the Figure below.



CO₂ levels and average global temperatures over geologic time
Source: Monte Hieb¹⁸⁹

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?

The source of Gore’s gloomy forecast is the U.S. Global Change Research Program (USGCRP).¹⁹⁰ The USGCRP’s source, in turn, is Kleypas et al. (1999), which predicts declining coral calcification rates from 1880 to 2050.¹⁹¹ The Center for the Study of Carbon Dioxide and Global Change 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.”¹⁹²

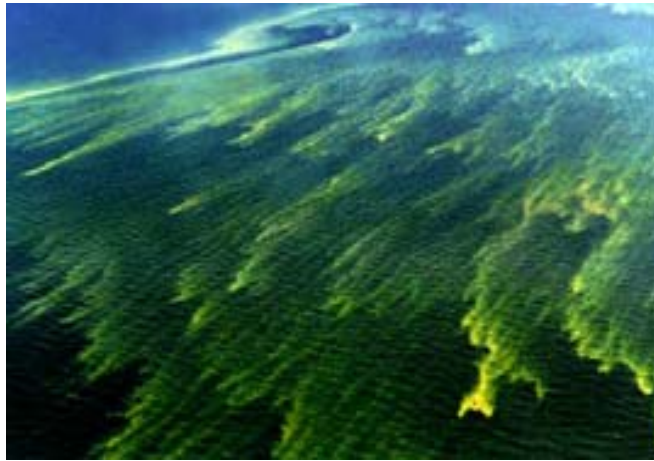
Accordingly, the Center also reviewed the marine *biology* literature on coral calcification. These studies find that coral calcification rates have *increased* as SSTs and CO₂ levels have risen. Three factors appear to be at work: (1) warmth promotes coral calcification; (2) higher CO₂ levels boost 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 the Center’s long review article must suffice to show that *AIT* does not present a balanced view of the science:

Another pair of scientists to address the subject was Bessat and Buigues (2001),¹⁹³ 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...”

XII. 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. A similar photo appears below. Gore concludes by saying, “Algae is just one of the disease vectors that have been increasing because of global warming.” (*AIT*, p. 170-172)



Blue-Green algae blooms in the Baltic Sea, Summer 2005

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.”¹⁹⁴ 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.¹⁹⁵ 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.¹⁹⁶ Similarly, in Florida, red tide blooms penetrate into bays and estuaries only in drought years with higher-than-normal salinity.¹⁹⁷

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.¹⁹⁸ 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.¹⁹⁹

A major cause of blue-green algae blooms in the Baltic 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*.²⁰⁰ 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. See Figure below.



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 algae bloom eruption. The regulations 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.

The Figure below shows the low DIN to DIP ratio in 2005.



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.

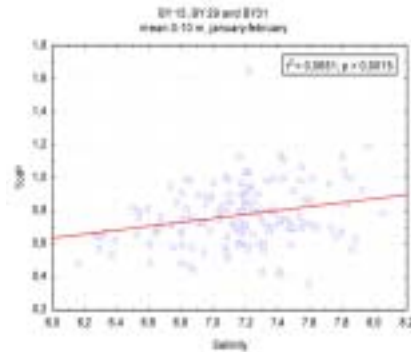


Figure 3.5. Total P and salinity in winter surface waters in the Baltic Proper (1971-2004 SMHI database). Increased inflows of saline water in the Kattegat vertically displace deep water in the Baltic Proper and transport more saline and P-rich deep waters towards the surface.

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.” (*AIT*, p. 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%.²⁰¹ Between 1960 and 2010, Florida's coastal population is projected to grow by 226%.²⁰² Because of these gigantic population increases, more people are likely to "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).²⁰³ That is nature re-imagined as 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.²⁰⁴

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.²⁰⁵ 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 the Center for the Study of Carbon Dioxide and Global Change summarizes:

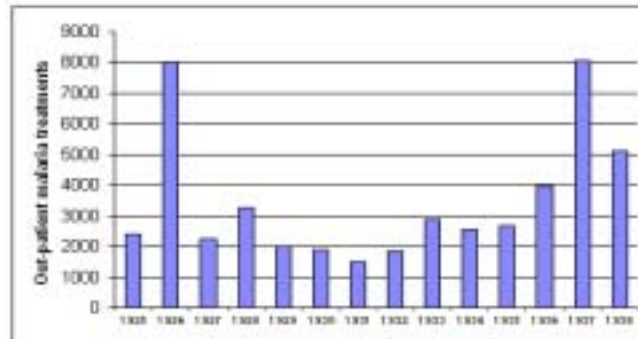
"Data from Denmark," in Randolph's words, "offer the best documented evidence for the impact of increasing densities of deer on both temporal and spatial variation in the rise of a tick-borne disease in Europe, this time Lyme borreliosis [LB] (Jensen and Frandsen, 2000; Jensen *et al.*, 2000)." From 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.



AIT: “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.” (AIT, p.141)

Comment: This implies that malaria is a newcomer to Kenya, unknown in that country until recent global warming. In reality, as a World Health Organization report shows, malaria was a common scourge in Nairobi during the 1920s, 1930s, and 1940s, with major outbreaks occurring in 1926 and 1938.²⁰⁶ The Figure below shows the number of outpatient malaria treatments at two Nairobi medical facilities during the 1920s and 1930s.



Outpatient treatments for malaria as recorded at the General and Railways dispensary in Nairobi between 1925 and 1938.
Source: Snow et al. (1999)

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.²⁰⁷ The resurgence of malaria in some developing countries is chiefly due to decreased spraying of homes with DDT, anti-malarial drug resistance,²⁰⁸ and incompetent public health programs, not to any ascertainable changes in climate.²⁰⁹

Moreover, even if global warming contributes 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 to attack malaria risk directly than to address it indirectly via weather modification. As economist Indur Goklany explains, 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.²¹⁰

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." (*AIT*, p. 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. Keyboard use has also increased during the past 30 years, yet this does not establish a link between personal computers and emerging diseases.



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." (*AIT*, p. 175)

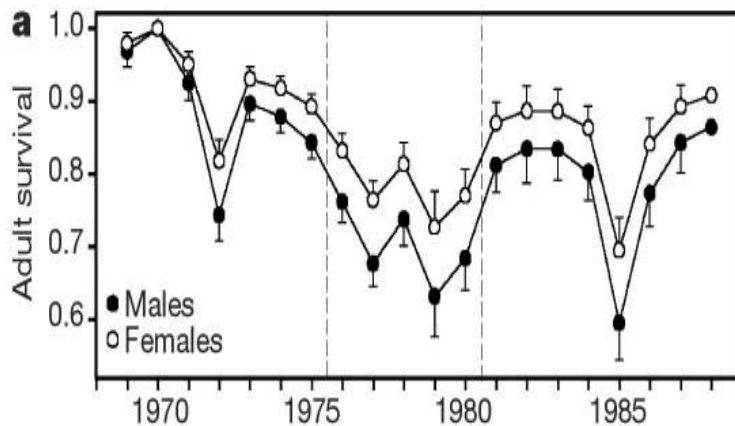
Comment: West Nile virus spread rapidly because the principal carriers of the disease, birds and mosquitoes, are mobile and plentiful in the United States. Risk of infection could be reduced by systematic use of pesticides, to wipe out the mosquitoes—an option fiercely opposed by some green pressure groups.²¹¹

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.

XIII. 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.” (*AIT*, p. 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*.²¹² 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. See the Figure below.



