# The Rate Debate

## Slowing

**Earth is actually getting colder - disproves anthropogenic warming**

**Klimenko 11** (RAS Klimenko, Moscow Power Engineering Institute, 2011, "Why is Global Warming Slowing Down?," *Doklady Earth Sciences*, Vol. 440(2))

The first decade of the present century has ended with a remarkable climatic event: for the first time over the past 65 years, the fiveyear average global temper ature over 2006–2010 turned out to be lower than the value for the previous fiveyear interval (2001–2005). In addition, the absolute maximum temperature, which was attained as long ago as in 1998, has not been surpassed for thirteen years. Both these facts seem ingly support the arguments of the opponents of global warming theory, at least those who regard the anthro pogenic origin of warming questionable or even far fetched. Indeed, the anthropogenic emission of car bon dioxide, which is the major greenhouse atmo spheric component, has risen by 60% from 5.2 giga tons to 8.5 gigatons of carbon, and its concentration has increased from 339 to 390 ppmv (parts per million by volume). How then do we explain the apparent slowdown in the rate of global warming? Evidently, the observed global rise in temperature (Fig. 1) is a response of the climatic system to the combined action of both anthropogenic and natural impacts. Some of the latter are precisely the factors responsible for the current climatic paradox. Further, we will attempt to identify these factors and, based on their analysis, forecast the global climatic trends for the next decades. Figure 2 presents the wavelet spectra yielded by continuously analyzing the time series of global tem perature over 1850–2011 [1]. Here, we analyze only one of three existing global temperature datasets which are continuously updated, namely the HadCRUT3 temperature series provided by the Uni versity of East Anglia (accessible at http://www.cru. uea.ac.uk/cru/data/temperature/), because this is, as of now, the only dataset covering more than a 150year interval, which is crucial for our study. We note that it only recently became possible to analyze such long time series and, thus, identification of multidecade rhythms became a solvable task. The temperature data were preliminarily rid of the longterm anthropogenic trend associated with the accumulation of greenhouse gases and aerosols in the atmosphere; this trend was calculated from the energybalance climate model developed at the Moscow Power Engineering Institute (MPEI) [2]. The resulting temperature series, free of anthropogenic trends, will contain important infor mation on the influence of natural factors. Figure 2 shows that, throughout the entire interval of instrumental observations since the mid nineteenth century, the data contain rather stable 70year and 20year cyclic components. A less significant 9year cycle was present in most observations (during 1870– 1900 and 1940–2000), and a 6year cycle persisted over a considerable part of the entire time span. Closely consistent results were also obtained when analyzing the temperature series by the maximum entropy method (MEM) (Fig. 3). As the order of the auroregression (AR) method is known to significantly affect the result, in our case this parameter was chosen to be onethird the length of the studied data series: according to the long experience in application of MEM in climate research, this value is suitable for providing useful information. All the harmonic com ponents identified above are statistically significant with a confidence level of 90%. Supposedly, the source of the dominant 70year cycle is the North Atlantic, where this harmonic is reliably identified not only in the ocean [3–5] but also on the continental margins: in Greenland [6], England [7], Finland [8], at the Novaya Zemlya Archipelago, and on the Yamal Peninsula [9]. More over, this periodical component is not only recognized in the instrumental data but it is also revealed in the time series of paleotemperature and pressure which date back to over hundreds and even thousands of years ago. We believe that this rhythm is associated with the quasiperiodical changes in the atmospheric and oceanic circulation known as the North Atlantic Oscillation (NAO) and with the related pulsations in the advection of warm waters to the basins of the Nor wegian and Barents seas. Indeed, the time series of the NAO index contain an approximately 60to 70year component [10] and show a strong positive correlation with the time series of temperature in the Northern hemisphere [11].

## Warming Inevitable

**Warming inevitable even with a complete emissions reduction**

**Solomon et. al 10** (Susan Solomon, Chemical Sciences Division, Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Ph.D. in Climotology University of California, Berkeley, Nobel Peace Prize Winner, Chairman of the IPCC, Gian-Kasper Plattner, Deputy Head, Director of Science, IPCC Affiliated, Climate and Environmental Physics, Physics Institute, University of Bern, Switzerland, John S. Daniel, research scientist at the National Oceanic and Atmospheric Administration (NOAA), Ph.D. Physics @ Michigan, Todd J. Sanford, Cooperative Institute for Research in Environmental Science @ Colorado, Daniel M. Murphy, Chemical Sciences Division, Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Boulder Gian-Kasper Plattner, Deputy Head, Director of Science, Technical Support Unit Working Group I, Intergovernmental Panel on Climate Change, Affiliated Scientist, Climate and Environmental Physics, Physics Institute, University of Bern, Switzerland Reto Knutti, Institute for Atmospheric and Climate Science, Eidgenössiche Technische Hochschule Zurich and Pierre Friedlingstein, Chair, Mathematical Modelling of Climate Systems, member of the Science Steering Committee of the Analysis Integration and Modeling of the Earth System (AIMES) programme of IGBP and of the Global Carbon Project (GCP) of the Earth System Science Partnership (ESSP), Proceedings of the National Academy of the Sciences of the United States of America, "Persistence of climate changes due to a range of greenhouse gases", Vol 107(43))

Carbon dioxide, methane, nitrous oxide, and other greenhouse gases increased over the course of the 20th century due to human activities. The human-caused increases in these gases are the primary forcing that accounts for much of the global warming of the past fifty years, with carbon dioxide being the most important single radiative forcing agent (1). Recent studies have shown that the human-caused warming linked to carbon dioxide is nearly irreversible for more than 1,000 y, even if emissions of the gas were to cease entirely (2–5). The importance of the ocean in taking up heat and slowing the response of the climate system to radiative forcing changes has been noted in many studies (e.g., refs. 6 and 7). The key role of the ocean’s thermal lag has also been highlighted by recent approaches to proposed metrics for comparing the warming of different greenhouse gases (8, 9). Among the observations attesting to the importance of these effects are those showing that climate changes caused by transient volcanic aerosol loading persist for more than 5 y (7, 10), and a portion can be expected to last more than a century in the ocean (11–13); clearly these signals persist far longer than the radiative forcing decay timescale of about 12–18 mo for the volcanic aerosol (14, 15). Thus the observed climate response to volcanic events suggests that some persistence of climate change should be expected even for quite short-lived radiative forcing perturbations. It follows that the climate changes induced by short-lived anthropogenic greenhouse gases such as methane or hydrofluorocarbons (HFCs) may not decrease in concert with decreases in concentration if the anthropogenic emissions of those gases were to be eliminated. In this paper, our primary goal is to show how different processes and timescales contribute to determining how long the climate changes due to various greenhouse gases could be expected to remain if anthropogenic emissions were to cease. Advances in modeling have led to improved AtmosphereOcean General Circulation Models (AOGCMs) as well as to Earth Models of Intermediate Complexity (EMICs). Although a detailed representation of the climate system changes on regional scales can only be provided by AOGCMs, the simpler EMICs have been shown to be useful, particularly to examine phenomena on a global average basis. In this work, we use the Bern 2.5CC EMIC (see Materials and Methods and SI Text), which has been extensively intercompared to other EMICs and to complex AOGCMs (3, 4). It should be noted that, although the Bern 2.5CC EMIC includes a representation of the surface and deep ocean, it does not include processes such as ice sheet losses or changes in the Earth’s albedo linked to evolution of vegetation. However, it is noteworthy that this EMIC, although parameterized and simplified, includes 14 levels in the ocean; further, its global ocean heat uptake and climate sensitivity are near the mean of available complex models, and its computed timescales for uptake of tracers into the ocean have been shown to compare well to observations (16). A recent study (17) explored the response of one AOGCM to a sudden stop of all forcing, and the Bern 2.5CC EMIC shows broad similarities in computed warming to that study (see Fig. S1), although there are also differences in detail. The climate sensitivity (which characterizes the long-term absolute warming response to a doubling of atmospheric carbon dioxide concentrations) is 3 °C for the model used here. Our results should be considered illustrative and exploratory rather than fully quantitative given the limitations of the EMIC and the uncertainties in climate sensitivity. Results One Illustrative Scenario to 2050. In the absence of mitigation policy, concentrations of the three major greenhouse gases, carbon dioxide, methane, and nitrous oxide can be expected to increase in this century. If emissions were to cease, anthropogenic CO2 would be removed from the atmosphere by a series of processes operating at different timescales (18). Over timescales of decades, both the land and upper ocean are important sinks. Over centuries to millennia, deep oceanic processes become dominant and are controlled by relatively well-understood physics and chemistry that provide broad consistency across models (see, for example, Fig. S2 showing how the removal of a pulse of carbon compares across a range of models). About 20% of the emitted anthropogenic carbon remains in the atmosphere for many thousands of years (with a range across models including the Bern 2.5CC model being about 19 4% at year 1000 after a pulse emission; see ref. 19), until much slower weathering processes affect the carbonate balance in the ocean (e.g., ref. 18). Models with stronger carbon/climate feedbacks than the one considered here could display larger and more persistent warmings due to both CO2 and non-CO2 greenhouse gases, through reduced land and ocean uptake of carbon in a warmer world. Here our focus is not on the strength of carbon/climate feedbacks that can lead to differences in the carbon concentration decay, but rather on the factors that control the climate response to a given decay. The removal processes of other anthropogenic gases including methane and nitrous oxide are much more simply described by exponential decay constants of about 10 and 114 y, respectively (1), due mainly to known chemical reactions in the atmosphere. In this illustrative study, we do not include the feedback of changes in methane upon its own lifetime (20). We also do not account for potential interactions between CO2 and other gases, such as the production of carbon dioxide from methane oxidation (21), or changes to the carbon cycle through, e.g., methane/ozone chemistry (22). Fig. 1 shows the computed future global warming contributions for carbon dioxide, methane, and nitrous oxide for a midrange scenario (23) of projected future anthropogenic emissions of these gases to 2050. Radiative forcings for all three of these gases, and their spectral overlaps, are represented in this work using the expressions assessed in ref. 24. In 2050, the anthropogenic emissions are stopped entirely for illustration purposes. The figure shows nearly irreversible warming for at least 1,000 y due to the imposed carbon dioxide increases, as in previous work. All published studies to date, which use multiple EMICs and one AOGCM, show largely irreversible warming due to future carbon dioxide increases (to within about 0.5 °C) on a timescale of at least 1,000 y (3–5, 25, 26). Fig. 1 shows that the calculated future warmings due to anthropogenic CH4 and N2O also persist notably longer than the lifetimes of these gases. The figure illustrates that emissions of key non-CO2 greenhouse gases such as CH4 or N2O could lead to warming that both temporarily exceeds a given stabilization target (e.g., 2 °C as proposed by the G8 group of nations and in the Copenhagen goals) and remains present longer than the gas lifetimes even if emissions were to cease. A number of recent studies have underscored the important point that reductions of non-CO2 greenhouse gas emissions are an approach that can indeed reverse some past climate changes (e.g., ref. 27). Understanding how quickly such reversal could happen and why is an important policy and science question. Fig. 1 implies that the use of policy measures to reduce emissions of short-lived gases will be less effective as a rapid climate mitigation strategy than would be thought if based only upon the gas lifetime. Fig. 2 illustrates the factors influencing the warming contributions of each gas for the test case in Fig. 1 in more detail, by showing normalized values (relative to one at their peaks) of the warming along with the radiative forcings and concentrations of CO2 , N2O, and CH4 . For example, about two-thirds of the calculated warming due to N2O is still present 114 y (one atmospheric lifetime) after emissions are halted, despite the fact that its excess concentration and associated radiative forcing at that time has dropped to about one-third of the peak value.

**It’s too late to stop climate change, and models fail to accurately predict what will occur**

**Idso 11** — Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Recent Reflections on Sea-Level Rise Reflect Poorly on the IPCC http://co2science.org/articles/V14/N50/EDIT.php

It has long been the practice of the world's climate alarmists to promote fear about the future in terms of anthropogenic-CO2-induced increases in various types of climatic extremes. As noted by Lee (2011), for example, "in 1990 the Intergovernmental Panel on Climate Change (IPCC) suggested that, for a 'business-as-usual' greenhouse gas forcing scenario, global sea level could rise by 8-29 cm by 2030 and 31-110 cm by 2100," as reported by Houghton et al. (1990), which report also stated that "even with substantial decreases in the emissions of greenhouse gases, future rises in sea level were unavoidable owing to 'lags in the climate system'." And he also noted that "the Second World Climate Conference (Jager and Ferguson, 1991) reached similar conclusions, which in the case of the British Isles was that there could be a [sea level] rise of between 50 and 70 cm over the next 100 years." Noting that "the IPCC projections set the framework for the coastal policy response to sea-level rise in England and Wales," which was developed by the Ministry of Agriculture, Fisheries and Food (MAFF, 1991), Lee says it was widely predicted that the expected relative sea-level rise (RSLR) would result in an increase in wave energy at the base of coastal cliffs that would lead to accelerated cliff recession that "inevitably would lead to increased risk to properties behind actively retreating cliff-lines," adding that Bray and Hooke (1997) suggested that "significant increases in recession rate could be expected to occur," as their analysis pointed towards "a 22-133% increase in cliff recession rates on the south coast of England by 2050." As a result of these projections, Lee decided to analyze the most recent 50-year recession records of the United Kingdom's Holderness Cliffs, stating that "twenty years on from the IPCC First Assessment Report seems an appropriate moment to reflect on what has actually happened." So what did he find? As Lee describes it, "relative sea level has risen over the second half of the 20th century," and "so have Holderness cliff recession rates, from around 1.2 m/year in the early 1950s to around 1.5 m/year by 2000." However, as he continues, "there has been no significant acceleration in the rate of global sea-level rise since 1990 and no rapid increase in the recession rate." Thus, he states that "predictions of 20-year recession distances made in the early 1990s that took account of the RSLR advice from MAFF (1991) are likely to have overestimated the risk to cliff-top property and the benefits of coast protection." In a candid expression of his feelings after conducting his analysis, Lee writes that "as someone who was heavily involved in providing technical support to policymakers through the research and development of methods for predicting cliff recession that took account of RSLR (see Lee et al., 2001; Hall et al., 2000; Lee and Clark, 2002; Lee, 2005), I feel somewhat awkward about the absence of accelerated cliff recession over the last two decades," acknowledging that "perhaps we were all too keen to accept the unquestioned authority of the IPCC and their projections." Thus, he ends by stating "I am left with the feeling that a healthy skepticism of the climate change industry might not be such a bad thing," suggesting that people see, in this regard, the report of the Nongovernmental Panel on Climate Change that was edited by Idso and Singer (2009).

## Past Tipping Point

**The plan is too little, too late – they can’t stop warming now**

Ghommem, Hajj, and Puri 12 (Mehdi Ghommem, Muhammad R. Hajj, Ishwar K. Puri, Department of Engineering Science and Mechanics, Virginia Tech, 4/26/12, “Influence of natural and anthropogenic carbon dioxide sequestration on global warming” Ecological Modelling, SciVerse Science Direct)

We have used the results of previous GCM simulations to develop a model that accounts for the couplings between the global temperature, atmospheric CO2 concentration, and the ocean and land CO2 uptakes. The good agreement between the results of the simplified model and historical records for both atmospheric CO2 and global temperature demonstrates that our reduced order analysis is able to correctly reproduce the major CO2 feedbacks between natural sinks and the atmosphere. We have also used the model to investigate the impact of anthropogenic CO2 sequestration on the increase in the global temperature. Our results suggest that an inordinately large, and perhaps unrealizable, fraction of CO2 emissions would have to be sequestered in order to prevent global warming. Undoubtedly, without referring to the environmental consequences, sequestration could be used as one among several carbon mitigation strategies to accomplish large effective μ values.

**Warming is real but the plan can’t solve it**

Ghommem, Hajj, and Puri 12 (Mehdi Ghommem, Muhammad R. Hajj, Ishwar K. Puri, Department of Engineering Science and Mechanics, Virginia Tech, 4/26/12, “Influence of natural and anthropogenic carbon dioxide sequestration on global warming” Ecological Modelling, SciVerse Science Direct)

The increase in the global surface temperature is influenced by several factors including anthropogenic and natural emissions of CO2, and the ability of natural sequestration reservoirs in the Earth's oceans and land to absorb and store it. The CO2 absorption in these reservoirs is sensitive to changes in the global temperature and the atmospheric CO2 concentration, thus creating a feedback loop in the Earth's ecosystem, which complicates predictions of the overall impact of rising atmospheric CO2 levels on global warming. Here, we model this interaction through a positive feedback loop and utilize general circulation models (GCM) to quantify the coupling between the carbon-cycle and the global temperature. We validate the model by comparing its predictions with those from high fidelity simulations and historical records. Thereafter, we investigate the impact of anthropogenic CO2 sequestration on lowering the rate of increase in the global temperature and find that a reduction in global warming is more sensitive to larger sequestration fractions. Thus, an inordinately large fraction of CO2 emissions would have to be sequestered to significantly impact global warming.

## Soon…

**Runaway warming leads to extinction – timeframe is 2020
Stein 7/18/12 —** (David Stein, Science Editor for The Canadian, news agency, “Scientists say Humanity ignores Antarctic melting and Greenhouse gas time-bombs with the price of Mass-Extinction,” <http://www.agoracosmopolitan.com/home/Frontpage/2007/02/26/01381.html>)

Global Warming continues to be approached by governments as a "luxury" item, rather than a matter of basic human survival. Humanity is being taken to its destruction by a greed-driven elite. These elites, which include 'Big Oil' and other related interests, are intoxicated by "the high" of pursuing ego-driven power, in a comparable manner to drug addicts who pursue an elusive "high", irrespective of the threat of pursuing that "high" poses to their own basic survival, and the security of others. Global Warming and the pre-emptive war against Iraq are part of the same self-destructive prism of a political-military-industrial complex, which is on a path of mass planetary destruction, backed by techniques of mass-deception. "The scientific debate about human induced global warming is over but policy makers - let alone the happily shopping general public - still seem to not understand the scope of the impending tragedy. Global warming isn't just warmer temperatures, heat waves, melting ice and threatened polar bears. Scientific understanding increasingly points to runaway global warming leading to human extinction", reported Bill Henderson in CrossCurrents. If strict global environmental security measures are not immediately put in place to keep further emissions of greenhouse gases out of the atmosphere we are looking at the death of billions, the end of civilization as we know it and in all probability the end of humankind's several million year old existence, along with the extinction of most flora and fauna beloved to man in the world we share. The Stephen Harper minority government backed by Alberta "Big Oil", the U.S. Republican President Bush administration, and a confederacy of other elites associated with a neo-conservative oriented political-military-industrial complex, has only sought to "buy time" against his critics, (and mount a disingenuous public relations campaign under a new Minister of the Environment). It is apparent that The Stephen Harper government has no commitment to providing any leadership on Canadian or global achievement of the minimum standards set on greenhouse gas emissions reductions under the Kyoto Protocol. The immediate threat of runaway global warming and climate change melt-down There are 'carbon bombs': carbon in soils, carbon in warming temperate and boreal forests and in a drought struck Amazon, methane in Arctic peat bogs and in methane hydrates melting in warming ocean waters. "For several decades it has been hypothesized that rising temperatures from increased greenhouse gases in the atmosphere due to burning fossil fuels could be releasing some of and eventually all of these stored carbon stocks to add substantially more potent greenhouse gases to the atmosphere," Bill Henderson further elaborates. Given time lags of 30-50 years, we might have already put enough extra greenhouse gases into the atmosphere to have crossed a threshold to these bombs exploding, their released greenhouse gases leading to ever accelerating global warming with future global temperatures maybe tens of degrees higher than our norms of human habitation and therefore extinction or very near extinction of humanity. "(T)he science is clear. We need not a 20% cut by 2020; not a 60% cut by 2050, but a 90% cut by 2030 (1). Only then do we stand a good chance of keeping carbon concentrations in the atmosphere below 430 parts per million, which means that only then do we stand a good chance of preventing some of the threatened positive feedbacks. If we let it get beyond that point there is nothing we can do. The biosphere takes over as the primary source of carbon. It is out of our hands," George Monbiot says.

## Tipping Points Soon

**Tipping points are approaching now - make warming irreversible - inaction multiplies certainty**

**Risby 11** — (James Risby, Researcher, Marine and Atmospheric Research at CSIRO, PhD in Climatology from MIT, 6/15/11, "Speaking science to climate policy," The Conversation, http://theconversation.edu.au/speaking-science-to-climate-policy-1548)

We’re only a few decades away from a major tipping point, plus or minus only about a decade. The rate at which the ice sheets would melt is fairly uncertain, but not the result that says we are very close to a tipping point committing to such melt and breakdown. If we were to keep remaining emissions inside the 250–450Gt carbon allocation, we would need to take account of the inertia in energy systems and infrastructure, which set some limits on the maximum rate that emissions can be reduced. To stay within the budget, we can’t hope to emit 10Gt a year (the present emissions rate) for the next thirty years and then reduce emissions suddenly to zero. Rather, net emissions would need to be phased down to zero to stay within the budget. The longer stringent emissions reductions are delayed, the more drastic they must be to stay within the 250–450Gt budget. With more than a small delay, the reductions needed are faster than can be achieved in turning over the stock of emitting infrastructure. Thus, if we were to stay within this budget, dramatic emission reductions would have to begin now. Delayed action on stringent emissions reductions almost certainly implies overshooting the thresholds and locking in vast long term impacts.

**Tipping points coming now - positive feedbacks make warming irreversible and fast**

**Worth 9** (Jess Worth, editorial and feature writer for New Internationalist, April 2009, "Can Climate Change be Averted?: The first tipping point to climate disaster is already here," CCPA Monitor 15(10))

The time for words of warning is long gone. One need only tune in briefly to the panicked tones of the world's leading climate scientists to grasp that we are already in a crisis. The Arctic ice-sheets are melting far faster than the UN's Intergovernmental Panel on Climate Change projected only last year. Their conclusion that the world needs to reduce greenhouse gas emissions by 80% by 2050 - no mean feat in itself - was based on the assumption that Arctic summer ice may be gone by the end of the century. It is now predicted to be gone in the next five years. Arctic sea-ice acts as a refrigerator for the globe. Without it, global warming will happen even faster. It also contributes to the "albedo effect" whereby white surfaces reflect more solar radiation than dark ones. As ice and snow disappear, darker ocean and land absorb more heat from the sun and add to warming. This in turn affects the Arctic permafrost, which currently locks away twice as much carbon as is now in the entire global atmosphere. That permafrost is starting to thaw, about 80 years ahead of schedule. We have reached the first climate "tipping point." As temperatures rise, changes are triggered in the planet's systems which create "positive feedbacks," further contributing to global warming, and potentially unleashing rapid, uncontrollable, and irreversible climate change. It's still not too late to prevent a catastrophe. But only just. Global warming has already resulted in a temperature increase of nearly 1°C, and we are committed to further warming caused by greenhouse gases already emitted around 0.2°C per decade. But scientists say that, if warming is kept below 2°C, we have a good chance of avoiding the worst effects of climate change.

## Tipping Points Impact

**Empirically tipping points are real -**

**Cook 9** (Kerry Cook, Geosciences @ UT Austin, 2009, "Abrupt climate change: atmospheric tipping points," IOP Conf. Ser.: Earth Environ. Sci., Vol. 6(6))

The atmosphere has a low heat capacity, and so it can change abruptly when forcing functions change rapidly. For example, rapid changes in ocean temperature or land surface conditions will cause a similarly rapid change in the atmosphere. But abrupt changes in climate can also come about through the atmosphere’s response to smooth changes in forcing when certain tipping points, or thresholds, are reached. Several types of atmospheric tipping mechanisms are discussed, with examples taken from seasonal variations of today’s climate and abrupt climate change on century and millennial time scales. Some tipping point mechanisms occur purely because of the nonlinearity of the atmosphere’s internal dynamics. One example is the rapid change in rainfall distributions that occur virtually every spring over northern Africa, known as the monsoon jump. Other examples relate to the vertical stability properties of the atmosphere, which are especially relevant for understanding drought and floods. Tipping points also arise due to phase changes of water within the atmosphere. For example, cooling to a threshold temperature will cause water to condense and form a cloud. As a result, sudden changes in atmospheric and surface heating rates will occur, and feedbacks from the condensational heating released into the atmosphere can drive a strong dynamical response with consequences for regional climate. Sudden aerosol loading, when threshold surface winds speeds are reached for suspending particles, also presents potential for abrupt change that may be felt on global space scales. We do not fully understand how effective these tipping points can be for changing climate, and we probably have not identified all of the potentially important tipping points. We need to investigate the mechanisms of these abrupt changes so they can be properly represented in climate models. Because of the existence of these tipping points, and their ability to cause rapid climate change, we need to prepare for surprise as climate changes.

## AT: No Tipping Pts = No Impact

**Warming makes disasters inevitable even absent tipping points - the impacts are linear**

**Risby 11** (James Risby, Researcher, Marine and Atmospheric Research at CSIRO, PhD in Climatology from MIT, 6/15/11, "Speaking science to climate policy," The Conversation, http://theconversation.edu.au/speaking-science-to-climate-policy-1548)

Climatology can tell us, however, what is likely to happen if we don’t act, or if we don’t act with sufficient speed to keep total emissions within specific carbon allocations. There is no single threshold above which climate change is dangerous and below which it is safe. There is a spectrum of impacts. But some of the largest impacts are effectively irreversible and the thresholds for them are very near. In particular, the melting and breakdown of polar ice sheets seems to be in the vicinity of a couple of degrees warming. This expectation is based on current high rates of mass loss from the ice sheets compared to relative stability through the Holocene (the past 10,000 years) and on past ice sheet response in periods such as the Pliocene (a few million years ago) when the Earth was a couple of degrees warmer than preindustrial times (and sea level up to 25m higher). We have already had about 0.8°C warming globally, with another third of a degree locked in by the inertia of the climate system. That leaves, somewhat optimistically, perhaps a degree or so of wiggle room. Translating that into carbon emissions, if we wish to keep the total warming below about 2°C (with 50% chance), then we have a total global carbon emission allocation of between about 800 and 1000Gt carbon. We have already emitted about 550Gt, leaving perhaps another 250–450Gt. Current global emissions are about 10Gt per year, growing at roughly 3% per year. That leaves a few decades at present rates before having committed to 2°C warming and crossing the expected thresholds for ice sheet disintegration. And that is for a 50% chance of not crossing the 2°C threshold. For more comfortable odds of staying within the threshold, the total carbon allocation drops and so the time to threshold is even shorter. Surely this estimate is vastly uncertain? Everything has some uncertainty, but the uncertainty in this case lies mostly in the timing, not in the essential result. Ice sheets are sensitive to warming somewhere in this vicinity of temperature change and the climate system will yield 2°C warming somewhere in the vicinity of 800–1000Gt of carbon emissions.

# Adaptation

## Yes Adaptation - Intervening Actors

Intervening actors solve - the SQ has plans to deal with warming

Kenny 12 (Charles Kenny, senior fellow at the Center for Global Development, a Schwartz fellow at the New America Foundation, 4/9/12, "Not Too Hot to Handle," Foreign Policy, http://www.foreignpolicy.com/articles/2012/04/09/not\_too\_hot\_to\_handle)

But for all international diplomats appear desperate to affirm the self-worth of pessimists and doomsayers worldwide, it is important to put climate change in a broader context. It is a vital global issue -- one that threatens to slow the worldwide march toward improved quality of life. Climate change is already responsible for more extreme weather and an accelerating rate of species extinction -- and may ultimately kill off as many as 40 percent of all living species. But it is also a problem that we know how to tackle, and one to which we have some time to respond before it is likely to completely derail progress. And that's good news, because the fact that it's manageable is the best reason to try to tackle it rather than abandon all hope like a steerage class passenger in the bowels of the Titanic. Start with the economy. The Stern Review, led by the distinguished British economist Nicholas Stern, is the most comprehensive look to date at the economics of climate change. It suggests that, in terms of income, greenhouse gasses are a threat to global growth, but hardly an immediate or catastrophic one. Take the impact of climate change on the developing world. The most depressing forecast in terms of developing country growth in Stern's paper is the "A2 scenario" -- one of a series of economic and greenhouse gas emissions forecasts created for the U.N.'s Intergovernmental Panel on Climate Change (IPCC). It's a model that predicts slow global growth and income convergence (poor countries catching up to rich countries). But even under this model, Afghanistan's GDP per capita climbs sixfold over the next 90 years, India and China ninefold, and Ethiopia's income increases by a factor of 10. Knock off a third for the most pessimistic simulation of the economic impact of climate change suggested by the Stern report, and people in those countries are still markedly better off -- four times as rich for Afghanistan, a little more than six times as rich for Ethiopia. It's worth emphasizing that the Stern report suggests that the costs of dramatically reducing greenhouse-gas emissions is closer to 1 (or maybe 2) percent of world GDP -- in the region of $600 billion to $1.2 trillion today. The economic case for responding to climate change by pricing carbon and investing in alternate energy sources is a slam dunk. But for all the likelihood that the world will be a poorer, denuded place than it would be if we responded rapidly to reduce greenhouse gases, the global economy is probably not going to collapse over the next century even if we are idiotic enough to delay our response to climate change by a few years. For all the flooding, the drought, and the skyrocketing bills for air conditioning, the economy would keep on expanding, according to the data that Stern uses.

## Yes Adaptation - Growth

Growth solves

Kenny 12 (Charles Kenny, senior fellow at the Center for Global Development, a Schwartz fellow at the New America Foundation, 4/9/12, "Not Too Hot to Handle," Foreign Policy, http://www.foreignpolicy.com/articles/2012/04/09/not\_too\_hot\_to\_handle)

Again, while climate change will make extreme weather events and natural disasters like flooding and hurricanes more common, the negative effect on global quality of life will be reduced if economies continue to grow. That's because, as Matthew Kahn from Tufts University has shown, the safest place to suffer a natural disaster is in a rich country. The more money that people and governments have, the more they can both afford and enforce building codes, land use regulations, and public infrastructure like flood defenses that lower death tolls.

## Yes Adaptation - Empirics

**Humans are already adapting to climate change**

Biello (Environmental specialist staff writer for the Scientific American) 2012

(David, “How to Adapt to Climate Change,” 60-Second Earth, Energy & Sustainability, May 6, 2012, <http://www.scientificamerican.com/podcast/episode.cfm?id=how-to-adapt-to-climate-change-12-05-06>) //CL

For want of a mangrove, the village was lost. In fact, the loss of coastal mangroves made even a costly dyke along the Vietnamese seashore inadequate to cope with a recent typhoon. Plus, the absence of mangroves hit livelihoods—less seafood to catch. But one village had painstakingly replanted mangroves, scraping barnacles off the seedlings to ensure they took root. In return, those mangroves protected the village from the typhoon that devastated the rest of the coast. This is not a fable, it's a tale of how people are already adapting to climate change, as revealed at the International Institute for Environment and Development's sixth conference on community-based adaptation to climate change held in Vietnam in April. Farmers are trying to adapt, too. Whether by growing ginger in the shade of banana fronds in Southeast Asia or planting millet beneath new trees in the Sahel region of Africa. Those who can't adapt have to move, like Alaskans whose coastal towns have been undermined by severe winds or waves. Or whose water sources have been infiltrated by brine.

**Humans will adapt to a climate-changed world - empirics**

McDermott (Science and Climate Change staff writer for the Discovery Network sub-site Treehugger) 2012

Mat, “Exxon's CEO is Right, We Will Adapt to Climate Change,” June 29, 2012, <http://www.treehugger.com/climate-change/exxons-ceo-right-we-will-adapt-climate-change.html>) //CL

(Image Caption: Unprecedented wildfires are burning in the American west. What does big oil have to say about climate change? “We have spent our entire existence adapting. We’ll adapt.” – ExxonMobil CEO Red Tillerson, 6/27/12) I'm a day late to this image above and the social media outrage around it, but I've been thinking, and unfortunately ExxonMobil's CEO is right. That's the unfashionable thing to say in green circles, but he is right. Humanity has spent its time on this planet adapting. Both adapting the world we inhabit to meet our needs, on various timescales and over various areas of the globe, as well as adapting to the local conditions under which we live. And, we will adapt to climate change. But nevertheless, the statement is obfuscation of the highest order; it is literally true but contextually entirely false. And it is there where it's deep insidiousness resides. How many humans the planet can support in a world that is 2°C, 3°C, 4-6°C warmer on average—with all the ecosystem, biodiversity, agricultural changes that brings—is a very much open question. The odds are solidly in favor of far less than it now does, just because of climate change, ignoring resource overconsumption and population growth. Which is all to say, that while humanity will adapt to a climate changed world is true, there is no doubt that climate change will create, in comparison to today, let alone a pre-industrial, lower population world, a world that is less bountiful, prone to more extremes of temperature and weather in many places, less fecund—and since we're talking about human adaptation, more difficult to live in and less conducive to human civilization.

## Yes Adaptation - Insects Prove

**Organisms are capable of adapting to climate change – insects prove**

P M Brakefield and P W de Jong (Institute of Biology, Leiden University) 27 July 2011 A steep cline in ladybird melanism has decayed over 25 years: a genetic response to climate change? http://www.nature.com/hdy/journal/v107/n6/full/hdy201149a.html#bib4

A variety of processes can enable organisms, including insects, to respond successfully to climate change (Stenseth et al., 2002; Bradshaw and Holzapfel, 2006; Parmesan, 2006). These include habitat tracking, phenotypic plasticity and genetic adaptation or some combination thereof. Evidence for the first of these mechanisms is becoming comparatively commonplace. Thus, many species of butterfly on the northern and southern edges of their range are clearly responding with northern extensions in their range limits (Parmesan and Yohe, 2003; see also Thomas et al., 2004; Hickling et al., 2006), and species of moth and other insects are moving up altitudinal gradients (Chen et al., 2009). The extent to which changes in phenotypic plasticity are (or will be) involved in the numerous reports of changes in phenology (Brakefield, 1987; Roy and Sparks, 2000; Amano et al., 2010) is not clear but in some case studies, including the timing of egg hatching in the winter moth and of egg laying in the great tit, there is already evidence that strong selection can occur on the characteristics of the underlying norms of reaction (Visser and Holleman, 2001; van Asch and Visser, 2007). There are as yet few reports of genetic changes within populations linked to climate change, including in insects. The pitcher plant mosquito, Wyeomyia smithii, showed a genetic response to climate change, which involved changes in sensitivity to photoperiod (Bradshaw et al., 2006). The change could be detected over a period as short as 5 years. On a wider geographic scale, changes in clines for the alcohol dehydrogenase polymorphism or in the frequencies of certain chromosome inversion polymorphisms have been detected in natural populations of species of Drosophila and linked to climate change (Umina et al., 2005; Balanyá et al., 2006).

## No Adaptation - Info

**Humans will be unable to adapt to climate change**

Haby (Meteorologist with The Weather Prediction) 2010

(Jeff, “Global Warming,” 2010, <http://www.theweatherprediction.com/global_warming/>) //CL

One of the most talked about topics in meteorology and climatology is global warming. Global warming is the theory that states when greenhouse gases are added to the earth's atmosphere the result will be for increased average global temperature. The main greenhouse gas that is of concern is Carbon Dioxide. The replacing of trees and vegetation with pavement also contributes to warmer surface temperatures. This page will clarify many of the issues about global warming. It has been debated whether global warming is a theory or a fact. The overwhelming majority of scientists studying the issue agree that global warming is a fact, although there is considerable debate on the magnitude. Although global warming is widely believed, it is a problem that is easy to put off. It is easier to notice sudden changes such as a volcanic eruptions and tsunamis than it is to notice slow processes such as climate change. At one extreme of the global warming debate is those that believe the change in precipitation, temperature and sea level will be severe. They predict the average global temperature to rise several degrees Celsius over the next several decades. Sea level will rise and take over large portions of the land in coastal areas. Agriculture will be significantly impacted with some currently rainy regions becoming much drier and some dry regions becoming much wetter. Humans will be unable to adapt very successfully to the change: disease, famine and destruction of the world economy will far surpass the problems of today.

## No Adaptation - AT: Growth

**Many countries can’t adapt to climate change – causes social crisis**

Marien (Founder and editor of Future Survey, Director, Global Foresight Books, Ph.D. in social science and national planning studies from Maxwell School of Citizenship and Public Affairs at Syracuse University, Fellow of the World Academy of Art and Science) 2012

(Michael, “Dow and Downing, The Atlas of Climate Change,” February 2012, <http://www.globalforesightbooks.org/Book-of-the-Month/dow-and-downing-the-atlas-of-climate-change.html>) //CL

CLIMATE & SOCIAL CRISES. Dramatic alterations called “tipping elements” could occur in the Earth’s biophysical system. Examples include an ice-free Arctic in summer that accelerates warming, accelerated melting of the Greenland ice sheet, collapse of the West Antarctic ice sheet, melting ice shifts the Gulf Stream south in the Atlantic Ocean, dieback of the Amazon rainforest, boreal forests exposed to fire and pests, and an abrupt climate shift resulting in Sahara and West African monsoons. Countries unable to adapt to the impact of climate change could see social and political upheaval. By 2050, “the global burden of migration related to climate change might be 100 million.”

