Global Warming:

A Survey of the Scientific Literature

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Opening Summary

Scientists know there is no such thing as a "normal" earth temperature. The earth's climate has **never been static**. Global temperatures are **always** either rising or cooling. Indeed, over the past 10 years temperatures have slightly cooled. You don't hear that often in the media but it is true. For the 20 years prior to that, temperatures were rising. For 30 years prior to that, temperatures cooled. For 90 years before that, temperatures warmed. For several hundred years before that, temperatures cooled.

Moreover, it is worth noting that up until the late 19th century, the planet was in the throes of the Little Ice Age, which entailed the coldest planetary temperatures since the end of the last ice age epoch 10,000 to 15,000 years ago. While global warming alarmists frequently compare current temperatures to those that existed at the end of the Little Ice Age, few will argue that Little Ice Age temperatures were either "normal" or beneficial to human beings and life on planet earth. This is a very important point to keep in mind when presented with the moderate 0.6 degrees Celsius rise in global temperature during the 20th century. The prior Little Ice Age baseline often cited by global warming alarmists was significantly more harmful than beneficial to human welfare and life on planet earth.

It is also important to understand the historic relationship between carbon dioxide and temperature. While it is true that carbon dioxide is a trace atmospheric gas that has greenhouse properties, it has never been the primary driver of climate. As each of the prior speakers will tell you, historically, temperatures have always risen first from natural causes, with carbon dioxide rising, as a result, shortly thereafter. There is no reason to believe that carbon dioxide has suddenly supplanted natural forces as the primary driver of climate. Indeed, let's look at the temperature history of the past 100-plus years.

From 1900 to 1945, greenhouse gas emissions were very **minimal**, yet temperatures **rose dramatically**.

From 1945 to 1977, greenhouse gas emissions **rose** steadily, yet temperatures **declined**.

From 1977-1998, greenhouse gas emissions and temperatures both rose.

From 1998 to 2007, greenhouse gas emissions **rose** yet temperatures have slightly **cooled**.

In summary, **IN ONLY ONE BRIEF, 20-YEAR PERIOD HAVE GREENHOUSE GAS TRENDS MATCHED UP WITH TEMPERATURE TRENDS. AND THAT SHORT PERIOD ENDED 10 YEARS AGO.**

Scientific Consensus

I would next like to address claims by global warming alarmists that all or nearly all scientists agree that human induced global warming is a planetary crisis. Such an assertion is simply not true. More than **19,000 scientists** have signed a petition sponsored by a past president of the National Academy of Sciences and co-authored by an astrophysicist at Harvard University, stating that scientific evidence does **not** support alarmist global warming theory. Also, in a 2006 survey conducted by the **National Registry of Environmental Professionals**, 41 percent of environmental scientists disagreed that the planet's recent warmth "can be, in large part, attributed to human activity." Moreover, a 2003 survey of more than **500 climate scientists** conducted by Germany's Institute of Coastal Research found that **less than half** of climate scientists believe that the science justifies turning the global warming issue over to policymakers.

Additionally, the Russian Academy of Sciences has presented evidence that **solar** cycles account for most of our recent planetary warming, and that these same solar cycles will usher in a **mini ice age** within a couple of decades. Scientists with the Danish National Space Center report in a February 2007 article in *Proceedings of the Royal Society Journal A*, "We have the highest solar activity we have had in at least 1,000 years." The scientists add, "The size of man's impact may be much smaller and so the man-made change is happening slower than predicted." And the February 11 *London Telegraph* noted, "There is a growing number of scientists who believe that the effect [reported by the Danish scientists] may be genuine."

Other scientists point out that our current warming is not unique, in that several planets in our solar system are also experiencing significant global warming right now, even though SUVs and coal-fired power plants seem to be mysteriously missing from the Martian landscape. And even alarmist groups such as the United Nations Intergovernmental Panel on Climate Change continue to reduce their global warming predictions with each new climate assessment.

Global Warming Misperceptions

Next I would like to address some of the particular misperceptions regarding global warming.

In September and October of 2007, newspapers and television news programs were frantically reporting that Arctic sea ice had shrunk to its lowest extent in recorded history. For two days the Fox News Channel featured live reports from Greenland, where a breathless correspondent told us that this was undeniable proof that global warming is real and requires dramatic action. The Web site CNN.com reported that the decline in sea ice is "an early warning of a changing climate." CNN.com further asserted that the loss in Arctic sea ice was part of a "steady, worldwide decline in ice cover" and that global warming was also causing similar ice loss in Antarctica, Greenland, and Africa's Mt. Kilimanjaro.