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 re-colonized—about half the Antarctica circumference,” which may be one reason most colonies of Adélie penguins are increasing.²¹³

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 is non-testable speculation. Nobody observed a reduction in the birds’ food supply during the 1970s. 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 assumed 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.”²¹⁴

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.”²¹⁵ 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.” Patrick Michaels elaborates:

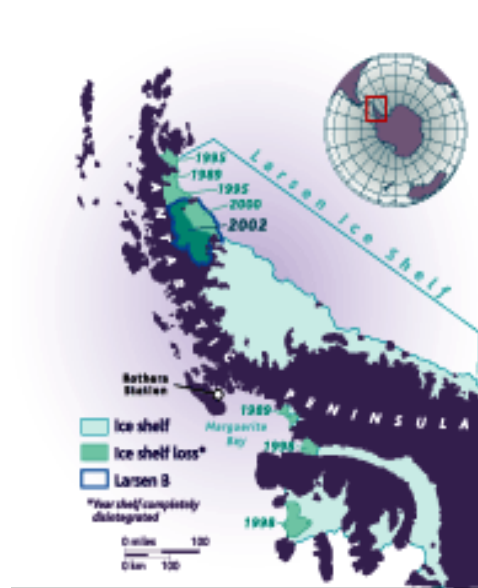
Perhaps it’s worth noting that the period of rapid decline in population coincides with the development of Antarctic “ecotourism,” which means people visiting the rookeries as well as buzzing them in airplanes. Remember, the biggest thing these birds have seen in their tens of millions of years of evolutionary 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!²¹⁶



A possible cause of penguin population decline in the early 1970s

AIT: Gore presents a map showing the Antarctic Peninsula. “Each [dated, green] 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].” (*AIT*, pp. 181-182)

See Figure below.



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.²¹⁷ 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).²¹⁸ 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 splotch represents an ice shelf 1/220th the size of Texas.”

AIT: “Scientists thought this ice shelf [Larsen-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.” (*AIT*, p. 183)

Comment: Again, some perspective is in order. The Larsen-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).²¹⁹

More importantly, research by Carol Pudsey of the British Antarctic Survey and three colleagues indicates that the breakup of the Larsen-B and other Antarctic Peninsula ice shelves is not unprecedented. The Pudsey team examined the region’s ice shelf history from “petrographic foraminiferal evidence” (fossils of tiny marine animals in rock sediments). Their data indicate that there was a “widespread ice shelf breakup in the mid-Holocene.” This finding “suggests that the recent decay may not result entirely

from anthropogenic climate perturbations.” Thus, contrary to the impression Gore gives, that the Larson-B was stable until Man started to tamper with the climate, Pudsey and her colleagues note that, “the maximum ice shelf limit may date only from the Little Ice Age.” Patrick Michaels comments:

The work of Carole Pudsey and her colleagues contributes to a growing body of literature that makes clear the idea that the greatest extent of the Larsen ice shelf during the current interglacial period occurred only a few hundred years ago. The ice shelves that have recently disintegrated were likely created at about that same time, meaning that previously they did not exist. The recurring conclusion is that the recent global warming may not be unprecedented, and that a significant portion of the warming may be natural.²²⁰

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.” (*AIT*, p. 184)

Comment: The break-off of floating ice shelves accelerates the flow of 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.”²²¹ The article estimates 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.” (*AIT* p. 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.²²² Tuvalu, at 179E longitude and 8S latitude, is smack dab in the central blue areas where sea levels fell.

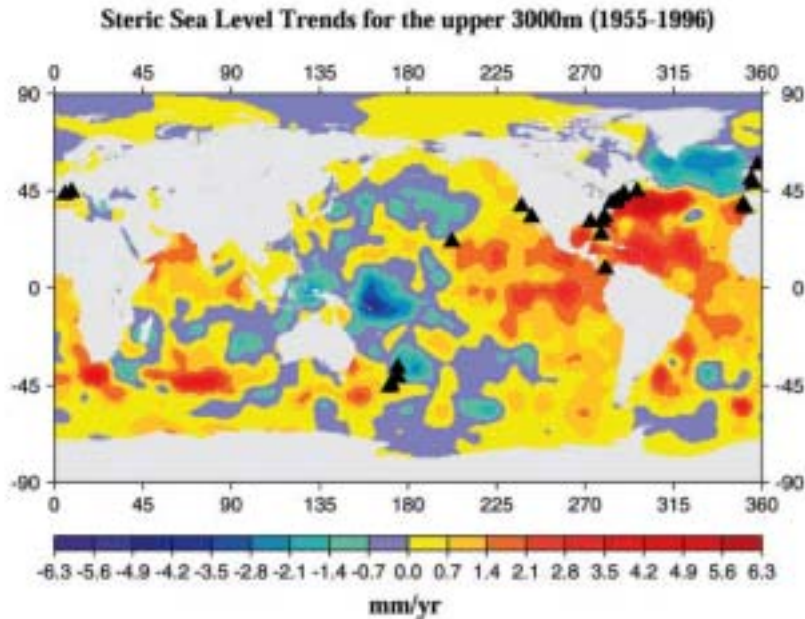
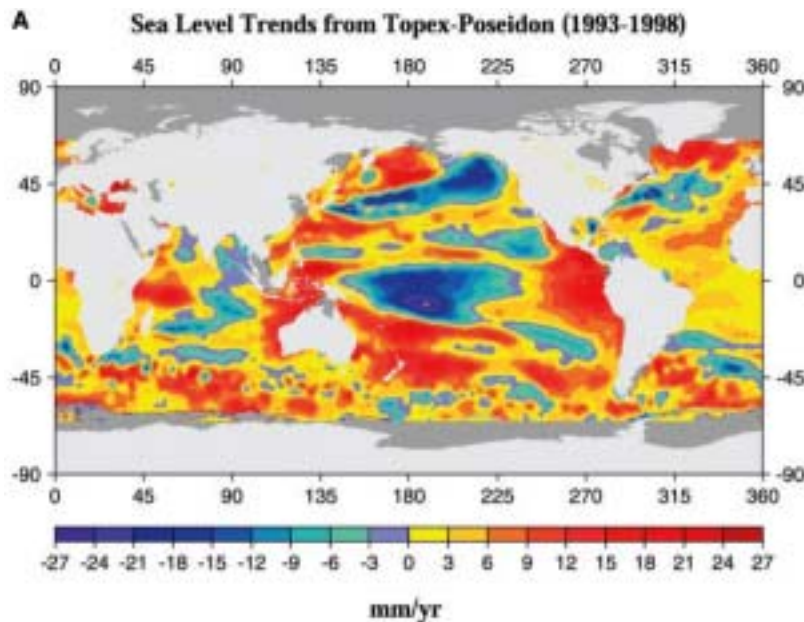


Fig. 4. Map of the geographical distribution of thermosteric sea level trends for 1955–96 computed with temperature data from (3) down to 3000-m depths. Black triangles show the locations of the 25 tide gauges.



Source: Cabanes et al. (2001).

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. (*AIT*, pp. 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.²²³

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.²²⁴

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.”²²⁵ 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.”²²⁶ The more people and property at risk, the more risk-averse decision makers are likely to be.