# Evidence Comparison

## Alarmism Good - More Qualified

**Cooption is inevitable on both sides because of the litany of incentives - objective measures prove our scientists more qualified**

**Andregg et. al 10** (William Andregg, Biology @ Stanford, James Prall, Electrical/Computer Engineering @ Univ of Toronto, Jacob Harold, William and Flora Hewlett Foundation, Stephen Schneider, Woods Institute for the Environment, April 2010, "Expert credibility in climate change," Proceedings of the National Academy of Sciences (PNAS), http://www.pnas.org/content/early/2010/06/04/1003187107.full.pdf+html)

The UE group comprises only 2% of the top 50 climate researchers as ranked by expertise (number of climate publications), 3% of researchers of the top 100, and 2.5% of the top 200, excluding researchers present in both groups (Materials and Methods). This result closely agrees with expert surveys, indicating that ≈97% of self-identiﬁed actively publishing climate scientists agree with the tenets of ACC (2). Furthermore, this ﬁnding complements direct polling of the climate researcher community, which yields qualitative and self-reported researcher expertise (2). Our ﬁndings capture the added dimension of the distribution of researcher expertise, quantify agreement among the highest expertise climate researchers, and provide an independent assessment of level of scientiﬁc consensus concerning ACC. In addition to the striking difference in number of expert researchers between CE and UE groups, the distribution of expertise of the UE group is far below that of the CE group (Fig. 1). Mean expertise of the UE group was around half (60 publications) that of the CE group (119 publications; Mann–Whitney U test: W = 57,020; P < 10 −14 ), as was median expertise (UE = 34 publications; CE = 84 publications). Furthermore, researchers with fewer than 20 climate publications comprise ≈80% the UE group, as opposed to less than 10% of the CE group. This indicates that the bulk of UE researchers on the most prominent multisignatory statements about climate change have not published extensively in the peer-reviewed climate literature. We examined a subsample of the 50 most-published (highestexpertise) researchers from each group. Such subsampling facilitates comparison of relative expertise between groups (normalizing differences between absolute numbers). This method reveals large differences in relative expertise between CE and UE groups (Fig. 2). Though the top-published researchers in the CE group have an average of 408 climate publications (median = 344), the top UE researchers average only 89 publications (median = 68; Mann– Whitney U test: W = 2,455; P < 10 −15 ). Thus, this suggests that not all experts are equal, and top CE researchers have much stronger expertise in climate science than those in the top UE group. Finally, our prominence criterion provides an independent and approximate estimate of the relative scientiﬁc signiﬁcance of CE and UE publications. Citation analysis complements publication analysis because it can, in general terms, capture the quality and impact of a researcher’s contribution—a critical component to overall scientiﬁc credibility—as opposed to measuring a researcher’s involvement in a ﬁeld, or expertise (Materials and Methods). The citation analysis conducted here further complements the publication analysis because it does not examine solely climaterelevant publications and thus captures highly prominent researchers who may not be directly involved with the climate ﬁeld. We examined the top four most-cited papers for each CE and UE researcher with 20 or more climate publications and found immense disparity in scientiﬁc prominence between CE and UE communities (Mann–Whitney U test: W = 50,710; P < 10 −6 ; Fig. 3). CE researchers’ top papers were cited an average of 172 times, compared with 105 times for UE researchers. Because a single, highly cited paper does not establish a highly credible reputation but might instead reﬂect the controversial nature of that paper (often called the single-paper effect), we also considered the average the citation count of the second through fourth most-highly cited papers of each researcher. Results were robust when only these papers were considered (CE mean: 133; UE mean: 84; Mann–Whitney U test: W = 50,492; P < 10 −6 ). Results were robust when all 1,372 researchers, including those with fewer than 20 climate publications, were considered (CE mean: 126; UE mean: 59; Mann–Whitney U test: W = 3.5 × 10 5 ; P < 10 −15 ). Number of citations is an imperfect but useful benchmark for a group’s scientiﬁc prominence (Materials and Methods), and we show here that even considering all (e.g., climate and nonclimate) publications, the UE researcher group has substantially lower prominence than the CE group. We provide a large-scale quantitative assessment of the relative level of agreement, expertise, and prominence in the climate researcher community. We show that the expertise and prominence, two integral components of overall expert credibility, of climate researchers convinced by the evidence of ACC vastly overshadows that of the climate change skeptics and contrarians. This divide is even starker when considering the top researchers in each group. Despite media tendencies to present both sides in ACC debates (9), which can contribute to continued public misunderstanding regarding ACC (7, 11, 12, 14), not all climate researchers are equal in scientiﬁc credibility and expertise in the climate system. This extensive analysis of the mainstream versus skeptical/contrarian researchers suggests a strong role for considering expert credibility in the relative weight of and attention to these groups of researchers in future discussions in media, policy, and public forums regarding anthropogenic global warming.

## Denialism Bad - Peer Review

## Denialism Good - More Qualified

**Warming skeptics are more scientifically knowledgeable than alarmists**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2012 (John M., “Climate Change Weekly: Global Warming Skeptics More Knowledgeable than Alarmists,” June 1, 2012, <http://news.heartland.org/newspaper-article/2012/06/01/climate-change-weekly-global-warming-skeptics-more-knowledgeable-alarmi>) //CL

Global warming alarmists often accuse skeptics of being “anti-science,” but a newly published peer-reviewed study finds skeptics are more scientifically knowledgeable than the alarmist name-callers. The study, published Sunday in Nature Climate Change, documented that global warming skeptics scored better on a test of 22 scientific and statistical questions than people who are worried about global warming. A team of researchers, led by a professor at Yale University, tested more than 1,500 U.S. adults on their scientific literacy and technical reasoning capacity, and then asked them to assign a numerical value to how concerned they are about climate change. According to the study, “Members of the public with the highest degrees of scientific literacy and technical reasoning capacity were not the most concerned about climate change.” “As respondents’ science literacy scores increased, their concern with climate change decreased,” observed the study, which was funded by the National Science Foundation.

## Denialism Good - Political Incentives

**Claims of warming are politics, not science – the IPCC reports are riddled with errors and should not be used to justify policy**

Armstrong, Green, and Soon 11 (J. Scott Armstrong is a professor of marketing at the University of Pennsylvania, Kesten C. Green is a Senior Research Fellow with the Business and Economic Forecasting Unit at Monash University, Willie Soon is an astrophysicist and geoscientist at the Solar and Stellar Physics Division of the Harvard-Smithsonian Center for Astrophysics, 2011, “Research on Forecasting for the Manmade Global Warming Alarm” Energy & Environment, Vol. 22 Issue 8, Ebsco)

The validity of the manmade global warming alarm requires the support of scientific forecasts of (1) a substantive long-term rise in global mean temperatures in the absence of regulations, (2) serious net harmful effects due to global warming, and (3) cost-effective regulations that would produce net beneficial effects versus alternatives policies, including doing nothing. Without scientific forecasts for all three aspects of the alarm, there is no scientific basis to enact regulations. In effect, the warming alarm is like a three-legged stool: each leg needs to be strong. Despite repeated appeals to global warming alarmists, we have been unable to find scientific forecasts for any of the three legs. We drew upon scientific (evidence-based) forecasting principles to audit the forecasting procedures used to forecast global mean temperatures by the Intergovernmental Panel on Climate Change (IPCC) — leg “1” of the stool. This audit found that the IPCC procedures violated 81% of the 89 relevant forecasting principles. We also audited forecasting procedures, used in two papers, that were written to support regulation regarding the protection of polar bears from global warming — leg “3” of the stool. On average the forecasting procedures violated 85% of the 90 relevant principles. The warming alarmists have not demonstrated the predictive validity of their procedures. Instead, their argument for predictive validity is based on their claim that nearly all scientists agree with the forecasts. This count of “votes” by scientists is not only an incorrect tally of scientific opinion, it is also, and most importantly, contrary to the scientific method. We conducted a validation test of the IPCC forecasts that were based on the assumption that there would be no regulations. The errors for the IPCC model long-term forecasts (for 91 to 100 years in the future) were 12.6 times larger than those from an evidence-based “no change” model. Based on our own analyses and the documented unscientific behavior of global warming alarmists, we concluded that the global warming alarm is the product of an anti-scientific political movement. Having come to this conclusion, we turned to the “structured analogies” method to forecast the likely outcomes of the warming alarmist movement. In our ongoing study we have, to date, identified 26 similar historical alarmist movements. None of the forecasts behind the analogous alarms proved correct. Twenty-five alarms involved calls for government intervention and the government imposed regulations in 23. None of the 23 interventions was effective and harm was caused by 20 of them. Our findings on the scientific evidence related to global warming forecasts lead to the following recommendations: 1. End government funding for climate change research. 2. End government funding for research predicated on global warming (e.g., alternative energy; CO2 reduction; habitat loss). 3. End government programs and repeal regulations predicated on global warming. 4. End government support for organizations that lobby or campaign predicated on global warming.

## Denalism Good - Economic Incentives

Alarmists have economic incentives to exaggerate

Jasper 12 (William Jasper, staff writer, 7/13/12, " 'Climate Science' in Shambles: Real Scientists Battle UN Agenda," The New American, http://www.thenewamerican.com/tech/environment/item/11998-%E2%80%9Cclimate-science%E2%80%9D-in-shambles-real-scientists-battle-un-agenda)

Until recently, the AGW alarmists definitely had the upper hand. For one thing, they have been organized. For another, they have been outspending the climate realists by a huge order of magnitude. In 2007, Sen. James Inhofe (R-Okla.), the ranking member of the Environment & Public Works Committee, showed that proponents of man-made global warming enjoyed a monumental funding advantage over the skeptics. The alarmists had received a whopping $50 billion — mostly from the federal government — compared to “a paltry $19 million and some change” for the realists. A 2009 study entitled “Climate Money,” by Joanne Nova for the Science & Public Policy Institute, found that the U.S. government had sunk $79 billion into climate-change-related activities (science research, alternative energy technology, foreign aid, etc.) between 1989 and 2009. That total does not include additional massive funding from state governments, foundations, and corporations. Similar levels of funding have been poured into “climate policy” by European Union institutions and the national governments of European nations and Japan. This super-extravagant lavishing of state funding on a new scientific field has created an instant global climate industry that is government-fed and completely political. However, these sums, impressive as they are, represent only the very tip of the mountain of “climate cash” that has the political classes panting and salivating. They smell not only tens of billions of dollars for research and technology, but also hundreds of billions for “climate debt” foreign aid, and trillions to be made in CO2 cap-and-trade schemes. The politicization and corruption of climate science is, perhaps, most clearly evident from the continuing cavalcade of shocking scandals: Climategate, Climate­gate 2.0, Himalayan Glaciergate, Alaskan Glaciergate, Amazongate, Sea Levelgate, Fakegate, Satellitegate, Antarctic Sea Icegate, Hockey Stickgate, Hurricanegate, Surface Weather Stationgate, Russiagate, etc. The Germany-based engineer P. Gosselin has catalogued 129 climate scandals at his website, NoTrickZone.com. Fortunately, each of these transgressions against the integrity of science has caused new circles of scientists to become aware of, and outraged by, the chicanery being employed by the political operatives masquerading as scientists. And the genuine scientists are stepping into the gap in increasing numbers to fight for truth and to expose the climate-change flim-flam artists who are perverting science.

**The perception of consensus about global warming is merely the result of scientist’s fear to speak out because it may cost them their job and alarmism spread by those who benefit from the spending to try and curb the supposed change**

Allegre et al 11 (Claude Allegre, former director of the Institute for the Study of the Earth, University of Paris; J. Scott Armstrong, cofounder of the Journal of Forecasting and the International Journal of Forecasting; Jan Breslow, head of the Laboratory of Biochemical Genetics and Metabolism, Rockefeller University; Roger Cohen, fellow, American Physical Society; Edward David, member, National Academy of Engineering and National Academy of Sciences; William Happer, professor of physics, Princeton; Michael Kelly, professor of technology, University of Cambridge, U.K.; William Kininmonth, former head of climate research at the Australian Bureau of Meteorology; Richard Lindzen, professor of atmospheric sciences, MIT; James McGrath, professor of chemistry, Virginia Technical University; Rodney Nichols, former president and CEO of the New York Academy of Sciences; Burt Rutan, aerospace engineer, designer of Voyager and SpaceShipOne; Harrison H. Schmitt, Apollo 17 astronaut and former U.S. senator; Nir Shaviv, professor of astrophysics, Hebrew University, Jerusalem; Henk Tennekes, former director, Royal Dutch Meteorological Service; Antonio Zichichi, president of the World Federation of Scientists, Geneva; 10/18/11; “No Need to Panic About Global Warming” Wall Street Journal; http://online.wsj.com/article/SB10001424052970204301404577171531838421366.html)

Although the number of publicly dissenting scientists is growing, many young scientists furtively say that while they also have serious doubts about the global-warming message, they are afraid to speak up for fear of not being promoted—or worse. They have good reason to worry. In 2003, Dr. Chris de Freitas, the editor of the journal Climate Research, dared to publish a peer-reviewed article with the politically incorrect (but factually correct) conclusion that the recent warming is not unusual in the context of climate changes over the past thousand years. The international warming establishment quickly mounted a determined campaign to have Dr. de Freitas removed from his editorial job and fired from his university position. Fortunately, Dr. de Freitas was able to keep his university job. This is not the way science is supposed to work, but we have seen it before—for example, in the frightening period when Trofim Lysenko hijacked biology in the Soviet Union. Soviet biologists who revealed that they believed in genes, which Lysenko maintained were a bourgeois fiction, were fired from their jobs. Many were sent to the gulag and some were condemned to death. Why is there so much passion about global warming, and why has the issue become so vexing that the American Physical Society, from which Dr. Giaever resigned a few months ago, refused the seemingly reasonable request by many of its members to remove the word "incontrovertible" from its description of a scientific issue? There are several reasons, but a good place to start is the old question "cui bono?" Or the modern update, "Follow the money." Alarmism over climate is of great benefit to many, providing government funding for academic research and a reason for government bureaucracies to grow. Alarmism also offers an excuse for governments to raise taxes, taxpayer-funded subsidies for businesses that understand how to work the political system, and a lure for big donations to charitable foundations promising to save the planet. Lysenko and his team lived very well, and they fiercely defended their dogma and the privileges it brought them. Speaking for many scientists and engineers who have looked carefully and independently at the science of climate, we have a message to any candidate for public office: There is no compelling scientific argument for drastic action to "decarbonize" the world's economy. Even if one accepts the inflated climate forecasts of the IPCC, aggressive greenhouse-gas control policies are not justified economically. A recent study of a wide variety of policy options by Yale economist William Nordhaus showed that nearly the highest benefit-to-cost ratio is achieved for a policy that allows 50 more years of economic growth unimpeded by greenhouse gas controls. This would be especially beneficial to the less-developed parts of the world that would like to share some of the same advantages of material well-being, health and life expectancy that the fully developed parts of the world enjoy now. Many other policy responses would have a negative return on investment. And it is likely that more CO2 and the modest warming that may come with it will be an overall benefit to the planet.

**The IPCC had no justification for its methods of investigation and violated 81% of forecasting principles**

Armstrong, Green, and Soon 11 (J. Scott Armstrong is a professor of marketing at the University of Pennsylvania, Kesten C. Green is a Senior Research Fellow with the Business and Economic Forecasting Unit at Monash University, Willie Soon is an astrophysicist and geoscientist at the Solar and Stellar Physics Division of the Harvard-Smithsonian Center for Astrophysics, 2011, “Research on Forecasting for the Manmade Global Warming Alarm” Energy & Environment, Vol. 22 Issue 8, Ebsco)

Kesten Green surveyed climate experts (many of whom were IPCC authors and editors) to find the most credible source for forecasts on climate change. Most respondents referred to the IPCC report and some specifically to Chapter 8, the key IPCC chapter on forecasting (Randall et al. 2007). Kesten Green and I examined the references to determine whether the authors of Chapter 8 were familiar with the evidence-based literature on forecasting. We found that none of their 788 references related to that body of literature. We could find no references that validated their choice of forecasting procedures. In other words, **the IPCC report contained no evidence that the forecasting procedures they used were based on evidence of their predictive ability**. We then conducted an audit of the forecasting procedures using Forecasting Audit Software, which is freely available on forprin.com. Kesten Green and I independently coded the IPCC procedures against the 140 forecasting principles, and then we discussed differences in order to reach agreement. We also invited comments and suggestions from the authors of the IPCC report that we were able to contact in hope of filling in missing information. None of them replied with suggestions and one threatened to lodge a complaint if he received any further correspondence. We described the coding procedures we used for our audit in Green and Armstrong (2007a). We concluded from our audit that invalid procedures were used for forecasting global mean temperatures. Our findings, described in Green and Armstrong (2007a), are summarized in Exhibit 1. Based on the available information, 81% of the 89 relevant principles were violated. There were an additional 38 relevant principles, but the IPCC chapter provided insufficient information for coding and the IPCC authors did not supply the information that we requested.

## AT: Consensus - Useless

So-called "denialists" are on the right side of the debate - their evidence is full of groupthink and scare tactics that marginalize legitimate scientists

Jasper 12 (William Jasper, staff writer, 7/13/12, " 'Climate Science' in Shambles: Real Scientists Battle UN Agenda," The New American, http://www.thenewamerican.com/tech/environment/item/11998-%E2%80%9Cclimate-science%E2%80%9D-in-shambles-real-scientists-battle-un-agenda)

“All agree that climate change is an existential threat to humankind,” stated UN Secretary-General Ban Ki-moon, before the UN’s 2009 Climate Change Conference in Copenhagen. “All agree”? “Existential threat”? In this statement, the chief UN bureaucrat took the false “consensus” claim a quantum leap beyond even Al Gore’s lurid assertions. The Gore choir has been declaring for years that there is an overwhelming “consensus” among scientists that catastrophic AGW is real and imminent. According to Ban Ki-moon, we’ve gone beyond consensus to unanimity, and not just among scientists but “all,” presumably meaning every person on Earth agrees that global warming is a dire threat to humanity’s very existence. That, of course, is nonsense. However, while Ban’s unanimity plea is easily recognizable as patently ridiculous, the consensus claim has bamboozled a great many people, including scientists who should know better. Aside from the fact that science is not determined by consensus, but by observation, experimentation, and measurement, the truth is that the AGW “consensus” involves a relatively small coterie of climate scientists who have been placed in key gatekeeper positions, enabling them to co-opt the claim of “scientific consensus” on AGW, while squashing dissenting voices and branding all dissenters as “cranks,” “outliers,” or, even, “deniers.” The use of the “denier” label is an especially odious tactic, intentionally aimed at smearing fellow scientists who dissent from AGW theory as equivalent to Holocaust deniers. The Climategate e-mails showed top climate activists at major universities and other institutions conspiring to punish scientists with opposing viewpoints and to prevent them from being published in the scientific literature. It also showed that they were going to great lengths to doctor their evidence to make it “prove” their preordained outcomes. What’s more, they have refused to make their data publicly available to scientific peers for independent review — as genuine scientific procedure demands — and when pressed on the issue, have claimed that the evidence has been “lost.” Some of the top names in climate alarmism — Michael Mann, Phil Jones, Kevin Trenberth, Rajendra Pachauri, Stephan Ramsdorf, James Hansen, Peter Gleick — demonstrated repeatedly that they are engaged in abusing science for a global political agenda. The AGW consensus scam is one of the most astounding frauds in all of history, not only because it is patently false, but also because it is being used to propel the most sweeping and authoritarian scheme for global economic, social, and political regimentation the world has ever seen. This is not merely a theoretical scientific debate; the alleged “science” is being used to drive policy and legislation — at a global level. The policies they have already succeeded in imposing have caused devastating impacts, especially on the world’s poorest populations. The additional policies they propose would cause even more horrendous results. The AGW alarmists insist that “science has spoken,” and it is telling us, they say, that we must subject ourselves to UN-mandated global governance — which is to be determined, of course, by scientists who toe the UN-approved, IPCC-certified party line.

Consensus is an inaccurate tool to determine the veracity of any truth claims - exaggerated numbers prove

Jasper 12 (William Jasper, staff writer, 7/13/12, " 'Climate Science' in Shambles: Real Scientists Battle UN Agenda," The New American, http://www.thenewamerican.com/tech/environment/item/11998-%E2%80%9Cclimate-science%E2%80%9D-in-shambles-real-scientists-battle-un-agenda)

Again, the aforementioned experts represent but a small sampling of the distinguished company of international scientific heavyweights who dispute the so-called AGW consensus. This is important to note, as the climate alarmists have gone to great lengths in using the logical fallacy of “argument by authority” to convince us that only right-wing whackos and illiterate wingnuts reject Al Gore’s “the science is settled” trope. The IPCC alarmists and their media allies never weary of telling us that the IPCC’s reports represent the views of 4,000 climate scientists who endorse the IPCC’s sense of crisis and alarm. However, as researcher John McLean reported in his 2009 study entitled “The IPCC Can’t Count Its ‘Expert Scientists’: Author and Reviewer Numbers Are Wrong,” the UN’s preeminent science body double-counts scientists and further pads their numbers by counting many non-scientific personnel who participate in the research assessments. Finally, the IPCC’s non-scientist policy wonks who write the political conclusions of the IPCC reports hijack whatever real science has been done by its qualified experts, falsely attributing a nonexistent consensus or unanimity to the scientific teams and ignoring the reservations or dissenting opinions of the non-conformists. McLean’s analysis, published by the Science & Public Policy Institute (SPPI), found that the “4,000 scientists” consensus claim for the IPCC’s 4th Assessment (2010) was spectacularly exaggerated. He notes: Fifty-three authors and five reviewers are all that might generously be said to have explicitly supported the claim of a significant human influence on climate. Forget any notion that 4,000 scientists supported the claim or even the 3750+ people as mentioned by the IPCC. Also forget any notion that all 2890 individuals who were authors, reviewers or both supported the claim. The only explicit evidence is for support from just less than 60 individuals. Please note, the number of scientists in the IPCC report that the organization may honestly be able to say have endorsed the IPCC’s AGW catastrophism, is more on the order of 50-60 individuals, not 4,000. That is a very significant discrepancy, to say the least! It has taken a long time for the thousands of AGW skeptics (or “climate realists,” as many prefer to be called) to come to the fore. Why is that? Astrophysicist Dr. Nir Shaviv of the Hebrew University of Jerusalem, a former AGW believer himself, says most scientists are so busy in their own specialties that, like most laymen, they don’t consider that the “consensus” may be completely contrived. But that has changed, he says. “Each one of us was working in his or her own niche,” says Shaviv. “While working there, each one of us realized that things just don't add up to support the AGW picture. So many had to change their views.”

Consensus flows against warming

Jasper 12 (William Jasper, staff writer, 7/13/12, " 'Climate Science' in Shambles: Real Scientists Battle UN Agenda," The New American, http://www.thenewamerican.com/tech/environment/item/11998-%E2%80%9Cclimate-science%E2%80%9D-in-shambles-real-scientists-battle-un-agenda)

A large number of noted climatologists, paleoclimatologists, meteorologists, atmospheric physicists, geophysicists, oceanographers, geologists, and scientists in virtually every field has been challenging the claims of the UN’s IPCC and vigorously denouncing the politicization of IPCC “science” to promote costly and draconian global policies. Some of the IPCC’s most severe critics are scientists who have served as lead authors and expert reviewers of IPCC reports and have witnessed from the inside the blatant bias and politics masquerading as science. Former and current IPCC experts who have spoken out against the IPCC’s abuse of science include such prominent scientists as: Dr. Richard Lindzen, MIT climate physicist and Alfred P. Sloan Professor of meteorology, Dept. of Earth, Atmospheric and Planetary Sciences; Dr. John Christy, a climatologist of the University of Alabama in Huntsville and NASA; Dr. Lee C. Gerhard, past director and state geologist with the Kansas Geological Society and a senior scientist emeritus of the University of Kansas; Dr. Patrick J. Michaels, former Virginia State climatologist, a UN IPCC reviewer, and University of Virginia professor of environmental sciences; Dr. Vincent Gray, New Zealand chemist and climate researcher; Dr. Tom V. Segalstad, geologist/geochemist, head of the Geological Museum in Norway; Dr. John T. Everett, a former National Oceanic and Atmospheric Administration (NOAA) senior manager and project manager for the UN Atlas of the Oceans. The above-mentioned IPCC experts represent only a tiny subset of the scientists involved in the climate debate who take serious issue with the alarmist claims. More than 31,000 scientists in the United States have signed a petition urging the U.S. government to reject the kinds of AGW policies proposed by the UN and environmental extremists. The Petition Project, organized by Dr. Arthur Robinson of the Oregon Institute of Science and Medicine and Dr. Frederick Seitz, past president of the National Academy of Sciences, refutes claims that there is any kind of “consensus” regarding man-made global warming as a crisis or existential threat. The petition reads, in part: The proposed limits on greenhouse gases would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind. There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gasses is causing or will, in the foreseeable future, cause catastrophic heating of the Earth’s atmosphere and disruption of the Earth’s climate. More than 1,000 internationally renowned scientists have gone further; they have not merely signed a petition, but have made public statements challenging key claims of the AGW alarmists. Published in 2010, in a report by Marc Morano of ClimateDepot.com, this important collection of statements is an update of a similar report of 700 scientists’ statements published by Senator James Inhofe of the U.S. Senate Environment & Public Works Committee. The 1,000+ lineup of scientists reads like a Who’s Who of the global scientific community. It includes: Dr. William Happer, Cyrus Fogg Bracket professor of physics, Princeton University; Dr. Leonard Weinstein, 35 years at the NASA Langley Research Center and presently a senior research fellow at the National Institute of Aerospace; Nobel Prize-winning Stanford University physicist Dr. Robert B. Laughlin, formerly a research scientist at Lawrence Livermore National Laboratory; Dr. Anatoly Levitin, the head of the geomagnetic variations laboratory at the Institute of Terrestrial Magnetism, Ionosphere and Radiowave Propagation of the Russian Academy of Sciences; Swedish climatologist Dr. Hans Jelbring of the Paleogeophysics & Geodynamics Unit at Stockholm University; Burt Rutan, renowned engineer, inventor, and aviation/space pioneer; Dr. Willie Soon, Harvard-Smithsonian Center astrophysicist; Dr. Syun-Ichi Akasofu, emeritus professor of physics, and Founding Director, International Arctic Research Center of the University of Alaska Fairbanks; Dr. Bjarne Andresen, physicist, and professor, The Niels Bohr Institute, University of Copenhagen, Denmark; Dr. Ian D. Clark, Professor, isotope hydrogeology and paleoclimatology, University of Ottawa, Canada.

## AT: Consensus - It's Shifting

**There is NO consensus that global warming is real, a substantial and growing group of scientists are convinced by facts that global warming is not occurring**

Allegre et al 11 (Claude Allegre, former director of the Institute for the Study of the Earth, University of Paris; J. Scott Armstrong, cofounder of the Journal of Forecasting and the International Journal of Forecasting; Jan Breslow, head of the Laboratory of Biochemical Genetics and Metabolism, Rockefeller University; Roger Cohen, fellow, American Physical Society; Edward David, member, National Academy of Engineering and National Academy of Sciences; William Happer, professor of physics, Princeton; Michael Kelly, professor of technology, University of Cambridge, U.K.; William Kininmonth, former head of climate research at the Australian Bureau of Meteorology; Richard Lindzen, professor of atmospheric sciences, MIT; James McGrath, professor of chemistry, Virginia Technical University; Rodney Nichols, former president and CEO of the New York Academy of Sciences; Burt Rutan, aerospace engineer, designer of Voyager and SpaceShipOne; Harrison H. Schmitt, Apollo 17 astronaut and former U.S. senator; Nir Shaviv, professor of astrophysics, Hebrew University, Jerusalem; Henk Tennekes, former director, Royal Dutch Meteorological Service; Antonio Zichichi, president of the World Federation of Scientists, Geneva; 10/18/11; “No Need to Panic About Global Warming” Wall Street Journal; http://online.wsj.com/article/SB10001424052970204301404577171531838421366.html)

A candidate for public office in any contemporary democracy may have to consider what, if anything, to do about "global warming." Candidates should understand that the oft-repeated claim that nearly all scientists demand that something dramatic be done to stop global warming is not true. In fact, a large and growing number of distinguished scientists and engineers do not agree that drastic actions on global warming are needed. In September, Nobel Prize-winning physicist Ivar Giaever, a supporter of President Obama in the last election, publicly resigned from the American Physical Society (APS) with a letter that begins: "I did not renew [my membership] because I cannot live with the [APS policy] statement: 'The evidence is incontrovertible: Global warming is occurring. If no mitigating actions are taken, significant disruptions in the Earth's physical and ecological systems, social systems, security and human health are likely to occur. We must reduce emissions of greenhouse gases beginning now.' In the APS it is OK to discuss whether the mass of the proton changes over time and how a multi-universe behaves, but the evidence of global warming is incontrovertible?" In spite of a multidecade international campaign to enforce the message that increasing amounts of the "pollutant" carbon dioxide will destroy civilization, large numbers of scientists, many very prominent, share the opinions of Dr. Giaever. And the number of scientific "heretics" is growing with each passing year. The reason is a collection of stubborn scientific facts. Perhaps the most inconvenient fact is the lack of global warming for well over 10 years now. This is known to the warming establishment, as one can see from the 2009 "Climategate" email of climate scientist Kevin Trenberth: "The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't." But the warming is only missing if one believes computer models where so-called feedbacks involving water vapor and clouds greatly amplify the small effect of CO2. The lack of warming for more than a decade—indeed, the smaller-than-predicted warming over the 22 years since the U.N.'s Intergovernmental Panel on Climate Change (IPCC) began issuing projections—suggests that computer models have greatly exaggerated how much warming additional CO2 can cause. Faced with this embarrassment, those promoting alarm have shifted their drumbeat from warming to weather extremes, to enable anything unusual that happens in our chaotic climate to be ascribed to CO2. The fact is that CO2 is not a pollutant. CO2 is a colorless and odorless gas, exhaled at high concentrations by each of us, and a key component of the biosphere's life cycle. Plants do so much better with more CO2 that greenhouse operators often increase the CO2 concentrations by factors of three or four to get better growth. This is no surprise since plants and animals evolved when CO2 concentrations were about 10 times larger than they are today. Better plant varieties, chemical fertilizers and agricultural management contributed to the great increase in agricultural yields of the past century, but part of the increase almost certainly came from additional CO2 in the atmosphere.

## IPCC Indict

**The IPCC reports are riddled with inaccuracies and false information**

Singer 12 (S. Fred Singer, Professor Emeritus of Environmental Sciences at the University of Virginia and Research Fellow at The Independent Institute, June 2012, “IPCC Exercise in ‘Curve-Fitting’ To ‘Prove’

Anthropogenic Global Warming (AGW)” Energy and Environment, Volume 23, Number 4, Meta Press)

In its four major reports, IPCC has always tried to manufacture evidence for anthropogenic global warming (AGW). For example, IPCC-1 [1990] mentions the correlation between a rise in [global average surface] temperature and a rise in carbon dioxide - - without discussing the 35-year period [1940-1975] where global temperatures diminished while CO2 kept on rising. IPCC-2 [1996], in Chapter 8 (B.D. Santer, lead author), attempted to show that modeled and observed ‘fingerprints’ agreed – i.e., patterns of warming trends with latitude and altitude. It was soon discovered that the chapter contained a key graph that had been doctored by Santer and another key graph that contained selected data points —a sub-interval of rising temperatures, while the overall record showed no warming. Finally also, it was discovered that between scientists’ approval and printing there were significant text changes that affected the meaning of the chapter. All of these are discussed in detail in my paper in Energy and Environment 2011 http://multi-science.metapress.com/content/kv75274882804k98/fulltext.pdf. Note also that these changes supported the political SPM (Summary for Policymakers) with its claim of “balance of evidence” for AGW. Thus this IPCC report is directly responsible for the Kyoto Protocol and the waste of hundreds of billions of dollars. That IPCC and chief Kyoto promoter Al Gore shared a Nobel Prize is a travesty. The third IPCC report, IPCC-3 [2001], featured the notorious ‘Hockeystick’ graph. It tried to advance the claim that the 20th century showed unusual warming, compared to the past 1000 years. It was later demonstrated that the data were inadequate and the methodology faulty - -all of which invalidated the IPCC conclusion. The fourth IPCC report, IPCC-4 [2007], no longer featured the Hockeystick or ‘fingerprints,’ but made the claim that a combination of natural and human forcings could explain the reported global temperature record of the 20th century [see IPCC Figure 9.5 and the accompanying discussion in the text] I maintain that this is a curve fitting exercise, accomplished by choosing appropriate climate sensitivities for each of the many forcings.

## IPCC Fails

**IPCC wrong about clouds**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2012 (John M., “Climate Change Weekly: Global Warming Skeptics More Knowledgeable than Alarmists,” June 1, 2012, <http://news.heartland.org/newspaper-article/2012/06/01/climate-change-weekly-global-warming-skeptics-more-knowledgeable-alarmi>) //CL

NEW STUDY CONTRADICTS IPCC ON CLOUDS A newly published peer-reviewed study contradicts one of the key assumptions of alarmist computer models. Those models are programmed to assume that a cooling of the stratosphere is occurring as a result of clouds over the Earth’s poles trapping a significant amount of heat beneath the stratosphere. To the contrary, the new study finds clouds over the poles act to cool the stratosphere by adiabatic cooling rather than by trapping outgoing radiation.

**IPCC wrong about aerosols**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2011 (John M., “New Aerosol Study Refutes Global Warming Theory,” October 20, 2011, <http://news.heartland.org/newspaper-article/new-aerosol-study-refutes-global-warming-theory>) //CL

The amount of warming due to aerosols was so significant, the researchers reported, that aerosols alone could explain--in and of themselves and completely independent of greenhouse gases--the observed glacier retreat in the Eastern Himalayan Mountains. Milloy noted the new discovery further calls into question unreliable global warming models that have failed to explain why manmade carbon dioxide emissions steadily increased from about 1940 to 1975 even as global temperatures cooled. Said Milloy, "Global warming alarmists, such as the UN's Intergovernmental Panel on Climate Change, attempt to counter this observation by claiming that aerosol particles in the atmosphere--like soot and sulfates from fossil fuel combustion, and dust from volcanic eruptions--can mask the warming effect of greenhouse gases and cool the planet by reflecting solar radiation back into space. Earth has not warmed as predicted, they argue, because aerosol pollution is cooling the planet in a way that temporarily mitigates greenhouse gas warming. "The new aerosol study doesn't show that climate alarmists may be just a little off course--it shows that they may be 180 degrees off," Milloy added. "The aerosol study opens up the possibility for an entirely new hypothesis for global warming, with aerosols as the culprit. Yet up to now, the 'consensus' crowd has portrayed aerosols in the opposite light, as cooling agents."

## Idsos Indict

**The Idsos don’t have peer review and fill their work with meaningless jargon**

**UCS 5** (“Misinformation about climate change,” http://www.ucsusa.org/ssi/archive/climate-misinformation.html)

In an attempt to bank on the credibility science generally enjoys and to fight off accusations of making unscientific, biased claims, skeptics also pursue the idea "if you can't beat them, join them"—if only in appearance. EXAMPLE: The Center for the Study of Carbon Dioxide and Global Change This pseudo-scientific research center located in Tempe, AZ is currently headed up by Craig D. and Keith E. Idso, who are also involved with the Greening Earth Society. In a position paper on global warming [13], the two authors (the only listed staff of the Center) state, "There is little doubt the air's CO2 concentration has risen significantly since the inception of the Industrial Revolution; and there are few who do not attribute the CO2 increase to the increase in humanity's use of fossil fuels. There is also little doubt that the earth has warmed slightly over the same period; but there is no compelling reason to believe that the rise in temperature was caused by the rise in CO2. Furthermore it is highly unlikely that future increases in the air's CO2 content will produce any global warming; for there are numerous problems with the popular hypothesis that links the two phenomena." The authors then go on to flesh out these "problems" with scientific jargon, criticizing unscientific interpretations, and debunking claims never made by serious climate scientists. The "scientific" positions held by Center staff are not subjected to peer-review, and the Center's Scientific Advisors are mostly retired scientists without past or current research in climate-related sciences. It is not clear whether the CO2 Center is actually a separate entity from the Greening Earth Society.

**They’re paid by oil and gas companies**

**UCS 7** (“Responding to Global Warming Skeptics—Prominent Skeptics Organizations”, http://www.ucsusa.org/global\_warming/science/skeptic-organizations.html)

Center for the Study of Carbon Dioxide & Global Change The Center claims to "disseminate factual reports and sound commentary on new developments in the world-wide scientific quest to determine the climactic and biological consequences of the ongoing rise in the air's CO2 content." The Center is led by two brothers, Craig and Keith Idso. Their father, Sherwood Idso, is affiliated with the Greening Earth Society; the Center also shares a board member (Sylvan Wittwer) with GES. Both Idso brothers have been on the Western Fuels payroll at one time or another. Spin: Increased levels of CO2 will help plants, and that's good. Funding: The Center is extremely secretive of its funding sources, stating that it is their policy not to divulge it funders. There is evidence for a strong connection to the Greening Earth Society (ergo Western Fuels Association). Affiliated Individuals: Craig Idso, Keith Idso, Sylvan Wittwer \

## Idsos Prodict

**The Idsos use peer review and have done extensive research**

**D'Aleo 10** (Joseph D’Aleo, Director of Icecap.us, former Prof Meteorology and Climatology, first director of Meteorology at the Weather Channel, Fellow at the American Meteorology Society, 2-14-2010, “Climategate: What Did Phil Jones Actually Admit? Was He Correct?”)

The Idsos at CO2 Science have done a very thorough job documenting, using the peer review literature, the existence of a global MWP. They have found data published by 804 individual scientists from 476 separate research institutions in 43 different countries supporting the global Medieval Warm Period.

**The Idsos are qualified and not paid off**

**Idso 7** (Sherwood B. Idso, President of the Center for the Study of Carbon Dioxide and Global Change, Position Papers on Funding, 2007, “What Motivates the Center for the Study of Carbon Dioxide and Global Change?”)