To the casual observer, reports of shrinking Arctic sea ice and similarly retreating ice pack in Antarctica, Greenland, and Mt. Kilimanjaro would seem to be proof that global warming is upon us and is taking a substantial toll on the earth's environment. Scientific facts, however, tell us something entirely different.

Arctic

As an initial matter, it is important to note that we have only been able to measure Arctic sea ice since 1979, when satellites first began taking such measurements. Thus, reports that Arctic sea ice loss "has shattered the all-time low record this summer," as stated by CNN.com, means merely that Arctic sea ice reached its smallest extent since 1979.

Moreover, we have substantial evidence that Arctic ice cover is far more extensive now than it was prior to 1979. Indeed, during World War II, a squadron of P-38 and B-17 bombers were forced to make an emergency landing in Greenland. The bombers have recently been located and recovered, buried under 268 feet of snow and ice, indicating that temperatures are colder and the ice pack is far more extensive now than it was in the 1940s.

Further, if global warming is the cause of melting sea ice in the Northern Hemisphere, then sea ice in the Southern Hemisphere should be receding in a similar manner. However, in 2007, Southern Hemisphere sea ice reached its greatest extent in recorded history. Common sense tells us that when sea ice is shrinking in one hemisphere and growing in another, this is not a sign of *global* warming.

Most important of all, NASA scientists released a paper on October 4, 2007, documenting that a short-term change in prevailing wind direction, rather than global warming, caused the recent decline in Arctic sea ice. Prevailing winds in the Arctic have been more westerly than usual in recent years, with the result that Arctic sea ice is being blown through Greenland's Fram Strait and out into the North Atlantic Ocean.

Notably—and perhaps indicating that Arctic regional winds may be returning to normal—Arctic sea ice from October to December of 2007 grew faster than at any time in recorded history.

While the media sold plenty of newspapers and snared many viewers with sensationalist reports of global warming doom and gloom in the Arctic Ocean, sound science has been telling us a different story all along.

Antarctica

What about Antarctica, Greenland, and Mt. Kilimanjaro? The assertions made by CNN.com and others that global warming is causing a retreat in glaciers in each of these places have also been proven untrue by sound science.

A famous movie by a former vice president declares that Antarctica is a “canary in the coal mine,” giving us the first signs of substantial and dangerous global warming. The movie then tells us that large icebergs have been breaking off the West Antarctic Peninsula due to global warming. These assertions have been picked up by the news media, with virtually every major newspaper in the country publishing stories about warming temperatures and large icebergs breaking off of Antarctica.

However, icebergs breaking off of polar ice packs is not a new climatic phenomenon—as the passengers of the *Titanic* might attest. The presence of icebergs, even very large ones, in polar seas is perfectly natural, and has never been a sign of global warming.

That said, media accounts of warming temperatures in Antarctica are very deceiving. Antarctica as a whole has been cooling dramatically ever since scientists began measuring its temperatures in the 1950s. Moreover, since then, the Antarctic polar ice cap has been continually growing in thickness and overall extent.

On January 13, 2002, online edition of *Nature* magazine reported that Antarctica as a whole has been dramatically cooling for decades. *Nature* reported that temperatures across the continent have dropped an average of 1.2 degrees Fahrenheit per decade, since 1978. (http://www.sciencedaily.com/releases/2002/01/020114073549.htm) and (http://www.usatoday.com/news/science/cold-science/2002-01-13-antarctic-cooling.htm)

"The decline is alarming," *Nature* quoted Diana Wall of Colorado State University who compiled the Antarctic data. "These cooling repercussions may have a long-term effect,” said Wall.

More recently, scientists reported in a July 2006 article published in the British journal *Philosophical Transactions of the Royal Society A: Mathematical, Physical, and Engineering Sciences*, that satellite measurements of the Antarctic ice sheet showed significant growth between 1992 and 2003. (http://bowfell.geol.ucl.ac.uk/~lidunka/EPSS-papers/djw3.pdf)

According to the most recent scientific measurements, as reported by Royal Society scientists, "Mass gains from accumulating snow, particularly on the Antarctic Peninsula and within East Antarctica, exceed the ice dynamic loss from West Antarctica." (http://www.journals.royalsoc.ac.uk/content/38315t2244r5w3m4/fulltext.pdf)

Indeed, in Febrary 2007 the UN Intergovernmental Panel on Climate Change reported: “the Antarctic ice sheet will remain too cold for widespread surface melting and is expected to gain in mass.” (http://www.ipcc.ch/WG1_SPM_17Apr07.pdf)

Canary in the coal mine, indeed.