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 were first used in 1983, Gore’s graph of annual barrier closings (*AIT*, p.189) goes back to 1930. Perhaps the graph’s pre-1980s portion illustrates the operation of earlier flood control devices—in which case, it is comparing apples to oranges. By so doing, 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.²²⁷

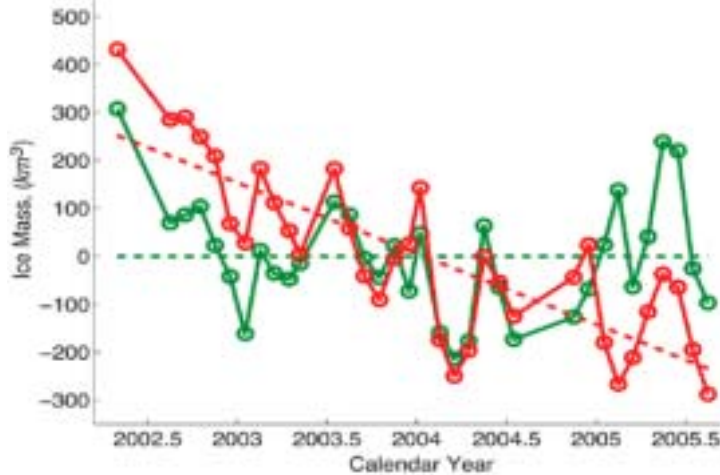
AIT: “Further sea level rise could be many times larger and more rapid depending on what happens in Antarctica and Greenland—and on choices we make or do not make—now concerning global warming.” (*AIT*, p. 189)

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.”²²⁸ The researchers 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. The U.S. East Coast experienced some of the world's most rapid sea level rise during the last half of the 20th century.²²⁹ Yet development and property values exploded.

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 2100.²³⁰ 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.” (*AIT*, p. 190)

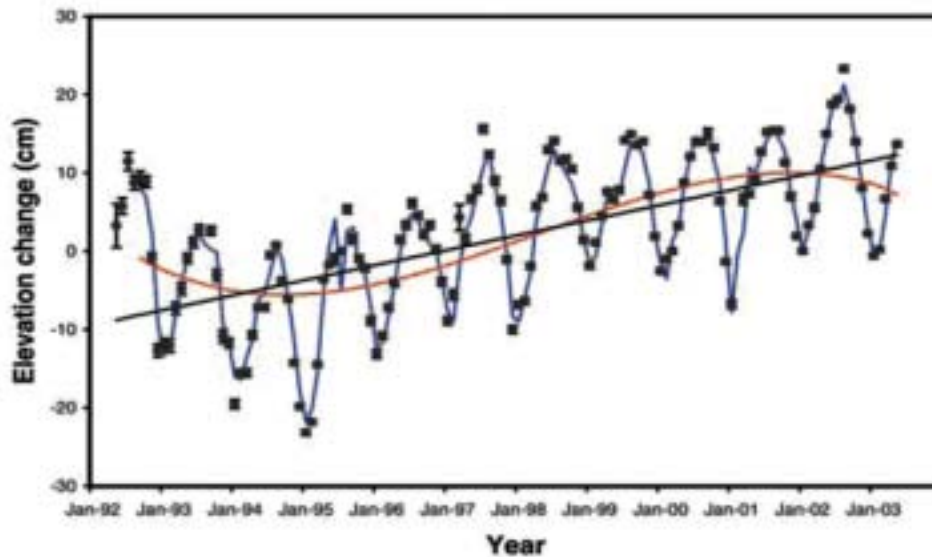
Comment: Of the two studies to which Gore alludes, I can identify only one. Isabella Velicogna and John Wahr of the University of Colorado used satellite measurements of gravity fluctuations to infer ice-mass changes in Antarctica.²³¹ Gore gives the impression that all of Antarctica, including the East 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).²³²



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

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 2003.²³³ 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.

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.



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

“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.”

Two other recent studies also indicate a positive mass balance in Antarctica. Chen et al. (2006) found that, during April 2002 to November 2005, ice mass gains in the EAIS exceeded ice mass losses in the WAIS, creating a small positive net gain.²³⁴ Similarly, Wingham et al. (2006) found that, during 1992-2003, mass gains from accumulating snow on the Antarctic Peninsula and within East Antarctica exceeded ice mass loss in West Antarctica.²³⁵

A study by Van den Broeke et al. (2006) of Antarctica’s ablation zones (areas where ice mass losses in the summer exceed winter snow accumulations) indicates that, so far, global warming has had no impact on overall Antarctic ice mass balance. The researchers found no net change in the size of the ablation zones, and none in the rate of mass loss, during the 25-year period from 1980 to 2004.²³⁶

AIT: “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.” (*AIT*, p. 190)

Gore refers to a study by John Turner and colleagues of the British Antarctic Survey. The Turner team 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. That is a warming rate about three times faster than the global average.

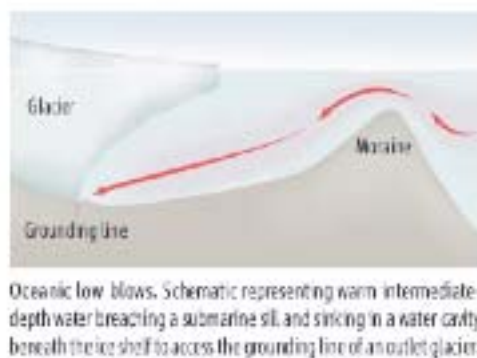
Lest anyone start to panic, several points should be kept in mind. First, NASA satellites that also measure troposphere temperatures show a 0.12°C per decade Antarctic *cooling trend* since November 1978.²³⁷ Second, as Gore indicates, the Turner group could not reproduce the observed warming pattern 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. The Turner team reports an Antarctic surface-warming trend of 0.15°C per decade from 1971 to 2003—roughly the global average. Fourth, some records indicate that large areas of the Antarctic surface actually cooled in recent decades.²³⁸

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.” (*AIT*, p. 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 Bindschadler 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.²³⁹

Bindschadler 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. See the Figure below.

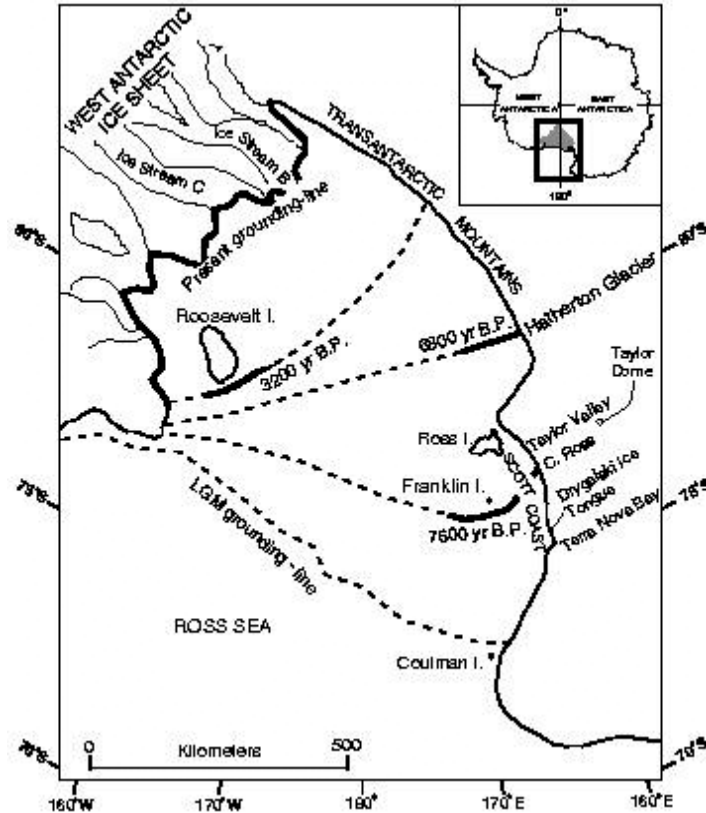


Source: Bindschadler (2006)

“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.”²⁴⁰



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

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.