Clearly, one should not believe what we at CO2 Science or anyone else says about carbon dioxide and global change without carefully examining the reasoning behind, and the evidence for, our and their declarations, which makes questions about funding rather moot. It is self-evident, for example, that one need not know from whence a person's or organization's funding comes in order to evaluate the reasonableness of what they say, if - and this is a very important qualification - one carefully studies the writings of people on both sides of the issue. Nevertheless, questions about funding persist, and they are clearly of great interest to many people, as evidenced by the spate of publicity aroused by the 4 Sep 2006 letter of Bob Ward (Senior Manager for Policy Communication of the UK's Royal Society) to Nick Thomas (Esso UK Limited's Director of Corporate Affairs), as well his criticism of us in his BBC Today Programe interview of 21 Sep 2006 with Sarah Montague, where he pointedly described our Center as being one of the organizations funded by ExxonMobil that "misrepresent the science of climate change." That we tell a far different story from the one espoused by the Intergovernmental Panel on Climate Change is true; and that may be why ExxonMobil made some donations to us a few times in the past; they probably liked what we typically had to say about the issue. But what we had to say then, and what we have to say now, came not, and comes not, from them or any other organization or person. Rather, it was and is derived from our individual scrutinizing of the pertinent scientific literature and our analyses of what we find there, which we have been doing and subsequently writing about on our website on a weekly basis without a single break since 15 Jul 2000, and twice-monthly before that since 15 Sep 1998 ... and no one could pay my sons and me enough money to do that. So what do we generally find in this never-ending endeavor? We find enough good material to produce weekly reviews of five different peer-reviewed scientific journal articles that do not follow the multiple doom-and-gloom storylines of the IPCC. In addition, we often review articles that do follow the IPCC's lead; and in these cases we take issue with them for what we feel are valid defensible reasons. Why do we do this? We do it because we feel that many people on the other side of the debate - but by no means all or even the majority of them - are the ones that "misrepresent the science of climate change." Just as beauty resides in the eye of the beholder, however, so too does the misrepresentation of climate change science live there; and with people on both sides of the debate often saying the same negative things about those on the other side, it behooves the rational person seeking to know the truth to carefully evaluate the things each side says about more substantial matters. Are they based on real-world data? Do the analyses employed seem appropriate? Do the researchers rely more on data and logic to make their points, or do they rely more on appeals to authority and claims of consensus? Funding also enters the picture; but one must determine if it is given to influence how scientists interpret their findings or to encourage them to maintain their intellectual integrity and report only what they believe to be the truth. In this regard, as I mentioned earlier, there are many scientists on both sides of the climate change debate who receive funds from people that admire their work and who continue to maintain their intellectual and moral integrity. Likewise, there are probably some on both sides of the controversy who do otherwise. So how does one differentiate between them? Clearly, each researcher's case is unique. In my case, I feel that a significant indication of what motivates me to do what I do can be gleaned from my publication record, which demonstrates that I studied and wrote about many of the topics we currently address on our website a full quarter-century ago in a host of different peer-reviewed scientific journals - as well as in a couple of books (Idso, 1982, 1989) that I self-published and for which I personally paid the publication costs - all of which happened well before I, or probably anyone else, had ever even contemplated doing what we now do and actually receiving funds to sustain the effort. What is more, many of these things occurred well before there was any significant controversy over the climate change issue, which largely began with the publication of one of my early contributions to the topic (Idso, 1980). Hence, it should be readily evident that my views about the potential impacts of the ongoing rise in the air's CO2 concentration from that time until now have never been influenced in even the slightest degree by anything other than what has appeared in the scientific literature. And my sons are in their father's image.

## AT: IPCC Indict

**Even if they win this - substantial evidence independent from the IPCC proves our impact**

Huber and Knutti 11 (Markus Huber is a doctoral student at and Reto Knutti is a Professor at the Institute for Atmospheric and Climate Science of the Federal Institute of Technology in Zurich 12/4/11, “Anthropogenic and natural warming inferred from changes in Earth’s energy balance” Nature Geoscience)

The Earth’s energy balance is key to understanding climate and climate variations that are caused by natural and anthropogenic changes in the atmospheric composition. Despite abundant observational evidence for changes in the energy balance over the past decades1, 2, 3, the formal detection of climate warming and its attribution to human influence has so far relied mostly on the difference between spatio-temporal warming patterns of natural and anthropogenic origin4, 5, 6. Here we present an alternative attribution method that relies on the principle of conservation of energy, without assumptions about spatial warming patterns. Based on a massive ensemble of simulations with an intermediate-complexity climate model we demonstrate that known changes in the global energy balance and in radiative forcing tightly constrain the magnitude of anthropogenic warming. We find that since the mid-twentieth century, greenhouse gases contributed 0.85 °C of warming (5–95% uncertainty: 0.6–1.1 °C), about half of which was offset by the cooling effects of aerosols, with a total observed change in global temperature of about 0.56 °C. The observed trends are extremely unlikely (<5%) to be caused by internal variability, even if current models were found to strongly underestimate it. Our method is complementary to optimal fingerprinting attribution and produces fully consistent results, thus suggesting an even higher confidence that **human-induced causes dominate the observed warming**.

**These account for natural forcings**

Huber and Knutti 11 (Markus Huber is a doctoral student at and Reto Knutti is a Professor at the Institute for Atmospheric and Climate Science of the Federal Institute of Technology in Zurich 12/4/11, “Anthropogenic and natural warming inferred from changes in Earth’s energy balance” Nature Geoscience)

Here we have shown that for global temperature the fundamental principle of conservation of energy, combined with knowledge about the evolution of radiative forcing, provides a complementary approach to attribution. Our results are strongly constrained by global observations and are robust when considering uncertainties in radiative forcing, the observed warming and in climate feedbacks. Each of the thousands of model simulations is a consistent realization of the ocean atmosphere energy balance. The resulting distribution of climate sensitivity (1.7–6.5 °C, 5–95%, mean 3.6 °C) is also consistent with independent evidence derived from palaeoclimate archives11. Using a more informative prior assumption does not significantly alter the conclusions (see Supplementary Information). Our results show that it is extremely likely that at least 74% (±12%, 1σ) of the observed warming since 1950 was caused by radiative forcings, and less than 26% (±12%) by unforced internal variability. Of the forced signal during that particular period, 102% (90–116%) is due to anthropogenic and 1% (−10 to 13%) due to natural forcing. The discrepancy between the total and the sum of the two contributions (14% on average) arises because the total ocean heat uptake is different from the sum of the responses to the individual forcings. Even for a reconstruction with high variability in total irradiance, solar forcing contributed only about 0.07 °C (0.03–0.13 °C) to the warming since 1950 (see Fig. 3c). The combination of those results with attribution studies based on optimal fingerprinting, with independent constraints on the magnitude of climate feedbacks, with process understanding, as well as palaeoclimate evidence leads to an even higher confidence about human influence dominating the observed temperature increase since pre-industrial times.

# Warming Real

## Yes Real - Consensus

**International consensus concurs warming is real**

**Harris 11** (Richard Harris, 6/21/11, "Climate Change: Public Skeptical, Scientists Sure," NPR, http://www.npr.org/2011/06/21/137309964/climate-change-public-skeptical-scientists-sure)

Most Americans are unaware that the National Academy of Sciences, known for its cautious and even-handed reviews of the state of science, is firmly on board with climate change. It has been for years. Ralph Cicerone, president of the National Academy, paraphrased its most recent report on the subject. "The consensus statement is that climate changes are being observed, are certainly real, they seem to be increasing, and that humans are mostly likely the cause of all or most of these changes," he said. That's not just the view of the U.S. National Academies. There's also a consensus statement from the presidents of science academies from around the world, including the academies of China, the United Kingdom, India, Japan, Russia, France, Brazil, the list goes on. Cicerone also points to strong statements about climate change from the leading professional organizations in the United States, including from the American Chemical Society, the American Physical Society and others. Of course, it's still possible to find a few scientists who reject the consensus. Cicerone says it is appealing to think they are right when they say there's no need to worry about complicated cap-and-trade policies or otherwise fuss about climate change.

Warming real - consensus

Brooks 12 (Jon Brooks, staff writer, KQED news, citing Craig Miller, environmental scientist, 5/3/12, "Is Climate Change Real? For the Thousandth Time, Yes," KQED News, http://blogs.kqed.org/newsfix/2012/05/03/is-climate-change-real-for-the-thousandth-time-yes/)

BROOKS: So what are the organizations that say climate change is real? MILLER: Virtually ever major, credible scientific organization in the world. It’s not just the UN’s Intergovernmental Panel on Climate Change. Organizations like the National Academy of Sciences, the American Geophysical Union, the American Association for the Advancement of Science. And that's echoed in most countries around the world. All of the most credible, most prestigious scientific organizations accept the fundamental findings of the IPCC. The last comprehensive report from the IPCC, based on research, came out in 2007. And at that time, they said in this report, which is known as AR-4, that there is "very high confidence" that the net effect of human activities since 1750 has been one of warming. Scientists are very careful, unusually careful, about how they put things. But then they say "very likely," or "very high confidence," they’re talking 90%. BROOKS: So it’s not 100%? MILLER: In the realm of science; there’s virtually never 100% certainty about anything. You know, as someone once pointed out, gravity is a theory. BROOKS: Gravity is testable, though... Virtually every major credible scientific organization in the world says climate change is real. MILLER: You're right. You can’t drop a couple of balls off of the Leaning Tower of Pisa to prove climate change. That’s why we have to rely on mathematical models to try to figure out where this is all going. And that's difficult. But it’s not impossible, as some people like to paint it. You know, the people doing the models are not inept. Over the past nearly four years, Climate Watch has interviewed a lot of scientists, attended conferences, read academic papers. To me, as what you might call an informed observer, the vast preponderance of scientific evidence supports this notion that the Earth is warming and that human activity is a significant cause. BROOKS: Are there legitimate debunkers of this proposition? MILLER: Certainly there are legitimate scientists on the other side of the question. If you take, for example, a guy by the name of John Christy from the University of Alabama, who is very strongly identified with climate change skeptics. That doesn’t mean that his work is invalidated. He came out recently with a study that basically refuted the idea that there’s been an observable shrinkage in the snow pack of the Sierra Nevada. And we talked to other scientists who do believe in anthropogenic or human-induced global warming and do believe that the Sierra snow pack is going to be shrinking, who thought that this study was sound. But that’s one study in a sea of studies. And you have look at the preponderance of the evidence and not at any one particular study, not any particular year, not even any particular ten years, because even a 10-year trend does not necessarily constitute climate change. BROOKS: What are some of the metrics scientists have looked at to come to the conclusion that human-caused climate change is real? MILLER: They study temperature records. There have been tidal gauges in place for a long time, looking at sea-level rise, and also augmented now by satellite data that measure with greater accuracy the rate of the rise. They’ve looked at things like ice cores from Greenland and elsewhere which gives us sort of a reverse chronological story of what the climate has done. And you can actually pull one of those ice cores and see the amount of C02 that was in the atmosphere at the time. And what they've found is what looks to be a pretty convincing relationship between the amount of carbon dioxide in the atmosphere and the behavior of the Earth’s climate. BROOKS: But there are some who refute that evidence? MILLER: Absolutely. We’ll get people frequently commenting on our blog who will say the sea level is not rising and that there’s been no warming for the past ten years. As I already pointed out, ten years of anything does not constitute a definitive pattern; it’s just too short a time span. It’s this idea of cherry-picking data, which both sides accuse the other of doing. You have to look at the Earth’s climate over time as a really big, complicated jigsaw puzzle. And clearly there are pieces missing. And there are pieces sitting off to the side that aren’t missing, but we don’t quite know how they fit into the puzzle yet. But still, you see enough of the picture to know what’s going on. The science has yielded at least -- as Stanford's Chris Field of the IPCC puts it -- a blurry picture of the future. And the blurry picture is enough to know the general direction we’re heading, even without knowing all of the specifics. BROOKS: Are there former critics who now acknowledge the reality of climate change? MILLER: Richard Muller would be a good example of that. He’s the physicist over at UC Berkeley who was identified with the skeptic camp for a long time. He wasn’t buying a lot of climate change theory. He launched a temperature-data audit because he wasn’t convinced that the temperature data being used by the IPCC and NOAA and others was accurate, that there were fundamental issues – they were getting bad data, garbage in, garbage out.

## Yes Real - Antarctica

**Warming is real - Antarctic vulnerability**

**Monash 12** (Monash University News, 7/13/12, "The challenges facing the vulnerable Antarctic," http://www.monash.edu.au/news/show/the-challenges-facing-the-vulnerable-antarctic)

Led by Monash University's Professor Steven Chown, a multidisciplinary team of experts from around the globe has set out the current and future conservation challenges facing the Antarctic in a Policy Forum article published today in Science. The team analysed the effectiveness of the existing Antarctic Treaty System for protecting the region, one of the world's largest commons, from the threats of climate change and, as technology improves, increasing prospects of use of the Antarctic's natural resources. Using a horizon scanning approach, the team determined that the major short-term threats included climate change impacts on marine systems, marine resource use, ocean acidification, invasive alien species, pollution, habitat alteration and regulatory challenges within the Treaty system. Professor Chown, incoming Head of Biological Sciences at Monash said the impacts of climate change were particularly worrying. "Interactions between resource use and climate change are especially significant threats," Professor Chown said. "Climate change is increasing the risk of the introduction of non-indigenous species. Several alien species, which have track records of being highly invasive, are already present in the Peninsula region and the risks are growing." The team also looked at the likely situation in half a century. In the longer-term, climate change impacts on terrestrial systems, and the impacts of ocean acidification on marine organisms are growing threats. Professor Chown said that the Treaty system remains effective, but swifter decision-making and more collaboration were vital if the Antarctic was to be conserved. "The quick pace of change in much of the region is under-appreciated. There’s warming in the Western Antarctic, changing species distributions, and a quickening in the rate of ice-loss, among other clear signs," Professor Chown said.

## Yes Real - Heat Waves

Warming real - heat waves

Kolbert 12 (Elizabeth Kolbert, Fulbright scholar, environmental writer for the New Yorker, 7/23/12, "The Big Heat," The New Yorker, http://www.newyorker.com/talk/comment/2012/07/23/120723taco\_talk\_kolbert)

Up until fairly recently, it was possible—which, of course, is not the same as advisable—to see climate change as a phenomenon that was happening somewhere else. In the Arctic, Americans were told (again and again and again), the effects were particularly dramatic. The sea ice was melting. This was bad for native Alaskans, and even worse for polar bears, who rely on the ice for survival. But in the Lower Forty-eight there always seemed to be more pressing concerns, like Barack Obama’s birth certificate. Similarly, the Antarctic Peninsula was reported to be warming fast, with unfortunate consequences for penguins and sea levels. But penguins live far away and sea-level rise is prospective, so again the issue seemed to lack “the fierce urgency of now.” The summer of 2012 offers Americans the best chance yet to get their minds around the problem. In late June, just as a sizzling heat wave was settling across much of the country—in Evansville, Indiana, temperatures rose into the triple digits for ten days, reaching as high as a hundred and seven degrees—wildfires raged in Colorado. Hot and extremely dry conditions promoted the flames’ spread. “It’s no exaggeration to say Colorado is burning,” KDVR, the Fox station in Denver, reported. By the time the most destructive blaze was fully contained, almost three weeks later, it had scorched nearly twenty-nine square miles. Meanwhile, a “super derecho”—a long line of thunderstorms—swept from Illinois to the Atlantic Coast, killing at least thirteen people and leaving millions without power. Referring to the fires, the drought, and the storms, Jonathan Overpeck, a professor of geosciences and atmospheric sciences at the University of Arizona, told the Associated Press, “This is certainly what I and many other climate scientists have been warning about.” He also noted, “This is what global warming looks like at the regional or personal level.” Or, at least, what it looks like right now. One of the most salient—but also, unfortunately, most counterintuitive—aspects of global warming is that it operates on what amounts to a time delay. Behind this summer’s heat are greenhouse gases emitted decades ago. Before many effects of today’s emissions are felt, it will be time for the Summer Olympics of 2048. (Scientists refer to this as the “commitment to warming.”) What’s at stake is where things go from there. It is quite possible that by the end of the century we could, without even really trying, engineer the return of the sort of climate that hasn’t been seen on earth since the Eocene, some fifty million years ago.

## Yes Real - Geological Data

Warming true - geological data

McGuire 12 (Bill McGuire, professor of geophysical and climate hazards at University College of London, 7/10/12, "Climate change is not science fiction, Jeremy Clarkson," The Guardian, http://www.guardian.co.uk/environment/blog/2012/jul/10/climate-change-science-fiction-jeremy-clarkson)

The bottom line is that rapid climate change drives a hazardous response from the Earth's crust – fact! The idea is not new and – in scientific circles – is not even controversial. We have a huge amount of data gleaned from the 20,000 years that has elapsed since the end of the last ice age, which saw one of the most dramatic transformations in our planet's history; from frigid wasteland to the broadly clement world we are familiar with today. The changes in stress and strain in the crust that resulted from melting of the 3km-thick continental ice sheets and a 130m rise in global sea levels, saw Lapland wracked by massive quakes associated today with places like the Pacific "ring of fire", while volcanic outbursts on Iceland increased 30 times. There is plenty of evidence too, for seismic shakings and volcanic rumblings, during this period, right across the planet. With the climate once again changing at least as rapidly as during post-glacial times, we are already seeing a seismic response to the loss of ice mass in Alaska, and a rise in the frequency of giant landslides as a reaction to heat waves across mountainous regions. How widespread and obvious the future response of the Earth beneath our feet will be to continued planetary warming, remains uncertain. Clearly, however, the potential exists for unmitigated climate change to bring about a significant and hazardous riposte.

## Yes Real - Sea Level Rise

Sea level rise is real

Lemonick 12 (Michael Lemonick, senior staff writer at Climate Central, former senior staff writer for Time, 7/12/12, "Climate Change: It Could Be Worse Than We Think," Climate Central, http://www.climatecentral.org/news/sea-level-rise-it-could-be-worse-than-we-think/)

A new analysis released Thursday in the journal Science implies that the seas could rise dramatically higher over the next few centuries than scientists previously thought — somewhere between 18-to-29 feet above current levels, rather than the 13-to-20 feet they were talking about just a few years ago. The increase in sea level would largely come from the partial melting of giant ice caps in Greenland and Antarctica, which have remained largely intact since the end of the last ice age, nearly 20,000 years ago. But rising global temperatures, thanks to human greenhouse-gas emissions, have already begun to melt that ancient ice, sending sea level up 8 inches since 1880 alone, with as much as 6 feet or so of additional increase projected by 2100. That’s not enough to inundate major population centers by itself, but coupled with storm surges, it could threaten millions of Americans long before the century ends. Around the world, sea level rise will put trillions in property at risk within the next few decades. West Antarctic Ice Sheet. Twenty-nine feet of sea-level rise, by contrast, or even 18, would put hundreds coastal cities around the globe entirely under water, displacing many hundreds of millions of people and destroying untold trillions in property. It would, in short, be a disaster of unimaginable proportions.

## Yes Real - Tree Rings

**Warming is real - tree rings**

**Speidel & Li 11** (Gisela Spidel, Outreach Specialist, International Pacific Research Center AND Jinbao Li, QIT, 5/9/2011, "Researchers discover tree rings tell a 1,100-year history of El Nino," University of Hawaii at Manoa)

An international team of climate scientists from the University of Hawai‘i at Mānoa recently found that annually resolved tree-ring records from North America, particularly from the U.S. Southwest, give a continuous representation of the intensity of El Niño events over the past 1,100 years and can be used to improve El Niño predictions. The study, spearheaded by postdoctoral fellow Jinbao Li and co-authored by meteorology professor Shang-Ping Xie of the International Pacific Research Center, was published in the May 6 issue of Nature Climate Change. Tree rings in the U.S. Southwest, the team found, agree well with the 150-year instrumental sea surface temperature records in the tropical Pacific. During El Niño, the unusually warm surface temperatures in the eastern Pacific lead to changes in the atmospheric circulation, causing unusually wetter winters in the U.S. Southwest, and thus wider tree rings; unusually cold eastern Pacific temperatures during La Niña lead to drought and narrower rings. The tree-ring records, furthermore, match well existing reconstructions of the El Niño-Southern Oscillation and correlate highly, for instance, with d18O isotope concentrations of both living corals and corals that lived hundreds of years ago around Palmyra in the central Pacific. “Our work revealed that the towering trees on the mountain slopes of the U.S. Southwest and the colorful corals in the tropical Pacific both listen to the music of El Niño, which shows its signature in their yearly growth rings,” explained Li. “The coral records, however, are brief, whereas the tree-ring records from North America supply us with a continuous El Niño record reaching back 1,100 years.” The tree rings reveal that the intensity of El Niño has been highly variable, with decades of strong El Niño events and decades of little activity. The weakest El Niño activity happened during the Medieval Climate Anomaly in the 11th century, whereas the strongest activity has been since the 18th century.

## Yes Anthro - Best Card

**Laundry list of indicators prove warming anthropogenic**

**Shulman 10** (Seth Shulman, citing Benjamin Santer, Lawrence Livermore National Laboratory, Max Planck Institute for Meteorology, Last updated: 7/15/10, "Global Warming Science and Impacts: Climate Fingerprinter," Union of Concerned Scientists, http://www.ucsusa.org/global\_warming/science\_and\_impacts/science/climate-scientist-benjamin-santer.html)

The key insight of the research is straightforward: the factors that might account for global warming—what climate scientists call "forcings"—operate in different ways. For instance, Santer explains, if the earth's warming were caused by an increase in the sun's energy output, "you would expect to see warming from the top of the atmospheric column straight down to the surface." But if massive volcanic eruptions, say, were a significant factor, their influence would show up with a distinctly different profile. When such eruptions occur, the dust they produce can reach upper portions of Earth's atmosphere, and remain there for several years. Because volcanic dust absorbs incoming sunlight, preventing it from penetrating to the earth's surface, the data would show cooling in the troposphere (the atmospheric layer closest to the surface) and heating in the stratosphere (the layer above the troposphere). But, Santer points out, those two profiles are "not at all what the data show." His research, now replicated by many others, instead documents a telltale warming of the troposphere and cooling of the stratosphere—the precise fingerprint that scientists since the 1960s had predicted would occur from the intensified "greenhouse effect" as increasing amounts of heat-trapping carbon dioxide from fossil-fuel emissions built up in the atmosphere. Because of his groundbreaking work, Santer was selected as the lead author on a chapter of the 1995 report issued by the Intergovernmental Panel on Climate Change (IPCC). That year, for the first time, the report said that "the balance of evidence suggests a discernible human influence on global climate." That measured statement has, of course, been dramatically strengthened in the latest IPCC report, which concludes that there is a greater than 90 percent likelihood that human activities have been the main cause of warming since the middle of the twentieth century. Santer's cutting-edge research led to widespread acclaim from his colleagues and earned him many accolades, including a MacArthur "genius grant," but his high-profile role in the 1995 IPCC report made him a target of those trying to stir up controversy and confuse the public about global warming. For instance, after the 1995 report was issued, an industry–funded group led an effort to discredit Santer personally by spuriously claiming that he had altered the IPCC's findings. He had not. "Nothing in my university training prepared me for what I faced in the aftermath of that report," Santer says of the vicious personal attacks by fossil-fuel interests. "You are prepared as a scientist to defend your research. But I was not prepared to defend my personal integrity. I never imagined I'd have to do that." Fifteen years later, the evidence that human activity is causing global warming is stronger than ever and accepted by the overwhelming majority of scientists. Our understanding of climate fingerprinting has also become far more sophisticated and now shows human causation in the measured changes in ocean temperatures, Arctic sea ice, precipitation, atmospheric moisture, and many other aspects of climate change. Some of Santer's more recent work, for instance, addresses changes in the height of the tropopause—the boundary between the troposphere, the more turbulent lower layer, and the more stable stratosphere above. (Between 5 and 10 miles above the earth's surface, a marker of the tropopause can be seen in the flat, anvil-like top of a thundercloud.) Measurements over the course of several recent decades have shown that the tropopause has risen markedly. By studying tropopause changes in computer climate models, and comparing model output with observations, Santer was able to show that both the warming of the lower atmosphere and cooling of the stratosphere led to a rise in the height of the tropopause—and that the observed rise in the tropopause matched the fingerprint of an increase in heat-trapping gases. "Nobody had looked at it before," Santer says, "but the data showed clearly that natural causes alone simply could not provide a convincing explanation for the observed change." All the climate fingerprinting research to date, Santer explains, has arrived at the same conclusion, namely that "natural causes cannot provide a convincing explanation for the particular patterns of climate change we see." That, he says, is why scientists "have come to have such confidence in our understanding of what is happening—not because of the claims of any one individual, but because of the breadth of scientific work and reproducibility of the results."

## Yes Anthro - Generic

**Warming is anthropogenic - even if there are alt causes, human emissions are the biggest factor**

**Fitzpatrick 6** (Melanie Fitzpatrick, Earth and Space Sciences and Atmospheric Sciences at the University of Washington, 5/11/06, "Human Fingerprints," Union of Concerned Scientists,

http://www.ucsusa.org/global\_warming/science\_and\_impacts/science/global-warming-human.html)

Background: Driving the Climate ("Forcing") Climate is influenced by many factors, both natural and human. [7] Things that increase temperature, such as increases in heat-trapping emissions from cars and power plants or an increase in the amount of radiation the sun emits, are examples of "positive" forcings or drivers. Volcanic events and some types of human-made pollution, both of which inject sunlight-reflecting aerosols into the atmosphere, lower temperature and are examples of "negative" forcings or drivers. Natural climate drivers include the sun's energy output, aerosols from volcanic activity, and changes in snow and ice cover. Human climate drivers include heat-trapping emissions from cars and power plants, aerosols from pollution, and soot particles. Much as the Air Force develops computer programs to simulate aircraft flight under different conditions, climate scientists develop computer programs to simulate global climate changes under different conditions. These programs use our knowledge of physical, chemical, and biological processes that occur within Earth's atmosphere and oceans and on its land surfaces. Mathematical models allow scientists to simulate the behavior of complex systems such as climate and explore how these systems respond to natural and human factors. Fingerprint 1: The Ocean Layers Warm The world's oceans have absorbed about 20 times as much heat as the atmosphere over the past half-century, leading to higher temperatures not only in surface waters but also in water 1,500 feet below the surface. [8,9] The measured increases in water temperature lie well outside the bounds of natural climate variation. Fingerprint 2: The Atmosphere Shifts Recent research shows that human activities have lifted the boundary of Earth's lower atmosphere. Known as the troposphere (from the Greek tropos, which means "turning"), this lowest layer of the atmosphere contains Earth's weather. The stable layer above is called the stratosphere. The boundary that separates the two layers, the tropopause, is as high as nine miles above the equator and as low as five miles above the poles. In an astounding development, a 2003 study showed that this tropopause has shifted upward over the last two decades by more than 900 feet. [10] The rising tropopause marks another human fingerprint on Earth's climate. In their search for clues, scientists compared two natural drivers of climate (solar changes and volcanic aerosols) and three human drivers of climate (heat-trapping emissions, aerosol pollution, and ozone depletion), altering these one at a time in their sophisticated models. Changes in the sun during the twentieth century have warmed both the troposphere and stratosphere. But human activities have increased heat-trapping emissions and decreased stratospheric ozone. This has led to the troposphere warming more because the increase in heat-trapping emissions is trapping more of Earth's outgoing heat. The stratosphere has cooled more because there is less ozone to absorb incoming sunlight to heat up the stratosphere. Both these effects combine to shift the boundary upward. Over the period 1979-1999, a study shows that human-induced changes in heat-trapping emissions and ozone account for more than 80 percent of the rise in tropopause height. [10] This is yet another example of how science detectives are quantifying the impact of human activities on climate. Fingerprint 3: The Surface Heats Up Measurements show that global average temperature has risen by 1.4 degrees Fahrenheit in the last 100 years, with most of that happening in the last three decades. [1,2] By comparing Earth's temperature over that last century with models comparing climate drivers, a study showed that, from 1950 to the present, most of the warming was caused by heat-trapping emissions from human activities [3]. In fact, heat-trapping emissions are driving the climate about three times more strongly now than they were in 1950. The spatial pattern of where this warming is occurring around the globe indicates human-induced causes. Even accounting for the occasional short-lived cooling from volcanic events and moderate levels of cooling from aerosol pollution as well as minor fluctuations in the sun's output in the last 30 years, heat-trapping emissions far outweigh any other current climate driver. Once again, our scientific fingerprinting identifies human activities as the main driver of our warming climate. Human Causes, Human Solutions

## Yes Anthro - We Assume their Ev

**Anthropogenic causes overwhelm alt causes - their data is descriptive of models we already assume, not predictive of a future of runaway climate change**

**Baum et. al 12** (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

Anthropogenic (human-caused) greenhouse gas emissions serve to increase surface temperature. However, this fact alone is insufﬁcient to attribute the warming observed over the last several decades to anthropogenic emissions. Other processes could be relevant. It is also important to consider the sources of greenhouse gas emissions (mainly the burning of fossil fuels) and the sinks for greenhouse gasses (mainly photosynthesis), as well as how these processes unfold over time. However, even after factoring in these processes, the observed warming cannot be reproduced without including anthropogenic greenhouse gas emissions as a factor. Anthropogenic greenhouse gas emissions also appear to be driving further temperature increases and other climatic changes in the future. The exact nature of the changes is uncertain. One reason for this uncertainty is that the amount of total greenhouse gas that humanity will emit in the future is unknown. Another reason for this uncertainty is that the understanding of the climate system, though strong, remains imperfect. Spier’s Skepticisms In his editorial, Spier questions four aspects of climate science: (1) an observed temperature decline between 1943 and 1975; (2) ice-core data which Spier interprets as evidence that changes in temperature cause changes in carbon dioxide (CO2) in the atmosphere, instead of changes in CO2 in the atmosphere causing changes in temperature; (3) the role of cloud formation in global temperature; and (4) the role of cosmic rays in global temperature (Spier 2008). Observed Temperature Decline Between 1943 and 1975 While it is true that global temperature records show a temperature decline from 1943 to 1975, 1 even while greenhouse gas concentrations were increasing, this temperature decline does not disprove the claim that broader temperature increases are driven primarily by greenhouse gas emissions. Instead, it highlights another contributor to global temperatures: sulfur emissions, which form sulfate aerosols in the atmosphere that reﬂect additional incoming solar radiation back to space (an increase in albedo) and thus cool Earth’s surface. Sulfur emissions began with a rapid rise in industrialization following World War II and peaked around 1980 (Stern 2005). During this time greenhouse gas emissions grew more slowly than sulfur emissions, which led to net cooling while the sulfate aerosols dominated (Ramaswamy et al. 2001). When sulfate aerosols are included in climate models, this same temperature decline appears, along with the familiar longer-term warming trend (Harvey and Kaufmann 2002; Stott et al. 2006).

## Yes Anthro - Ice Cores

Ice cores prove warming is self-reinforcing

Baum et. al 12 (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

Interpreting Ice Core Data Because there are few human-produced records of climate longer than 150 years, to learn about past climates, one must seek information from climate proxies. Some of the most informative climate proxies are ice cores on Greenland and Antarctica. The cores, up to two miles deep, provide information for periods of hundreds of thousands of years (Alley 2002). Spier claims that ice core data presented by Petit et al. (1999) indicate that historic temperature increases preceded atmospheric CO2 increases, suggesting that temperature increases cause CO2 increases, instead of the other way around as would be expected under the view that CO2 increases are driving current global warming. We are unable to conclusively reproduce this assessment from our own analysis of the work of Petit et al. (1999). Ice core data show that CO2 and temperature have ﬂuctuated in synch with each other as a result of Milankovitch cycles (variations in Earth’s orbital patterns), demonstrating a correlation between the two but no causation. The causal role of CO2 as a greenhouse gas is derived from the well-understood physical properties of the CO2 molecule. There is also positive feedback in that increased warming of the oceans can cause a decrease in the saturation concentration of CO2 in the ocean waters. As a result, CO2 is released into the atmosphere from warming oceans and can cause further atmospheric warming. CO2 concentrations thus can either lag or precede temperature increases. Even if it is demonstrated that in one situation atmospheric CO2 levels were driven by a temperature change, this does not exclude the possibility that CO2 concentrations may drive temperature changes in other situations.

## AT: Alt Cause - Sunspots

**Human emissions, not the sun, are the primary cause of global warming – NASA satellites prove**

Parry 12 (Wynne Parry, LiveScience Senior Writer, 2/1/12, “NASA Report: Greenhouse Gases, Not Sun, Driving Warming” www.livescience.com/18255-solar-cycle-climate-change-warming.html)

A recent, prolonged lull in the sun's activity did not prevent the Earth from absorbing more solar energy than it let escape back into space, a NASA analysis of the Earth's recent energy budget indicates. An imbalance like this drives global warming — since more energy is coming in than leaving — and, because it occurred during a period when the sun was emitting comparatively low levels of energy, the imbalance has implications for the cause of global warming. The results confirm greenhouse gases produced by human activities are the most important driver of global climate change, according to the researchers. They found that the Earth absorbed 0.58 watts of excess energy per square meter than escaped back into space during the study period from 2005 to 2010, a time when solar activity was low. By comparison, the planet receives 0.25 watts less energy per square meter during a solar minimum, than during a period of maximum activity in the sun's 11-year cycle. (Currently, the sun is in the midst of Solar Cycle 24, with activity expected to ramp up toward solar maximum in 2013.) "The fact we still see a positive imbalance despite the prolonged solar minimum isn't a surprise given what we've learned about the climate system," lead researcher James Hansen, director of NASA's Goddard Institute for Space Studies, said in a statement. "But it's worth noting, because this provides unequivocal evidence that the sun is not the dominant driver of global warming."

## AT: Alt Cause - Clouds

**Cloud formations irrelevant - they are net coolants**

**Baum et. al 12** (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

The Role of Cloud Formation Clouds do play an important role in surface air temperatures: water vapor is Earth’s most prevalent greenhouse gas, so increased cloud cover will cause surface warming. However, clouds also reﬂect incoming solar radiation back into space, thereby cooling Earth’s surface. In general, thick clouds, such as the cumulonimbus Evidence of Human Causes and Arguments 397 123clouds found in thunderstorms, tend to have a net cooling effect on Earth’s surface, whereas thin clouds, such as high cirrus clouds, have a net warming effect (Grenci and Nese 2006). Higher global temperatures will cause higher rates of evaporation, bringing more of both thick and thin clouds. Clouds thus constitute an important source of uncertainty in future temperature change.

## AT: Alt Cause - Cosmic Rays

**Baum et. al 12** (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

The Role of Cosmic Rays The amount of incoming radiation from both the sun and other cosmic ray sources is not constant over time. As Spier (2008) indicates, some researchers have claimed that these cosmic ray ﬂuctuations are at least as dominant a driver of global temperature changes as greenhouse gas emissions, including via changes in cloud cover (Carslaw et al. 2002; Marsh and Svensmark 2000a, b). However, there is no apparent correspondence between the cosmic ray time series and global low-level cloud cover past 1994 (Kristjansson et al. 2002, 2004; Sun and Bradley 2002). Likewise, the overall contribution of solar variability to global radiative forcing is small relative to anthropogenic contributions (Solomon et al. 2007).

## AT: Alt Cause - Volcanoes

**Volcanic eruptions actually help slow down warming**

Eilperin 11 (Juliet Eilperin joined The Washington Post as the House of Representatives reporter, where she covered the impeachment of Bill Clinton, lobbying, legislation, and four national congressional campaigns, since April of 2004 she has covered the environment for the national desk, reporting on science, policy and politics in areas including climate change, oceans, and air quality, 7/21/11, “Volcanic ash, soot helped slow recent warming, study shows” www.washingtonpost.com/national/health-science/volcanic-ash-soot-helped-slow-recent-warming-study-shows/2011/07/20/gIQAg7k8RI\_story.html)

Tiny solid and liquid particles in the atmosphere, including volcanic ash and soot from fossil fuel burning, have kept the Earth from warming as fast as it otherwise would have in the past dozen years, according to a new study published online Thursday in the journal Science. The findings show that both natural and human factors have slowed the rate of global warming 20 percent since 1998. Small particles, otherwise known as aerosols, help cool the Earth’s climate by blocking out sunlight. The study is significant because although average global temperatures last decade were higher than in the 1990s and 1980s, it appears the rate of warming has slowed compared with previous decades. Now, scientists say, persistent aerosols in the stratosphere — the region of the atmosphere that contains the ozone layer — might account for why warming has not been as rapid. John S. Daniel, who co-authored the paper and is a research scientist at the National Oceanic and Atmospheric Administration’s Earth System Research Laboratory in Boulder, Colo., said the analysis shows the impact minor volcanic eruptions and soot from coal burning is “certainly not negligible.” By looking at both ground-based and satellite data, “you could see without a doubt volcanoes were having an impact” even though there has not been a colossal eruption since Mount Pinatubo erupted in 1991, Daniel said. The six researchers, from France and the United States, did not determine how much of the cooling effect stemmed from natural causes and how much was from human activities such as sulfur dioxide emissions from power plants and vehicles. Alan Robock, a professor at Rutgers University’s Department of Environmental Sciences who specializes in analyzing volcanic activity’s climatic impact, said the paper buttresses the argument that the climate change taking place is consistent with computer modeling.

## AT: Warming isn't Global (Essex)

**Baum et. al 12** (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

Climate Sensitivity Climate sensitivity is deﬁned as the average global temperature increase that would come from a doubling of atmospheric CO2 concentration. 2 Average global temperature is not a perfect proxy for aggregate climate change: temperature changes are not uniform across Earth, and other climatic changes such as changes in precipitation, severe weather events, and climate variability are also important. However, average global temperature is nonetheless often a reasonable approximation of aggregate climate change, which makes climate sensitivity a variable of great interest. Climate sensitivity has been studied since the early days of climate change research (Arrhenius 1896). However, the exact magnitude of climate sensitivity remains unknown, due to uncertainty about positive and negative feedbacks in the climate system in which a response to warming could lead to additional warming or cooling. As noted above, perhaps the main uncertain feedback is in clouds. The basic physics of greenhouse gases indicates that, without these feedbacks, climate sensitivity would be an increase of approximately 1.2C. As a result of the cumulative effects of all of the planet’s feedback systems, climate sensitivity is frequently estimated to be approximately 3C but magnitudes as high as 6C or even 10C have not been ruled out (Knutti and Hegerl 2008). A high climate sensitivity could result in catastrophic outcomes.

**Baum et. al 12** (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

Regional Climate As mentioned above, global mean temperature is not necessarily a robust indicator of aggregate climate change. Atmosphere–ocean climate models under global warming scenarios predict non-uniform change in temperature distribution across the planet. For example, greater warming often occurs over land masses than oceans because less available water reduces the magnitude of evaporative cooling. Warming also tends to increase the spatial variability of precipitation, leading to a drying of the subtropics and an increase in tropical and mid-latitude rainfall (Solomon et al. 2007). This spatial variability in precipitation, coupled with the poleward expansion of the subtropical high pressure belt under global warming (Lu et al. 2007; Seidel et al. 2008), points toward an intense reduction in precipitation at subtropical dry zones. Thus, climate change involves important regional changes in addition to increases in global mean temperature. The current understanding of how climates will change in speciﬁc regions remains uncertain. Uncertainty in regional climate projection owes partially to the limitations of climate models. The resolution of global atmosphere–ocean models ranges from 400 to 125 km, which makes ﬁner scale variability difﬁcult to resolve. However, these models can provide boundary conditions for nested regional climate models, which are capable of resolving detail down to 50 km—and some as small as 15 km (Solomon et al. 2007). Advances in computing will lead to increased resolution for both types of models. Nevertheless, improved prediction of regional responses to global warming will also require a better understanding of the underlying physics, including changes in cloud cover, radiative forcing, soil parameterization, and biomass feedback. In short, many of the challenges involved in regional climate forecasts are common to the pursuit of global climate projections.