Greenland

Media reports of global warming in Greenland are similarly misleading. In January of 2007, the *New York Times* published a story about retreating glaciers exposing new islands off the coast of Greenland. It was asserted that the maps of the world would have to be redrawn because of global warming. The story created a media sensation, and the public was told that global warming was clearly the cause of such dramatic events.

Yet Greenland is in a prolonged cold spell. In a 2006 study in *Journal of Geophysical Research*, researchers at the Danish Meteorological Institute and the Climatic Research Unit at the University of East Anglia (UK) correlated Greenland's surface temperature readings and ice core data dating back to 1784.

They made a remarkable discovery. The past two full decades – the 1980s and 1990s – were the coldest decades for Greenland since the 1910s. Average annual temperatures during these past two decades were colder than in any of the previous six decades. Indeed, Greenland's temperatures during the 1980s and 1990s averaged a full 1.5 degrees Celsius lower than average annual temperatures during the 1930s and 1940s.
(http://www.worldclimatereport.com/index.php/2006/11/17/cooling-the-debate-a-longer-record-of-greenland-air-temperature/) and
(http://www.agu.org/pubs/crossref/2006/2005JD006810.shtml)

Temperatures in Greenland since 2000 are slightly warmer than they were in the '80s and '90s, but still colder than they were for much of the twentieth century. How can it be, then, that Greenland's glaciers are *retreating*?

First of all, glaciers as a whole are not retreating. According to a December 2005 study in *Journal of Glaciology*, seven scientists who had analyzed 10 years worth of data reported, "the Greenland ice sheet is thinning at the margins and growing inland, with a small overall mass gain." (http://www.ingentaconnect.com/content/igsoc/jog/2005/00000051/00000175/art00001)

To the extent that some melting is occurring at the margins, some of the ice that accrued during the brutally cold 1980s and 1990s should be expected to melt when temperatures follow up by becoming "merely" colder than average throughout this decade. Elaborate and exaggerated media reports of "alarming warming" in Greenland since the intensely low temperatures of the previous two decades are about as accurate as, say, the media reporting an "alarming power slump" after Babe Ruth followed up his record sixty home runs in 1927 by hitting *merely* fifty-four in 1928.

Kilimanjaro

Africa's Mt. Kilimanjaro presents another example of selective and misleading reporting. Not only CNN.com, but also *USA Today*, the *New York Times*, the *Washington Post*, and just about every other major newspaper in the country have run feature articles claiming that human-induced global warming is causing a retreat of the glacier atop Mt. Kilimanjaro.

It *is* true that Kilimanjaro's mountaintop glacier is in retreat, but what caused it to begin to retreat? Certainly not human-induced global warming. Kilimanjaro's glacier began retreating in the 1800s, long before humans could have had any significant impact on global climate.

Indeed, from 1953 through 1976, the globe was cooling, and yet Kilimanjaro **lost** 21 percent of its original snow cover. Moreover, from 1979 to 2000, satellite data measured additional cooling in the Kilimanjaro region, and yet Kilimanjaro's glacier continued to shrink.

So how can Kilimanjaro's snow cap be shrinking during cooling temperatures?

As far back as 2003, science had the answer. The following is a quote from a November 24, 2003 article in *Nature* magazine's *Nature Online* (http://www.nature.com/nsu/031117/031117-8.htm):

"Although it's tempting to blame the ice loss on global warming, researchers think that deforestation of the mountain's foothills is the more likely culprit. Without the forests' humidity, previously moisture-laden winds blew dry. No longer replenished with water, the ice is evaporating in the strong equatorial sunshine."

Scientists confirmed this in the July-August 2007 issue of *American Scientist* (http://www.americanscientist.org/template/AssetDetail/assetid/55553/page/1):

"[W]arming fails spectacularly to explain the behavior of the glaciers and plateau ice on Africa's Kilimanjaro massif, just 3 degrees south of the equator, and to a lesser extent other tropical glaciers. The disappearing ice cap of the 'shining mountain,' which gets a starring role in the movie, is not an appropriate poster child for global climate change. Rather, extensive field work on tropical glaciers over the past 20 years by one of us (Kaser) reveals a more nuanced and interesting story. Kilimanjaro, a trio of volcanic cones that penetrate high into the cold upper troposphere, has gained and lost ice through processes that bear only indirect connections, if any, to recent trends in global climate." …

"[A]ir temperatures measured at the altitude of the glaciers and ice cap on Kilimanjaro are almost always substantially below freezing (rarely above -3 degrees)." …

"Is Kilimanjaro's ice cap doomed? It may be. … Imagine, though, a scenario in which the atmosphere around Kilimanjaro were to warm occasionally above 0 degrees. Sensible and infrared heating of the ice surface would gradually erode the sharp corners of the ice cap; gentler slopes would quickly develop. If, in addition, precipitation increased, snow could accumulate on the slopes and permit the ice cap to grow. Ironically, substantial global warming accompanied by an increase in precipitation might be one way to save Kilimanjaro's ice."