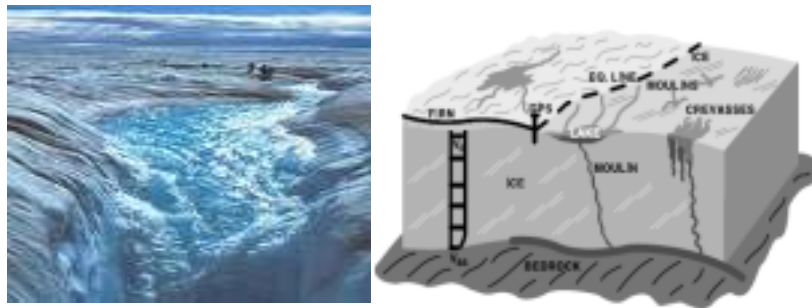
When might the “inevitable” occur? Conway et al. state that “if the grounding line continues to pull back at the present [i.e. 1990s] rate, complete deglaciation will take about 7,000 years.”

Of course, such estimates are uncertain, because ice sheets are dynamic systems that can change in unpredictable ways and global warming might accelerate the ongoing recession of the WAIS. Nonetheless, 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 any significant portion of it.

XIV. 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. (AIT, p. 192)

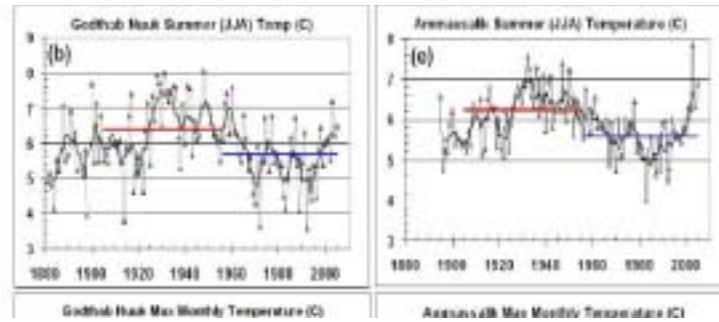
Comment: To illustrate these points, Gore presents a photograph and a diagram from a study of “moulins” by Zwally et al. (2002), published in the journal *Science*.²⁴¹ See the images below.



Photograph and diagram of a “moulin”
Source: Zwally et al. (2002)

The study found that moulins accelerate glacial movement in Greenland in the summertime, but only by a few percent. For example, glacial flow in 1998 increased from 31.3 cm/day in winter to 40.1cm/day in July, falling back to 29.8 cm/day in August, increasing annual glacial movement by 4.7 meters. Were it not for satellite sensing systems, nobody would even notice!

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 Mamassalik on the east coast of southern Greenland.²⁴² See the Figure below.



Greenland summers were warmer in the 1920s-1940s; moulins were probably more abundant.
Source: Chylek et al. (2006)

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),²⁴³ “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. (*AIT*, p. 196)

Comment: “The Greenland ice sheet cannot slip into the sea,” as one reviewer explains, “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.”²⁴⁴ Also, as noted above, there is no evidence that “moulins” are destabilizing the ice sheet.

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.”²⁴⁵

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.²⁴⁶ According to *Salon*, Schmidt believes a

20-foot rise in sea level is plausible “in the long run—the very long run.” How long, *Salon* asked? “Maybe 1,000 years,” said Schmidt. “There’s some uncertainty about how quickly that could happen,” he continued, “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*.²⁴⁷ 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” (*AIT*, pp. 204-206).

Nobody knows how warm Greenland is going to be over the next thousand years. We do have data on the net rate of ice mass loss in Antarctica and Greenland. Greenland’s glaciers are thinning at the edges and thickening in the interior. If the gains are subtracted from the losses, the net volume of ice lost during 2003 to 2005 was ~101 gigatons a year.²⁴⁸ At that rate, Greenland is contributing 0.28 mm of sea-level rise per year—about one inch per century.

Zwally et al. (2005) used satellite altimetry to examine ice mass changes in Greenland, East Antarctica, and West Antarctica during 1992-2002.²⁴⁹ They found a combined sea-level-rise-ice-loss-equivalent rate of 0.05 mm per year. At that rate, comments the Center for the Study of Carbon Dioxide and Global Change, “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.”²⁵⁰

XV. Humanity and Nature

AIT: “We are witnessing an unprecedented and massive collision between our civilization and the Earth.” (*AIT*, p. 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 industrial civilization.

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.” (*AIT*, p. 216)

Comment: Gore sees “success” in the reduction of birth and death rates and average family size, 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.²⁵¹

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 might 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.²⁵²

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 treeless landscape on the Haitian side of the border and lush green forest cover on the Dominican side. (AIT, pp. 222-223)

Comment: The photograph also illustrates Berkeley professor Jack Hollander’s thesis that “poverty, not affluence, is the environment’s number one enemy.”²⁵³ The per capita income of the Dominican Republic is more than four times that of Haiti.²⁵⁴ Desperately poor people live too close to the edge of subsistence to safeguard 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 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.” (AIT, p. 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.²⁵⁵

The Kyoto “process” aims to suppress fossil energy use, initially in industrialized countries but eventually in all countries. At what point in their development does Mr. Gore think it is appropriate for today’s energy-poor countries to begin limiting their people’s access to fossil fuels?

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.” (AIT, pp. 240-245)



Stranded boat on the Aral Sea

Comment: These statements raise a question about how seriously Gore takes his own doomsday scenario. Let us recapitulate Gore’s threat assessment:

- 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 he 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.

XVI. 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.” (AIT pp. 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 for the past 60 years or more. 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.” (AIT, p. 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.

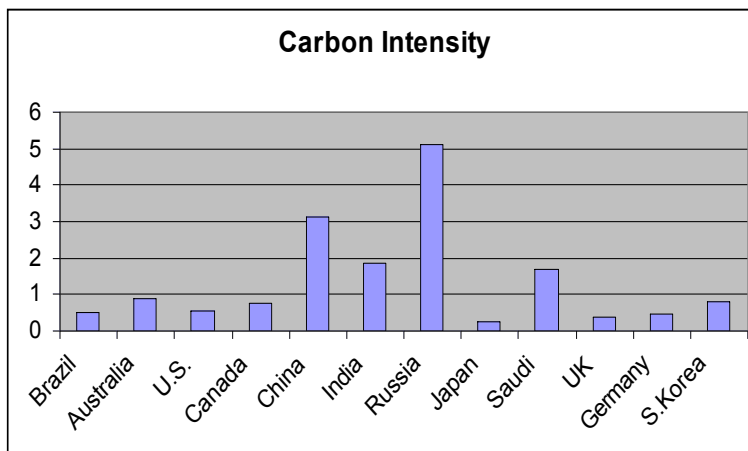
There are also compelling economic and cultural reasons why U.S. per capita emissions are higher than Japanese and European per capita emissions.

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.²⁵⁶ European unemployment rates are higher and economic growth rates are lower than ours. All of these dubious “advantages” contribute to Europe’s lower per capita emission levels.

A more accurate measure of environmental 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, the U.S. economy is far from the world’s most carbon intensive. We are more carbon intensive than the U.K., Germany, Japan, and Brazil, but less carbon intensive than Russia, China, India, Saudi Arabia, Australia, South Korea, and Canada. See the Figure below.

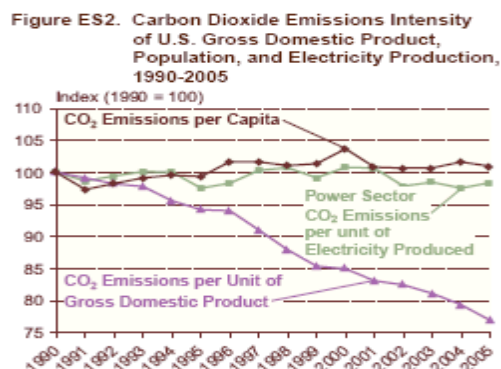


Metric tons CO₂ per \$1000 GDP
Source: EIA²⁵⁷

U.S. carbon intensity is declining at a rate of about 1.6% annually. Per unit of GDP, U.S. CO₂ emissions in 2005 were 23% lower than in 1990.²⁵⁸ See the Figures below.