## AT: You Don't Solve All Wmg

**Even if the plan doesn't solve warming we slow its rate - that's k2 adaptation**

**Baum et. al 12** (Seth Baum, Research on Environmental Decisions @ Columbia, Chris Karmosky, Geography @ Penn State, Jacob Haqq-Misra, Meteorology and Astrobiology Research Center, June 2012, "Climate Change: Evidence of Human Causes and Arguments for Emissions Reduction," Science and Engineering Ethics 18(2))

In general, what is of importance is not only how much the sea level rises, but also how fast this rise occurs, because a rapid rise gives humans and ecosystems less time to adapt to the change. There is presently much concern that an abrupt ice sheet collapse could cause a rapid sea level rise. The WAIS is particularly prone to abrupt collapse because it rests on ground that lies below sea level. If the surrounding oceans warm enough, then WAIS could rapidly disintegrate. Meanwhile, the Antarctic Peninsula, home to the northernmost fringes of WAIS, is undergoing perhaps the largest increase in temperature of any location on the planet (King et al. 2002; Turner et al. 2005), and there are already some warning signs that a WAIS collapse could be in progress. 3 Thus, abrupt WAIS collapse is a major cause for concern. However, it is not known if or when such a collapse is likely to occur.

## AT: Bobertz/Blaming Kritik Alts

**Green attitudes don't solve - adopting a federal approach is key to offset the worst of the existential impacts warming has
Karlsson 11 —** (Rasmus Karlsson is a post-doctoral fellow at the Hong Kong Institute of Education, PSA Annual Conference

London, 19-21 April 2011, http://www.psa.ac.uk/journals/pdf/5/2011/1223\_662.pdf)

Recently, a number of bright-green or “Promethean” environmentalists have challenged this pessimistic analysis (Galiana & Green, 2009; Lewis, 1992; Mandle, 2008; Shellenberger, Nordhaus, Navin, Norris, & Van Noppen, 2008). Unlike cornucopian liberals of the past such as Julian Simon, these bright-green authors acknowledge the existential risk that climate change poses. However, instead of seeing the prevailing impasse as inevitable due to the physics of climate change (for instance the dispersion of causes and effects as discussed above), they argue that the impasse is rather caused by the way the problem has been politically structured and interpreted. Most importantly, they have challenged the premise that achieving climate stability will require immense sacrifices or lead to permanent welfare losses. Bright-green authors believe that the primary reason that the current approach does not work is that it perceives climate change mitigation as a burden and a cost that unwilling countries have to accept in the name of the greater good. In its stead, bright-green authors argue that we need a proactive investment-oriented approach to global sustainability, one that takes into account not only the risks of the future but also the possibilities for radical innovation that the coming decades could offer. Bright-greens believe that the convergence of disruptive technological change and social innovation offers a far more politically promising path to global sustainability than either the fear-mongering of “deep-greens” or the complacent green consumerism of “light-greens”. In terms of practical politics this means shifting the focus from “targets” and “timetables” to the far more interesting question of how emissions are to be reduced. Making this shift means accepting the impossibility of putting the “cart” (large cuts in emissions) before the “horse” (the technological means for making those cuts) (Galiana & Green, 2010, p. 331). It also means accepting that while global rebound effects make the possible reductions from energy efficiency improvements uncertain (Alcott, 2005; Roy, 2000; Wei, 2010), the other possible route, i.e. brute-force mitigation through welfare losses, is unlikely to ever win sufficient public support, not even if the world were to experience abrupt climate change (Gardiner, 2009). That does not mean that bright-greens think that we should not do what we can in order to reduce wasteful consumption, it only means that they recognize the political futility in believing that such demand-side changes will suffice to secure long-term global sustainability.

## Aerosols = Warming - Asia

**Aerosols exacerbate warming - Asia**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2011 (John M., “New Aerosol Study Refutes Global Warming Theory,” October 20, 2011, <http://news.heartland.org/newspaper-article/new-aerosol-study-refutes-global-warming-theory>) //CL

However, a team of researchers from NASA and the University of California at San Diego reported in the August 2 issue of the British science journal Nature that they sent instruments into "brown clouds" of aerosols over Asia to measure their effect on temperature. To their surprise, the researchers discovered the common assumption that aerosols lower temperatures was wrong. Instead, aerosols were found to substantially amplify the Earth's greenhouse effect. "We found that atmospheric brown clouds enhanced lower atmospheric solar heating by about 50 percent," explained the researchers. "[The pollution] contributes as much as the recent increase in anthropogenic greenhouse gases to regional lower atmospheric warming trends," the researchers added. The amount of warming due to aerosols was so significant, the researchers reported, that aerosols alone could explain--in and of themselves and completely independent of greenhouse gases--the observed glacier retreat in the Eastern Himalayan Mountains.

## Aerosols = Warming - Masking

**Aerosols cause warming – masked effect**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2011 (John M., “New Aerosol Study Refutes Global Warming Theory,” October 20, 2011, <http://news.heartland.org/newspaper-article/new-aerosol-study-refutes-global-warming-theory>) //CL

The amount of warming due to aerosols was so significant, the researchers reported, that aerosols alone could explain--in and of themselves and completely independent of greenhouse gases--the observed glacier retreat in the Eastern Himalayan Mountains. Milloy noted the new discovery further calls into question unreliable global warming models that have failed to explain why manmade carbon dioxide emissions steadily increased from about 1940 to 1975 even as global temperatures cooled. Said Milloy, "Global warming alarmists, such as the UN's Intergovernmental Panel on Climate Change, attempt to counter this observation by claiming that aerosol particles in the atmosphere--like soot and sulfates from fossil fuel combustion, and dust from volcanic eruptions--can mask the warming effect of greenhouse gases and cool the planet by reflecting solar radiation back into space. Earth has not warmed as predicted, they argue, because aerosol pollution is cooling the planet in a way that temporarily mitigates greenhouse gas warming. "The new aerosol study doesn't show that climate alarmists may be just a little off course--it shows that they may be 180 degrees off," Milloy added. "The aerosol study opens up the possibility for an entirely new hypothesis for global warming, with aerosols as the culprit. Yet up to now, the 'consensus' crowd has portrayed aerosols in the opposite light, as cooling agents."

# Warming Not Real

## Not Real - Consensus

**Warming not real - 30,000 scientists signed a petition saying warming is flat-out nonexistent - their data is skewed**

**Bell 12** (Larry Bell, Prof at Univ of Houston, Sasakawa International Center for Space Architecture, 7/17/2012, "That Scientific Global Warming Consensus...Not!," Forbes, http://www.forbes.com/sites/larrybell/2012/07/17/that-scientific-global-warming-consensus-not/2/)

Since 1998, more than 31,000 American scientists from diverse climate-related disciplines, including more than 9,000 with Ph.D.s, have signed a public petition announcing their belief that “…there is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth’s atmosphere and disruption of the Earth’s climate.” Included are atmospheric physicists, botanists, geologists, oceanographers, and meteorologists. So where did that famous “consensus” claim that “98% of all scientists believe in global warming” come from? It originated from an endlessly reported 2009 American Geophysical Union (AGU) survey consisting of an intentionally brief two-minute, two question online survey sent to 10,257 earth scientists by two researchers at the University of Illinois. Of the about 3.000 who responded, 82% answered “yes” to the second question, which like the first, most people I know would also have agreed with. Then of those, only a small subset, just 77 who had been successful in getting more than half of their papers recently accepted by peer-reviewed climate science journals, were considered in their survey statistic. That “98% all scientists” referred to a laughably puny number of 75 of those 77 who answered “yes”. That anything-but-scientific survey asked two questions. The first: “When compared with pre-1800s levels, do you think that mean global temperatures have generally risen, fallen, or remained relatively constant?” Few would be expected to dispute this…the planet began thawing out of the “Little Ice Age” in the middle 19th century, predating the Industrial Revolution. (That was the coldest period since the last real Ice Age ended roughly 10,000 years ago.) The second question asked: “Do you think human activity is a significant contributing factor in changing mean global temperatures?” So what constitutes “significant”? Does “changing” include both cooling and warming… and for both “better” and “worse”? And which contributions…does this include land use changes, such as agriculture and deforestation?

## Natural - Water Vapors

**Alt cause - water vapors**

**Goldblatt & Watson 12** (Colin Goldblatt, School of Earth and Ocean Sciences at U of Victoria AND Andrew Watson, School of Environmental Sciences, University of East Anglia, Norwich, 1/8/2012, "The Runaway Greenhouse: implications for future climate change, geoengineering and planetary atmospheres," The Royal Society TEX Paper, http://arxiv.org/pdf/1201.1593v1.pdf)

One major uncertainty is relative humidity. We have assumed a saturated troposphere as the end member which makes a runaway greenhouse most likely, with the aim that uncertainty here would be how much less likely the runaway greenhouse would be. If Earth’s tropics were saturated, they would be in a local runaway greenhouse, whereas in reality columns of unsaturated air allow radiation to escape (Pierrehumbert, 1995). How relative humidity will change with warming is very poorly understood, but will have a ﬁrst order eﬀect on temperature change. Explicit inclusion of a hydrological cycle in models has given rise to multiple equilibria (Renn´o, 1997), which adds an additional threat. Likewise, we have not discussed clouds (the physics is hard enough without them). Presently, the greenhouse eﬀect of clouds is about half the albedo eﬀect (e.g. Zhang et al., 2004). A typical argument, following Kasting (1988), is that in an optically thick atmosphere, the cloud greenhouse eﬀect would diminish as noncloud optical depth would be so high and the albedo eﬀect would dominate further, making the runaway greenhouse less likely. This is not a watertight argument: for example, with much more water vapour aloft high clouds might become thicker and more widespread, causing net warming. We do not know what will happen. There are uncertainties in the radiative transfer too. The last full, spectrally resolved, treatments of the problem (Abe & Matsui, 1988; Kasting, 1988) are over two decades old. Much of the uncertainty relates to the so-called continuum absorption of water vapour (in window regions, both 8 to 12 µm and 4 µm, there is more absorption than one would expect considering nearby water vapour lines). This is probably caused by far-wing line absorption by water lines, which depends on selfcollisions of water molecules. Hence this depends on vapour pressure squared, and is highly relevent to our problem. Understanding and empirical constraints on this continuum have improved, but remain unsatisfactory.

## Natural - Laundry List

**Climate change is completely natural and the world is cooling – historical cycle, satellite data, ocean oscillation, and sunspots prove**

Ferrara 12 (Peter Ferrara, Director of Entitlement and Budget Policy for the Heartland Institute, General Counsel for the American Civil Rights Union, and Senior Fellow at the National Center for Policy Analysis, he served in the White House Office of Policy Development under President Reagan, and as Associate Deputy Attorney General of the United States under President George H.W. Bush, he is a graduate of Harvard College and Harvard Law School, 5/31/12, “Sorry Global Warming Alarmists, The Earth Is Cooling” www.forbes.com/sites/peterferrara/2012/05/31/sorry-global-warming-alarmists-the-earth-is-cooling/2/)

Check out the 20th century temperature record, and you will find that its up and down pattern does not follow the industrial revolution’s upward march of atmospheric carbon dioxide (CO2), which is the supposed central culprit for man caused global warming (and has been much, much higher in the past). It follows instead the up and down pattern of naturally caused climate cycles. For example, temperatures dropped steadily from the late 1940s to the late 1970s. The popular press was even talking about a coming ice age. Ice ages have cyclically occurred roughly every 10,000 years, with a new one actually due around now. In the late 1970s, the natural cycles turned warm and temperatures rose until the late 1990s, a trend that political and economic interests have tried to milk mercilessly to their advantage. The incorruptible satellite measured global atmospheric temperatures show less warming during this period than the heavily manipulated land surface temperatures. Central to these natural cycles is the Pacific Decadal Oscillation (PDO). Every 25 to 30 years the oceans undergo a natural cycle where the colder water below churns to replace the warmer water at the surface, and that affects global temperatures by the fractions of a degree we have seen. The PDO was cold from the late 1940s to the late 1970s, and it was warm from the late 1970s to the late 1990s, similar to the Atlantic Multidecadal Oscillation (AMO). In 2000, the UN’s IPCC predicted that global temperatures would rise by 1 degree Celsius by 2010. Was that based on climate science, or political science to scare the public into accepting costly anti-industrial regulations and taxes? Don Easterbrook, Professor Emeritus of Geology at Western Washington University, knew the answer. He publicly predicted in 2000 that global temperatures would decline by 2010. He made that prediction because he knew the PDO had turned cold in 1999, something the political scientists at the UN’s IPCC did not know or did not think significant. Well, the results are in, and the winner is….Don Easterbrook. Easterbrook also spoke at the Heartland conference, with a presentation entitled “Are Forecasts of a 20-Year Cooling Trend Credible?” Watch that online and you will see how scientists are supposed to talk: cool, rational, logical analysis of the data, and full explanation of it. All I ever see from the global warming alarmists, by contrast, is political public relations, personal attacks, ad hominem arguments, and name calling, combined with admissions that they can’t defend their views in public debate. Easterbrook shows that by 2010 the 2000 prediction of the IPCC was wrong by well over a degree, and the gap was widening. That’s a big miss for a forecast just 10 years away, when the same folks expect us to take seriously their predictions for 100 years in the future. Howard Hayden, Professor of Physics Emeritus at the University of Connecticut showed in his presentation at the conference that based on the historical record a doubling of CO2 could be expected to produce a 2 degree C temperature increase. Such a doubling would take most of this century, and the temperature impact of increased concentrations of CO2 declines logarithmically. You can see Hayden’s presentation online as well. Because PDO cycles last 25 to 30 years, Easterbrook expects the cooling trend to continue for another 2 decades or so. Easterbrook, in fact, documents 40 such alternating periods of warming and cooling over the past 500 years, with similar data going back 15,000 years. He further expects the flipping of the ADO to add to the current downward trend. But that is not all. We are also currently experiencing a surprisingly long period with very low sunspot activity. That is associated in the earth’s history with even lower, colder temperatures. The pattern was seen during a period known as the Dalton Minimum from 1790 to 1830, which saw temperature readings decline by 2 degrees in a 20 year period, and the noted Year Without A Summer in 1816 (which may have had other contributing short term causes). Even worse was the period known as the Maunder Minimum from 1645 to 1715, which saw only about 50 sunspots during one 30 year period within the cycle, compared to a typical 40,000 to 50,000 sunspots during such periods in modern times. The Maunder Minimum coincided with the coldest part of the Little Ice Age, which the earth suffered from about 1350 to 1850. The Maunder Minimum saw sharply reduced agricultural output, and widespread human suffering, disease and premature death. Such impacts of the sun on the earth’s climate were discussed at the conference by astrophysicist and geoscientist Willie Soon, Nir J. Shaviv, of the Racah Institute of Physics in the Hebrew University of Jerusalem, and Sebastian Luning, co-author with leading German environmentalist Fritz Vahrenholt of The Cold Sun. Easterbrook suggests that the outstanding question is only how cold this present cold cycle will get. Will it be modest like the cooling from the late 1940s to late 1970s? Or will the paucity of sunspots drive us all the way down to the Dalton Minimum, or even the Maunder Minimum? He says it is impossible to know now. But based on experience, he will probably know before the UN and its politicized IPCC.

**Warming is not anthropogenic or a big deal – history, satellites, and IPCC’s falsified data prove**

Arrak 11 (Arno Arrak, author of the book “What Warming?” and was a nuclear chemist on NASA's Apollo program, 12/1/11, “Arctic Warming Is Not Greenhouse Warming” Energy & Environment, Vol. 22, No. 8, Ebsco)

Present Arctic warming started at the turn of the twentieth century. Its probable cause is a change in the North Atlantic current system that directed warm water from the Gulf Stream into the Arctic Ocean. Prior to that there had been only slow cooling for two thousand years according to Kaufman et al. A foraminiferal core taken near Svalbard by Spielhagen et al. also shows the same long term cooling. Rapid warming of Greenland glaciers, polar bears in trouble, permafrost melting, the Northwest Passage becoming navigable etc. have been used as proofs that greenhouse warming is real. Since it is now clear that Arctic warming is not greenhouse warming these observations cannot be used as proof of greenhouse warming. It is therefore incumbent upon us to look at what other proofs remain of the existence of greenhouse warming. Most axiomatic is the claim that we are now living through a greenhouse warming period that started with a global temperature rise in the late seventies. After all, Hansen said so in his testimony to the Senate. But satellites which have been measuring global temperature for the last 31 years cannot even see this so-called late twentieth century warming. What global warming they do see is a short spurt that began with the super El Nino of 1998, raised temperature by a third of a degree in four years, and then stopped. Its origin was oceanic. And this satellite record is in accord with the observations of Ferenc Miskolczi on IR absorption by the atmosphere. A third of a degree may not sound like much but it is half of what is allotted to the entire twentieth century. It, and not the greenhouse effect, was responsible for the very warm first decade of our century. But there are ground-based temperature curves that do show warming in the eighties and nineties. These are simply cooked, as in falsified. It was done by systematically raising up the cool La Nina temperatures and leaving the warm El Nino peaks in place. This fake warming was then used to justify the establishment of the IPCC in 1988. According to satellites there has been no warming in the twentyfirst century either but thanks to the IPCC we still get major governmental efforts to “mitigate” a non-existent warming. The global warming extremists today are not just in charge of government policy but have also infiltrated and taken over control of our scientific organizations. Those who should be our scientific leaders, such as the Royal Society and the National Academies of Science, have all knuckled under to extremist propaganda and now support the global warming movement. As a scientist I repudiate such a mass dereliction of their mission to advance science. Last time the scientific elite espoused such wrong ideas was in the eighteenth century when phlogiston was king. They renamed it caloric to make it more palatable but it still would not fly and both imaginary concepts ended up in the dust bin of history. That is where the global warming doctrine belongs.

## Natural - Solar Variation

**Warming is overwhelmingly due to natural causes – natural fluctuations, solar activity, and IPCC flaws prove**

Marsh 12 (Gerald E. Marsh is a retired physicist from the Argonne National Laboratory and a former consultant to the Department of Defense on strategic nuclear technology and policy in the Reagan, Bush, and Clinton Administrations, 2/1/12, “Climate Change: Sources of Warming In the Late 20th Century” Energy and Environment, Ebsco)

\* PDO is Pacific Decadal Oscillation and NAO is North Atlantic Oscillation

The Visbeck, et at. argument that “anthropogenic climate change might influence modes of natural variability, perhaps making it more likely that one phase of the NAO is preferred over the other” cannot be decided by correlation over the limited period available. Most of the anthropogenic carbon dioxide was put into the atmosphere after ~1940. The period from ~1940 to 1976-1977 was dominated by a large negative NAO—see Fig. 1—followed by a large positive NAO. Since similar positive NAOs have occurred in the past, it cannot be said that the latest is due to human activity simply because it correlates with rising carbon dioxide concentrations. It is interesting that the large negative NAO that began in the earlier portion of the 20th century and extended to about 1975 roughly corresponds to a negative phase of the Pacific Decadal Oscillation (PDO) shown in Fig. 2. And the recent large positive NAO also corresponds to the positive shift of the PDO of 1976-1977. However, the correlation does not appear to be robust when compared to PDOs extending back to 1600, as seen in Figure 3. In terms of the temperature shift in the arctic, however, the impact of the positive phase of the PDO—often called “The Great Pacific Climate Shift of 1976-1977”—has been dramatic. Composite temperatures from Fairbank, Anchorage, Nome and Barrow (see Fig. 4) show a rise of ~1.4 oC followed by a decrease of ~0.24 oC/decade. [11] It is worth reiterating the observation of Visbeck, et al. that “because global average temperatures are dominated by temperature variability over the northern land masses, a significant fraction of the recent warming trend in global surface temperatures can be explained as a response to observed changes in atmospheric circulation.” In addition to a positive NAO phase beginning in ~1980, and the positive PDO beginning in 1976-1977, there are also the effects of aerosols and the extraordinary solar activity in the last half of the 20th century to be considered. 3.1. Aerosols The Arctic is purported to be the region of the earth most sensitive to radiative forcing by rising carbon dioxide concentrations. The temperature rise there is often cited, usually without consideration being given to the PDO shift in 1976-1977, as proof of the climate impact of rising anthropogenic concentrations of greenhouse gases. But other factors, even if one excludes the PDO shift, may be responsible for most if not all of the temperature rise. Shindell and Faluvegi [12] have looked at the impact of aerosols on Arctic climate and concluded that “decreasing concentrations of sulphate aerosols and increasing concentrations of black carbon have substantially contributed to rapid Arctic warming during the past three decades.” They estimate that some 45% of the warming during this period was due to this change in both types of aerosol concentrations. What this means is that rising concentrations of carbon dioxide are not responsible for almost half of arctic warming. Temperature rise comparisons for different regions of the globe are shown in Figure 5. From Fig. 5, the temperature rise in the Arctic over the past three decades (~1978- 2002) is ~1.1 oC. If 45% of this increase is due to changes in the concentrations of aerosols and black carbon, that leaves ~0.5 oC for other causes. This is obviously not compatible with the ~1.4 oC Arctic temperature rise due to the shift in the PDO in 1976-1977 shown in Fig. 4. The discrepancy may possibly be due to the use of different databases or other factors having to do with the model-based study of Shindell and Faluvegi. In any case, if the limited data in Fig. 4 is indicative of the rest of the Arctic, almost all of the Arctic warming since 1976-1977 is apparently due to causes unrelated to the rising concentrations of carbon dioxide. It would be a sophistry to claim that since the aerosols and black carbon came from burning fossil fuels there is a relationship between the carbon dioxide and the production of aerosols and black carbon—of course there is, but it is not a causal connection. 3.2. Solar Activity As can be seen from Fig. 6 below, [13] the high level of solar activity during the last sixty years transcends anything seen during the last 1150 years! Notice in Fig. 6 that the variation in 14C has an inverted scale. High solar activity, however, does not mean there are large changes in solar irradiance. The most likely mechanism for coupling solar activity to climate is the modulation of the cosmic ray flux by solar activity and the observed, correlated, variations in the earth’s albedo. This coupled with the fact that cosmic-ray intensity, as reconstructed from 10Be concentrations in ice cores show a ~5-6% decrease over the twentieth century, corresponding to a 1% decrease in cloud cover. A simple phenomenological approach allows one to obtain an estimate of solar variations on climate since 1900. [14] This yields a range of 36-50% for the percentage of temperature rise since 1900 due to the increase in solar activity. For additional discussion see reference 14. How this estimate fits with Hurrell’s claim that “nearly all of the cooling in the northwest Atlantic and the warming across Europe and downstream over Eurasia since the mid-1970s results from changes in the NAO depends on whether there is a relationship between solar activity and the NAO, and this is unknown. One thing that should be clear at this point, however, is that the recent rise in global temperature is probably not due to rising carbon dioxide concentrations as is generally assumed. Given the uncertainties outlined above, even this basic assumption behind the findings of the Intergovernmental Panel on Climate Change (IPCC) is probably incorrect. And while rising carbon dioxide concentrations are likely to be responsible for a small portion of the warming since the mid-1970s, the IPCC has been using far too high an estimate for climate sensitivity to a doubling of carbon dioxide in its projections. It is also important to understand the uncertainties associated with such projections. Future climate projections by the IPCC are based on coupled ocean-atmosphere climate models. These models are validated by using past data to predict present surface temperatures. There is, however, as put by Valdes, “large intermodel variability in the prediction of present-day surface temperature for atmospheric GCMs [Global Climate Models—often using a simplified ocean treatment rather than being coupled to an ocean circulation model]. At high latitudes the differences can exceed 10oC. Simulations with coupled ocean-atmosphere models will almost certainly have an even wider spread of results. . . . Thus it could be said that the models and data agree to within the error bars. However, this interpretation of modeling results is controversial since a similar argument applied to future climate predictions would suggest that the predicted change in future climates in mid- and high latitudes does not exceed the modeling errors!” [15] That is, the modeling errors could well exceed the temperature changes predicted by the models. In that case, how can one argue that model projections are a sound basis for formulating public policy? SUMMARY The conclusion of this essay can be stated in a single sentence: Much, if not all, of the warming during the late 20th century was most likely due to natural rather than anthropogenic causes.

## Natural - Sunspots

**Sun spots are the primary cause of climate change – those who believe in human induced warming are simply ignoring the facts**

Bell 11 (Larry Bell is an endowed professor at the University of Houston where he founded and direct the Sasakawa International Center for Space Architecture and head the graduate program in space architecture, his background deals extensively with research, planning and design of habitats, structures and other support systems for applications in space and extreme environments on Earth, he is the author of the book "Climate of Corruption: Politics and Power Behind the Global Warming Hoax" 9/20/11, “Sorry, But With Global Warming It's The Sun, Stupid” www.forbes.com/sites/larrybell/2011/09/20/sorry-but-with-global-warming-its-the-sun-stupid/)

Man-made global warming crisis crusaders are now facing a new threat. Their anti-fossil carbon-based premise for alarmism is being challenged by new scientific evidence of important solar influences upon climate that can’t readily be blamed on us. Not that there wasn’t lots of good evidence of this before. Actually, there has been, and it has been routinely denigrated and ignored. Only this time, the high-profile international source will be impossible for the entrenched scientific establishment to casually dismiss. No, not after experiments at the world’s leading physics laboratory, the European Organization for Nuclear Research (CERN) in Geneva, Switzerland recently revealed an inverse correlation between periodic changes in sunspot activity levels, and quantities of cosmic rays entering Earth’s atmosphere that trigger surface-cooling cloud formations. Sunspots are areas of localized magnetic activity on the sun’s surface that are coupled with high energy streams of charged particles called solar winds. The overall number of sunspots typically varies in frequency over 11 year cycles. During the most active periods the solar winds shield more outer space cosmic rays from penetrating the Earth’s magnetic field and entering the atmosphere to nucleate low-level clouds. But when sun spot activity is low, a condition that can sometimes persist over decades and longer, the increased cosmic ray bombardment produces more cloud cover, hence cooling influences. The sunspot-climate part of the connection isn’t a new idea. Astronomer Royal, William Herschel, noticed a correlation between sunspots and the price of wheat in England two centuries ago. Some scientists have also observed that sunspots all but disappeared for 70 years during the frigid “Little Ice Age” around the 17th and 18th centuries. Yet the notion didn’t begin to receive any real attention, albeit mostly negative, until 1995. That was when Danish physicist, Henrik Svensmark, decided to explore the matter after coming across a 1991 paper by fellow Danes Eigil Friis-Christensen and Knud Lassen that charted solar variations and global surface temperatures since 1860. Svensmark then teamed up with Friis-Christensen to review solar activity, cloud cover and cosmic ray levels recorded using satellite data available since 1979. The connections seemed clear. Responses to their findings by prominent members of the climate science community were unwelcoming. When presented at a 1996 conference in Birmingham, England, Svensmark recalls that “everything went completely crazy…It turned out that it was very, very sensitive to say these things already at that time.” Upon returning to Copenhagen he was greeted by a statement quoting Bert Bolin who was then chairman of the U.N. Intergovernmental Panel on Climate Change (IPCC): “I find the move from this pair scientifically extremely naïve and irresponsible.” Failing to raise any significant research support, Svensmark managed to conduct a boot-strap-funded experiment in 2007 at the Danish National Space Center that yielded convincing validation. Using a particle accelerator, he demonstrated that cosmic rays colliding with molecules in the atmosphere can, in fact, cause gaseous water vapor to condense into cloud-forming droplets. Again, he received little scientific applause for this accomplishment. But fortunately, at least one person took the Danes’ early observations seriously. Following their presentation at the Birmingham conference, CERN scientist Jasper Kirkby\*, a British experimental physicist, told the scientific press in 1998 that the theory “will probably be able to account for somewhere between half and the whole of the increase in the Earth’s temperature that we have seen in the last century.” Furthermore, he too, set out to obtain more proof. But his plan to do so wasn’t an easy sell. It took Kirkby nearly 10 years to convince the CERN bureaucracy to create a stainless steel cloud chamber to precisely replicate the Earth’s atmosphere and conduct independent experiments. It worked! As reported in the Aug. 25 issue of the journal Nature, Jasper Kirkby and his 62 co-authors from 17 institutes in Europe and the U.S. announced that the sun indeed has a significant influence on our planet’s temperature. Their “Cosmics Leaving Outdoor Droplets” (CLOUD) experiment proved that its magnetic field does, in fact, act as a gateway for cosmic rays that play a large role in cloud formation. The report stated “Ion-induced nucleation [cosmic ray action] will manifest itself as a steady production of new particles [molecular clusters] that is difficult to isolate in atmospheric observations because of other sources of variability but is nevertheless taking place and could be quite large globally over the troposphere [the lower atmosphere].” In other words, the big influence exists, yet hasn’t been factored into climate models.

## Natural - Satellites

**NASA has already collected satellite data that proves their feedback theory is wrong and warming is not a problem - heat can escape the atmosphere**

Taylor 11 (James M. Taylor, senior fellow for environment policy at The Heartland Institute and managing editor of Environment & Climate News, 5/27/11, “New NASA Data Blow Gaping Hole In Global Warming Alarmism” http://news.yahoo.com/nasa-data-blow-gaping-hold-global-warming-alarmism-192334971.html)

NASA satellite data from the years 2000 through 2011 show the Earth's atmosphere is allowing far more heat to be released into space than alarmist computer models have predicted, reports a new study in the peer-reviewed science journal Remote Sensing. The study indicates far less future global warming will occur than United Nations computer models have predicted, and supports prior studies indicating increases in atmospheric carbon dioxide trap far less heat than alarmists have claimed. Study co-author Dr. Roy Spencer, a principal research scientist at the University of Alabama in Huntsville and U.S. Science Team Leader for the Advanced Microwave Scanning Radiometer flying on NASA's Aqua satellite, reports that real-world data from NASA's Terra satellite contradict multiple assumptions fed into alarmist computer models. "The satellite observations suggest there is much more energy lost to space during and after warming than the climate models show," Spencer said in a July 26 University of Alabama press release. "There is a huge discrepancy between the data and the forecasts that is especially big over the oceans." In addition to finding that far less heat is being trapped than alarmist computer models have predicted, the NASA satellite data show the atmosphere begins shedding heat into space long before United Nations computer models predicted. The new findings are extremely important and should dramatically alter the global warming debate. Scientists on all sides of the global warming debate are in general agreement about how much heat is being directly trapped by human emissions of carbon dioxide (the answer is "not much"). However, the single most important issue in the global warming debate is whether carbon dioxide emissions will indirectly trap far more heat by causing large increases in atmospheric humidity and cirrus clouds. Alarmist computer models assume human carbon dioxide emissions indirectly cause substantial increases in atmospheric humidity and cirrus clouds (each of which are very effective at trapping heat), but real-world data have long shown that carbon dioxide emissions are not causing as much atmospheric humidity and cirrus clouds as the alarmist computer models have predicted. The new NASA Terra satellite data are consistent with long-term NOAA and NASA data indicating atmospheric humidity and cirrus clouds are not increasing in the manner predicted by alarmist computer models. The Terra satellite data also support data collected by NASA's ERBS satellite showing far more longwave radiation (and thus, heat) escaped into space between 1985 and 1999 than alarmist computer models had predicted. Together, the NASA ERBS and Terra satellite data show that for 25 years and counting, carbon dioxide emissions have directly and indirectly trapped far less heat than alarmist computer models have predicted.

## Natural - Volcanoes

**Alt causes - volcanoes and solar variations - their models don't account for them**

**Cooper 11** (Barry Cooper, political science professor at the University of Calgary, 2011, "Scientists grow cool to global warming theory," Calgary Herald)

Today, academic conferences have become venues for real scientific debate. Recently, the University of Ottawa hosted an international meeting of "climate realists," as Bob Carty, a geology professor from Australia, called his colleagues. Only one speaker came close to endorsing the catastrophic claims of the IPCC. The rest of the panic-mongers stayed home. For them, the science is truly settled. They have nothing more to learn. And yet, science moves on. For example, earlier this year, a Swedish geophysicist, Nils-Axel Moerner, published a paper in the journal Energy and Environment flatly contradicting the IPCC predictions of an ice-free Arctic, a prospect that has significant policy implications for Canada. His argument was straightforward. Variation in solar activity -radiance and sun spots -affect the Earth's temperature and rotation, which in turn affect the Gulf Stream and the movement of ice and cold Arctic water, allowing it to penetrate as far south as Portugal. Soon, kids will skate again on the Thames and England will become a hockey powerhouse. Another geophysicist, Ivanka Charvatova, has shown how gravitational forces in the solar system affect the wobble of the sun, called solar inertial motion, which affects weather patterns on Earth. The IPCC has never considered solar inertial motion or any other solarterrestrial link. Not geomagnetic changes, cosmic rays, solar gravitational change. Nothing. They haven't even looked at volcanic eruptions. Volcanoes matter. Somebody calculated that in four days, the Grimsvotn eruption in Iceland a month ago wiped out five years of effort to control CO2 emissions. No one has required Iceland to purchase carbon offsets. Yet. Somebody else calculated the year-long eruption of Mount Pinatubo in the Philippines 20 years ago spewed more carbon dioxide than the entire human race for the whole of human history. Up the road in Edmonton, Fangliang Hu co-authored a paper published in the important science journal Nature that explained the models attempting to show disappearing Arctic fauna, from polar bugs to polar bears, were deeply flawed. Reaction by a selfdescribed "conservation biologist" (as distinct from an ordinary scientific biologist) was that the authors had taken a cheap shot at his research. Stephen Hubbel, the other co-author, said it was evidence that science is self-correcting. And speaking of models, last month, John Mitchell, a research fellow at the Meteorological Office in London, was asked about the absence of warming since 1995. He replied: "People underestimate the power of models. Observational evidence is not very useful. Our approach is not entirely empirical."

## Natural - Prefer our Ev

**The effects of human emissions are negligible – the threat of imminent warming is all hype so scientists and politicians don’t have to admit they were wrong**

Evans 11 (David Evans, Award winning researcher and editor for Environment & Climate News, 4/8/11, “Climate Models Go Cold; Carbon Warming Too Minor To Be Worth Worrying About” LexisNexis)

The debate about global warming has reached ridiculous proportions and is full of micro-thin half-truths and misunderstandings. I am a scientist who was on the carbon gravy train, understands the evidence, was once an alarmist, but am now a skeptic. Watching this issue unfold has been amusing but, lately, worrying. This issue is tearing society apart, making fools out of our politicians. Let's set a few things straight. The whole idea that carbon dioxide is the main cause of the recent global warming is based on a guess that was proved false by empirical evidence during the 1990s. But the gravy train was too big, with too many jobs, industries, trading profits, political careers, and the possibility of world government and total control riding on the outcome. So rather than admit they were wrong, the governments, and their tame climate scientists, now outrageously maintain the fiction that carbon dioxide is a dangerous pollutant. Let's be perfectly clear. Carbon dioxide is a greenhouse gas, and other things being equal, the more carbon dioxide in the air, the warmer the planet. Every bit of carbon dioxide that we emit warms the planet. But the issue is not whether carbon dioxide warms the planet, but how much. Most scientists, on both sides, also agree on how much a given increase in the level of carbon dioxide raises the planet's temperature, if just the extra carbon dioxide is considered. These calculations come from laboratory experiments; the basic physics have been well known for a century. The disagreement comes about what happens next. The planet reacts to that extra carbon dioxide, which changes everything. Most critically, the extra warmth causes more water to evaporate from the oceans. But does the water hang around and increase the height of moist air in the atmosphere, or does it simply create more clouds and rain? Back in 1980, when the carbon dioxide theory started, no one knew. The alarmists guessed that it would increase the height of moist air around the planet, which would warm the planet even further, because the moist air is also a greenhouse gas. This is the core idea of every official climate model: For each bit of warming due to carbon dioxide, they claim it ends up causing three bits of warming due to the extra moist air. The climate models amplify the carbon dioxide warming by a factor of three -so two-thirds of their projected warming is due to extra moist air (and other factors); only one-third is due to extra carbon dioxide. That's the core of the issue. All the disagreements and misunderstandings spring from this. The alarmist case is based on this guess about moisture in the atmosphere, and there is simply no evidence for the amplification that is at the core of their alarmism. Weather balloons had been measuring the atmosphere since the 1960s, many thousands of them every year. The climate models all predict that as the planet warms, a hot spot of moist air will develop over the tropics about 10 kilometres up, as the layer of moist air expands upwards into the cool dry air above. During the warming of the late 1970s, '80s and '90s, the weather balloons found no hot spot. None at all. Not even a small one. This evidence proves that the climate models are fundamentally flawed, that they greatly overestimate the temperature increases due to carbon dioxide. This evidence first became clear around the mid-1990s. At this point, official "climate science" stopped being a science. In science, empirical evidence always trumps theory, no matter how much you are in love with the theory. If theory and evidence disagree, real scientists scrap the theory. But official climate science ignored the crucial weather balloon evidence, and other subsequent evidence that backs it up, and instead clung to their carbon dioxide theory -that just happens to keep them in well-paying jobs with lavish research grants, and gives great political power to their government masters. There are now several independent pieces of evidence showing that the earth responds to the warming due to extra carbon dioxide by dampening the warming. Every long-lived natural system behaves this way, counteracting any disturbance. Otherwise the system would be unstable. The climate system is no exception, and now we can prove it. But the alarmists say the exact opposite, that the climate system amplifies any warming due to extra carbon dioxide, and is potentially unstable. It is no surprise that their predictions of planetary temperature made in 1988 to the U.S. Congress, and again in 1990, 1995, and 2001, have all proved much higher than reality. They keep lowering the temperature increases they expect, from 0.30C per decade in 1990, to 0.20C per decade in 2001, and now 0.15C per decade -yet they have the gall to tell us "it's worse than expected." These people are not scientists. They overestimate the temperature increases due to carbon dioxide, selectively deny evidence, and now they conceal the truth. One way they conceal is in the way they measure temperature. The official thermometers are often located in the warm exhaust of air conditioning outlets, over hot tarmac at airports where they get blasts of hot air from jet engines, at waste-water plants where they get warmth from decomposing sewage, or in hot cities choked with cars and buildings. Global warming is measured in 10ths of a degree, so any extra heating nudge is important. In the United States, nearly 90% of official thermometers surveyed by volunteers violate official siting requirements that they not be too close to an artificial heating source. Global temperature is also measured by satellites, which measure nearly the whole planet 24/7 without bias. The satellites say the hottest recent year was 1998, and that since 2001 the global temperature has levelled off. Why does official science track only the surface thermometer results and not mention the satellite results? The Earth has been in a warming trend since the depth of the Little Ice Age around 1680. Human emissions of carbon dioxide were negligible before 1850 and have nearly all come after the Second World War, so human carbon dioxide cannot possibly have caused the trend. Within the trend, the Pacific Decadal Oscillation causes alternating global warming and cooling for 25 to 30 years at a go in each direction. We have just finished a warming phase, so expect mild global cooling for the next two decades. We are now at an extraordinary juncture. Official climate science, which is funded and directed entirely by government, promotes a theory that is based on a guess about moist air that is now a known falsehood. Governments gleefully accept their advice, because the only ways to curb emissions are to impose taxes and extend government control over all energy use. And to curb emissions on a world scale might even lead to world government -how exciting for the political class! Even if we stopped emitting all carbon dioxide tomorrow, completely shut up shop and went back to the Stone Age, according to the official government climate models it would be cooler in 2050 by about 0.015 degrees. But their models exaggerate 10-fold -in fact our sacrifices would make the planet in 2050 a mere 0.0015 degrees cooler! Finally, to those who still believe the planet is in danger from our carbon dioxide emissions: Sorry, but you've been had. Yes, carbon dioxide is a cause of global warming, but it's so minor it's not worth doing much about.