Scientists know, and indeed have known for years, that global warming has nothing to do with Kilimanjaro's ice loss. And yet even to this day the media and global warming alarmists continue to deliberately misrepresent the science and point to Kilimanjaro as a poster child for global warming.

Drought

It has been asserted that global warming is causing more drought. The scientific data say just the opposite. The July 2004 issue of *International Journal of Climatology* reports, "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." The study concludes, "a good analogy to describe the changes in these places is that the terrestrial surface is **literally becoming more like a gardener's greenhouse**."
(http://www.rsbs.anu.edu.au/Profiles/Graham_Farquhar/documents/214RoderickAustpan2004_000.pdf)

The May 25, 2006 issue of *Geophysical Research Letters* reports that for 20th century soil moisture trends, "An increasing trend is apparent in both model soil moisture and runoff over much of the U.S." The study adds, "This wetting trend is consistent with the general increase in precipitation in the latter half of the 20th century. Droughts have, for the most part, become shorter, less frequent, and cover a smaller portion of the country over the last century."
(http://www.agu.org/pubs/crossref/2006/2006GL025711.shtml)

The National Oceanic and Atmospheric Administration reports, "A number of tree-ring records exist for the last two millennia which suggest that 20th century droughts may be **mild** when evaluated in the context of this longer time frame."
(http://www.ncdc.noaa.gov/paleo/drought/drght_data.html)

The July 2007 issue of *Climatic Change* reports that during the Little Ice Age, there occurred three "very large-scale drought[s] more severe and sustained than any witnessed during the period of instrumental weather observations" [i.e., the 20th century].
(http://www.springerlink.com/content/5478q5t795671806/)

What we see from the refereed scientific literature is that droughts have definitively become less frequent and less severe during our recent global warming. Asserted trends to the contrary are

decidedly short term, limited in geographic reach, and quite minor when compared to droughts that have dominated colder climatic conditions.

Hurricanes

It has been asserted that global warming is causing more intense hurricanes. Once again, this is simply not so.

The National Oceanic and Atmospheric Administration, known as the NOAA, on November 29, 2005 released a study in response to claims that Hurricanes Katrina and Rita were caused by global warming. According to NOAA, "NOAA attributes this increased activity to natural occurring cycles in tropical climate patterns near the equator. … NOAA research shows that the tropical multi-decadal signal is causing the increased Atlantic hurricane activity since 1995, and is not related to greenhouse warming." (http://www.magazine.noaa.gov/stories/mag184.htm)

Scientists at the National Hurricane Center published a study on May 1, 2007 documenting that hurricane activity is no higher now than in decades past. Regarding the number of recent hurricanes compared to earlier decades, "[W]e don't see any new trend. There's no link to global warming that you can see at all," the lead scientist reported.
(http://www.newsdaily.com/TopNews/UPI-1-20070502-19042700-bc-us-hurricanes.xml)

Hurricane expert William Gray reported just a few days earlier, on April 27, 2007, that the number of major hurricanes making landfall on the U.S. Atlantic coast has declined in the past 40 years, even while temperatures and carbon dioxide levels have risen.
(http://www.iht.com/articles/ap/2007/04/28/america/NA-GEN-US-Top-Forecaster-Global-Warming.php)

Hurricane scientists from the National Oceanic and Atmospheric Administration reported in the April 18, 2007 *Geophysical Research Letters* that computer models show global warming will not significantly increase hurricane activity. Global warming will cause more wind shear, which serves to prevent hurricanes from forming, the hurricane scientists report.

"The environmental changes found here do not suggest a strong increase in tropical Atlantic hurricane activity during the 21st century," reported the authors.
(http://www.rsmas.miami.edu/pressreleases/20070417-wind.html)

Sahara Desert

Claims by Al Gore and others that Africa's deserts, and particularly the southern Sahara desert, are expanding due to global warming are contradicted by sound science.
September 18, 2002 *New Scientist* magazine:

"Africa's deserts are in 'spectacular' retreat." The article documents how vegetation is reclaiming large expanses of barren land across the entire southern edge of the Sahara desert." (http://www.newscientist.com/article.ns?id=dn2811)

The article continues, "The southern Sahara desert is in retreat, making farming viable again in what were some of the most arid parts of Africa. ... Burkina Faso, one of the West African countries devastated by drought and advancing deserts 20 years ago, is growing so much greener that families who fled to wetter coastal regions are starting to go home."