Decade	Overall Change in Intensity (Percent)		Average Annual Change in Intensity (Percent)	
	Carbon Dioxide	Total GHG	Carbon Dioxide	Total GHG
History				
1950-1960	-12.9	—	-1.4	—
1960-1970	-3.3	—	-0.3	—
1970-1980	-17.8	—	-1.9	—
1980-1990	-25.6	—	-2.7	—
1990-2000	-15.0	-17.7	-1.6	-1.9

Source: Energy Information Administration, *Annual Energy Review 2005*, DOE/EIA-0384(2005) (Washington, DC, August 2006), and estimates presented in historical carbon dioxide emissions data series.



U.S. Carbon Intensity Trends
Source: EIA

AIT neglects to mention the circumstances that make it reasonable rather than blameworthy for America to be the world’s biggest CO₂-emitter: the world’s largest economy, abundant fossil energy resources,

markets integrated across continental distances, highly productive workers, plentiful real estate, and the world's most mobile population. These are all positive attributes. Yet Gore manages to depict the United States as an environmental villain.

Gore claims his message is non-partisan and non-ideological (*AIT*, p. 287). But he blames America-the-‘fuelish’ for everything from floods, to hurricanes, to famine in Africa. In this respect, Gore is just another partisan ideologue who “blames America first”—a practice that was habitual among left-leaning activists and politicians long before global warming emerged as a public concern.²⁵⁹

XVII. 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. 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.” (AIT, p. 262)

Comment: This is misleading. A “central element” of the “consensus” as Gore defines it is the view that global warming’s “consequences are so dangerous as to warrant immediate action” (AIT, p. 261). The “consensus” Oreskes found was of a more limited character.

None of the abstracts of the papers her team examined (they read only the abstracts, not the full papers) disputed the IPCC’s conclusion that, “Most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations.”²⁶⁰ However, that tells us nothing about how dangerous global warming is likely to be, or what type of policy response is appropriate.

Gore persistently confuses the fact of global warming with his alarmist interpretation of global warming. This commentary has referenced numerous studies that indicate a significant role of natural variability in recent climate change,²⁶¹ indicate warmer-than-present conditions in earlier periods of the Holocene,²⁶² challenge the alarmist spin on global warming impacts,²⁶³ and provide data inconsistent with alarmist forecasts.²⁶⁴

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.” (AIT, p. 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 well-funded 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 people are more willing to buy insurance and pay higher premiums when they’re scared.²⁶⁵ “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,”²⁶⁶ generate electricity from low- and non-carbon fuels,²⁶⁷ or manufacture high-end (ultra-energy efficient) appliances,²⁶⁸ wind turbines, natural gas turbines, coal gasification technology, and nuclear reactors.²⁶⁹

Gore’s preferred policy, a cap-and-trade scheme, is essentially a carbon cartel.²⁷⁰ 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 manipulation²⁷¹—Enron,²⁷² American Electric Power, Cinergy, Entergy,²⁷³ and Calpine—have been among the most aggressive lobbyists for the Kyoto Protocol or kindred emission trading schemes. Among the most influential lobbyists for Kyoto-style policy are Wall Street firms that expect to make commissions on carbon permit purchases and sales and manage “green” investment portfolios.²⁷⁴

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.²⁷⁵ 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, and more than 1,000,000 firms emit at least 100 metric tons of CO₂ per year.²⁷⁶ 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. (*AIT*, p. 263)

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.²⁷⁷ By comparing non-alarmists to ‘tobacco scientists,’ Gore in effect says that anyone who disagrees with him is a corporate shill whose views and motives do not deserve respect. If the media were to adopt this attitude, then Gore and his allies would monopolize the public conversation on global warming. A more self-serving line of argument is hard to imagine.

XVIII. 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.” (AIT, p. 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.” (AIT, p. 264)

Comment: The “assessments” to which Cooney made editorial contributions (he was not the sole or final editor)—*Our Changing Planet*, the Climate Change Science Program’s *Strategic Plan*, 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.”²⁷⁸ *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.²⁷⁹ 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.

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.” (AIT, p. 264)

An Editor in the White House

Handwritten revisions and comments by Philip A. Cooney, chief of staff for the White House Council on Environmental Quality, appear on two draft reports by the Climate Change Science Program and the Subcommittee on Global Change Research. Mr. Cooney’s changes were incorporated into later versions of each document, shown below with revisions in bold.

“STRATEGIC PLAN FOR THE U.S. CLIMATE CHANGE SCIENCE PROGRAM,” DRAFT TEXT, OCT. 2002

14 wetlands will expand in areas where meltwater resulting from deeper and longer thaw
15 periods does not have a natural drainage path to the ocean.
16
17 Warming will also cause retreating in mountain glaciers and advance the timing of the melt
18 of mountain snow packs in polar regions. In turn, runoff rates will change and flood
19 potential will be altered in ways that are currently not well understood. There will be
20 significant shifts in the seasonality of runoff that will have serious impacts on entire
21 populations that rely on fishing and hunting for their livelihood. These changes will be
22 further complicated by shifts in precipitation regimes and a possible intensification and
23 increased frequency of extreme hydrologic events. Reducing the uncertainties in current
24 understanding of the relationships between climate change and Arctic hydrology is critical

Handwritten notes:
- Increase in
- frequency of
- extreme
- hydrologic
- events
- due to
- melting
- permafrost
- and
- changing
- precipitation
- patterns

Phil Cooney’s edits
Source: *New York Times*

Comment: Gore conveniently neglects to mention that the whistleblower, Rick Piltz, was also a non-scientist whose job was to produce those reports by editing drafts from agency scientists. Piltz did not like Cooney's edits, but then few editors like being edited. More importantly, 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 Antarctica and Greenland.²⁸⁰ 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, when Alaska was as warm as or warmer than it is today.²⁸¹

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." (*AIT*, pp. 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, carbon trading commission, regulatory power, prosecutorial pillage, or political career depends on his not questioning it.

AIT: "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." (*AIT*, pp. 269-270)

Comment: Gore neglects to mention that the scientists in question are members of "Scientists and Engineers for Change," a 527 political 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.²⁸²

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.²⁸³ 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*.²⁸⁴

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 2006.²⁸⁵ So, in the last year of Bush’s first term, federal funding for general science and basic research was \$2.348 billion higher than in the last year of Clinton’s second term—an increase of 35%. Scientists and Engineers for Change accuse Bush of undermining science because they want MORE. That these partisan whiners are also Nobel laureates shows how politicized science has become.

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.” (AIT, pp. 270-271)

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

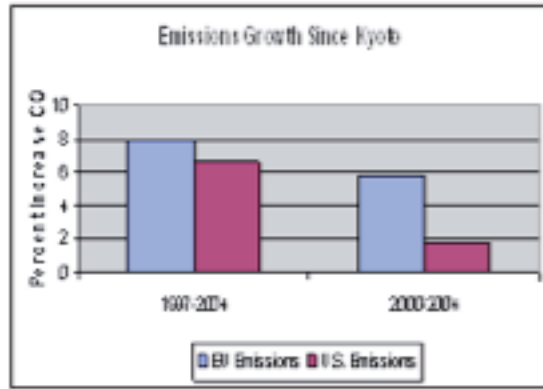
Benny paused, and the studio audience — knowing his skinflint character — laughed loud and long. The robber then repeated his demand: “Look, pal! I said your money or your life!” And that’s when Benny snapped back without a break, “I’m thinking it over!” This time, the audience laughed louder and longer than they had during the pause.²⁸⁶

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.