## Models Flawed

**Climate models empirically unreliable**

Sherwood, Keith, and Craig Idso et al 2012 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Global Warming Fosters High-Latitude Cooling??? http://co2science.org/articles/V15/N27/EDIT.php

In a study recently published in Environmental Research Letters, Cohen et al. (2012) note that over the last four decades Arctic temperatures have warmed at nearly double the global rate, citing Solomon et al. (2007) and Screen and Simmonds (2010); and they state that "coupled climate models attribute much of this warming to rapid increases in greenhouse gases and project the strongest warming across the extratropical Northern Hemisphere during boreal winter due to 'winter (or Arctic) amplification'," citing Holland and Bitz (2003), Hansen and Nazarenko (2004), Alexeev et al. (2005) and Langen and Alexeev (2007). However, they say that "recent trends in observed Northern Hemisphere winter surface temperatures diverge from these projections," noting that "while the planet has steadily warmed, Northern Hemisphere winters have recently grown more extreme across the major industrialized centers," and reporting that "record cold snaps and heavy snowfall events across the United States, Europe and East Asia garnered much public attention during the winters of 2009/10 and 2010/11 (Blunden et al., 2011; Cohen et al., 2010)," with the latter set of researchers suggesting that "the occurrence of more severe Northern Hemisphere winter weather is a two-decade-long trend starting around 1988." So what's going on here? Cohen et al. say that "whether the recent colder winters are a consequence of internal variability or a response to changes in boundary forcings resulting from climate change remains an open question." But like most scientists who love to resolve dilemmas, they go on to propose their answer to the puzzle, suggesting that "summer and autumn warming trends are concurrent with increases in high-latitude moisture and an increase in Eurasian snow cover, which dynamically induces large-scale wintertime cooling." But, again, who knows? The only thing that is certain, as Cohen et al. describe it, is that "traditional radiative greenhouse gas theory and coupled climate models forced by increasing greenhouse gases alone cannot account for this seasonal asymmetry." And so we have yet another reason why so many scientists are so skeptical about the ability of even the most sophisticated of today's climate models to adequately portray reality.

## Models Flawed - Glaciers

**Current glacial models are totally unreliable**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Weaknesses in Our Knowledge of Land-Ice/Sea-Level Interactions http://co2science.org/articles/V14/N43/EDIT.php

In a review paper published in Oceanography, Pfeffer (2011) provides a 30-year perspective on what scientists have learned about the relationship between land ice and sea level, while at the same time openly acknowledging the weaknesses associated with current views of the subject. The professor -- who holds positions in both the Institute of Arctic and Alpine Research and the Department of Civil, Environmental and Architectural Engineering of the University of Colorado at Boulder (USA) -- begins by acknowledging that for all the success of air- and space-borne observations of glaciers and ice sheets, "certain long-standing objectives have consistently eluded researchers," such as obtaining trustworthy observations of basal sliding and calving, as well as an improved understanding of subglacial processes, while further writing that "at present, the foundations of our theoretical knowledge of subglacial sliding and iceberg calving are not very different than what was available at the time of the First IPCC Assessment (Houghton et al., 1990)." "As was the case nearly three decades ago," as Pfeffer continues, "basal sliding and calving remain obscure but exert critical controls on glacier and ice sheet dynamics," and he notes that as a result, "the lack of detailed observations of basal topography, temperature, and other boundary conditions in critical regions further complicates modeling efforts." In fact, he writes that the situation is so bleak that researchers "have still not closed the gaps in our knowledge to a degree that 'sliding laws' can be reliably and broadly implemented in numerical models," even adding that "no clear solution to this problem is in sight." Pfeffer additionally reports that there has been "no comprehensive, global upscaled compilation of glacier and ice cap loss rates after 2005," stating that "without any proper accounting of the aggregate glacier and ice cap loss rate, the net loss from land ice cannot be reliably calculated." And without such observations, he adds that "no reliable assessment of contemporary rates of sea level rise can be made," commenting that "without this knowledge, projections of sea level rise are blind to future contributions from glaciers and ice caps." In concluding his "weakness" commentary, Pfeffer states that our ability to project what glacier and ice discharge will actually be in years and decades to come "is grossly compromised, both by lack of basic inventory knowledge (where are the glaciers and how big are they?) and up-to-date observations of their rate of change." Thus, there is still much important work to be done in the area of land-ice/sea-level interactions before we can have much confidence in what the world's climate alarmists are currently predicting about future sea level rise.

## Models Flawed - Rainfall

**Climate models fail - cannot accurately predict something as basic as rainfall**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) State-of-the-Art Climate Models and Extreme Meteorological Events and Consequences http://co2science.org/articles/V14/N30/EDIT.php

In a recent paper published in Climate Research, Trenberth (2011) compares the projections of state-of-the-art climate models with what is known about the real world with respect to extreme meteorological events related to atmospheric moisture, such as precipitation and various types of storm systems, as well as subsequent extreme consequences such as droughts, floods and wind damage. So what does he find? In the concluding sentence of his paper's abstract, the U.S. researcher -- a Distinguished Senior Scientist in the Climate Analysis Section at the National Center for Atmospheric Research -- states that model-simulated precipitation "occurs prematurely and too often, and with insufficient intensity, resulting in recycling that is too large and a lifetime of moisture in the atmosphere that is too short, which affects runoff and soil moisture," while in the text of the paper he writes that "all models contain large errors in precipitation simulations, both in terms of mean fields and their annual cycle (such as the spurious migration of the Intertropical Convergence Zone into the other hemisphere), as well as their characteristics: the intensity, frequency, and duration of precipitation, plus the amount (e.g. IPCC, 2007; Bosilovich et al., 2008; Liepert and Previdi, 2009)." And he states that "it appears that many, perhaps all, global climate and numerical weather prediction models and even many high-resolution regional models have a premature onset of convection and overly frequent precipitation with insufficient intensity," citing the work of Yang and Slingo (2001) and Dai and Trenberth (2004). Continuing, Trenberth states that "confidence in model results for changes in extremes is tempered by the large scatter among the extremes in modeling today's climate, especially in the tropics and subtropics (Kharin et al., 2007), which relates to poor depiction of transient tropical disturbances, including easterly waves, Madden-Julian Oscillations, tropical storms, and hurricanes (Lin et al., 2006)." These phenomena, in his words, "are very resolution dependent, but also depend on parameterizations of sub-grid-scale convection, the shortcomings of which are revealed in diurnal cycle simulations," wherein "models produce precipitation that is too frequent and with insufficient intensity (Yang and Slingo, 2001; Trenberth et al., 2003; Dai and Trenberth, 2004; Dai, 2006)." In light of these several observations, Trenberth concludes that "major challenges remain to improve model simulations of the hydrological cycle." And until such is accomplished and it is proven that the models can at least correctly simulate something as basic as precipitation, it would seem unwise in the extreme to make major global-economy-impacting political decisions on so flimsy a basis as what today's climate models are currently predicting, not only with respect to the meteorological phenomena that are discussed by Trenberth, but with respect to the many other extreme weather and climatic events that the world's climate alarmists use to terrorize the public on a never-ending basis via their over-the-top rhetoric about impending catastrophic consequences if anthropogenic CO2 emissions are not drastically reduced.

## AT: Weather Impacts

**All climate impacts are untrue**

**Solomon 11** (Lawrence Solomon, executive director of Energy Probe and Urban Renaissance Institute, 9/17/2011, "Warmed right over; The global-warming theory is nearing its end as evidence against it mounts," The National Post)

Some Canadians blame humans for global warming because they've been told that Antarctica is melting in unprecedented ways, the "proof" being spectacular film footage of huge chunks of ice breaking off into the Antarctic Ocean. They don't yet know that Antarctic ice has always broken off, that satellites show Antarctica to be gaining ice overall, and that Antarctica has been getting colder, not warmer, over the last half century. Other Canadians think the Arctic ice is in danger of disappearing, unaware that several times over the last century the Arctic Ocean was actually navigable - today's Arctic is no different from before. What about all the hurricanes predicted to ravage our shores because of global warming? They never happened, and for good reason: As the IPCC's own hurricane expert said in resigning from that organization, there is no evidence that global warming will cause an increase in hurricanes. The submerged islands in the Pacific? That, too, never happened. Yes, the oceans have been rising, as they have been for centuries, but not because of recent carbon dioxide emissions. In fact, the recent evidence shows the oceans' rate of rise has been slowing.

## CO2 Doesn't Increase warming

**CO2 doesn’t cause warming - variability**

**Solomon 11** (Lawrence Solomon, executive director of Energy Probe and Urban Renaissance Institute, 9/17/2011, "Warmed right over; The global-warming theory is nearing its end as evidence against it mounts," The National Post)

The correlation between carbon dioxide and global warming? In the last century, there has been none. While carbon-dioxide emissions have steadily increased, the temperature has gone up and down like a yo-yo. The down period in the 1970s was so severe that many scientists at the time thought we were heading for a period of global cooling, as many do again, now that the planet has again stopped warming.

**CO2 cannot affect radiation**

**Goldblatt & Watson 12** (Colin Goldblatt, School of Earth and Ocean Sciences at U of Victoria AND Andrew Watson, School of Environmental Sciences, University of East Anglia, Norwich, 1/8/2012, "The Runaway Greenhouse: implications for future climate change, geoengineering and planetary atmospheres," The Royal Society TEX Paper, http://arxiv.org/pdf/1201.1593v1.pdf)

Figure 5 illustrates how increasing the carbon dioxide inventory of the atmosphere aﬀects the change in outgoing longwave radiation with temperature, using a grey atmosphere model. Presently, Earth’s absorbed solar ﬂux is smaller than all of the radiation limits described above and the surface temperature adjusts so that outgoing longwave radiation matches the absorbed solar ﬂux. More carbon dioxide means that the surface must be warmer to provide the same outgoing ﬂux—this is the familiar greenhouse eﬀect. The runaway greenhouse only occurs when the outgoing longwave ﬂux reaches a radiation limit. The fundamental point is that adding carbon dioxide does not increase the outgoing longwave ﬂux, so cannot cause a runaway greenhouse. Whilst this result comes from simple models, a qualitatively similar result can be obtained from spectrally resolved radiative transfer codes (see ﬁgure 9 of Kasting, 1988): even 100 bar of CO2 does not give a radiation limit (Kasting & Ackerman, 1986; Kasting, 1988).

**Their studies have zero *causal warrant***

**Bell 12** (Larry Bell, Prof at Univ of Houston, Sasakawa International Center for Space Architecture, 7/17/2012, "That Scientific Global Warming Consensus...Not!," Forbes, http://www.forbes.com/sites/larrybell/2012/07/17/that-scientific-global-warming-consensus-not/2/)

Consider the National Academy of Sciences for example. In 2007, Congress appropriated $5,856,000 for NAS to complete a climate change study. The organization subsequently sold its conclusions in three separate report sections at $44 per download. The first volume, upon which the other two sections were based titled Advancing the Science of Climate Change, presents a case that human activities are warming the planet, and that this “poses significant risks”. The second urges that a cap-and-trade taxing system be implemented to reduce so-called greenhouse gas (GHG) emissions. The third explores strategies for adapting to the “reality” of climate change, meaning purported “extreme weather events like heavy precipitation and heat waves.” What scientific understanding breakthrough did that big taxpayer-financed budget buy? Namely that the Earth’s temperature has risen over the past 100 years, and that human activities have resulted in a steady atmospheric CO2 increase. This is hardly new information, and few scientists are likely to challenge either of these assertions, which essentially prove no link between the two observations. All professional scientists recognize that correlation does not establish causation.

## Past Temperatures Outweigh

**Their impacts are all empirically denied ---- past temperatures were substantially warmer than the present**

**Idsos 7** (Sherwood, Research Physicist @ US Water Conservation laboratory, and Craig, President of Center for the Study of Carbon Dioxide and Global change and PhD in Geography, “Carbon Dioxide and Global Change: Separating Scientific Fact from Personal Opinion”, 6-6, http://www.co2science.org/education/reports/hansen/HansenTestimonyCritique.pdf)

In an attempt to depict earth's current temperature as being extremely high and, therefore, extremely dangerous, Hansen focuses almost exclusively on a single point of the earth's surface in the Western Equatorial Pacific, for which he and others (Hansen et al., 2006) compared modern sea surface temperatures (SSTs) with paleo-SSTs that were derived by Medina-Elizade and Lea (2005) from the Mg/Ca ratios of shells of the surface-dwelling planktonic foraminifer Globigerinoides rubber that they obtained from an ocean sediment core. In doing so, they concluded that “this critical ocean region, and probably the planet as a whole [our italics], is approximately as warm now as at the Holocene maximum and within ~1°C of the maximum temperature of the past million years [our italics].” Is there any compelling reason to believe these claims of Hansen et al. about the entire planet? In a word, no, because there are a multitude of other single-point measurements that suggest something vastly different. Even in their own paper, Hansen et al. present data from the Indian Ocean that indicate, as best we can determine from their graph, that SSTs there were about 0.75°C warmer than they are currently some 125,000 years ago during the prior interglacial. Likewise, based on data obtained from the Vostok ice core in Antarctica, another of their graphs suggests that temperatures at that location some 125,000 years ago were about 1.8°C warmer than they are now; while data from two sites in the Eastern Equatorial Pacific indicate it was approximately 2.3 to 4.0°C warmer compared to the present at about that time. In fact, Petit et al.’s (1999) study of the Vostok ice core demonstrates that large periods of all four of the interglacials that preceded the Holocene were more than 2°C warmer than the peak warmth of the current interglacial. But we don’t have to go nearly so far back in time to demonstrate the non-uniqueness of current temperatures. Of the five SST records that Hansen et al. display, three of them indicate the mid-Holocene was also warmer than it is today. Indeed, it has been known for many years that the central portion of the current interglacial was much warmer than its latter stages have been. To cite just a few examples of pertinent work conducted in the 1970s and 80s – based on temperature reconstructions derived from studies of latitudinal displacements of terrestrial vegetation (Bernabo and Webb, 1977; Wijmstra, 1978; Davis et al., 1980; Ritchie et al., 1983; Overpeck, 1985) and vertical displacements of alpine plants (Kearney and Luckman, 1983) and mountain glaciers (Hope et al., 1976; Porter and Orombelli, 1985) – we note it was concluded by Webb et al. (1987) and the many COHMAP Members (1988) that mean annual temperatures in the Midwestern United States were about 2°C greater than those of the past few decades (Bartlein et al., 1984; Webb, 1985), that summer temperatures in Europe were 2°C warmer (Huntley and Prentice, 1988) – as they also were in New Guinea (Hope et al., 1976) – and that temperatures in the Alps were as much as 4°C warmer (Porter and Orombelli, 1985; Huntley and Prentice, 1988). Likewise, temperatures in the Russian Far East are reported to have been from 2°C (Velitchko and Klimanov, 1990) to as much as 4-6°C (Korotky et al., 1988) higher than they were in the 1970s and 80s; while the mean annual temperature of the Kuroshio Current between 22 and 35°N was 6°C warmer (Taira, 1975). Also, the southern boundary of the Pacific boreal region was positioned some 700 to 800 km north of its present location (Lutaenko, 1993). But we needn’t go back to even the mid-Holocene to encounter warmer-than-present temperatures, as the Medieval Warm Period, centered on about AD 1100, had lots of them. In fact, every single week since 1 Feb 2006, we have featured on our website (www.co2science.org) a different peer-reviewed scientific journal article that testifies to the existence of this several-centuries-long period of notable warmth, in a feature we call our Medieval Warm Period Record of the Week. Also, whenever it has been possible to make either a quantitative or qualitative comparison between the peak temperature of the Medieval Warm Period (MWP) and the peak temperature of the Current Warm Period (CWP), we have included those results in the appropriate quantitative or qualitative frequency distributions we have posted within this feature; and a quick perusal of these ever-growing databases (reproduced below as of 23 May 2007) indicates that, in the overwhelming majority of cases, the peak warmth of the Medieval Warm Period was significantly greater than the peak warmth of the Current Warm Period.

## Temperatures Limited

**Worst case scenario warming will only be 1.5 degrees**

**deFreitas 2** (C. R., Associate Prof. in Geography and Enivonmental Science @ U. Aukland, Bulletin of Canadian Petroleum Geology, “Are observed changes in the concentration of carbon dioxide in the atmosphere really dangerous?” 50:2, GeoScienceWorld)

In any analysis of CO2 it is important to differentiate between three quantities: 1) CO2 emissions, 2) atmospheric CO2 concentrations, and 3) greenhouse gas radiative forcing due to atmospheric CO2. As for the first, between 1980 and 2000 global CO2 emissions increased from 5.5 Gt C to about 6.5 Gt C, which amounts to an average annual increase of just over 1%. As regards the second, between 1980 and 2000 atmospheric CO2 concentrations increased by about 0.4 per cent per year. Concerning the third, between 1980 and 2000 greenhouse gas forcing increase due to CO2 has been about 0.25 W m–2 per decade (Hansen, 2000). Because of the logarithmic relationship between CO2 concentration and greenhouse gas forcing, even an exponential increase of atmospheric CO2 concentration translates into linear forcing and temperature increase; or, as CO2 gets higher, a constant annual increase of say 1.5 ppm has less and less effect on radiative forcing, as shown in Figure 3. Leaving aside for the moment the satellite temperature data and using the surface data set, between 1980 and 2000 there has been this linear increase of both CO2 greenhouse gas forcing and temperature. If one extrapolates the rate of observed atmospheric CO2 increase into the future, the observed atmospheric CO2 increase would only lead to a concentration of about 560 ppm in 2100, about double the concentration of the late 1800’s. That assumes a continuing increase in the CO2 emission rate of about 1% per year, and a carbon cycle leading to atmospheric concentrations observed in the past. If one assumes, in addition, that the increase of surface temperatures in the last 20 years (about 0.3 °C) is entirely due to the increase in greenhouse gas forcing of all greenhouse gas, not just CO2, that would translate into a temperature increase of about 1.5 °C (or approximately 0.15 °C per decade). Using the satellite data, the temperature increase is correspondingly lower. Based on this, the temperature increase over the next 100 years might be less than 1.5 °C, as proposed in Figure 19.

## No "Global" Temperatures

**Warming is incoherent - "global" temperatures don't exist**

**Essex et. al 7** (Chris, Prof. Applied Math @ U. Western Ontario, Ross McKitrick, Assistant Prof. Econ @ U. Guelph, and Bjarne Andersen, Prof. Physics @ Niels Bohr Institute @ U. Copenhagen, Journal of Non-Equilibrium Thermodynamics, “Does a Global Temperature Exist?” 32, http://www.reference-global.com/doi/pdf/10.1515/JNETDY.2007.001)

Ranking a particular type of field average computed over a sequence of times amounts to determining a trend in that average. Here we show that the sign and size of such a trend computed statistically is dependent on the choice of averaging rules, which will suffice to demonstrate both that the ‘‘global temperature trend’’ is not a unique physical variable, and that ranking this or that year as the ‘‘warmest of the millennium’’ is not possible, since other averages will give other results with no grounds for choosing among them. To illustrate with actual temperature data, we computed averages of temperatures over twelve sites (see Table 1) and computed a linear trend in each case. The trends through the 1979–2000 period were computed with r-means and s-means. The raw data are themselves averaged (simple monthly means: r ¼ 1) smoothing out some variability, but this could not be avoided, and does not a¤ect the main results below. Stations were selected to give reasonable geographic variation, but whether it is a ‘‘global’’ sample or not is secondary for the purpose of the example. Stations had to be in continuous use during the 1979–2000 interval. Missing months were interpolated linearly as long as there was no more than one missing month in sequence, and it was not at the start or finish of the sample. For each value of r, s (cf. Eq. (23)), the monthly r; s-means across the stations were computed, then a linear trend was fitted using ordinary least squares after deleting rows with missing data. The trend values are plotted in Figures 2 and 3. For the simple mean (r ¼ 1; s ¼ 0) the decadal ‘‘warming’’ trend was 0.06\_C/decade. This turns out to be the peak value of the trend: for most values of r and s the trends are negative, indicating ‘‘cooling’’ across the 1979 to 2000 interval. It might seem contradictory that the same data show ‘‘global warming’’ of about 0.02\_C/decade for s ¼ 0:04, but ‘‘global cooling’’ of \_0:04\_C/decade for s ¼ \_0:04. But there is no contradiction in the data: They do not show ‘‘global’’ anything. The data are local. The interpretation of ‘‘global’’ warming or cooling is an artificial imposition on the data achieved by attaching a label to, respectively, a positive or negative trend in one particular average.

# Warming Bad

## Impact - Generic

**Warming causes extinction - a preponderance of evidence proves it's real, anthropogenic, and outweighs other threats**

**Deibel 7** — International Relations @ Naval War College (Terry, "Foreign Affairs Strategy: Logic of American Statecraft," Conclusion: American Foreign Affairs Strategy Today)

Finally, there is one major existential threat to American security (as well as prosperity) of a nonviolent nature, which, though far in the future, demands urgent action. It is the threat of global warming to the stability of the climate upon which all earthly life depends. Scientists worldwide have been observing the gathering of this threat for three decades now, and what was once a mere possibility has passed through probability to near certainty. Indeed not one of more than 900 articles on climate change published in refereed scientific journals from 1993 to 2003 doubted that anthropogenic warming is occurring. “In legitimate scientific circles,” writes Elizabeth Kolbert, “it is virtually impossible to find evidence of disagreement over the fundamentals of global warming.” Evidence from a vast international scientific monitoring effort accumulates almost weekly, as this sample of newspaper reports shows: an international panel predicts “brutal droughts, floods and violent storms across the planet over the next century”; climate change could “literally alter ocean currents, wipe away huge portions of Alpine Snowcaps and aid the spread of cholera and malaria”; “glaciers in the Antarctic and in Greenland are melting much faster than expected, and…worldwide, plants are blooming several days earlier than a decade ago”; “rising sea temperatures have been accompanied by a significant global increase in the most destructive hurricanes”; “NASA scientists have concluded from direct temperature measurements that 2005 was the hottest year on record, with 1998 a close second”; “Earth’s warming climate is estimated to contribute to more than 150,000 deaths and 5 million illnesses each year” as disease spreads; “widespread bleaching from Texas to Trinidad…killed broad swaths of corals” due to a 2-degree rise in sea temperatures. “The world is slowly disintegrating,” concluded Inuit hunter Noah Metuq, who lives 30 miles from the Arctic Circle. “They call it climate change…but we just call it breaking up.” From the founding of the first cities some 6,000 years ago until the beginning of the industrial revolution, carbon dioxide levels in the atmosphere remained relatively constant at about 280 parts per million (ppm). At present they are accelerating toward 400 ppm, and by 2050 they will reach 500 ppm, about double pre-industrial levels. Unfortunately, atmospheric CO2 lasts about a century, so there is no way immediately to reduce levels, only to slow their increase, we are thus in for significant global warming; the only debate is how much and how serous the effects will be. As the newspaper stories quoted above show, we are already experiencing the effects of 1-2 degree warming in more violent storms, spread of disease, mass die offs of plants and animals, species extinction, and threatened inundation of low-lying countries like the Pacific nation of Kiribati and the Netherlands at a warming of 5 degrees or less the Greenland and West Antarctic ice sheets could disintegrate, leading to a sea level of rise of 20 feet that would cover North Carolina’s outer banks, swamp the southern third of Florida, and inundate Manhattan up to the middle of Greenwich Village. Another catastrophic effect would be the collapse of the Atlantic thermohaline circulation that keeps the winter weather in Europe far warmer than its latitude would otherwise allow. Economist William Cline once estimated the damage to the United States alone from moderate levels of warming at 1-6 percent of GDP annually; severe warming could cost 13-26 percent of GDP. But the most frightening scenario is runaway greenhouse warming, based on positive feedback from the buildup of water vapor in the atmosphere that is both caused by and causes hotter surface temperatures. Past ice age transitions, associated with only 5-10 degree changes in average global temperatures, took place in just decades, even though no one was then pouring ever-increasing amounts of carbon into the atmosphere. Faced with this specter, the best one can conclude is that “humankind’s continuing enhancement of the natural greenhouse effect is akin to playing Russian roulette with the earth’s climate and humanity’s life support system. At worst, says physics professor Marty Hoffert of New York University, “we’re just going to burn everything up; we’re going to het the atmosphere to the temperature it was in the Cretaceous when there were crocodiles at the poles, and then everything will collapse.” During the Cold War, astronomer Carl Sagan popularized a theory of nuclear winter to describe how a thermonuclear war between the Untied States and the Soviet Union would not only destroy both countries but possible end life on this planet. Global warming is the post-Cold War era’s equivalent of nuclear winter at least as serious and considerably better supported scientifically. Over the long run it puts dangers form terrorism and traditional military challenges to shame. It is a threat not only to the security and prosperity to the United States, but potentially to the continued existence of life on this planet.

**Warming causes biodiversity loss, storms, and agriculture
Weart 11 —** (Spencer Weart, Director of the Center for History of Physics of the American Institute of Physics, December 2011, The Discovery of Global Warming)

A large body of scientific studies, exhaustively reviewed, has produced a long list of possibilities. Nobody can say that any of the items on the list are certain to happen. But the world's climate experts almost all agree that the impacts listed below are more likely than not to happen. For some items, the probabilities range up to almost certain. The following are the likely consequences of warming by a few degrees Celsius — that is, what we may expect if humanity manages to begin restraining its emissions soon, so that greenhouse gases do not rise beyond twice the pre-industrial level. Without strong action the doubling will come well before the end of this century, bringing the planet to temperatures not seen since the spread of agriculture. By 2007, many of the predicted changes were observed to be actually happening. For details see reports referenced in this footnote: (22) \* Most places will continue to get warmer, especially at night and in winter. The temperature change will benefit some regions while harming others — for example, patterns of tourism will shift. The warmer winters will improve health and agriculture in some areas, but globally, mortality will rise and food supplies will be endangered due to more frequent and extreme summer heat waves and other effects. Regions not directly harmed will suffer indirectly from higher food prices and a press of refugees from afflicted regions. \* Sea levels will continue to rise for many centuries. The last time the planet was 3°C warmer than now, the sea level was at least 6 meters (20 feet) higher.(23) That submerged coastlines where many millions of people now live, including cities from New York to Shanghai. The rise will probably be so gradual that later generations can simply abandon their parents' homes, but a ruinously swift rise cannot be entirely ruled out. Meanwhile storm surges will cause emergencies. <=Sea rise & ice \* Weather patterns will keep changing toward an intensified water cycle with stronger floods and droughts. Most regions now subject to droughts will probably get drier (because of warmth as well as less precipitation), and most wet regions will get wetter. Extreme weather events will become more frequent and worse. In particular, storms with more intense rainfall are liable to bring worse floods. Some places will get more snowstorms, but most mountain glaciers and winter snowpack will shrink, jeopardizing important water supply systems. Each of these things has already begun to happen in some regions.(24) Drought in the 2060s \* Ecosystems will be stressed, although some managed agricultural and forestry systems will benefit, at least in the early decades of warming. Uncounted valuable species, especially in the Arctic, mountain areas, and tropical seas, must shift their ranges. Many that cannot will face extinction. A variety of pests and tropical diseases are expected to spread to warmed regions. These problems have already been observed in numerous places. \* Increased carbon dioxide levels will affect biological systems independent of climate change. Some crops will be fertilized, as will some invasive weeds (the balance of benefit vs. harm is uncertain). The oceans will continue to become markedly more acidic, gravely endangering coral reefs, and probably harming fisheries and other marine life. <=Biosphere \* There will be significant unforeseen impacts. Most of these will probably be harmful, since human and natural systems are well adapted to the present climate. The climate system and ecosystems are complex and only partly understood, so there is a chance that the impacts will not be as bad as predicted. There is a similar chance of impacts grievously worse than predicted. If the CO2 level keeps rising to well beyond twice the pre-industrial level along with a rise of other greenhouse gases, as must inevitably happen if we do not take strong action soon, the results will certainly be worse. Under a "business as usual" scenario, recent calculations give even odds that global temperature will rise 5°C or more by the end of the century — causing a radical reorganization and impoverishment of many of the ecosystems that sustain our civilization.(25) All this is projected to happen to people who are now alive. What of the more distant future? If emissions continue to rise for a century — whether because we fail to rein them in, or because we set off an unstoppable feedback loop in which the warming itself causes ever more greenhouse gases to be evaporated into the air — then the gases will reach a level that the Earth has not seen since tens of millions of years ago. The consequences will take several centuries to be fully realized, as the Earth settles into its new state. It is probable that, as in the distant geological eras with high CO2, sea levels will be many tens of meters higher and the average global temperature will soar far above the present value: a planet grossly unlike the one to which the human species is adapted.

**Warming causes famine, disease, and resource wars – impacts already happening**

Lean 7 (Geoffrey Lean, Enviorment Editor for The Indepedant, news agency, <http://www.independent.co.uk/environment/climate-change/wars-of-the-world-how-global-warming-puts-60-nations-at-risk-442788.html>)

Scores of countries face war for scarce land, food and water as global warming increases. This is the conclusion of the most devastating report yet on the effects of climate change that scientists and governments prepare to issue this week. More than 60 nations, mainly in the Third World, will have existing tensions hugely exacerbated by the struggle for ever-scarcer resources. Others now at peace - including China, the United States and even parts of Europe - are expected to be plunged into conflict. Even those not directly affected will be threatened by a flood of hundreds of millions of "environmental refugees". The threat is worrying world leaders. The new UN Secretary General, Ban Ki-moon, told a global warming conference last month: "In coming decades, changes in the environment - and the resulting upheavals, from droughts to inundated coastal areas - are likely to become a major driver of war and conflict." Margaret Beckett, the Foreign Secretary, has repeatedly called global warming "a security issue" and a Pentagon report concluded that abrupt climate change could lead to "skirmishes, battles and even war due to resource constraints". The fears will be increased by the second report this year by the Intergovernmental Panel on Climate Change. The result of six years' work by 2,500 of the world's top scientists, it will be published on Good Friday. The first report, released two months ago, concluded that global warming was now "unequivocal" and it was 90 per cent certain that human activities are to blame. The new one will be the first to show for certain that its effects are already becoming evident around the world. Tomorrow, representatives of the world's governments will meet in Brussels to start four days of negotiation on the ultimate text of the report, which they are likely to tone down somewhat. But the final confidential draft presented to them by the scientists makes it clear that the consequences of global warming are appearing far sooner and faster than expected. "Changes in climate are now affecting biological and physical systems on every continent," it says. In 20 years, tens of millions more Latin Americans and hundreds of millions more Africans will be short of water, and by 2050 one billion Asians could face water shortages. The glaciers of the Himalayas, which feed the great rivers of the continent, are likely to melt away almost completely by 2035, threatening the lives of 700 million people. Though harvests will initially increase in temperate countries - as the extra warmth lengthens growing seasons - they could fall by 30 per cent in India, confronting 130 million people with starvation, by the 2050s. By 2080, 100 million people could be flooded out of their homes every year as the sea rises to cover their land, turning them into environmental refugees. And up to a third of the world's wild species could be "at high risk of irreversible extinction" from even relatively moderate warming. International Alert, "an independent peace-building organisation", has complied a list of 61 countries that are already unstable or have recently suffered armed conflict where existing tensions will be exacerbated by shortages of food and water and by the disease, storm flooding and sea-level rise that will accompany global warming, or by the deforestation that helps to cause it. The list forms the basis of the map on the opposite page. Four years ago the Pentagon report concluded: "As famine, disease and weather-related disasters strike... many countries' needs will exceed their carrying capacity. This will create a sense of desperation, which is likely to lead to offensive aggression." Many experts believe this has begun. Last year John Reid, the Home Secretary, blamed global warming for helping to cause the genocide in Darfur. Water supplies are seen as a key cause of the Arab-Israeli conflicts. The Golan Heights are important because they control key springs and rivers and the Sea of Galilee, while vital aquifers lie under the West Bank. John Ashton, the Government's climate change envoy, says that global warming should be addressed "not as a long-term threat to our environment, but as an immediate threat to our security and prosperity".

## Impact - South Asia

Climate change leads to south Asian nuclear war

Sharma 10 (Rajeev Sharma, journalist-author who has been writing on international relations, foreign policy, strategic affairs, security and terrorism for over two decades, 2/25/2010, "Climate Change = War?" The Diplomat, http://thediplomat.com/2010/02/25/climate-change-war/)

For all the heat generated by discussions of global warming in recent months, it is an often overlooked fact that climate change has the potential to create border disputes that in some cases could even provoke clashes between states. Throw into the mix three nuclear-armed nations with a history of disagreements, and the stakes of any conflict rise incalculably. Yet such a scenario is becoming increasingly likely as glaciers around the world melt, blurring international boundaries. The chastened United Nation’s Intergovernmental Panel on Climate Change, for example, still doesn’t dispute that glaciers are melting; the only question is how fast. The phenomenon is already pushing Europeans and Africans to redraw their borders. Switzerland and Italy, for example, were forced to introduce draft resolutions in their respective parliaments for fresh border demarcations after alpine glaciers started melting unusually quickly. And in Africa, meanwhile, climate change has caused rivers to change course over the past few years. Many African nations have rivers marking international boundaries and are understandably worried about these changing course and therefore cutting into their borders. Chad, Egypt, Ethiopia, Kenya and Sudan are just some of the African countries that have indicated apprehension about their international boundaries. But it is in Asia where a truly nightmarish scenario could play out between India, Pakistan and China–nuclear weapon states that between them have the highest concentration of glaciers in the world outside the polar regions. A case in point is the Siachen Glacier in the Karakoram range, the largest glacier outside the polar region, which is the site of a major bilateral dispute between India and Pakistan. According to scientific data, Siachen Glacier is melting at the rate of about 110 meters a year–among the fastest of any glaciers in the world. The glacier’s melting ice is the main source of the Nubra River, which itself drains into the Shyok River. These are two of the main rivers in Ladakh in Jammu and Kashmir. The Shyok also joins the Indus River, and forms the major source of water for Pakistan. It is clear, then, why the melting of glaciers in the Karakoram region could have a disastrous impact on ties between India and Pakistan. French geologists have already predicted the Indus will become a seasonal river by 2040, which would unnerve Pakistan as its ‘granary basket,’ Punjab, would become increasingly drought-prone and eventually a desert–all within a few decades. It takes no great leap of imagination to see the potential for conflict as the two nations resort to military means to control this water source. Meanwhile, glacier melting could also be creating a potential flashpoint between India and China. The melting Himalayan glaciers will inevitably induce changes to the McMahon Line, the boundary that separates India and China. Beijing has already embarked upon a long-term strategy of throttling of India’s major water source in the north-east–the Brahmaputra River that originates in China.

Indo-China territorial disputes go nuclear - results in great-power draw-in

Kahn 9 (Jeremy Kahn, staff writer for Newsweek, 10/9/2009, "Why India Fears China," http://www.thedailybeast.com/newsweek/2009/10/09/why-india-fears-china.print.html)

Ever since the anti-Chinese unrest in Tibet last year, progress toward settling the border dispute has stalled, and the situation has taken a dangerous turn. The emergence of videos showing Tibetans beating up Han Chinese shopkeepers in Lhasa and other Tibetan cities created immense domestic pressure on Beijing to crack down. The Communist Party leadership worries that agitation by Tibetans will only encourage unrest by the country's other ethnic minorities, such as Uighurs in Xinjiang or ethnic Mongolians in Inner Mongolia, threatening China's integrity as a nation. Susan Shirk, a former Clinton-administration official and expert on China, says that "in the past, Taiwan was the 'core issue of sovereignty,' as they call it, and Tibet was not very salient to the public." Now, says Shirk, Tibet is considered a "core issue of national sovereignty" on par with Taiwan. The implications for India's security—and the world's—are ominous. It turns what was once an obscure argument over lines on a 1914 map and some barren, rocky peaks hardly worth fighting over into a flash point that could spark a war between two nuclear-armed neighbors. And that makes the India-China border dispute into an issue of concern to far more than just the two parties involved. The United States and Europe as well as the rest of Asia ought to take notice—a conflict involving India and China could result in a nuclear exchange. And it could suck the West in—either as an ally in the defense of Asian democracy, as in the case of Taiwan, or as a mediator trying to separate the two sides.

## Impact - Migrations

**That results in sudden onset migrations which risk resource wars—escalation is likely**

**Bahati 10** — Policy Analyst @ Africa Faith and Social Justice Network Originally published in the Jan-Feb edition of Around Africa, Climate Change: What About the Displaced?, February 9, 2010, Bahati Ntama Jacques, Policy Analyst, http://afjn.org/focus-campaigns/other/other-continental-issues/82-general/792-climate-change-what-about-the-displaced.html

Already, as a result of climate change, at least 18 islands have been submerged worldwide. These include Lohachara Island in India, Bedford, Kabasgadi and Suparibhanga Island near India. Other islands are at risk of being submerged. They include Bangladesh’s Bhola Island, half of which is permanently flooded, Kutubdia in southeastern Bangladesh with thousands of people already displaced and more to be displaced, in Shishmaref and Kivalini of Alaska, and Maldives, a state island in the Indian Ocean whose President wishes to relocate the entire country. Climate change-related disasters not only affect ecosystems, but cause people to relocate either by choice or by force. Some will be displaced within the boundaries of their affected countries (Internal Displacement or ID) and others will cross state borders. Some will be displaced because of sudden-onset hydro-meteorological disasters, such as flooding, hurricanes, landslides, etc. Others will be affected by slow-onset disasters, like desertification, rising sea levels and droughts. Sea level rise will, in some cases, lead to permanent loss of small state islands, Maldives being an example, which means permanent displacement of the inhabitants of the island. In high-risk zones authorities have to choose between the cost of rebuilding every time a disaster hits or of just displacing the people permanently. Furthermore, as a result of displacement, disputes over resources such as water and land will cause violence. It is more than likely that some of the violence will end up in armed conflict.