Still further: "Nor is it just a short-term trend. Analysts say the gradual greening has been happening since the mid-1980s, though has gone largely unnoticed. Only now is the evidence being pieced together….

Moreover, the January 1, 2007 issue of *Geology* reports that central Africa is currently "experiencing an unusually prolonged period of stable, wet conditions in comparison to previous centuries of the past millennium. … "The patterns and variability of 20th century rainfall in central Africa have been unusually conducive to human welfare in the context of the past 1400 years."

Indeed, Geology reports, "unless global warming is a mitigating factor, central Africa is overdue for a return to decades-long drought that exceeds anything observed in the past century." (http://www.co2science.org/scripts/CO2ScienceB2C/articles/V10/N13/C2.jsp)

This phenomenon of a greening planet is not limited to the southern Sahara desert. A study on variations in northern hemisphere vegetation taken from satellite data from 1981-1999, reported in the September 16, 2001 (http://www.gsfc.nasa.gov/topstory/20010904greenhouse.html) issue of *Journal of Geophysical Research*, found an 8-to-12 percent increase in vegetation across North America and Eurasia. A subsequent comment in the same journal, *Journal of Geophysical Research* concluded that a concurrent rise in atmospheric CO2 was primarily responsible for the increased vegetation.
(http://www.co2science.org/scripts/CO2ScienceB2C/articles/V5/N45/EDIT.jsp)

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Moreover, according to a December 2005 study in *Journal of Glaciology*, seven scientists who had analyzed 10 years worth of data reported, "the Greenland ice sheet is thinning at the margins and growing inland, with a small overall mass gain."
(http://www.ingentaconnect.com/content/igsoc/jog/2005/00000051/00000175/art00001)

Short-term accelerated melting in 2005-2006, has now returned to normal.
(http://tierneylab.blogs.nytimes.com/2007/02/08/greenlands-glaciers-take-a-breather/) and
(http://www.sciencemag.org/cgi/content/abstract/1138478v1)

Economics

Now even if we are to disregard the science and consider greenhouse gas restrictions, we need to consider whether the benefits of such restrictions outweigh the costs. The answer here is clearly, "no."

In 2004, the Danish government convened many of the world's leading economists and presented them with this question. Assuming you have access to roughly $50 billion to address global health and environment concerns, where would the money best be spent? From a list of more than a dozen health and environmental issues, the world's leading economists ranked addressing global warming as dead last in terms of benefits accrued per dollar spent, even assuming alarmist global warming scenarios. Significantly, the economists concluded that spending such money on preventing global warming actually did more harm than good, as the benefits that could be achieved did not justify the money spent on mitigating global warming.

Conclusion

Finally, I would like to conclude with a couple of practical matters. Current U.S. policy is in no need of change. Since 2000, the U.S. has been cutting the greenhouse gas intensity of its economy significantly faster than the European Union. Moreover, greenhouse gas emissions are rising much more rapidly in the European Union, China, India, and many other nations than they are in the U.S. By encouraging market forces and research and development rather than implausible mandates, the U.S. is doing more to address greenhouse gas emissions than any other nation in the world.

Indeed, the U.S. is **not** the world's leading emitter of carbon dioxide emissions. China emits the most, the U.S. is second, and India is in third place, rapidly gaining on the U.S. China and India

have stated unequivocally that they will not place limits on their greenhouse gas emissions, regardless of what Western nations do. We can cut our emissions all we want, but it will have virtually no impact on global greenhouse gas emissions unless China, India, and other rapidly developing nations do the same. Until and unless we obtain a commitment from such nations to match our efforts, we are merely punishing U.S. citizens, sending jobs and wealth overseas, and slashing our hard-earned standard of living for very little impact on global greenhouse gas emissions. This can hardly be in the best interest of the citizens of Montana.

Moreover, the moderate warming that has occurred in our recovery from the Little Ice Age has brought substantial benefits to human welfare and very little detriment. Global crop yields are continually setting records, global forests are expanding, deserts are shrinking, and the earth's biosphere is becoming much more robust. Why sacrifice the standard of living of ourselves and our children to battle an imaginary demon that has in fact benefited the earth's biosphere and improved the lives of most people on the planet?

When you are pressured to enact all sort of economically punitive measures to fight global warming, remember that the fight quite likely is entirely unnecessary.