XIX. Climate Policy

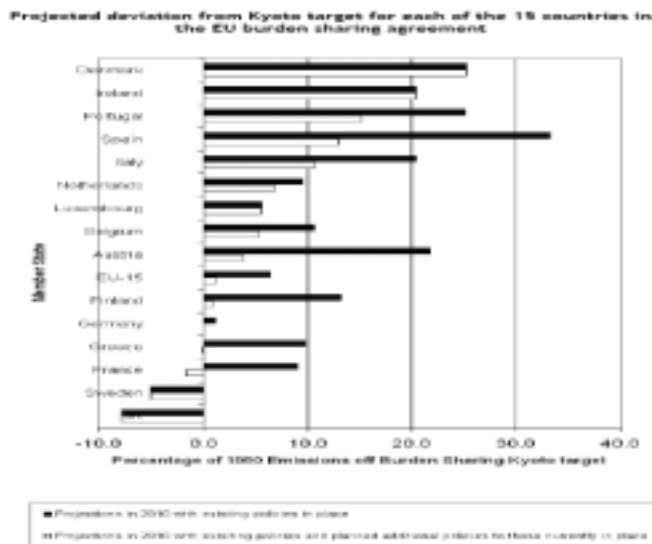
AIT: “The European Union has adopted this U.S. innovation [emissions trading] and is making it work effectively there.” (*AIT*, p. 252)

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. Since 1997, the year the Kyoto Protocol was negotiated, EU emissions have increased. What is more, EU emissions are increasing faster than U.S. emissions.



U.S. and EU emissions growth since Kyoto
Source: EIA data²⁸⁷

EU emissions are rising so rapidly that most EU countries are not on track to meet their Kyoto targets.²⁸⁸ See the Figure below.



188. A negative value indicates a country will more than meet its Kyoto target.

Source: Institute for Public Policy Research, Traffic Lights Report (Dec. 27, 2005)

Open Europe, a British think tank, notes several “serious problems” with the EU Emission Trading Scheme (ETS).²⁸⁹

- **Most countries game the 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 a red tape nightmare for small entities.** “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%.”
(*AIT*, p. 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.”²⁹⁰ 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.²⁹¹

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.” (*AIT*, p. 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 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.” (*AIT*, p. 272)

Comment: This is incorrect. U.S. fuel economy standards specify a fleet *average* mpg. Many U.S. cars exceed the *average*, and many meet China’s new standards. According to World Resources Institute, 100% of Ford’s 2003 sales already meet China’s Phase I (2005/2006) standards, and 72% of its 2003 sales meet the Phase II (2008) standards. Similarly, 42% of GM’s 2003 sales meet Phase I standards, and 32% meet the Phase II standards.²⁹²

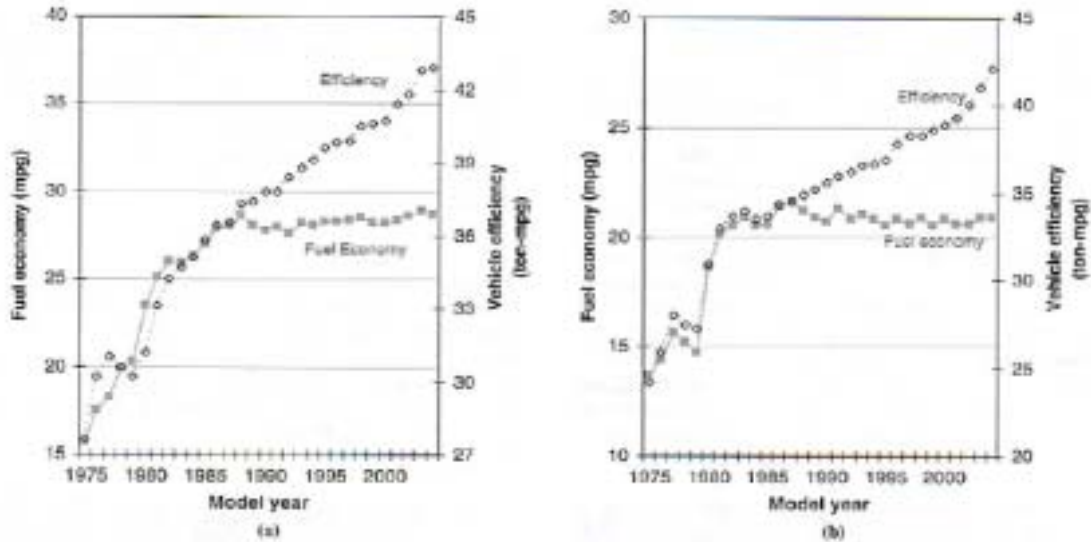
Gore argues as if U.S. companies cannot sell a single car in China unless all U.S.-made cars comply with Beijing’s fuel economy standards—the equivalent of saying U.S. firms won’t be able to sell cars in India’s market until all U.S.-made cars are built to drive on the left side of the road.

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.” (*AIT*, p. 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 establish de facto fuel economy standards for new vehicles sold in California,²⁹³ and the Energy Policy and Conservation Act prohibits states from adopting laws or regulations “related to” fuel economy.²⁹⁴ 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.” (*AIT*, p. 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.²⁹⁵ See the Figures below.



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

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.” (AIT p. 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. For example, who in the year 2000 anticipated oil prices rising to \$70 a barrel? Gore overlooks two big points. First, U.S. automakers would probably not even exist today had

they been “ahead of their time” and emphasized “climate-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.²⁹⁶

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.²⁹⁷

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 quads in 2005 to 22 quads in 2030. (*AIT*, p. 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).²⁹⁸

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. (*AIT*, pp. 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),²⁹⁹ intermittency (the turbines spin and generate power only when the wind blows), avian mortality,³⁰⁰ 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, who fought to block construction of a wind farm in Nantucket Sound about eight miles from his home in Hyannis Port.³⁰¹



Remains of a Condor at Altamont Wind Farm

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.” (*AIT*, pp. 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 current fuel economy standard is 27.5 mpg for passenger cars and 21.6 mpg for light trucks.³⁰² So S&P are really proposing an almost threefold increase in fuel economy for a large portion of the U.S. fleet. 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 2054.³⁰³ 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 the USA already faces a 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.³⁰⁴

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.³⁰⁵

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*, implicitly comes to the same conclusion.³⁰⁶ 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.

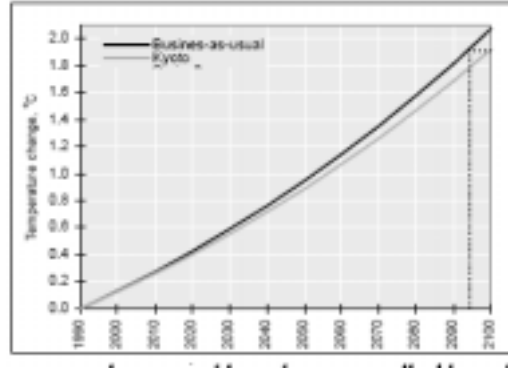
“Technology Triumphs” is really a “Politics Triumphs” scenario with state governments implementing a wide array of “technology forcing” schemes to “green” U.S. energy markets. These are the very types of measures S&P advocate in their study and which Gore claims would create wealth while reducing emissions.

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.