**Climate change diplaces millions and destroys fundamental human rights**

**EFJ 11** — Environmental Justice Foundation EJF a UK Registered charity working internationally to protect the natural environment and human rights 2011 Climate Change and migration:forced displacement, ‘climate refugees’ and the need for a new legal instrument <http://www.ejfoundation.org/pdf/climate_briefing.pdf>

Climate change is without doubt one of the foremost and most profound threats to environmental security and basic human rights, and its eﬀects are already being observed across the globe. For human populations, the impacts are considerable, with an estimated 325 million people adversely aﬀected, and 300,000 deaths each year 1 . Climate change is deteriorating environmental conditions and compromising the most basic human rights to life, food, shelter, health, and water. The short and long-term eﬀects of climate change will compound existing poverty levels and obstruct social and economic development. The overall impacts for the developing world are sobering: within this century, hundreds of millions of people are likely to be displaced by Sea Level Rise (SLR); accompanying economic and ecological damage will be severe for many. The world has not previously faced a crisis on this scale, and planning for adaptation should begin immediately 17 . Environmental factors arising from climate change and leading to migration may be fast occurring. For example more intense tropical cyclones or in the longer-term, eﬀects such as desertiﬁcation or sea level rise that inundates lowlying regions damaging homes and infrastructure, increased health risks, declining soil fertility and lack of freshwater. Fisheries and agriculture are already showing signs of stress, yet they are projected to face a 50% increase in demand by 2030 18 . In the oceans, climate change is reducing the abundance and diversity of ﬁsh and other marine life – this could be devastating for the 520 million people – around 8% of the global population – who are dependent on ﬁsheries for food and income. In Africa, an estimated 10 million people have migrated or been displaced over the last two decades mainly because of environmental degradation and desertiﬁcation 7,19 . A recent (2009) report suggested that about 12 million people have fallen into poverty today because of climate change 1 .

## Impact - Water

**Water Shortages are a form of structural violence driven by colonialism and present day corporations plan breaks down oppression**

**Mukherjee 7** — Joia S Mukherjee. Medical Director of Partners in Health. 2007. “Structural Violence, Poverty and the AIDS Pandemic” http://www.palgrave-journals.com/development/journal/v50/n2/full/1100376a.html

Current global inequalities are often the legacies of oppression, colonialism and slavery, and are to- day perpetuated by radical, market-driven inter- national financial policies that foment poor health. Neo-liberal economic ‘reforms’ imposed on poor countries by international financial insti- tutions such as the International Monetary Fund and the World Bank force poor governments, as the recipients of qualified loans, to decrease their public sector budgets, privatize health services and, when they would rather invest their minus- cule capital to protect their vulnerable citizens and educate their children, these recipient coun- tries are instead forced to march in lock step to- ward the ‘free’ market, enforcing policies such as user fees for health and primary education. In poor countries, revitalizing the public health infrastructure and improving the delivery of es- sentials such as vaccination, sanitation and clean water are critical aspects to remediating the struc- tural violence that underlies disease. It is only with ongoing, large-scale international assistance that poor governments will be able to address the right to health in a sustained way. Advocacy to re- dress the violations of the basic right to health must recognize that more money is needed for health now, and for decades to come. Further- more, the coercion by international financial in- stitutions of poor governments to restrict health spending only serves to deepen inequalities in health care and perpetuate social injustice.

## Impact - Arctic

**Warming melts arctic ice that opens up new areas of conflict
Kramnik 4/19/12 —** (Ilya Kramnik, writer for The Voice of Russia, “News Agency about Russian Affair”, NATO, Russia stage Arctic war games

 4/19/12, <http://english.ruvr.ru/2012_04_19/72301024/>)

As global warming is thawing permafrost around the Earth's poles, the Arctic is gradually emerging from under the eternal ice as a new geopolitical arena, a focal point of interest and concern to the major world powers. The conflict of economic interests is already on the horizon and won’t probably be resolved any soon, although military clashes remain an equally hazy perspective. In the past, only scientist and journalists seemed to be concerned about the “opening up” of the Arctic. Now, politicians and the military are also turning their gaze to this region, which rising temperatures have made more accessible than ever. The global media and especially local agencies are bristling with threats of a new Cold War in the Arctic, while major northern states are meeting to discuss regional security. One of such meetings was held by military chiefs of all Arctic powers in Canada on April 12, 13. It was attended, among others, by Gen. Nikolai Makarov, Chief of Russia’s Armed Forces General Staff. The meeting took place at a time when the icy region was buzzing with activity, with both Russia and NATO engaged in war games beyond the Arctic Circle. In March, NATO wrapped up its Cold Response maneuvers on the stretch from Sweden to Canada, with 16,300 troops engaged in this unprecedented military exercise. The war game was only clouded by a crash, when a Norwegian C-130J plane rammed into the western slope of the Swedish mountain, Kebnekaise, killing five servicemen. The Russian military kept apace, staging their own maneuvers. Its 200th motor rifle brigade from Murmansk tested the T-80 tanks, which are believed to be best-suited for the Arctic climate, with their gas turbine engines, which are much easier to start in the cold weather than the traditional diesel ones. The Russian Northern Fleet, as well as Air Defense planes, choppers and marine aviation participated in the drills. The Air Forces also trained in Russia’s northern reaches. On April 9-15, Russia staged Ladoga 2012 maneuvers at the Karelian Besovets air base with 50 choppers and aircraft, which engaged and shot down over 150 air targets. In their war games, NATO and Russia are both pursuing one and the same goal. As rising temperatures are freeing larger and larger areas of the Arctic from its icy shackles, all regional key players are flexing their military muscle to score psychological points in the information battlespace, the main arena of modern diplomatic conflicts. No one wants a “Hot War.” Even more so, the US, the potential northern leader, is now focused on more pressing issues in Iraq, Afghanistan and the Pacific, where it is engaged in a standoff with China. However, Arctic’s natural riches, territorial disputes and expanding shipping lanes have rendered it a very lucrative region – and thus potentially a “hot” one. The situation around maritime traffic nodes has never been simple. Such was the case with the Mediterranean, the Horn of Africa, or the Strait of Malacca. If the Arctic emerges as another junction of sea lanes it will spawn conflicts among the world powers, depending on how determined they will be to protect their national interests. Russia is one of such ambitious northern powers, currently planning on boosting its Arctic infrastructure, for instance building twenty frontier posts to protect its polar reaches. Some of them will be erected close to nine emergency and transport ministerial centers, set up to further the development of Russia’s Northern Sea Route. The rest of the frontiers will be built on the islands. A satellite system called Arktika will allow for their uninterrupted communication with the "mainland." These frontier posts, which are to be erected in the upcoming years, will serve as Russia’s bulwark beyond the Arctic Circle and will be secured by its Northern Fleet, air forces and the so-called “Arctic brigades,” specially trained to operate in the polar region. For now, Arctic conflicts are still a matter of theoretical disputes and an inspiration for computer games designers. For instance, the recent game called Naval Warfare: Arctic Circle tells a story about navies and air forces of Russia and NATO fighting for Arctic dominance. Today, major world powers are too busy wrestling with global economic crisis to let this story out of its cyber realm. But no one knows what the nearest future has in store for us.

**Nuclear war**

**Staples 9** (Stephen, Rideau Institute, Danish Institute of International Studies, "Steps Toward an Arctic Nuclear Weapon Free Zone," August)

The fact is, the Arctic is becoming an zone of increased military competition. Russian President Medvedev has announced the creation of a special military force to defend Arctic claims. Russian General Vladimir Shamanov declared that Russian troops would step up training for Arctic combat, and that Russia’s submarine fleet would increase its “operational radius.” This week, two Russian attack submarines were spotted off the U.S. east coast for the first time in 15 years.6 In January, on the eve of Obama’s inauguration, President Bush issued a National Security Presidential Directive on Arctic Regional Policy. As Michael Hamel-Greene has pointed out, it affirmed as a priority to preserve U.S. military vessel and aircraft mobility and transit throughout the Arctic, including the Northwest Passage, and foresaw greater capabilities to protect U.S. borders in the Arctic. The Bush administration’s disastrous eight years in office, particularly its decision to withdraw from the ABM treaty and deploy missile defence interceptors and a radar in Eastern Europe, has greatly contributed to the instability we are seeing today. The Arctic has figured in this renewed interest in Cold War weapons systems, particularly the upgrading of the Thule Ballistic Missile Early Warning System radar for ballistic missile defence. The Canadian government, as well, has put forward new military capabilities to protect Canadian sovereignty claims in the Arctic, including proposed ice-capable ships, a northern military training base and a deep water port. Denmark last week released an all-party defence position paper that suggests the country should create a dedicated Arctic military contingent that draws on army, navy and air force assets with ship-based helicopters able to drop troops anywhere. Danish fighter planes could be patrolling Greenlandic airspace. Last year, Norway chose to buy 48 Lockheed F-35 fighter jets, partly because of their suitability for Arctic patrols. In March, that country held a major Arctic military practice involving 7,000 soldiers from 13 countries in which a fictional country called Northland seized offshore oil rigs. The manoeuvres prompted a protest from Russia – which objected again in June after Sweden held its largest northern military exercise since the end of the Second World War. About 12,000 troops, 50 aircraft and several warships were involved. Jayantha Dhanapala, President of Pugwash and former UN Under-Secretary for Disarmament Affairs, summarizes the situation bluntly. He warns us that “From those in the international peace and security sector, deep concerns are being expressed over the fact that two nuclear weapon states – the United States and the Russian Federation, which together own 95 per cent of the nuclear weapons in the world – converge on the Arctic and have competing claims. These claims, together with those of other allied NATO countries – Canada, Denmark, Iceland, and Norway – could, if unresolved, lead to conflict escalating into the threat or use of nuclear weapons.

## Impact Calc - Resource Wars

**Climate change escalates all wars that are already happening
Evans 10** (Alex Evans, Center on International Cooperation, New York University, September 9, 2010, http://siteresources.worldbank.org/EXTWDR2011/Resources/6406082-1283882418764/WDR\_Background\_Paper\_Evans.pdf)

Even before climate change is taken into account, scarcity of land, food, water and oil is likely to be an increasing driver of change between now and 2030, and beyond. Climate change will exacerbate the challenge in all of these areas, and the combined effect of these changes is likely to put tens to hundreds of millions more people at risk of impacts including hunger, disease, displacement, injury, poverty or other forms of hardship. Although the conflict risk posed by climate change and resource scarcity will almost always be better understood as a ‘threat multiplier’ than as a sole cause of violent conflict, a range of potential linkages between climate, scarcity and conflict risk can nonetheless be identified, whether through intensifying existing problems, or through creating new environmental problems that lead to instability.79The most obvious such linkage is the risk of direct conflict over access to or control of scarce resources such as land or water. Most current examples of such conflicts take place within countries, but intensifying resource scarcity and climate change could see an increase in strategic resource competition between states, both at the regional level (particularly if abrupt climate effects, such as rapid glacial melting, manifest themselves and thus impact trans-boundary water resources) and internationally (with some countries already pursuing third country access rights to oil, land, food and potentially water). However, a range of other conflict risks arising from climate change and resource scarcity also have the potential to make themselves felt in the future. Among them are cases where livelihoods or economies are undermined by resource scarcity, potentially increasing state fragility in the process; cases where violent conflict itself has the effect of contributing to environmental degradation, thus potentially creating a cyclical relationship between scarcity and conflict; large-scale unplanned migration as a result of climate impacts or resource scarcity; and the risk that changing geographical circumstances, such as rising sea levels or changing water flows in trans-boundary watercourses, render existing legal agreements out of date. Making specific projections about the extent or location of future conflict risks driven by climate change and resource scarcity is highly complex and resistant to specificity. In part this is because, as just noted, climate and scarcity effects will rarely if ever be felt in isolation from the impacts of other risks. The extent of the impacts caused by climate and scarcity will also depend as much on social, institutional, economic and ecological vulnerability as on the magnitude of the threats themselves. Above all, projections of the future effects of climate and scarcity issues are highly uncertain and unpredictable, given not only limitations in the current scientific outlook (particularly at more granular levels of geographical focus), but also the non-linear nature of many of the changes involved and the complex feedback loops between different scarcity issues. For all these reasons, policymakers will often face an uphill struggle in deciding on priorities for measures to invest in preparedness and reduce vulnerability to increasing climate change and resource scarcity. However, some general observations may still be made about some key areas for action.

**Turns their impacts - creates strategic overstretch and irrational actors
Harvey 11** (Fiona Harvey, Enviorment Correspondant for the Guardian, http://www.guardian.co.uk/environment/2011/jul/06/climate-change-war-chris-huhne)

Climate change will lead to an increased threat of wars, violence and military action against the UK, and risks reversing the progress of civilisation, the energy and climate secretary Chris Huhne will say on Thursday, in his strongest warning yet that the lack of progress on greenhouse gas emission cuts would damage the UK's national interests. "Climate change is a threat multiplier. It will make unstable states more unstable, poor nations poorer, inequality more pronounced, and conflict more likely," Huhne is expected to say in a speech to defence experts. "And the areas of most geopolitical risk are also most at risk of climate change." He will warn that climate change risks reversing the progress made in prosperity and democracy since the industrial revolution, arguing that the results of global warming could lead to a return to a "Hobbesian" world in which life is "nasty, brutish and short". Huhne believes the UK and other countries must act urgently to prepare for the threat. "We cannot be 100% sure that our enemies will attack our country, but we do not hesitate to prepare for the eventuality," he plans to say. "The same principle applies to climate change, which a report published by the Ministry of Defence (MoD) has identified as one of the four critical issues that will affect everyone on the planet over the next 30 years." His comparison of climate change and terrorism echoes Sir David King, the former chief scientific adviser to the government who warned in 2004 that global warning posed "a bigger threat than terrorism". The warning so incensed the then US president George W Bush that he phoned Tony Blair to ask him to gag the scientist. Huhne argues that it is clearly in the UK's national interest to cut carbon dioxide emissions sharply, and persuade other nations to join in the effort. His speech comes at a delicate time for the prime minister, David Cameron, who was embarrassed earlier in the week by an open revolt over climate issues staged by his members of the European parliament. MEPs were voting on whether to adopt more ambitious emissions reduction targets that would raise the goal from a 20% cut in carbon by 2020, compared with 1990 levels, to a tougher 30% cut. Despite Downing St intervention, more than two-thirds of Tory MEPs rebelled against the party line, to support the tougher target. Their revolt was instrumental in defeating the proposal, part of a complex series of votes in the parliament. Green campaigners hope to revive the issue in future votes, and with member states and the European commission, but the vote revealed the depths of climate scepticism within the Tory party. Huhne has scored key victories in recent months in his attempts to put climate change at the centre of coalition policy. He helped to persuade Cameron to accept the "fourth carbon budget" - a plan that would see the UK halve emissions by 2025, the stiffest target of any developed country. Yesterday the prime minister announced tough new energy efficiency standards, supported by Huhne, that would require central government to cut emissions by 25% in the five-year term of this parliament. Huhne will quote military experts, including the MoD and the US Pentagon, who have warned that climate change will increase the risk of conflict and potentially terrorism. Climate change intensifies security threats in three ways: increasing competition for resources; more natural and humanitarian disasters, such as the droughts now causing famine in Africa, which will also lead to mass migration and the conflicts that ensue; and threats to the security of energy supplies.

## Impact - Biodiversity

**Warming kills biodiversity - leads to extinction**

**Coyne & Hoekstra 7** - Prof Ecology @ Chicago AND Prof Biology @ Harvard (Jerry AND Hopi, "The Greatest Dying," Truthout, <http://www.truthout.org/article/jerry-coyne-and-hopi-e-hoekstra-the-greatest-dying>)

We are relentlessly taking over the planet, laying it to waste and eliminating most of our fellow species. Moreover, we're doing it much faster than the mass extinctions that came before. Every year, up to 30,000 species disappear due to human activity alone. At this rate, we could lose half of Earth's species in this century. And, unlike with previous extinctions, there's no hope that biodiversity will ever recover, since the cause of the decimation - us - is here to stay. To scientists, this is an unparalleled calamity, far more severe than global warming, which is, after all, only one of many threats to biodiversity. Yet global warming gets far more press. Why? One reason is that, while the increase in temperature is easy to document, the decrease of species is not. Biologists don't know, for example, exactly how many species exist on Earth. Estimates range widely, from three million to more than 50 million, and that doesn't count microbes, critical (albeit invisible) components of ecosystems. We're not certain about the rate of extinction, either; how could we be, since the vast majority of species have yet to be described? We're even less sure how the loss of some species will affect the ecosystems in which they're embedded, since the intricate connection between organisms means that the loss of a single species can ramify unpredictably. But we do know some things. Tropical rainforests are disappearing at a rate of 2 percent per year. Populations of most large fish are down to only 10 percent of what they were in 1950. Many primates and all the great apes - our closest relatives - are nearly gone from the wild. And we know that extinction and global warming act synergistically. Extinction exacerbates global warming: By burning rainforests, we're not only polluting the atmosphere with carbon dioxide (a major greenhouse gas) but destroying the very plants that can remove this gas from the air. Conversely, global warming increases extinction, both directly (killing corals) and indirectly (destroying the habitats of Arctic and Antarctic animals). As extinction increases, then, so does global warming, which in turn causes more extinction - and so on, into a downward spiral of destruction. Why, exactly, should we care? Let's start with the most celebrated case: the rainforests. Their loss will worsen global warming - raising temperatures, melting icecaps, and flooding coastal cities. And, as the forest habitat shrinks, so begins the inevitable contact between organisms that have not evolved together, a scenario played out many times, and one that is never good. Dreadful diseases have successfully jumped species boundaries, with humans as prime recipients. We have gotten aids from apes, sars from civets, and Ebola from fruit bats. Additional worldwide plagues from unknown microbes are a very real possibility. But it isn't just the destruction of the rainforests that should trouble us. Healthy ecosystems the world over provide hidden services like waste disposal, nutrient cycling, soil formation, water purification, and oxygen production. Such services are best rendered by ecosystems that are diverse. Yet, through both intention and accident, humans have introduced exotic species that turn biodiversity into monoculture. Fast-growing zebra mussels, for example, have outcompeted more than 15 species of native mussels in North America's Great Lakes and have damaged harbors and water-treatment plants. Native prairies are becoming dominated by single species (often genetically homogenous) of corn or wheat. Thanks to these developments, soils will erode and become unproductive - which, along with temperature change, will diminish agricultural yields. Meanwhile,with increased pollution and runoff, as well as reduced forest cover, ecosystems will no longer be able to purify water; and a shortage of clean water spells disaster. In many ways, oceans are the most vulnerable areas of all. As overfishing eliminates major predators, while polluted and warming waters kill off phytoplankton, the intricate aquatic food web could collapse from both sides. Fish, on which so many humans depend, will be a fond memory. As phytoplankton vanish, so does the ability of the oceans to absorb carbon dioxide and produce oxygen. (Half of the oxygen we breathe is made by phytoplankton, with the rest coming from land plants.) Species extinction is also imperiling coral reefs - a major problem since these reefs have far more than recreational value: They provide tremendous amounts of food for human populations and buffer coastlines against erosion. In fact, the global value of "hidden" services provided by ecosystems - those services, like waste disposal, that aren't bought and sold in the marketplace - has been estimated to be as much as $50 trillion per year, roughly equal to the gross domestic product of all countries combined. And that doesn't include tangible goods like fish and timber. Life as we know it would be impossible if ecosystems collapsed. Yet that is where we're heading if species extinction continues at its current pace. Extinction also has a huge impact on medicine. Who really cares if, say, a worm in the remote swamps of French Guiana goes extinct? Well, those who suffer from cardiovascular disease. The recent discovery of a rare South American leech has led to the isolation of a powerful enzyme that, unlike other anticoagulants, not only prevents blood from clotting but also dissolves existing clots. And it's not just this one species of worm: Its wriggly relatives have evolved other biomedically valuable proteins, including antistatin (a potential anticancer agent), decorsin and ornatin (platelet aggregation inhibitors), and hirudin (another anticoagulant). Plants, too, are pharmaceutical gold mines. The bark of trees, for example, has given us quinine (the first cure for malaria), taxol (a drug highly effective against ovarian and breast cancer), and aspirin. More than a quarter of the medicines on our pharmacy shelves were originally derived from plants. The sap of the Madagascar periwinkle contains more than 70 useful alkaloids, including vincristine, a powerful anticancer drug that saved the life of one of our friends. Of the roughly 250,000 plant species on Earth, fewer than 5 percent have been screened for pharmaceutical properties. Who knows what life-saving drugs remain to be discovered? Given current extinction rates, it's estimated that we're losing one valuable drug every two years. Our arguments so far have tacitly assumed that species are worth saving only in proportion to their economic value and their effects on our quality of life, an attitude that is strongly ingrained, especially in Americans. That is why conservationists always base their case on an economic calculus. But we biologists know in our hearts that there are deeper and equally compelling reasons to worry about the loss of biodiversity: namely, simple morality and intellectual values that transcend pecuniary interests. What, for example, gives us the right to destroy other creatures? And what could be more thrilling than looking around us, seeing that we are surrounded by our evolutionary cousins, and realizing that we all got here by the same simple process of natural selection? To biologists, and potentially everyone else, apprehending the genetic kinship and common origin of all species is a spiritual experience - not necessarily religious, but spiritual nonetheless, for it stirs the soul. But, whether or not one is moved by such concerns, it is certain that our future is bleak if we do nothing to stem this sixth extinction. We are creating a world in which exotic diseases flourish but natural medicinal cures are lost; a world in which carbon waste accumulates while food sources dwindle; a world of sweltering heat, failing crops, and impure water. In the end, we must accept the possibility that we ourselves are not immune to extinction. Or, if we survive, perhaps only a few of us will remain, scratching out a grubby existence on a devastated planet. Global warming will seem like a secondary problem when humanity finally faces the consequences of what we have done to nature: not just another Great Dying, but perhaps the greatest dying of them all.

**Warming decimates biodiversity - decreases genetic variation**

**Romm 11** — (Joe Romm, a Senior Fellow at American Progress and holds a Ph.D. in physics from MIT, 9/20/11, "Global Warming: Extinction of Biodiversity," Think Progress)

If global warming continues as expected, it is estimated that almost a third of all flora and fauna species worldwide could become extinct. Scientists … discovered that the proportion of actual biodiversity loss should quite clearly be revised upwards: by 2080, more than 80% of genetic diversity within species may disappear in certain groups of organisms, according to researchers in the title story of the journal Nature Climate Change. The study is the first world-wide to quantify the loss of biological diversity on the basis of genetic diversity. That’s from the news release of a study, “Cryptic biodiversity loss linked to global climate change” (subs. req’d). The recent scientific literature continues to paint a bleak picture of what Homo sapiens ‘sapiens’ is doing to the other species on the planet. In 2007, the Intergovernmental Panel on Climate Change warned that “as global average temperature increase exceeds about 3.5°C [relative to 1980 to 1999], model projections suggest significant extinctions (40-70% of species assessed) around the globe.” That is a temperature rise over pre-industrial levels of a bit more than 4.0°C. So the 5°C rise we are facing on our current emissions path would likely put extinctions beyond the high end of that range. Last fall, the Royal Society ran a special issue on “Biological diversity in a changing world,” concluding “There are very strong indications that the current rate of species extinctions far exceeds anything in the fossil record.” I realize that the mass extinction of non-human life on this planet isn’t going to be a great driver for human action. Most people simply don’t get that the mass extinctions we are causing could directly harm our children and grandchildren as much as sea level rise. Such extinctions threaten the entire fabric of life on which we depend for food, among other things. This may be clearest in the case of marine life — see “Geological Society (8/10): Acidifying oceans spell marine biological meltdown “by end of century.” And then there’s the worst-case scenario in Nature Stunner — “Global warming blamed for 40% decline in the ocean’s phytoplankton”: “Microscopic life crucial to the marine food chain is dying out. The consequences could be catastrophic.” Life matters. Here’s more from the release: Most common models on the effects of climate change on flora and fauna concentrate on “classically” described species, in other words groups of organisms that are clearly separate from each other morphologically. Until now, however, so-called cryptic diversity has not been taken into account. It encompasses the diversity of genetic variations and deviations within described species, and can only be researched fully since the development of molecular-genetic methods. As well as the diversity of ecosystems and species, these genetic variations are a central part of global biodiversity. In a pioneering study, scientists from the Biodiversity and Climate Research Centre (BiK-F) and the Senckenberg Gesellschaft für Naturkunde have now examined the influence of global warming on genetic diversity within species. Over 80 percent of genetic variations may become extinct The distribution of nine European aquatic insect species, which still exist in the headwaters of streams in many high mountain areas in Central and Northern Europe, was modelled. They have already been widely researched, which means that the regional distribution of the inner-species diversity and the existence of morphologically cryptic, evolutionary lines are already known. If global warming does take place in the range that is predicted by the Intergovernmental Panel on Climate Change (IPCC), these creatures will be pushed back to only a few small refugia, e.g. in Scandinavia and the Alps, by 2080, according to model calculations. If Europe’s climate warms up by up to two degrees only, eight of the species examined will survive, at least in some areas; with an increase in temperature of 4 degrees, six species will probably survive in some areas by 2080. However, due to the extinction of local populations, genetic diversity will decline to a much more dramatic extent. According to the most pessimistic projections, 84 percent of all genetic variations would die out by 2080; in the “best case,” two-thirds of all genetic variations would disappear. The aquatic insects that were examined are representative for many species of mountainous regions of Central Europe. Slim chances in the long term for the emergence of new species and species survival Carsten Nowak of the Biodiversity and Climate Research Centre (BiK-F) and the Senckenberg Gesellschaft für Naturkunde, explains: “Our models of future distribution show that the “species” as such will usually survive. However, the majority of the genetic variations, which in each case exist only in certain places, will not survive. This means that self-contained evolutionary lineages in other regions such as the Carpathians, Pyrenees or the German Central Uplands will be lost. Many of these lines are currently in the process of developing into separate species, but will become extinct before this is achieved, if our model calculations are accurate.” Genetic variation within a species is also important for adaptability to changing habitats and climatic conditions. Their loss therefore also reduces the chances for species survival in the long term. New approach for conservation So the extinction of species hides an ever greater loss, in the form of the massive disappearance of genetic diversity. “The loss of biodiversity that can be expected in the course of global warming has probably been greatly underestimated in previous studies, which have only referred to species numbers,” says Steffen Pauls, Biodiversity and Climate Research Centre (BiK-F), of the findings. However, there is also an opportunity to use genetic diversity in order to make conservation and environmental protection more efficient. A topic that is subject to much discussion at present is how to deal with conservation areas under the conditions of climate change. The authors of the study urge that conservation areas should also be oriented to places where both a suitable habitat for the species and a high degree of inner-species genetic diversity can be preserved in the future. “It is high time,” says Nowak, “that we see biodiversity not only as a static accumulation of species, but rather as a variety of evolutionary lines that are in a constant state of change. The loss of one such line, irrespective of whether it is defined today as a “species” in itself, could potentially mean a massive loss in biodiversity in the future.”

**Warming ruins biodiversity – tropical habitats, reefs, and aquaculture
Hannah 12** (Lee Hannah, senior researcher in climate change biology at Conservation International (CI), As Threats to Biodiversity Grow,Can We Save World’s Species?, [http://e360.yale.edu/feature/as\_threats\_to\_biodiversity\_grow\_can\_we\_save\_worlds\_species/2518**/**](http://e360.yale.edu/feature/as_threats_to_biodiversity_grow_can_we_save_worlds_species/2518/), 19 APR 2012)

To date, marine systems have experienced the most extensive impacts of climate change. From coral bleaching to melting sea ice, marine systems are changing on global and regional scales. Coral bleaching occurs when water temperatures exceed regional norms, causing corals to expel symbiotic micro-organisms from their tissues, ultimately leading to morbidity or death. Bleaching has exterminated some coral species from entire ocean basins. Global extinctions may follow as temperatures continue to rise. Corals face a second threat from acidification as CO2 builds up in the atmosphere and oceans, which prevents corals and many other marine organisms, including clams and oysters, from forming their calcium carbonate shells. Overall, the evidence suggests that the world’s roughly 5 million marine species face as severe threats from climate change as their terrestrial counterparts. On land, tropical biodiversity hotspots in places such as the Amazon and the rainforests of Indonesia and Malaysia are especially at risk. All global climate models now show significant future warming in the tropics, even if more muted than warming at high latitudes. Tropical animals, insects, and plants are tightly packed along climatic gradients from lowlands to mountaintops, and these organisms are sensitive to changes in temperature and rainfall. Already, scores of amphibians in South America have disappeared as a warmer, drier climate has led to outbreaks of disease such as the chytrid fungus. At the same time, large areas of tropical forest are being cleared for timber, ranching, and farming such crops as soybeans and oil palm. While these circumstances point to likely biological extinctions in the oceans and on land, functional extinctions may be of even greater concern. Functional extinctions occur when a species’ population crashes to the point We need to protect species not only where they are, but also where they will be as the world warms. at which its functional roles within an ecosystem collapse. Functional extinction always accompanies biological extinction, but can happen before biological extinction is complete. Corals, for example, may be lost from huge areas, resulting in ecosystem conversion from coral reef to algal mat while some coral individuals still persist in isolation. Bark beetle outbreaks driven by climate change have killed tens of millions of trees from Colorado to Canada, causing functional extinctions of lodgepole pine across large areas of western North America. The repercussions of these tree losses are felt in a host of ways, from declining food for keystone species, such as bears, to increased risk of fire.

**Warming kills 80% of genetic diversity
Science Daily 11** (Science Daily, News Agency…about Science…, Aug. 24, 2011, http://www.sciencedaily.com/releases/2011/08/110824091146.htm)

If global warming continues as expected, it is estimated that almost a third of all flora and fauna species worldwide could become extinct. Scientists from the Biodiversity and Climate Research Centre (Biodiversität und Klima Forschungszentrum, BiK-F) and the SENCKENBERG Gesellschaft für Naturkunde discovered that the proportion of actual biodiversity loss should quite clearly be revised upwards: by 2080, more than 80 % of genetic diversity within species may disappear in certain groups of organisms, according to researchers in the title story of the journal Nature Climate Change. The study is the first world-wide to quantify the loss of biological diversity on the basis of genetic diversity.Most common models on the effects of climate change on flora and fauna concentrate on "classically" described species, in other words groups of organisms that are clearly separate from each other morphologically. Until now, however, so-called cryptic diversity has not been taken into account. It encompasses the diversity of genetic variations and deviations within described species, and can only be researched fully since the development of molecular-genetic methods. As well as the diversity of ecosystems and species, these genetic variations are a central part of global biodiversity. In a pioneering study, scientists from the Biodiversity and Climate Research Centre (BiK-F) and the Senckenberg Gesellschaft für Naturkunde have now examined the influence of global warming on genetic diversity within species. Over 80 percent of genetic variations may become extinct The distribution of nine European aquatic insect species, which still exist in the headwaters of streams in many high mountain areas in Central and Northern Europe, was modelled. They have already been widely researched, which means that the regional distribution of the inner-species diversity and the existence of morphologically cryptic, evolutionary lines are already known. If global warming does take place in the range that is predicted by the Intergovernmental Panel on Climate Change (IPCC), these creatures will be pushed back to only a few small refugia, e.g. in Scandinavia and the Alps, by 2080, according to model calculations. If Europe's climate warms up by up to two degrees only, eight of the species examined will survive, at least in some areas; with an increase in temperature of 4 degrees, six species will probably survive in some areas by 2080. However, due to the extinction of local populations, genetic diversity will decline to a much more dramatic extent. According to the most pessimistic projections, 84 percent of all genetic variations would die out by 2080; in the "best case," two-thirds of all genetic variations would disappear. The aquatic insects that were examined are representative for many species of mountainous regions of Central Europe. Slim chances in the long term for the emergence of new species and species survival Carsten Nowak of the Biodiversity and Climate Research Centre (BiK-F) and the Senckenberg Gesellschaft für Naturkunde, explains: "Our models of future distribution show that the "species" as such will usually survive. However, the majority of the genetic variations, which in each case exist only in certain places, will not survive. This means that self-contained evolutionary lineages in other regions such as the Carpathians, Pyrenees or the German Central Uplands will be lost. Many of these lines are currently in the process of developing into separate species, but will become extinct before this is achieved, if our model calculations are accurate." Genetic variation within a species is also important for adaptability to changing habitats and climatic conditions. Their loss therefore also reduces the chances for species survival in the long term.

**Warming kills biodiversity
Hannah 12** (Lee Hannah, senior researcher in climate change biology at Conservation International (CI), As Threats to Biodiversity Grow,Can We Save World’s Species?, <http://e360.yale.edu/feature/as_threats_to_biodiversity_grow_can_we_save_worlds_species/2518/>, 19 APR 2012)

With soaring human populations and rapid climate change putting unprecedented pressure on species, conservationists must look to innovative strategies — from creating migratory corridors to preserving biodiversity hotspots — if we are to prevent countless animals and plants from heading to extinction. by lee hannah Throughout much of the Pleistocene era, which began 2.5 million years ago, many of the world’s large mammals survived periods of glaciation and deglaciation by moving across a landscape devoid of humans. Then as the Pleistocene drew to a close at the end of the last Ice Age — some 20,000 to 12,000 years ago — creatures such as the wooly mammoth had to confront not only shrinking habitat caused by climate change. They also faced thousands of humans with stone-tipped weapons, a one-two punch that led to the extinction of dozens of so-called megafauna species, including the wooly mammoth, across Eurasia and North and South America. Now, with 7 billion people on the planet — heading to 10 billion — and with greenhouse gas emissions threatening more rapid temperature rises than the warming that brought the last Ice Age to an end, the many millions of living things on Earth face an unprecedented squeeze. Is a wave of extinctions possible, and if so, what can we do about it? The late climate scientist and biologist Stephen Schneider once described this confluence of events — species struggling to adapt to rapid warming in a world heavily modified by human action — as a “no-brainer for an extinction A million species could face extinction due to human encroachment and climate change. spasm.” My colleagues Barry Brook and Anthony Barnosky recently put it this way, “We are witnessing a similar collision of human impacts and climatic changes that caused so many large animal extinctions toward the end of the Pleistocene. But today, given the greater magnitude of both climate change and other human pressures, the show promises to be a wide-screen technicolor version of the (by comparison) black-and-white letterbox drama that played out the first time around.” The magnitude of the threat was first quantified in a 2004 Nature study, “Extinction Risk from Climate Change.” This paper suggested that in six diverse regions, 15 to 37 percent of species could be at risk of extinction. If those six regions were typical of the global risk, the study’s authors later calculated, more than a million terrestrial and marine species could face extinction due to human encroachment and climate change — assuming conservatively that 10 million species exist in the world. Headlines around the world trumpeted the 1 million figure. Whether that scenario will unfold is unclear. But signs of what is to come are already all around us: nearly 100 amphibian species in South America vanishing in a disease outbreak linked to climate change, large areas of western North American facing massive die-offs of trees because of warming-driven beetle outbreaks, and increasing loss of coral reefs worldwide because of human activities and coral bleaching events driven by rising ocean temperatures. Most of the world’s biologically unique areas have already lost more than 70 percent of their high-quality habitat.

## Impact - Resources

**Warming causes resource scarcity
Evans 10** (Alex Evans, Center on International Cooperation, New York University, September 9, 2010, http://siteresources.worldbank.org/EXTWDR2011/Resources/6406082-1283882418764/WDR\_Background\_Paper\_Evans.pdf)

Climate change and its effects on resource scarcity

All of these potential limitations to supply growth are before climate change is considered, which is likely to be the most important long-term driver of change on all of the above sectors. Since pre-industrial times, global average temperatures have increase by 0.7° Celsius, and emissions already in the atmosphere mean that the world is committed to a further increase of 0.6° Celsius.18 Overall, even stringent global mitigation action may not be enough to avoid a 2.0° Celsius increase on pre-industrial temperatures. Even if the 2009 Copenhagen summit had agreed that global emissions would peak in 2015 and decline by 3% a year thereafter, this would still have left the world with an even chance of exceeding a 2° Celsius temperature increase.19 As it is, the summit’s outcome appears insufficient to prevent warming of 3° Celsius or more.20 Most of the key near-term impacts of climate change will result from reduced freshwater availability, which will expose hundreds of millions of people to additional water stress.21 Decreased crop yields (in all areas except mid and high latitudes, and in all areas above 2.0° Celsius), will also be particularly important, and will expose tens to hundreds of millions more people to the risk of hunger.22 The IPCC also highlights a number of regions that will be particularly exposed to climate change, including the Arctic, Africa, small islands, and densely populated coastal “megadeltas” in Asia and Africa such as the Nile, Ganges-Brahmaputra and Mekong, where tens of millions will be at increased risk of acute flood and storm damage, chronic coastal flooding and loss of coastal wetlands.23 Significantly, these regions’ high exposure is in some cases as much the result of their high vulnerability as of the scale of climate impacts they are projected to experience; Africa, for example, is likely to be especially affected by climate change because of its “low adaptive capacity”, whilst the high population densities of Asian and African megadeltas are also factors in determining their exposure.24However, assessments of the climate and scarcity outlook are complicated by a number of methodological issues, particularly in the area of climate change. New science findings continue to emerge rapidly, with the effect that overall estimates quickly become dated: the IPCC’s 2007 Fourth Assessment Report is already out of date in some key respects, for example, whilst the next assessment is not due to be published until 2014.25 Although climate models are improving all the time, their findings remain subject to a substantial degree of uncertainty, a problem that increases at more specific levels of geographical focus. A further challenge for policymakers arises from the fact that while some estimates of future climate impacts may seem to imply steady, gradual changes that can be adapted to over time, in fact past changes in the earth’s climate have been the opposite: highly non-linear and unpredictable, and hallmarked by sudden shifts as key thresholds are passed. Accordingly, an increasing concern for policymakers in recent years has been the risk of abrupt climate change that could result from positive feedback effects, such as:  rapid die-back of tropical forests or melting of Arctic tundra (both of which would release large amounts of methane into the atmosphere);26  rapid melting of polar ice sheets or glaciers (which would result in higher sea levels);27 or  reduction in the capacity of atmospheric sinks such as the world’s oceans to absorb carbon dioxide (which would magnify the impact of current emissions).28 While these kinds of risk are largely omitted from IPCC assessments, due to the high degree of uncertainty associated with them, they nonetheless remain a real consideration for policymakers wanting to take a risk management approach based on feasible worst case scenarios.29 Some best-guess estimates suggest that global average warming of around 2.0° Celsius may be a key threshold for some of these effects, while the IPCC concluded in its Third Assessment Report that “there is low to medium confidence that a rapid warming of over 3° Celsius would trigger large-scale singularities in the climate system”, but such assessments are highly uncertain.30

## Impact - Poverty

**Warming exacerbates poverty - resource scarcities
UNDP et al 3** ( United Nations Development Programme, African Development Bank, Asian Development Bank Department for International Development, United Kingdom Directorate-General for Development, European Commission Federal Ministry for Economic Cooperation and Development, Germany Ministry of Foreign Affairs - Development Cooperation, The Netherlands Organization for Economic Cooperation and Development United Nations Development Programme United Nations Environment Programme The World Bank, June, 2003, <http://www.unpei.org/PDF/Poverty-and-Climate-Change.pdf>)

Poor people are often directly dependent on goods and services from ecosystems, either as a primary or supplementary source of food, fodder, building materials, and fuel. This makes them highly vulnerable to ecosystem degradation. While local economic and social conditions drive poor people into marginal areas and force them to exploit natural resources to support their livelihoods, climate change further erodes the quality of the natural resource base, thereby reinforcing conditions of poverty. Changes in ecosystem composition and provision of goods and services may also have wider economic effects. Essential ecosystem services include breaking down wastes and pollutants, purifying water, and maintaining soil fertility. Climate change will alter the quality and functioning of ecosystems, reducing their capacity to perform their role as important life support systems. This will have important impacts on key economic sectors such as agriculture, water supply, and others.