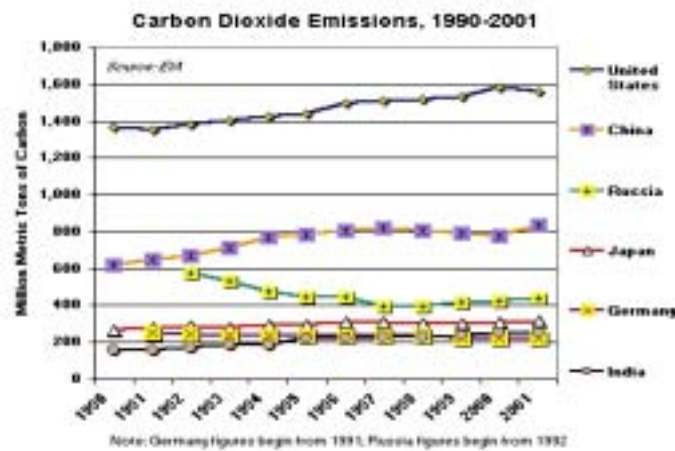
It is also unclear what environmental benefit the P&S program could accomplish. P&S aim at reducing U.S. emissions to 1970 levels by 2054. But even if by some miracle *global* emissions fell to 1970 levels *tomorrow*, carbon dioxide levels in the atmosphere would continue to rise. Mankind would still be emitting about 4.5 billion tons of carbon equivalent emissions annually.³⁰⁷

AIT never confronts the most obvious objection to regulatory climate policy. The main regulatory policies debated in Congress today—the Kyoto Protocol, McCain-Lieberman,³⁰⁸ the Bingaman-Domenici initiative³⁰⁹—would have no discernible impact on global warming. The Kyoto Protocol, for example, would avert only 0.07°C of global warming by 2050.³¹⁰ It would postpone the arrival of a 2°C warming by six years—from 2094 to 2100. See the Figure below.

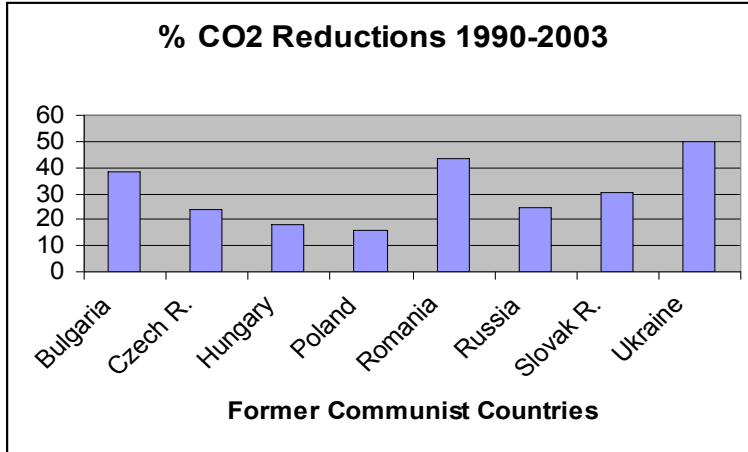


Kyoto postpones the arrival of a 2°C warming by six years—from 2094 to 2100
 Source: Bjorn Lomborg³¹¹

However, although Kyoto would have no measurable effect on global warming, it could cost the U.S. economy tens to hundreds of billions of dollars in higher energy prices, lost jobs, and lower GDP.³¹² Alas, the only proven “method” for making deep emission cuts is that of the former Soviet Union and Eastern Europe: economic collapse. See the Figures below.



Of the six countries, only Russia’s emissions declined
 Source: EIA³¹³



Percent CO₂ emission reductions of seven former communist countries, 1990-2003
Source: International Energy Agency data³¹⁴

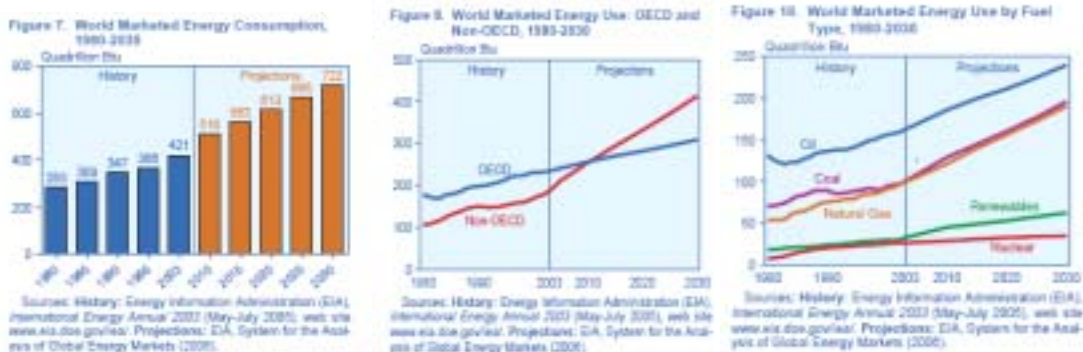
Regulatory climate policies are either all economic pain for no environmental gain or a “cure” worse than the alleged disease.

XX. 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.” (AIT, p. 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.” (AIT, p. 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. 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.

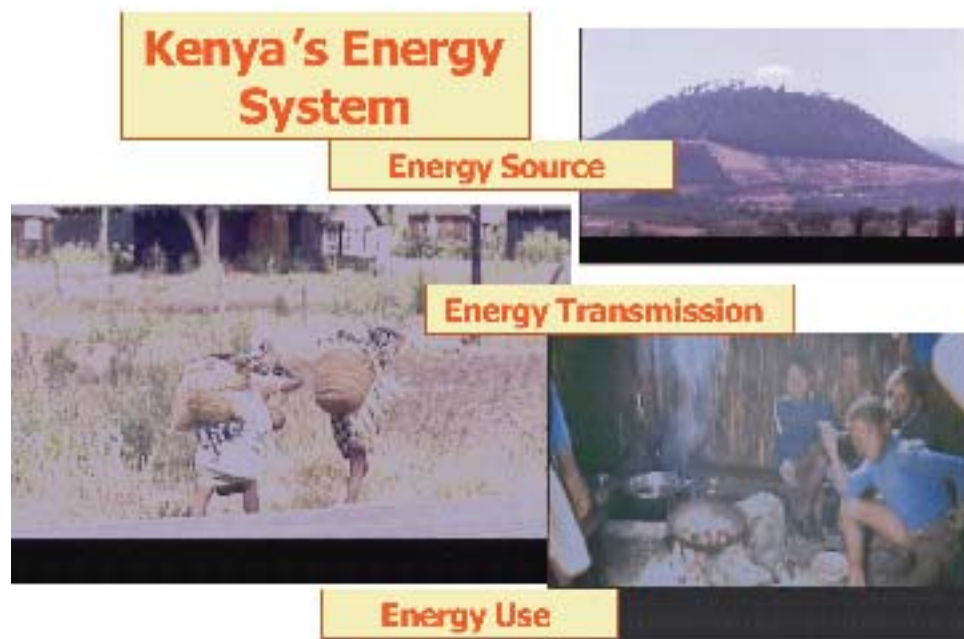
Gore never considers the obvious moral objection to his agenda—its potentially catastrophic impacts on the world’s poor. Stabilizing atmospheric CO₂ levels is not even remotely possible unless China, India, and other developing countries restrict their use of carbon-based energy.³¹⁵ Consequently, Kyoto advocates view the treaty as just a “first step” in a series of carbon-suppression agreements, each more stringent and/or inclusive than its predecessor.³¹⁶ But the global economy is moving in exactly the opposite direction. Demand for fossil energy is growing, especially in developing countries. For example, the Energy Information Administration projects that global energy consumption will increase by 71% between 2003 and 2030, with non-OECD (Organization for Economic Cooperation and Development) countries accounting for three-quarters of the growth. In 2030, energy demand in non-OECD countries is projected to exceed that in OECD countries by 34%. Fossil fuels account for the lion’s share of the increase in consumption.³¹⁷ See the Figures below.