**This adversely affects the poor - agricultural growth**

**UNDP et al 3** ( United Nations Development Programme, African Development Bank, Asian Development Bank Department for International Development, United Kingdom Directorate-General for Development, European Commission Federal Ministry for Economic Cooperation and Development, Germany Ministry of Foreign Affairs - Development Cooperation, The Netherlands Organization for Economic Cooperation and Development United Nations Development Programme United Nations Environment Programme The World Bank, June, 2003, <http://www.unpei.org/PDF/Poverty-and-Climate-Change.pdf>)

Agriculture is the most important sector for most least developed countries as the impact of agricultural growth on poverty reduction tends to exceed the impact of growth in other sectors (ODI 2002). Food security is a function of several interacting factors, including food production as well as food purchasing power. Climate change could worsen the prevalence of hunger through direct negative effects on production and indirect impacts on purchasing powers. Land degradation, price shocks, and population growth are already a major concern for sustaining agricultural productivity. Changes in temperature, precipitation, and climatic extremes will add to the stress on agricultural resources in many developing country regions and reduce the quality of land areas for agricultural production. This will be particularly serious for areas where droughts and land degradation, including desertification, are already severe. As access to productive land is important for reducing rural poverty, the impacts of climate change on the productivity of land will further constrain efforts to combat rural poverty. Low-lying coastal communities will have to deal with sea level rise and the impact of climate change on marine resources. Sea level rise may lead to salinization and render agriculture areas unproductive. In areas where fish constitute a significant source of protein for poor people, declining and migration of fish stocks due to climate change and associated changes in the marine environment will further need to be considered in their impact on the local food security. The impact of climate change on food supply varies significantly by region. In general, crop yields are projected to decrease in most tropical and subtropical regions due to changes in temperature and rainfall (IPCC 2001b). Consequently, there is a real risk that climate change will worsen food security and exacerbate hunger in some developing-country regions. In the short term, however, the greater impact on food security could come from the projected increases and severity of extreme weather events rather than from gradual changes in the climate (FAO 2002). The impact of climate change on food security will be a major concern for Africa. In conjunction with the previously discussed changes in water supply, the production losses for Sub-Saharan countries could be substantial as the length of suitable growing periods decreases. Livestock activities and crop yields for many countries in Asia and Latin America are also projected to decrease.

**It's structurally most likely to displace individuals who are already disadvantages**

**UNDP et al 3** ( United Nations Development Programme, African Development Bank, Asian Development Bank Department for International Development, United Kingdom Directorate-General for Development, European Commission Federal Ministry for Economic Cooperation and Development, Germany Ministry of Foreign Affairs - Development Cooperation, The Netherlands Organization for Economic Cooperation and Development United Nations Development Programme United Nations Environment Programme The World Bank, June, 2003, <http://www.unpei.org/PDF/Poverty-and-Climate-Change.pdf>)

The direct and indirect effects of climate change and their interaction with other vulnerabilities and environmental exposures may lead to mass migrations, as crucial resources become degraded and livelihoods are threatened. Loss of land mass in coastal areas due to sea level rise is, for example, likely to lead to greater permanent or semi-permanent displacement of populations, which may have considerable economic and political ramifications. Areas most vulnerable to sea level rise lie in the tropics: the west coast of Africa; the north and eastern coast of South America; South and Southeast Asia; and small island states in the Caribbean, Pacific and Indian Oceans (IPCC 2001a). Of the world’s 19 mega-cities (those with over 10 million people), 16 are on coastlines and all but 4 are in the developing world. The poor living in Asian mega-cities are particularly at risk, as sea level rise compounds subsidence caused by excessive groundwater extraction in Manila, Bangkok, Shanghai, Dhaka, and Jakarta. To this should be added the risk for potential conflicts, including social unrest, political instability, and wars over decreasing water or other natural resources and possible mass migration due to, for example, land loss or degradation and extreme weather events. Such conflicts may have considerable costs both in macroeconomic terms and in human suffering.

**Warming increases poverty
Science Daily 9** (Science Daily, Science news agency, Climate Change Could Deepen Poverty In Developing Countries, Study Finds Aug. 21, 2009, <http://www.sciencedaily.com/releases/2009/08/090820082101.htm>)

ScienceDaily (Aug. 21, 2009) — Urban workers could suffer most from climate change as the cost of food drives them into poverty, according to a new study that quantifies the effects of climate on the world's poor populations.A team led by Purdue University researchers examined the potential economic influence of adverse climate events, such as heat waves, drought and heavy rains, on those in 16 developing countries. Urban workers in Bangladesh, Mexico and Zambia were found to be the most at risk. "Extreme weather affects agricultural productivity and can raise the price of staple foods, such as grains, that are important to poor households in developing countries," said Noah Diffenbaugh, the associate professor of earth and atmospheric sciences and interim director of Purdue's Climate Change Research Center who co-led the study. "Studies have shown global warming will likely increase the frequency and intensity of heat waves, drought and floods in many areas. It is important to understand which socioeconomic groups and countries could see changes in poverty rates in order to make informed policy decisions." The team used data from the late 20th century and projections for the late 21st century to develop a framework that examined extreme climate events, comparable shocks to grain production and the impact on the number of impoverished people in each country. Thomas Hertel, a distinguished professor of agricultural economics and co-leader of the study, said that although urban workers only contribute modestly to total poverty rates in the sample countries, they are the most vulnerable group to changes in grains production. "Food is a major expenditure for the poor and, while those who work in agriculture would have some benefit from higher grains prices, the urban poor would only get the negative effects," said Hertel, who also is executive director of Purdue's Center for Global Trade Analysis. "This is an important finding given that the United Nations projects a continuing shift in population concentrations from rural to urban areas in virtually all of these developing countries." With nearly 1 billion of the world's poor living on less than $1 a day, extreme events can have a devastating impact, he said. "Bangladesh, Mexico and Zambia showed the greatest percentage of the population entering poverty in the wake of extreme drought, with an additional 1.4 percent, 1.8 percent and 4.6 percent of their populations being impoverished by future climate extremes, respectively," Hertel said. "This translates to an additional 1.8 million people impoverished per country for Bangladesh and Mexico and an additional half million people in Zambia." A paper detailing the work will be published in Thursday's (Aug. 20) issue of Environmental Research Letters. In addition to Diffenbaugh and Hertel, Syud Amer Ahmed, a recent Purdue graduate and a member of the development research group for The World Bank, co-authored the paper. The World Bank's Trust Fund for Environmentally and Socially Sustainable Development funded the research. The team identified the maximum rainfall, drought and heat wave for the 30-year periods of 1971-2000 and 2071-2100 and then compared the maximums for the two time periods. The global climate model experiments developed by the Intergovernmental Panel on Climate Change, or IPCC, were used for the future projections of extreme events. The team used an IPCC scenario that has greenhouse gas emissions continuing to follow the current trend, Diffenbaugh said. "The occurrence and magnitude of what are currently the 30-year-maximum values for wet, dry and hot extremes are projected to substantially increase for much of the world," he said. "Heat waves and drought in the Mediterranean showed a potential 2700 percent and 800 percent increase in occurrence, respectively, and extreme rainfall in Southeast Asia was projected to potentially increase by 900 percent." In addition, Southeast Asia showed a projected 40 percent increase in the magnitude of the worst rainfall; central Africa showed a projected 1000 percent increase in the magnitude of the worst heat wave; and the Mediterranean showed a projected 60 percent increase in the worst drought. A statistical analysis was used to determine grain productivity shocks that would correspond in magnitude to the climate extremes, and then the economic impact of the supply shock was determined. Future predicted extreme climate events were compared to historical agricultural productivity extremes in order to assess the likely impact on agricultural production, prices and wages. Because the projected changes in extreme rainfall and heat wave events were too large for the current model to accept, only the extreme drought events were incorporated into the economic projections, making the projected poverty impacts a conservative estimate, he said. To assess the potential economic impact of a given change in wages and grains prices, the team used data from each country's household survey. The estimates of likely wage and price changes following an extreme climate event were obtained from a global trade model, called the Global Trade Analysis Project, or GTAP, which is maintained by Purdue's agricultural economics department. Purdue's GTAP framework is supported by an international consortium of 27 national and international agencies and is used by a network of 6,500 researchers in 140 countries. Large reductions in grains productivity due to extreme climate events are supported by historical data. In 1991 grains productivity in Malawi and Zambia declined by about 50 percent when southern Africa experienced a severe drought. Diffenbaugh said this is an initial quantification of how poverty is tied to climate fluctuations, and the team is working to improve the modeling and analysis system in order to enable more comprehensive assessments of the link between climate volatility and poverty vulnerability.

**Warming specifically affects the poor
Stone 10** (Chad Stone, Chief Economist, and Hannah Shaw, Research Assistant, the Center on Budget and Policy Priorities, Posted March 29, 2010, <http://www.spotlightonpoverty.org/ExclusiveCommentary.aspx?id=d760b301-190c-4c0d-b9b2-5ce4edaeb4da>)

Fighting global warming requires policies that significantly restrict greenhouse gas emissions. Current legislative proposals put a limit (or "cap") on the overall amount of greenhouse gases – mainly carbon dioxide from the burning of fossil fuels – that businesses are allowed to emit each year. Electric power plants, oil refineries, and other firms responsible for emissions of carbon dioxide and other greenhouse gases are then required to purchase permits (called allowances) for each ton of greenhouse gas pollution they emit. The number of allowances is capped at an amount below business-as-usual emissions levels, forcing companies to find ways to reduce their emissions to the capped amount. As a result of the cost to companies of obtaining scarce emissions allowances and the cost of reducing emissions to the capped level, the price of fossil-fuel energy products – from home energy and gasoline to food and other goods and services with significant energy inputs – will rise. Those higher prices will create incentives, sometimes referred to as a “price signal,” for energy efficiency and conservation measures and for the development and increased use of clean energy alternatives. But they will also put a squeeze on consumers’ budgets, and low-income consumers will feel the squeeze most acutely. The impact of higher prices for energy and energy-intensive products is smaller in dollar terms for lower-income households than it is for higher-income households—because low-income households don’t spend as much to begin with. As a share of their income, however, the impact is substantially greater for low-income households (see Figure 1). FIGURE 1: Without Assistance, Low-Income Households Would Bear Disproportionate Costs from Climate Legislation Source: Congressional Budget Office These people are vulnerable not only because they spend a larger share of their budgets on necessities like energy than do better-off consumers, but also because they already face challenges making ends meet and are the people least able to afford purchases of new, more energy-efficient automobiles, heating systems, and appliances. That’s why it is vital that climate change legislation include low-income protections. Protecting the budgets of low-income households does not mean that those households should be exempt from doing their share to reduce emissions. But it does mean that they should not have to face additional financial hardship in the process. The key is to design policies that draw on the revenue that is available from the sale of emissions allowances to finance refunds that preserve both the purchasing power of low-income households and the price signal that encourages energy-saving behavior by all households.

## Impact - Disease

**Warming causes disease spread
Adair 12** ( KIRSTEN ADAIR, CONTRIBUTING REPORTER for Daily Yale News, Wednesday, April 11, 2012, <http://www.yaledailynews.com/news/2012/apr/11/global-warming-may-intensify-disease/>)

There may be more to fear from global warming than environmental changes. According to several leading climate scientists and public health researchers, global warming will lead to higher incidence and more intense versions of disease. The direct or indirect effects of global warming might intensify the prevalence of tuberculosis, HIV/AIDS, dengue and Lyme disease, they said, but the threat of increased health risks is likely to futher motivate the public to combat global warming. “The environmental changes wrought by global warming will undoubtedly result in major ecologic changes that will alter patterns and intensity of some infectious diseases,” said Gerald Friedland, professor of medicine and epidemiology and public health at the Yale School of Medicine. Global warming will likely cause major population upheavals, creating crowded slums of refugees, Friedland said. Not only do areas of high population density facilitate disease transmission, but their residents are more likely to be vulnerable to disease because of malnutrition and poverty, he said. This pattern of vulnerability holds for both tuberculosis and HIV/AIDS, increasing the incidence of both the acquisition and spread of the diseases, he explained. He said these potential effects are not surprising, since tuberculosis epidemics historically have followed major population and environmental upheavals. By contrast, global warming may increase the infection rates of mosquito-borne diseases by creating a more mosquito-friendly habitat. Warming, and the floods associated with it, are like to increase rates of both malaria and dengue, a debilitating viral disease found in tropical areas and transmitted by mosquito bites, said Maria Diuk-Wasser, assistant professor of epidemiology at the Yale School of Public Health. “The direct effects of temperature increase are an increase in immature mosquito development, virus development and mosquito biting rates, which increase contact rates (biting) with humans. Indirect effects are linked to how humans manage water given increased uncertainty in the water supply caused by climate change,” Diuk-Wasser said. Global warming may affect other diseases in even more complicated ways, Diuk-Wasser said. The effect of global warming on the incidence of Lyme disease, a tick-borne chronic disease, is more difficult to examine and measure, though she said it will probably increase. “One possible way in which temperature may limit tick populations is by increasing the length of their life cycle from two to three years in the north, where it is colder,” she said. “Climate change could be reverting that and therefore increasing production of ticks. The transmission of the Lyme bacterium is so complex, though, that it is difficult to ‘tease out’ a role of climate change.” Diuk-Wasser added, however, that scientists do find an effect of climate change on the distribution of Lyme disease in their data, but are not yet sure of the reasons behind such results. While the study of global warming itself is relatively new, research on the impact of global warming on disease is an even more recent endeavor that draws on the skills and expertise of a wide variety of scientists and researchers. “The field is multi-sourced, and recently interest has been evolving among climatologists, vector biologists, disease epidemiologists, ecologists, and policymakers alike,” said Uriel Kitron, professor and chair of the environmental studies department at Emory University. Kitron said that in order to mitigate the effects of global warming on disease, the public must turn its attention to water management and an increased understanding of the connecting between “global processes and local impact.” Diuk-Wasser said that raising awareness about the public health effects of global warming might aid climate control efforts, because it made the potential impact of global warming more personal. “There’s been a great interest in climate advocacy groups to look for negative effects of climate change on health, since studies have found that this motivates people to adopt measures to curb climate change,” Diuk-Wasser said. The Yale Climate and Engery Institute recently won a grant to study the direct and indirect effects of climate change on dengue transmission in Colombia.

**Warming spreads tropical disease everywhere
Irfan 12** (Umfair Irfan, reporter for Scientific America, a scientific news agency, June 4, 2012, <http://www.scientificamerican.com/article.cfm?id=exotic-diseases-warmer-climate-us-gain>)

Diseases once thought to be rare or exotic in the United States are gaining a presence and getting new attention from medical researchers who are probing how immigration, limited access to care and the impacts of climate change are influencing their spread. Illnesses like schistosomiasis, Chagas disease and dengue are endemic in warmer, wetter and poorer areas of the world, often closer to the equator. According to the World Health Organization, almost 1 billion people are afflicted with more than one tropical disease. Caused by bacteria, parasites and viruses, these diseases are spread through bites, excrement and dirty water stemming from substandard housing and sanitation. Consequently, the United States has been largely isolated from them. But Americans are traveling more, and as tropical vacationers return home, they may unwittingly bring back dangerous souvenirs. Immigrants from endemic regions are also bringing in these diseases, some of which can lie dormant for years. All the while, the flies, ticks and mosquitoes that spread these illnesses are moving north as rising temperatures make new areas more welcoming. In 2009, dengue emerged in south Florida and infected more than 60 people, the first outbreak since 1934, according to the Centers for Disease Control and Prevention (CDC). Dengue is caused by four closely related viruses spread by mosquitoes. It results in joint and muscle pain, severe headaches and bleeding. The outbreak was first detected in a Rochester, N.Y., woman who traveled to Key West, Fla., for one week, with several Key West residents subsequently reporting infections. The infection rate rose to 5 percent, which CDC said indicated "a serious risk of transmission." According to the Monroe County Health Department, there hasn't been a confirmed dengue case in the Florida Keys since November 2010. "We keep the public aware that they need to be dumping standing water and wearing mosquito repellent," explained Chris Tittle, public information officer at the health department. The outbreak may have been linked to travel from Latin America and the Caribbean, where the disease's incidence has risen fourfold over the past 30 years. In 2010, Puerto Rico faced the largest dengue epidemic in its history. However, not every outbreak is imported, and future epidemics may come from within. "There's a substantial but hidden burden of tropical disease in the United States, particularly among people in poverty," said Peter Hotez, founding dean of the National School of Tropical Medicine, the first such school in the United States, at Baylor College of Medicine in Texas. Diseases like leishmaniasis often are not tracked rigorously in this country and are classified as neglected, unlike vector-borne illnesses like Lyme disease that are monitored.

**Warming makes spreads disease – misquitos
Surendran et al 12** (Ranjan Ramasamy and Sinnathamby Noble Surendran, National Center for Biotechnology Information, U.S. National Library of Medicine, Published online 2012 June 19, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3377959/)

Models have been developed for forecasting the impact of global climate change on mosquito-borne diseases, notably the global distributions of malaria (Lindsay and Martens, 1998; Githeko et al., 2000; Rogers and Randolph, 2000; Paaijmans et al., 2009) and dengue (Hales et al., 2002). One model used current temperature, rainfall, and humidity ranges that permit malaria transmission to forecast malaria distribution in 2050 in a global climate change scenario (Rogers and Randolph, 2000). This model found surprisingly few changes, but predicted that some parts of the world that are presently free of malaria may be prone to a greater risk of malaria transmission while certain malaria-endemic areas will have a decreased risk of malaria transmission (Rogers and Randolph, 2000). Larger areas of northern and eastern Australia are expected to become more conducive for the transmission of dengue (McMichael et al., 2006) and a greater proportion of the global population at risk of dengue (Hales et al., 2002) as a result of global climate change. While these models did not specifically address changes in coastal zones, the transmission of malaria (Rogers and Randolph, 2000) and dengue (Hales et al., 2002; McMichael et al., 2006) were generally predicted to increase in coastal areas of northern and eastern Australia. Many modeling forecasts are limited by uncertainties in the extent of global climate change as a result of the inability to accurately predict major drivers such as future emission rates of greenhouse gases. Other factors such as the resilience of the geosphere and biosphere that are difficult to estimate precisely, and regional characteristics, can also influence climate change parameters. Furthermore, the considerable adaptability of mosquito vectors and their pathogens to changing environments are difficult to model. Models however have an important role in highlighting potential problems and the need to develop measures to counter possible increases in disease transmission. Global climate change has led to observable alterations in the global distribution of plants and animals with species adapted to warmer temperatures moving to higher latitudes (Root et al., 2003). However there is no unequivocal evidence yet that global climate change has already affected the distribution of a mosquito-borne disease in inland or coastal areas. The reports of increased incidence of malaria epidemics related to warmer temperatures in the Kenyan highlands have been controversial as changes in many other factors could have influenced malaria transmission in this area, and perhaps even masked an increase in transmission due to higher temperatures (Githeko et al., 2000; Alonso et al., 2011; Omumbo et al., 2011; Chaves et al., 2012). However it is clear that the incidence of malaria has decreased over the last decade in many countries due primarily to better case detection and treatment, the use of insecticide treated mosquito nets and indoor residual spraying of more effective insecticides (World Health Organization, 2011). It seems quite likely that such improvements in malaria control measures worldwide have masked any tendency for the incidence of malaria to increase as a result of global climate change (Gething et al., 2010). On the other hand, there is evidence that short term changes in global climate can influence the incidence of mosquito-borne diseases. The El-Nino Southern Oscillation (ENSO) entails multi-annual cyclic changes in the temperature of the eastern Pacific Ocean that influences air temperature and rainfall in large areas of the bordering continents, spreading as far as Africa. ENSO has been associated with a higher incidence of dengue in some countries, notably in parts of Thailand in recent times (Tipayamongkholgul et al., 2009). Global warming due to the greenhouse effect may increase the frequency of ENSO events (Timmermann et al., 1999) and therefore cause more numerous epidemics of dengue. The warming of surface sea temperatures in the western Indian Ocean due to short term fluctuations known as the Indian Ocean Dipole (IOD) is associated with higher malaria incidence in the western Kenyan highlands (Hashizume et al., 2009). The effects of short term ENSO and IOD events are a likely indication of the potential impacts of long term global climate change on mosquito-borne diseases that can also affect coastal zones. There have been very few studies on other primary climate changes like wind and atmospheric pollution that can also affect mosquito populations in coastal areas. Changes in wind patterns as a result of climate change are difficult to predict and likely to be locality-specific. It can be expected that higher onshore wind velocities will tend to disperse mosquito populations further inland. Atmospheric pollution will be higher in the vicinity of urban coastal areas, and it may be anticipated that mosquitoes will adapt to pollution with time. The gaps in knowledge in these areas need to be addressed.

**Warming causes disease – parasites
SPPI 12** (Science and Public Policy Institute, Center for the Study of Carbon Dioxide and Global Change. "Global Warming and Animal Parasitic Diseases.” Last modified February 8, 2012. [**http://www.co2science.org/subject/p/summaries/animalparasites.php**](http://www.co2science.org/subject/p/summaries/animalparasites.php).)

One of the perceived great tragedies of CO2-induced global warming is that rising temperatures will increase the development, transmission, and survival rates of parasites in general, leading to a perfect storm of biological interactions that will raise the prevalence of parasitic disease among animals in the future. But is this really so? In a provocative paper analyzing the intricacies of this complex issue, Hall et al. (2006)1 begin their analysis of the subject by asking “Will an increasingly warmer world necessarily become a sicker world?” They posed this question because, in their words, “increased temperatures can accelerate the fitness of parasites, reduce recruitment bottlenecks for parasites during winter, and weaken hosts,” while further noting that “warmer temperatures may allow vectors of parasites to expand their range,” which would enable them to “introduce diseases to novel habitats,” which is something climate alarmists frequently claim about mosquitoes and malaria. However, as they continue, “these doom-and-gloom scenarios do not necessarily apply to all taxa or all situations,” and they note that “warming does not necessarily increase the fitness of all parasites.” Enlarging upon these latter points, the four biologists and their statistician co-author write that the “virulence of parasites may not change, may decrease, or may respond unimodally to increasing temperatures (Stacey et al., 2003; Thomas and Blanford, 2003),” and in this regard they further note that “vital rates increase with temperature until some optimum is reached,” and that “once temperature exceeds this optimum, vital rates decline gradually with increasing temperature for some taxa, but rapidly for others,” such that “in some host-parasite systems, a parasite’s optimum occurs at cooler temperatures than the optimum of its host,” citing the work of Carruthers et al. (1992), Blanford and Thomas (1999) and Blanford et al. (2003) on fungus-grasshopper associations in substantiation of this scenario. In such cases, as they describe it, “a host can use warmer temperatures to help defeat its parasites through behavioral modification of its thermal environment.”However, the situation sometimes can be even more complex than this; for Hall et al. write that “warmer temperatures can also lead to shifts in temperature optima (Huey and Hertz, 1984; Huey and Kingsolver, 1989, 1993),” and that “the exact evolutionary trajectory of host-parasite systems in a warmer world may depend sensitively upon underlying genetic correlation structures and interactions between host genotypes, parasite genotypes, and the environment (Blanford et al., 2003; Thomas and Blanford, 2003; Stacey et al., 2003; Mitchell et al., 2004).” Consequently, they conclude that “longer-term response of the physiology of host-parasite systems to global warming becomes difficult to predict.” But these considerations are not the end of the story either; for the researchers note that “other species can profoundly shape the outcome of parasitism in host populations,” and that “predators provide an important example” because, as they elucidate, predators “can actually inhibit epidemics by selectively culling sick hosts and/or by maintaining host densities below levels required for parasites to persist (Hudson et al., 1992; Packer et al., 2003, Lafferty, 2004; Ostfeld and Holt, 2004; Duffey et al., 2005; Hall et al., 2005).” When all is said and done, therefore, Hall et al. conclude that “global warming does not necessarily mean that disease prevalence will increase in all systems.”

## Impact - Ice Age

**Warming melts arctic sea ice – that leads to an ice age
The Telegraph 2/27/12**

(The Telegraph, news agency, 27 Feb 2012, Freezing winters ahead due to melting Arctic Sea ice, <http://www.telegraph.co.uk/earth/earthnews/9109106/Freezing-winters-ahead-due-to-melting-Arctic-Sea-ice.html>)

Climate change means autumn levels of sea ice have dropped by almost 30 percent since 1979 - but this is likely to trigger more frequent cold snaps such as those that brought blizzards to the UK earlier this month. And Arctic sea ice could be to blame. Dr Jiping Liu and colleagues studied the extensive retreat of the ice in the summer and its slow recovery focusing on the impacts of this phenomenon on weather in the Northern Hemisphere. Information about snow cover, sea level pressure, surface air temperature and humidity was used to generate model simulations for the years 1979-2010. The researchers say dramatic loss of ice may alter atmospheric circulation patterns and weaken the westerly winds that blow across the North Atlantic Ocean from Canada to Europe. This will encourage regular incursions of cold air from the Arctic into Northern continents - increasing heavy snowfall in the UK. Dr Liu said: "The results of this study add to an increasing body of both observational and modeling evidence that indicates diminishing Arctic sea ice plays a critical role in driving recent cold and snowy winters over large parts of North America, Europe and east Asia." While the Arctic region has been warming strongly in recent decades there has been abnormally large snowfall in these areas. Dr Liu, of Georgia Institute if Technology in Atlanta, said: "Here we demonstrate the decrease in autumn Arctic sea ice area is linked to changes in the winter Northern Hemisphere atmospheric circulation. "This circulation change results in more frequent episodes of blocking patterns that lead to increased cold surges over large parts of northern continents. "Moreover, the increase in atmospheric water vapor content in the Arctic region during late autumn and winter driven locally by the reduction of sea ice provides enhanced moisture sources, supporting increased heavy snowfall in Europe during early winter and the northeastern and midwestern United States during winter. "We conclude the recent decline of Arctic sea ice has played a critical role in recent cold and snowy winters." In November research showed there is less Arctic sea ice now than there has been at any time in the last 1,450 years.

**Warming causes a second ice age – melting ice
Black 2/27/12**

(By Richard Black, Environment correspondent, BBC News, Melting Arctic link to cold, snowy UK winters, <http://www.bbc.co.uk/news/science-environment-17143269>)

The progressive shrinking of Arctic sea ice is bringing colder, snowier winters to the UK and other areas of Europe, North America and China, a study shows. As global temperatures have risen, the area of Arctic Ocean covered by ice in summer and autumn has been falling. Writing in Proceedings of the National Academy of Sciences (PNAS), a US/China-based team show this affects the jet stream and brings cold, snowy weather. Whether conditions will get colder still as ice melts further is unclear. There was a marked deterioration in ice cover between the summers of 2006 and 2007, which still holds the record for the lowest extent on record; and it has not recovered since. The current winter is roughly tracking the graph of 2007, according to the US National Snow and Ice Data Center (NSIDC). The new study is not the first to propose a causal relationship between low Arctic ice in autumn and Europe's winter weather. But it has gone further than others in assessing the strength of the link. Through observations and computer modelling, the team headed by Jiping Liu from Georgia Institute of Technology in Atlanta, US, and the Insitute of Atmospheric Physics in Beijing has also elucidated the mechanisms involved. "For the past four winters, for much of the northern US, east Asia and Europe, we had this persistent above-normal snow cover," Dr Liu told BBC News. "We don't see a predictive relationship with any of the other factors that have been proposed, such as El Nino; but for sea ice, we do see a predictive relationship." How it happens If less of the ocean is ice-covered in autumn, it releases more heat, warming the atmosphere. This reduces the air temperature difference between the Arctic and latitudes further south, over the Atlantic Ocean. The dwindling Arctic summer ice may have severe consequences for wildlife In turn, this reduces the strength of the northern jet stream, which usually brings milder, wetter weather to Europe from the west. It is these "blocking" conditions that keep the UK and the other affected regions supplied with cold air. The researchers also found that the extra evaporation from the Arctic Ocean makes the air more humid, with some of the additional water content falling out as snow. "I agree with the study - I have no beef with the case that declining Arctic sea ice can drive easterly winds and produce colder winters over Europe," commented Adam Scaife, head of monthly to decadal prediction at the UK Met Office. Research in other institutions, including the Met Office, confirmed the argument, he said. Dr Scaife was involved with another study published last year that showed how small, natural changes in the Sun's output can also affect winter weather. And he emphasised that the declining Arctic ice cover was just one of several factors that could increase blocking. "You can hit a bell with anything, and you still produce the same note," he told BBC News. "This is no bigger than the solar effect or the El Nino effect. But they vary, whereas Arctic ice is on a pretty consistent downward trend." The picture is further complicated by the involvement of the Arctic Oscillation, a natural variation of air pressure that also changes northern weather. Dr Len Shaffrey, University of Reading: "This is very early days for this research" The oscillation is not understood well enough to predict - and even if it were, any pattern it has may be changing due to escalating greenhouse gas concentrations. Nevertheless, the research suggests that on average, winters in the UK and the rest of the affected region will be colder in years to come than they have been in recent decades. Various computer simulations have generated a range of dates by which the Arctic might be completely ice-free in summer and autumn, ranging from 2016 to about 2060. A few years ago, one projection even showed 2013 was possible, though this now appears unlikely. So a related question is whether UK winters will get colder and snowier still as the melting progresses, "It's possible that future winters will be colder and snowier, but there are some uncertainties," cautioned Dr Liu. His team's next research project is to feed Arctic ice projections and the mechanisms they have deciphered into various computer models of climate, and see whether they do forecast a growing winter chill.

## Impact - Authoritarianism

Climate change leads to authoritarianism – studies prove

Fritsche 12 (Immo Fritsche, Institut für Psychologie, Lehrstuhl für Sozialpsychologie, Friedrich-Schiller-Universität Jena, Germany, J. Christopher Cohrs, School of Psychology, Queen’s University Belfast, United Kingdom, Thomas Kessler, Humboldt-Universität zu Berlin, Germany, Judith Bauer, Institut für Psychologie, Abteilung Sozialpsychologie, Universität Leipzig, Germany, journal published on 3/12, published online on 9/24/11, “Global warming is breeding social conflict: The subtle impact of climate change threat on authoritarian tendencies,” Journal of Environmental Psychology, Volume 32, Issue 1, pages 1-10, ScienceDirect)

Climate change can increase societies’ propensity to conflict by changes in socio-structural conditions (e.g., resource scarcity, migration). We propose an additional, subtle, and general effect of climate change threat via increases in authoritarian attitudes. Three studies in Germany and the UK support this suggestion. Reminding participants of the adverse consequences climate change may have for their country increased the derogation of societal groups that may threaten the collective (e.g., criminals) as well as general authoritarian attitudes. Salient climate change threats also led to system justification and approval of system supporting groups (e.g., judges) in those people who were highly identified with their nation. We discuss the implications of these findings for the explanation of authoritarian attitudes and the question of how societies may cope with the subtle social psychological effects of climate change.

Climate change doubles risk of civil conflict

Schiermeier 11 — (Quirin Schiermeier, staff writer, published online on 8/24/11, “Climate cycles drive civil war,” *Nature*,“International weekly journal of science,” accessed online, http://www.nature.com/news/2011/110824/full/news.2011.501.html)

Previous studies have focused on the question of how anthropogenic climate change might increase conflict risk. A 2009 study2 by economist Marshall Burke at the University of California, Berkeley, and his co-workers found that the probability of armed conflict in sub-Saharan Africa was about 50% higher than normal in some unusually warm years since 1981. But critics point to statistical problems — for instance when linking possibly random local temperature and rainfall variations with outbreaks of civil war — that may have resulted in a false appearance of causality. To overcome this problem, Solomon Hsiang, an economist currently at Princeton University in New Jersey, and his colleagues opted to look at how historical changes in the global, rather than local, climate affect conflict risk1. Clear signal The team designed a 'quasi-experiment' for which they divided the world into regions strongly affected by the ENSO — the tropical parts of South America, Africa and the Asia–Pacific region, including parts of Australia — and regions only weakly affected by it. They then searched for a link between climate and armed conflicts that arose in the first group between 1950 and 2004. A very clear signal appeared in the data. The team found that the risk of annual civil conflict doubles, from 3% to 6%, in countries of the ENSO-affected, or 'teleconnected', group during El Niño years relative to La Niña years. In many cases, conflicts that might have broken out anyway may have occurred earlier owing to the effects of El Niño, Hsiang suggests.

Climate change could link to one fifth of global civil conflicts

Schiermeier 11 — (Quirin Schiermeier, staff writer, published online on 8/24/11, “Climate cycles drive civil war,” *Nature*,“International weekly journal of science,” accessed online, http://www.nature.com/news/2011/110824/full/news.2011.501.html)

Civil conflicts have been by far the most common form of organized political violence in recent decades, Hsiang says. Globally, one-fifth of the 240 or so civil conflicts since 1950 could be linked to the 4–7-year climate cycle originating in the southern Pacific, the study concludes. The results were unaffected by any modification to the statistical set-up of the analysis — such as excluding particularly crisis-prone African countries — which the team performed to confirm the robustness of their findings.

Climate change impacts stability – doubles likelihood of civil war and may have caused one fifth of global conflicts

Goodman 11 — interview conducted by Amy Goodman, host of Democracy Now!, “A Daily Independent Global News Hour,” 8/29/11, “Global Warming & War: New Study Finds Link Between Climate Change and Conflict,” an interview with Solomon Hsiang, lead author of a study linking civil wars with global climate change, and postdoctoral researcher at the Woodrow Wilson School of Public and International Affairs at Princeton University, Democracy Now!)

We move to another issue around climate. A new study has found that war is associated with global climate. According to the report, there are links between the climate phenomenon El Niño and outbreaks of violence in countries from southern Sudan to Indonesia and Peru. In fact, the scientists find that El Niño, which brings hot and dry conditions to tropical nations, doubles the risk of civil war in up to 90 countries. The study was published online last week in the journal Nature. El Niño may help account for a fifth of conflicts worldwide during the past 50 years.

## AT: Warming Solves Itself

**Atmospheric CO2 lingers and decay is slow**

Cherubini et al. (FRANCESCO CHERUBINI\*, GLEN P. PETERSw, TERJE BERNTSENwz, ANDERS H. STRØMMAN\*andEDGAR HERTWICH\* \*Department of Energy and Process Engineering, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway, wCenter for International Climate and Environmental Research – Oslo (CICERO), Oslo, Norway, zDepartment of Geosciences, University of Oslo, Norway) 2011 (Francesco, “CO2 emissions from biomass combustion for bioenergy: atmospheric decay and contribution to global warming,” GCB Bioenergy (2011) 3, <http://onlinelibrary.wiley.com/doi/10.1111/j.1757-1707.2011.01102.x/full>, Pages 415-416) //CL

\*Note in this article “C” refers to carbon as indicated by the author at the beginning

Atmospheric decay. Thanks to the elaboration of these CC models it is possible to predict the atmospheric decay of CO2 emissions (Maier-Reimer & Hasselmann, 1987; Lashof & Ahuja, 1990; Caldeira & Kasting, 1993; Joos et al., 1996, 2001; Enting et al., 2001). In all the cases, CO2 does not follow a simple decay according to one single lifetime (as it is for the two other main GHG, N2O and CH4), but its decay is described by several time constants and there is a fraction of the initial emission that always remains in the atmosphere. The fraction of CO2 remaining in the air following a CO2 release depends on future atmospheric CO2 concentrations, because the partial pressure of CO2 in the ocean surface is a nonlinear function of surface total dissolved inorganic C concentration (Caldeira & Kasting, 1993). The analytical form of the atmospheric decay of anthropogenic CO2 is given by a superposition of a number of exponentials of different amplitude Ai and relaxation time ti The value of this function at any time represents the fraction of the initial emission which is still found in the atmosphere, and the removed fraction corresponds to the ocean/biosphere uptake. The amplitude A0 represents the asymptotic airborne fraction of CO2 which remains in the atmosphere because of the equilibrium response of the ocean–atmosphere system. The amplitudes Ai may be interpreted as the relative capacity of the other sinks, which are filled up by the atmospheric input at rates characterized by the relaxation time scales ti. These time scales determine the redistribution of anthropogenic CO2 emissions in the climate system and are linked to the time scales of the natural C cycle. Because of this exponential decay trend, more than half of the initial input is removed from the atmosphere within few decades after emissions through uptake by the upper ocean layer and the fast overturning reservoirs of the land biosphere. However, a certain fraction is still found in the atmosphere after 1000 years; this fraction is only very slowly reduced further by ocean–sediment interaction and the weathering cycle (Archer et al., 1998).