Projected energy consumption growth from 2003 to 2030
Source: EIA

The inconvenient truth is that nobody knows how to meet current much less future global energy needs with low- and non-emitting technologies.³¹⁸

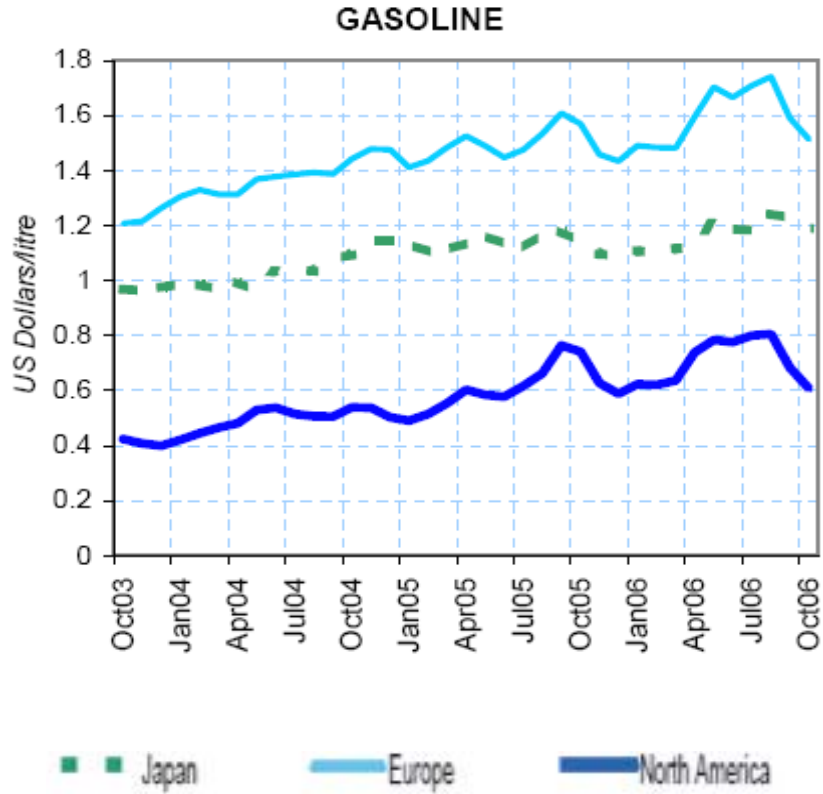
Energy poverty is a scourge, shortening the lives and impairing the health of untold millions of people around the globe. An estimated 1.6 billion people lack access to electricity, and some 2.4 billion people still rely on traditional biomass—wood, crop waste, and dung—for cooking and heating.³¹⁹ Daily indoor air pollution for these people is 3 to 37 times as dirtier than outdoor in the world's most polluted cities, and kills about 2.8 million people a year, most of them women and children.³²⁰ Reliance on traditional biomass also takes a heavy toll on forests and wildlife habitat. The Figure below illustrates the energy poverty that plagues much of the developing world.



Energy poverty
Source: John Christy

Even in a wealthy country like the United States, energy taxes or their regulatory equivalent can inflict hardship on low-income households.³²¹ Millions of families already feel pinched by the high cost of gasoline, natural gas, and home heating oil. A Kyoto-style system would push energy prices to even higher levels.

Many U.S. politicians professed to be outraged in late 2005 when gasoline prices spiked above \$3.00 a gallon. Consumers pay twice as much for gasoline in some European countries, due to high motor fuel taxes.³²² See Figure below.



End User Petroleum Product Prices, Oct. 2006
Source: IEA³²³

Yet from 1990 to 2004, EU transport sector CO₂ emissions increased almost 26% and are projected under current policies to be 35% above 1990 levels in 2010.³²⁴ How much higher than European-level gasoline prices does Gore think Americans should have to pay in order to reduce U.S. emissions?

Gore should at least admit that the pursuit of carbon stabilization has the potential to do more harm than good.

XXI. 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 have never flipped a light switch 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

One Sided

AIT:

- Never acknowledges the indispensable role of fossil fuels in 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 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), potentially 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.
- 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 a study's finding 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 re-imagined as 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.
- 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, and 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 industrial civilization.
- Sees “success” in the reduction of global population birth and death rates, but 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, 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, carbon trading commissions, 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, was still more costly than regular gasoline even when oil prices exceeded \$70 a barrel.
- 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 emphasized 'climate-friendly' vehicles in the 1990s—and never mentions the staggering payments U.S. auto companies must make 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.
- Touts a study by Robert Socolow and Stephen Pacala (S&P), which allegedly demonstrates that existing technologies could reduce CO₂ emissions to 1970 levels, without mentioning that S&P 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

AIT:

- 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), inflating the importance of climate change as a factor in flood risk.
- 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), inflating the importance of climate change as a factor in fire risk.
- Conflates the oceanic 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 became operational in 1983. This apples-to-oranges comparison conveys the false impression that London faced no serious flood risk until recent decades.
- Blames global warming for the increase of “invasive alien species” in Switzerland, never mentioning that the species in question were ‘exotic’ trees and shrubs deliberately introduced into Swiss parks and gardens as long as 200 years ago.
- 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) disputed that IPCC’s conclusion that rising greenhouse gas levels likely caused most of the warming of the past 50 years, shows that Gore’s apocalyptic view of global warming is the “consensus” view among climate scientists.
- Reports that 48 Nobel Prize-winning scientists accused Bush of distorting science, without mentioning that the scientists acted as members of a 527 political group set up to promote the Kerry for President Campaign.
- 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.
- 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

AIT:

- Exaggerates the certainty and hypes the 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 tropical storms in 2005, and the fact that some storms continued into December. The practice of naming storms only goes back to 1953, and storm 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 storms 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 during 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 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. According to the World Resources Institute, the Chinese standards are only about 5% more stringent.

Speculative

AIT:

- 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. A study of leaf stoma remains indicates that, in the early Holocene, CO₂ levels exceeded 330 ppm for centuries and reached 348 ppm—roughly the CO₂ level in 1987.
- 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 and the Bermuda Rise 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 a greater number of tropical cyclones in the Western North Pacific during the late 1960s and early 1970s than in recent decades.
- 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 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, 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 10,000 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 were five times current concentrations for millions of 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 recent malaria outbreaks in Kenya, even though malaria was common in Nairobi in the 1920s-1940s, and several studies attribute the current 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 speculation 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 West Antarctic Ice Sheet (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 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

AIT:

- 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 that several decades of the Medieval Warm Period were as warm as or warmer than any recent decade.
- Calls carbon dioxide 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.
- Assumes that CO₂ levels are increasing at roughly 1 percent annually. The actual rate is half that.
- 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 less heat than 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. A leading climate modeler estimates 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 and operates as a wealth transfer scheme.
- 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.

About the Author

Marlo Lewis, Jr. is a Senior Fellow at the Competitive Enterprise Institute, where he writes on global warming, energy policy, regulatory process reform, and other public policy issues. He has published in National Review, the Washington Times, Investors Business Daily, the American Spectator, Tech Central Station, Energy, Pollution Liability Report, and The Hill. He has appeared on various TV and radio programs including Oprah Winfrey, C-SPAN, CNBC Capital Report, CBC-News Marketplace, and BBC TV. He holds a Ph.D. in Government from Harvard University and a B.A. in Political Science from Claremont McKenna College.

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