## AT: Intervening Actors

**Intervening actors arguments justify delay - that multiplies the costs which collapses the economy and means intervention fails**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2012 (John M., “Chevy Volt Costing Taxpayers $250,000 Per Car,” July 17, 2012, http://news.heartland.org/newspaper-article/2012/07/17/chevy-volt-costing-taxpayers-250000-car) //CL

Despite $700 million dollars in development costs and taxpayer subsidies of $250,000 per vehicle, Chevrolet is selling very few Chevy Volts, Seton Motley of News Busters reports today in an eye-opening column. The federal government and various state governments repeatedly bill taxpayers for a litany of “can’t miss” automobile technologies that repeatedly end in failure. Remember California’s hydrogen highway? How about the Bush administration’s own wasted investments in unrealistic hydrogen technologies? Taxpayer dollars pour into hybrid vehicles that rarely save enough money in fuel costs to justify their additional expense (let alone their additional environmental damage). Now we have the Chevy Volt as the latest black hole for taxpayer subsidies. If a technology makes sense, it will succeed with or without government subsidies and mandates. On the other hand, no amount of government subsidies or mandates can ever make a failure technology beneficial for society.

## AT: Aerosols

**Aerosols cannot completely reverse the effects of warming**

Global Warming Focus 12 (6/11/12, “Global Warming and Climate Change; Data from University of Washington Provide New Insights into Global Warming and Climate Change” Global Warming Focus, ProQuest)

Our news editors obtained a quote from the research by the authors from the University of Washington, "The Community Climate System Model, version 3, is used to evaluate simulations with enhanced CO2 and prescribed stratospheric sulfate to investigate the effects on regional climate. To further explore the sensitivity of these regions to ocean dynamics, a suite of simulations with and without ocean dynamics is run. The authors find that, when global average warming is roughly canceled by aerosols, temperature changes in the polar regions are still 20%-50% of the changes in a warmed world. Atmospheric circulation anomalies are also not canceled, which affects the regional climate response. It is also found that agreement between simulations with and without ocean dynamics is poorest in the high latitudes. The polar climate is determined by processes that are highly parameterized in climate models. Thus, one should expect that the projected climate response to geoengineering will be at least as uncertain in these regions as it is to increasing greenhouse gases. In the context of climate emergencies, such as melting arctic sea ice and polar ice sheets and a food crisis due to a heated tropics, the authors find that, while it may be possible to avoid tropical climate crises, preventing polar climate emergencies is not certain."

**Aerosols cause warming**

**Idso et. al 11** (Craig, Center for Study of Carbon Dioxide and Global Change, CO2 Magazine, Robert Carter, paleontologist, stratiagrapher, geologist, research fellow at James Cook Univ., Fred Singer, Environmental Science @ UVA, Susan Crockford, PhD Anthropology @ Victoria, Joseph D'Aleo, Executive Director of ICECAP, Co-Chief Meteorologist, Indur Goklany, founded the Electronic Journal of Sustainable Development, Sherwood Idso, president of the Center for the Study of Carbon Dioxide and Global Change, Madhav Khandekarhas, PhD, Editorial Board Member of natural hazards, AR4 Climate Assessment, Anthony Lupo, PhD, Soil, Environmental and Atmospheric Sciences at Mizzou - Columbia, Willie Soon, PhD, Mitch Taylor, Geography @ Lakehead Univ., "Climate Change Reconsidered: 2011 Interim Report," NIPCC Rport http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf)

Some scientists believe aerosols could have a warming effect. Kiendler-Scharr et al. (2009) ―present evidence from simulation experiments conducted in a plant chamber that isoprene can significantly inhibit new particle formation.‖ The significance of this finding derives from the fact that ―the most abundant volatile organic compounds emitted by terrestrial vegetation are isoprene and its derivatives, such as monoterpenes and sesquiterpenes,‖ and the fact, as described in the ―This Issue‖ abstract section of the Nature issue in which the paper appeared (p. 311), that ―these compounds are involved in the formation of organic aerosols [the ‗new particles‘ mentioned by them], which act as ‗seeds‘ for cloud formation and hence as cooling agents via an effect on radiative forcing.‖ Ziemann (2009), in a ―News & Views‖ article that discusses the Kiendler-Scharr et al. paper, writes that ―clouds formed at higher CCN [cloud condensation nuclei] concentrations have more and smaller drops than those formed at lower concentrations, and so reflect more sunlight and are longer-lived—effects that, at the global scale, enhance the planetary cooling that counteracts some of the warming caused by greenhouse gases.‖ Thus, if vegetative isoprene emissions were to increase, driven directly by rising temperatures and/or indirectly by warming-induced changes in the species composition of boreal forests (as further suggested by Ziemann), the resulting decrease in CCN concentrations ―could lead to increased global-warming trends,‖ as suggested by Kiendler-Scharr in a ―Making the Paper‖ article in the same issue of Nature (p. 313).

## AT: Post-Hoc Analysis

**Uncertainty is inevitable - even if warming isn't the sole cause of wars it's a huge proximate cause
Evans 10** (Alex Evans, Center on International Cooperation, New York University, September 9, 2010, http://siteresources.worldbank.org/EXTWDR2011/Resources/6406082-1283882418764/WDR\_Background\_Paper\_Evans.pdf)

As concern over both climate change and resource scarcity has increased in recent years, so speculation has grown that they will lead to increased risk or incidence of violent conflict. UN Secretary-General Ban Ki-moon, for example, said in 2007 that “changes in our environment and the resulting upheavals - from droughts to inundated coastal areas to loss of arable lands - are likely to become a major driver of war and conflict”.31 However, while climate change and resource scarcity do pose risks – especially for poor people and fragile states, which as discussed below are most vulnerable to their effects – caution is needed in forecasting their effects, particularly in the area of violent conflict.In part, this is because the impacts of resource scarcity or climate change will in practice almost always blur with those of other risk drivers, with the effect that it becomes extremely difficult to attribute particular impacts solely to climate change or resource scarcity. The rise in the number of undernourished people from 854 million people in 2007 to over 1 billion in late 2009, for example, is only partly attributable to the effects of the food price spike: also critical were the subsequent effects of the global downturn, which further eroded the purchasing power of many poor people.32 Similarly, while poor people are undoubtedly vulnerable to the direct impacts of climate change, the most far-reaching effects of global warming may be the indirect “consequences of consequences” – such as political instability, economic weakness, food insecurity or large-scale migration (see below).33 Secondly, it is important to remember that the actual risk of violent conflict posed by climate change or resource scarcity depends as much on the vulnerability of populations, ecosystems, economies and institutions as on the strength of climate or scarcity impacts. The fact that poor people are more exposed to price spikes, resource scarcity and climate impacts is well-established, for example – as is the fact that environmental risks are among the most frequent, costly and impactful causes of the kinds of shock that can cause people to become poor in the first place, and that make escape from poverty so difficult.34 Similarly, the institutional and political weaknesses of fragile states have been argued to make them more susceptible to conflict risk arising from climate change and resource scarcity. A 2007 report from International Alert, for example, found that 46 countries, home to 2.7 billion people, would experience a “high risk of violent conflict” as a result of climate change interacting with economic, social and political problems, while in a further 56 countries with 1.2 billion inhabitants “the institutions of government will have great difficulty taking the strain of climate change on top of all their other current challenges”.35 Climate change and resource scarcity are rarely, if ever, the sole cause of violent conflict, then: instead, they are better understood as ‘threat multipliers’ that will in practice interact both with other risk drivers, and with diverse sources of vulnerability.36 However, this is not to say that climate and scarcity do not increase the risk of violent conflict. On the contrary, as a United Nations Environment Programme report recently argued: “the exploitation of natural resources and related environmental stresses can be implicated in all phases of the conflict cycle, from contributing to the outbreak and perpetuation of violence to undermining prospects for peace”.37 Kahl (2006) cites a range of evidence for the argument that scarcity can increase the risk of violent conflict, including quantitative studies that suggest population size and density are significant conflict risk factors, and statistical work indicating that countries highly dependent on natural resources, as well as those experiencing high rates of deforestation and soil degradation or low per capita availability of arable land and freshwater, have higher than average risks of conflict.

## AT: Oceans Check

**Oceans absorb Co2 – that kills everything in it – your turns flow aff
Hutchings et al 12** (Jeffery Hutchings, Prof. Isabelle M. Côté Prof. Julian J. Dodson Prof. Ian A. Fleming Prof. Je­ rey A. Hutchings (Chair) Prof. Simon Jennings Prof. Nathan J. Mantua Prof. Randall M. Peterman Dr. Brian E. Riddell Prof. Andrew J. Weaver, FRSC, The Royal Society of Canada Acedmic of Arts, February 2012, http://www.rsc.ca/documents/RSC\_MBD\_1\_3\_25\_Twenty-Five\_EN\_FORMAT.pdf)

Climate Change: Observed and Projected Stressors The immediate consequences of climate change are likely to include ocean warming, altered sea levels, and acidification of the ocean. All of these are already changing marine biodiversity. Water and air temperature are both pivotal in determining distribution of ocean plants and animals. Altered temperature patterns affect marine biodiversity, and potential yields from fisheries, by changing where different species live. Increased precipitation and warmer temperatures can change salt content and the density of water, or wash more nutrients from land into rivers and then into the sea; those kinds of changes reach right down to “primary production”, the development of the most basic organisms in the food chain. Changes there could reduce the transfer of food value from organic matter. Inevitably, every organism is affected. Climate change can also cause disconnects between the needs species have for survival and their access to vital resources. An earlier bloom of plankton, for example, may mean that fish larvae or newly hatched seabirds don’t get the food that they need. The consequences of these resource ‘mismatches’ can be transferred up the food chain. At the species level, effects can be seen in Chinook salmon, where climate change is making some streams too warm or too shallow for young fish to survive and grow properly. That’s projected to reduce population abundance and significantly increase the chance of extinction for affected populations. Temperature change also affects where species live. Empirical and theoretical studies suggest marine fish and invertebrates respond to ocean warming by shifting between 30-130 km per decade pole-wards and 3.5 m per decade deeper. That could lead to local extinction of some species, while others invade new areas. We think this will inevitably lead to significant changes in fisheries. In the northern hemisphere, that could mean declines in fishing in temperate regions (25oN-50oN), but increases at higher latitudes, particularly in the sub-Arctic. However, benefits further north might be countered by the loss of species at lower latitudes in Canadian waters.Climate change also plays a role in depleting oxygen in water. When surface water gets warmer, the water may not produce and exchange oxygen well. Heavier precipitation that increases freshwater discharge and the flux of nutrients adds to the problem. Along the Oregon coast, low-oxygen events have caused fish and crab kills during the last several years, events that were not observed in the previous century. The world’s oceans absorb some 84 per cent of the carbon dioxide generated by burning fossil fuels. As the concentration of CO2 in the oceans increases, more carbonic acid (H2CO3) is formed, which partially dissociates into bicarbonate (HCO3) and hydrogen (H+) ions. The combination of increased acidity and decreased carbonate means many marine organisms that use calcium carbonate to construct their shells or skeletons— including corals, some phytoplankton, lobsters, mussels, snails and sea urchins—are at risk from acidification. Analyses of corals on the Great Barrier Reef show that calcification rates declined 21% between 1988 and 2003. By the middle of this century, coral reefs may be eroding faster than they are growing

# Warming No Impact

## AT: Disease

**No good scientific link between climate change and disease**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) The Effects of Climate Change on Infectious Diseases http://co2science.org/articles/V14/N40/EDIT.php

In an Opinion article published in a recent issue of Trends in Ecology and Evolution, Rhor et al. (2011) state that "the notion that climate change will generally increase human and wildlife diseases has garnered considerable public attention, but remains controversial and seems inconsistent with the expectation that climate change will also cause parasite extinctions." Therefore, they decided to review the subject in some detail to see what the bulk of the scientific studies that have addressed the topic have concluded on this contentious matter. In describing the nature of their review, the eight scientists say they highlighted frontiers in climate change-infectious disease research by "reviewing knowledge gaps that make this controversy difficult to resolve." And in doing so, they came to the conclusion that "understanding climate change-disease interactions is a formidable problem because of its interdisciplinary nature and the complexities of hosts, parasites and their interactions with the multiple factors that can co-vary with climate change." As a result of this enlightenment, they go on to state that "effective forecasting of climate-change impacts on disease will require filling the many gaps in data, theory and scale," adding that their findings suggest that "forecasts of climate-change impacts on disease can be improved by more interdisciplinary collaborations, better linking of data and models, addressing confounding variables and context dependencies, and applying metabolic theory to host-parasite systems with consideration of community-level interactions and functional traits." In terms of the implications of their findings, the eight U.S. researchers -- who hail from the University of South Florida, Princeton University, the University of Colorado, the University of California at Santa Cruz, Cornell University and the Pennsylvania State University -- write that "although there should be genuine concern regarding future disease risk for humans and wildlife, we discourage alarmist claims and encourage rigor, open-mindedness and broad thinking regarding this crucial and interdisciplinary global issue." We agree. For far too long, we have heard only one catastrophic scare story after another in regard to how humanity will suffer from climate-change-induced impacts on various vector-borne diseases and other maladies, nearly all of which have been based on studies lacking the "rigor, open-mindedness and broad thinking" that Rhor et al. state is essential for evaluating all of the many interrelated aspects of the subject. We can only hope their plea will be taken to heart by all researchers working in this most important field of endeavor.

No disease

Kenny 12 (Charles Kenny, senior fellow at the Center for Global Development, a Schwartz fellow at the New America Foundation, 4/9/12, "Not Too Hot to Handle," Foreign Policy, http://www.foreignpolicy.com/articles/2012/04/09/not\_too\_hot\_to\_handle)

And what about the impact on global health? Suggestions that malaria has already spread as a result of climate change and that malaria deaths will expand dramatically as a result of warming in the future don't fit the evidence of declining deaths and reduced malarial spread over the last century. The authors of a recent study published in the journal Nature conclude that the forecasted future effects of rising temperatures on malaria "are at least one order of magnitude smaller than the changes observed since about 1900 and about two orders of magnitude smaller than those that can be achieved by the effective scale-up of key control measures." In other words, climate change is and will likely remain a small factor in the toll of malaria deaths into the foreseeable future.

**Burnout - powerful diseases kill their hosts off too quickly to spread**

Carlson 6(Shawn Carlson, PhD MacArthur Fellow, The Citizen Scientist, **2006,** “**Dealing with Doctor Doom,” http://www.sas.org/tcs/weeklyIssues\_2006/2006-04-07/editorial-p/index.html)**

The data stand utterly against this idea. Plagues have run rampant through human populations throughout time. Millions have died. Huge fractions of some populations have been wiped out. But the net death rate has never come close to the fractions that Pianka envisions. Virulent diseases that kill quickly tend to burn themselves out. Natural selection creates less lethal varieties because an organism can't spread if it kills its host before it can propagate. The flu pandemic of 1918 (the influenza virus is championed by Pianka) may have killed 50 million people, but that was only about 5 percent of those infected. Moreover, every year sees medical advancements—screening techniques improve, as do our methods of creating new vaccines and treating illness of all kinds. Not only that, a desperate situation would be met by desperate measures, including the implementation of martial law, the halting of all air and ground traffic except for emergency vehicles and so on, to stop contagion.

## AT: Biodiversity

**Climate change does not cause mass extinction – empirically proven**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Thoughts on Species' Abilities to Survive Rapid Climate Change http://co2science.org/articles/V14/N47/EDIT.php

In an Opinion article published in Global Change Biology, Hof et al. (2011) note that recent and projected climate change is assumed to be exceptional because of its supposedly unprecedented velocity; and they say that this view has fuelled the prediction that CO2-induced global warming "will have unprecedented effects on earth's biodiversity," primarily by driving many species to extinction, because of the widespread belief that earth's plants and animals are unable to migrate poleward in latitude or upward in altitude fast enough to avoid that deadly consequence, as well as the assumption that current climate change simply outpaces evolutionary adaptation. But are these assumptions correct? The four biological researchers address this important question in stages. First, they present evidence demonstrating that "recent geophysical studies challenge the view that the speed of current and projected climate change is unprecedented." In one such study, for example, they report that Steffensen et al. (2008) showed that temperatures in Greenland warmed by up to 4°C/year near the end of the last glacial period. And they state that this change and other rapid climate changes during the Quaternary (the last 2.5 million years) did not cause a noticeable level of broad-scale, continent-wide extinctions of species. Instead, they state that these rapid changes appeared to "primarily affect a few specific groups, mainly large mammals (Koch and Barnosky, 2006) and European trees (Svenning, 2003)," with the result that "few taxa became extinct during the Quaternary (Botkin et al., 2007)." So how were the bulk of earth's species able to survive what many today believe to be unsurvivable? Hof et al. speculate that "species may have used strategies other than shifting their geographical distributions or changing their genetic make-up." They note, for example, that "intraspecific variation in physiological, phenological, behavioral or morphological traits may have allowed species to cope with rapid climatic changes within their ranges (Davis and Shaw, 2001; Nussey et al., 2005; Skelly et al., 2007)," based on "preexisting genetic variation within and among different populations, which is an important prerequisite for adaptive responses," noting that "both intraspecific phenotypic variability and individual phenotypic plasticity may allow for rapid adaptation without actual microevolutionary changes." So do these observations imply that all is well with the planet's many and varied life forms? Not necessarily, because, as Hof et al. continue, "habitat destruction and fragmentation, not climate change per se, are usually identified as the most severe threat to biodiversity (Pimm and Raven, 2000; Stuart et al., 2004; Schipper et al., 2008)." And since Hof et al. conclude that "species are probably more resilient to climatic changes than anticipated in most model assessments of the effect of contemporary climate change on biodiversity," these several observations suggest to us that addressing habitat destruction and fragmentation, rather than climate change, should take center stage when it comes to striving to protect earth's biosphere, since the former more direct and obvious effects of mankind are more destructive, more imminent and more easily addressed than are the less direct, less obvious, less destructive, less imminent, and less easily addressed effects of the burning of fossil fuels.

**Robust peer reviewed evidence indicates ecosystems are resilient**

McDermott 09 (Matthew McDermott, “Good news: most ecosystems can recover in one lifetime from human induced or natural disturbance” 2009, www.treehugger.com/files/2009/05/most-ecosystems-can-recover-from-disturbance-in-one-lifetime.php)

There's a reason the phrase "let nature take its course" exists: New research done at the Yale University School of Forestry & Environmental Science reinforces the idea that ecosystems are quiet resilient and can rebound from pollution and environmental degradation. Published in the journal PLoS ONE, the study shows that most damaged ecosystems worldwide can recover within a single lifetime, if the source of pollution is removed and restoration work done: Forests Take Longest of Ecosystems Studied The analysis found that on average forest ecosystems can recover in 42 years, while in takes only about 10 years for the ocean bottom to recover. If an area has seen multiple, interactive disturbances, it can take on average 56 years for recovery. In general, most ecosystems take longer to recover from human-induced disturbances than from natural events, such as hurricanes. To reach these recovery averages, the researchers looked at data from peer-reviewed studies over the past 100 years on the rate of ecosystem recovery once the source of pollution was removed. Interestingly, the researchers found that it appears that the rate at which an ecosystem recovers may be independent of its degraded condition: Aquatic systems may recover more quickly than, say, a forest, because the species and organisms that live in that ecosystem turn over more rapidly than in the forest.

## AT: Resource Wars

**Resource shortages don’t cause wars, surplus does – empirically proven**

Salehyan 07 (Idean Salehyan is a Professor of Political Science at the University of North Texas, 8/14/07, “The New Myth About Climate Change Corrupt, tyrannical governments—not changes in the Earth’s climate—will be to blame for the coming resource wars” foreignpolicy.com/articles/2007/08/13/the\_new\_myth\_about\_climate\_change)

 First, aside from a few anecdotes, there is little systematic empirical evidence that resource scarcity and changing environmental conditions lead to conflict. In fact, several studies have shown that an abundance of natural resources is more likely to contribute to conflict. Moreover, even as the planet has warmed, the number of civil wars and insurgencies has decreased dramatically. Data collected by researchers at Uppsala University and the International Peace Research Institute, Oslo shows a steep decline in the number of armed conflicts around the world. Between 1989 and 2002, some 100 armed conflicts came to an end, including the wars in Mozambique, Nicaragua, and Cambodia. If global warming causes conflict, we should not be witnessing this downward trend. Furthermore, if famine and drought led to the crisis in Darfur, why have scores of environmental catastrophes failed to set off armed conflict elsewhere? For instance, the U.N. World Food Programme warns that 5 million people in Malawi have been experiencing chronic food shortages for several years. But famine-wracked Malawi has yet to experience a major civil war. Similarly, the Asian tsunami in 2004 killed hundreds of thousands of people, generated millions of environmental refugees, and led to severe shortages of shelter, food, clean water, and electricity. Yet the tsunami, one of the most extreme catastrophes in recent history, did not lead to an outbreak of resource wars. Clearly then, there is much more to armed conflict than resource scarcity and natural disasters.

**Turn – resource scarcity solves conflict, no resource wars**

Dinar 11 (Shlomi, 8/12/11, “Beyond Resource Wars” <http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12531>)

This volume asserts that while resource scarcity and environmental degradation may well constitute sources of conflict, political dispute, and mismanagement between states, they may also be the impetus for coop- eration, coordination, and negotiation between them. While the volume recognizes both sides of the resource scarcity and environmental degra- dation coin, the cooperative relationship is of particular interest and scrutiny. Indeed, conflict frequently motivates cooperation, and resource scarcity and environmental degradation are important elements of this relationship. Generally, the authors in this volume maintain that increasing scarcity and degradation induce cooperation across states. To that Solve Extent, we provide a different perspective than that of the resource wars argument made with regard to particular natural resources such as oil, freshwater, minerals, and fisheries. Yet beyond this claim, the volume systematically explores the intricacies and nuances of this scarcity and degradation contention across a set of additional resources and environmental prob- lems, which may merely motivate political conflicts such as climate change, ozone depletion, oceans pollution, transboundary air pollution, and biodiversity conservation. In particular, and in line with the collec- tive action school, the volume investigates the notion that as scarcity and degradation worsen, interstate cooperation becomes difficult to achieve since it may be too costly to manage the degradation or there is simply too little of the resource to share (Ostrom 2001). Similarly, low levels of scarcity may depress cooperation as there is less urgency to organize and coordinate. Scarcity and degradation levels, in other words, should matter in explaining the intensity of cooperation.

## AT: Arctic War

**Russia will cooperate on arctic – they don’t want conflict and will work through international organizations**

Shuster 10 (Simon Shuster, “The Race for Arctic Oil: Is Russia Ready to Share?” Sept. 27, 2010, www.time.com/time/world/article/0,8599,2021644,00.html#ixzz1x4fGS8Fk)

Russia's leaders have never been coy about their designs on the Arctic. In recent years, their message has been clear: We want a a big, fat slice of it, including the seas of oil and gas underneath, and we are ready to defend our claim. The country expressed its intentions blatantly in August 2007, when a Russian lawmaker planted a flag on the seabed at the top of the world, and a year later, when President Dmitri Medvedev told his top generals at a meeting that defending Russia's interests in the Arctic was nothing less than "their direct duty to posterity." Which is why so many of the world's Arctic decisionmakers were amazed last week when they were called to a forum in Moscow to hear a very different message. Russia wants the Arctic to be "a zone of peace and cooperation," Prime Minister Vladimir Putin told them. But could he possibly be serious? Many observers, including a large portion of the guests at the Sept. 23 forum, say the rhetoric is welcome, but the world will have to wait and see. For now, no one is rushing to dismantle the huge military capacities all of the Arctic countries — the U.S., Canada, Denmark, Norway (all members of NATO) and Russia — have been building north of the Arctic Circle. Ebbing and swelling over the past half-century, the intensity of this militarization has largely depended on Russia's assertiveness over the years. (See pictures of the Arctic.) It began, of course, at the height of the Cold War, when the Arctic was studded with more nuclear weapons than virtually any other part of the world. Then, in the late 1980s, as the Soviet Empire approached its collapse, the military build-up tapered off and began to decline after Soviet leader Mikhail Gorbachev made his famous Murmansk speech in October 1987 in which he said the Arctic should become "a zone of peace and fruitful cooperation." When Gorbachev used that phrase, it meant something very different from how Putin used it last week. By the end of the 1980s, Russia was financially incapable of waging an arms race in the polar regions. With no more threat from the Russians, the four other Arctic powers began to let their northern militaries lapse. Attitudes changed after 2001, when soaring oil prices put jets beneath the Russian economy and Putin's government began allocating billions to its Arctic infrastructure. Canada and other Arctic states responded with a greater focus on military spending in the north. At the same time, it became obvious to everyone that the polar ice caps were melting fast and the potential for drilling for and shipping oil and gas in the Arctic would soon be considerable. The northern powers were suddenly facing the last great energy frontier, with a quarter of the world's untapped reserves in the Arctic — more than 400 billion bbl. of oil and oil-equivalent natural gas — and the scramble to claim it began. (See pictures of the rise and fall of Gorbachev.) By the end of 2014, the U.N. will receive competing claims for parts of the Arctic from Canada, Denmark and Russia, which are using seabed samples to try to prove that the oil-rich regions are extensions of their continental shelves and therefore belong to them. But even though the U.N. will rule on whether the science behind these claims is accurate (it already rejected a Russian claim in 2001 based on poor evidence), it is not the job of the U.N. to delineate borders. That will be up to the countries themselves, and that is where things might get sticky. A hopeful sign on this front came on Sept. 15, when Russia and Norway settled an Arctic border dispute that had been festering for four decades. The agreement came in the lead-up to last week's forum in Moscow, "The Arctic — Territory of Dialogue," and was seen as part of Russia's push to shed its image as the Arctic aggressor. "We're at a transition," says Paul Berkman, professor of Arctic Ocean geopolitics at the University of Cambridge. "Russia, from the perspective of the West, had been the difficult entity and is now inviting the international community to participate." The reasoning behind Russia's change of tune is both pragmatic and political. A gentler approach to Arctic policy is in line with Medvedev's broader effort to win over the West, as symbolized by his budding friendship with President Obama. (Remember the french fries they shared at Ray's Hell Burger in June?) And as Russia realizes, exploiting the energy wealth of the Arctic will be much harder if the region gets mired in conflict. "In the absence of stability, none of the energy opportunities are possible," says Berkman.

## AT: Crop Yields

**Cuts in crop yields due to warming are negligible**

Gillis (Environmental specialist staff writer for the New York Times) 2011 (Justin, “Global Warming Reduces Expected Yields of Harvests in Some Countries, Study Says,” May 5, 2011, <http://www.nytimes.com/2011/05/06/science/earth/06warming.html>) //CL

Some countries saw small gains from the temperature increases, however. And in all countries, the extra carbon dioxide that humans are pumping into the air acted as a fertilizer that encouraged plant growth, offsetting some of the losses from rising temperatures caused by that same greenhouse gas. Consequently, the study’s authors found that when the gains in some countries were weighed against the losses in others, the overall global effect of climate change has been small so far: losses of a few percentage points for wheat and corn from what they would have been without climate change. The overall impact on production of rice and soybeans was negligible, with gains in some regions entirely offsetting losses in others.

## AT: Weather = War

Intense weather doesn't cause violence - post-hoc fallacy

Kenny 11 (Charles Kenny, senior fellow at the Center for Global Development, a Schwartz fellow at the New America Foundation, 8/29/12, "Cloudy with a chance of insurgency," Foreign Policy, http://www.foreignpolicy.com/articles/2011/08/29/cloudy\_with\_a\_chance\_of\_insurgency?page=0,1)

But is the relationship between climate and violence really that clear? First off, even when rainfall and temperature patterns were directly included in Hsiang and colleague's statistical analysis, the association between El Niño years and civil violence remained. In other words, whatever the impact of El Niño on violence, it apparently isn't connected to its effect on precipitation levels or high temperatures in tropical countries. Perhaps, the paper suggests, El Niño's impact on violence is due to the timing of the rainfall, or altered wind patterns, or humidity, or cloud cover -- but those theories are (so far) untested. And these results regarding temperature and precipitation should come as no surprise given earlier studies on the climate-conflict link. In 2010, Halvard Buhaug, a researcher at the Peace Research Institute Oslo, re-examined Burke's earlier study of weather and war in Africa and concluded that it didn't stand up to further scrutiny. With more data, he argued, the link between rainfall, temperature, and violence disappeared -- a point accepted by Burke and his colleagues. Second, Hsiang and his co-authors are careful to clarify that they don't think El Niño caused warfare, but rather that it was a contributing factor -- that in many cases, conflicts that would have broken out anyway may have occurred earlier owing to the effects of the El Niño cycle. That fits with the conclusions of a 2008 review of the evidence linking climate to conflict in the Journal of Peace Research, which suggested that any link is contingent on a range of factors from governance through wealth to land-use patterns and "claims of environmental determinism leading seamlessly from climate change to open warfare are suspect." Indeed, saying the weather is responsible for civil war is like saying drought is responsible for famine. At most, weather can be an additional stressor to an environment already made combustible by human activities. For example, experts on the Shining Path insurgency in Peru or the Sudanese conflict might be surprised at the idea that these two conflicts are seen as prime examples of the impact of Pacific weather patterns on civil war, given that both have a whole range of causes (including poverty, twisted ideology, and a cruel and incompetent government and military response in the case of the Shining Path).

Geopolitical factors overwhelm

Kenny 11 (Charles Kenny, senior fellow at the Center for Global Development, a Schwartz fellow at the New America Foundation, 8/29/12, "Cloudy with a chance of insurgency," Foreign Policy, http://www.foreignpolicy.com/articles/2011/08/29/cloudy\_with\_a\_chance\_of\_insurgency?page=0,1)

Second, the analysis points to the relative importance of factors like geopolitics in explaining the outbreak of violence. The second-highest risk of civil war between 1950 and 2004, according to the paper, was in 1989 -- a La Niña year -- part of a dramatic peak in war risk that continued until 1994, and has gone unmatched before or since. That speaks to the impact of the end of the Cold War on civil conflict. The good news is that in the period since the mid-1990s, conflict risk has been on the decline as global cooperation to settle disputes has been on the rise. Even if climate cycles are a short-term influence on conflict, the long-term trends are dominated by factors other than the weather. The argument that we should reduce greenhouse gas emissions to slow climate change is beyond reasonable dispute -- but that it will make for a more pacific world is yet to be demonstrated.

## AT: Ice Caps Melting

No tipping point—the aff reverses current warming—causes polar ice to come back; kills shipping lanes

Science Daily 11

Science Daily Aug. 18, 2011; “ Polar Ice Caps Can Recover from Warmer Climate-Induced Melting, Study Shows”; http://www.sciencedaily.com/releases/2011/08/110817194235.htm;

 ScienceDaily (Aug. 18, 2011) — A growing body of recent research indicates that, in Earth's warming climate, there is no "tipping point," or threshold warm temperature, beyond which polar sea ice cannot recover if temperatures come back down. New University of Washington research indicates that even if Earth warmed enough to melt all polar sea ice, the ice could recover if the planet cooled again. In recent years scientists have closely monitored the shrinking area of the Arctic covered by sea ice in warmer summer months, a development that has created new shipping lanes but also raised concerns about humans living in the region and the survival of species such as polar bears. In the new research, scientists used one of two computer-generated global climate models that accurately reflect the rate of sea-ice loss under current climate conditions, a model so sensitive to warming that it projects the complete loss of September Arctic sea ice by the middle of this century. However, the model takes several more centuries of warming to completely lose winter sea ice, and doing so required carbon dioxide levels to be gradually raised to a level nearly nine times greater than today. When the model's carbon dioxide levels then were gradually reduced, temperatures slowly came down and the sea ice eventually returned. "We expected the sea ice to be completely gone in winter at four times the current level of carbon dioxide but we had to raise it by more than eight times," said Cecilia Bitz, a UW associate professor of atmospheric sciences. "All that carbon dioxide made a very, very warm planet. It was about 6 degrees Celsius (11 degrees Fahrenheit) warmer than it is now, which caused the Arctic to be completely free of sea ice in winter."

## AT: Drought

**Warming doesn’t cause extreme weather or drought**

Taylor (Managing editor of Environment & Climate News, senior fellow at The Heartland Institute, bachelor’s degree from Dartmouth College, law degree from Syracuse University College of Law) 2012 (John M., “Climate Change Weekly: Global Warming Skeptics More Knowledgeable than Alarmists,” June 1, 2012, <http://news.heartland.org/newspaper-article/2012/06/01/climate-change-weekly-global-warming-skeptics-more-knowledgeable-alarmi>) //CL

NOAA DATA SHOW NO INCREASE IN TORNADOES Federal government data show no increase in tornadoes in recent decades as the planet has warmed. According to the data, tornado activity has declined significantly during the past 40 years, contradicting alarmist assertions that global warming is causing more extreme weather events. NO LINK BETWEEN GLOBAL WARMING AND SOUTHWEST U.S. DROUGHTS Global warming models predict lower drought stress in the U.S. Southwest, which is consistent with real-world data showing global soil moisture has improved as the planet has warmed. While the U.S. Southwest has experienced above-average drought in recent years, a new study shows global warming is not to blame.

**Warming does not cause greater frequency or severity of droughts**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Droughts of Southwestern North America: Past and Present http://co2science.org/articles/V14/N41/EDIT.php

The world's climate alarmists claim that rising temperatures will bring ever worse droughts to precipitation-deficient regions of the earth. One such region is Southwest North America, for which Woodhouse et al. (2010) developed a 1200-year history of drought that allowed them to compare recent droughts with those of prior centuries; and in spite of the fact that the warmth of the last few decades is said by alarmists to have been unprecedented over the past millennium or more, the review and analysis presented by the five U.S. researchers demonstrates that major 20th century droughts "pale in comparison to droughts documented in paleoclimatic records over the past two millennia (Cook et al., 2009)," which suggests that recent temperatures have not been unprecedented. Presenting a little more detail, Woodhouse et al. report that "the medieval period, ~AD 900-1300," was "a period of extensive and persistent aridity over western North America," with paleoclimatic evidence suggesting that drought in the mid-12th century (AD 1146-1155) "far exceeded the severity, duration, and extent of subsequent droughts," including the 21st century drought of 2000-2009; and they also state that the AD 1146-1155 period was "anomalously warm," which would seem to confirm the climate-alarmist contention that greater warmth leads to greater droughts. However, the five scientists contend that temperature was "almost certainly higher during the 21st century drought," which again contradicts the climate-alarmist claim that greater warmth translates into greater drought in precipitation-deficient regions of the earth. These observations do little to advance the climate-alarmist cause; for in order for their claim that rising temperatures promote more severe and expansive droughts to be correct, the peak warmth of the Medieval Warm Period would have had to have been greater than the Current Warm Period has been to date; but that situation is in conflict with their even more basic claim that recent temperatures have been unprecedented compared to those of the prior millennium or two.

**No flooding**

**Idso et. al 11** (Craig, Center for Study of Carbon Dioxide and Global Change, CO2 Magazine, Robert Carter, paleontologist, stratiagrapher, geologist, research fellow at James Cook Univ., Fred Singer, Environmental Science @ UVA, Susan Crockford, PhD Anthropology @ Victoria, Joseph D'Aleo, Executive Director of ICECAP, Co-Chief Meteorologist, Indur Goklany, founded the Electronic Journal of Sustainable Development, Sherwood Idso, president of the Center for the Study of Carbon Dioxide and Global Change, Madhav Khandekarhas, PhD, Editorial Board Member of natural hazards, AR4 Climate Assessment, Anthony Lupo, PhD, Soil, Environmental and Atmospheric Sciences at Mizzou - Columbia, Willie Soon, PhD, Mitch Taylor, Geography @ Lakehead Univ., "Climate Change Reconsidered: 2011 Interim Report," NIPCC Rport http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf)

The IPCC claims flooding has become more frequent and severe in response to twentieth century global warming. But it is important to establish whether floods are truly becoming more frequent or severe, and whether other factors might be behind such trends if they in fact exist. In this section we highlight studies addressing both questions. To test for long-term changes in flood magnitudes and frequencies in the Mississippi River system of the United States, Pinter et al. (2008) ―constructed a hydrologic database consisting of data from 26 rated stations (with both stage and discharge measurements) and 40 stage-only stations.‖ Then, to help ―quantify changes in flood levels at each station in response to construction of wing dikes, bendway weirs, meander cutoffs, navigational dams, bridges, and other modifications,‖ they put together a geospatial database consisting of ―the locations, emplacement dates, and physical characteristics of over 15,000 structural features constructed along the study rivers over the past 100–150 years.‖ As a result of these operations, Pinter et al. write, ―significant climate- and/or land use-driven increases in flow were detected,‖ but they indicate ―the largest and most pervasive contributors to increased flooding on the Mississippi River system were wing dikes and related navigational structures, followed by progressive levee construction.‖ In discussing the implications of their findings, Pinter et al. write, ―the navigable rivers of the Mississippi system have been intensively engineered, and some of these modifications are associated with large decreases in the rivers‘ capacity to convey flood flows.‖ Hence, it would appear man has indeed been responsible for the majority of the increased flooding of the rivers of the Mississippi system over the past century or so, but not in the way suggested by the IPCC. The question that needs addressing by the region‘s inhabitants has nothing to do with CO2 and everything to do with how to ―balance the local benefits of river engineering against the potential for large-scale flood magnification.‖In a study designed to determine the environmental origins of extreme flooding events throughout the southwestern United States, Ely (1997) wrote, ―paleoflood records from nineteen rivers in Arizona and southern Utah, including over 150 radiocarbon dates and evidence of over 250 flood deposits, were combined to identify regional variations in the frequency of extreme floods,‖ and that information ―was then compared with paleoclimatic data to determine how the temporal and spatial patterns in the occurrence of floods reflect the prevailing climate.‖ The results of this comparison indicated ―long-term variations in the frequency of extreme floods over the Holocene are related to changes in the climate and prevailing large-scale atmospheric circulation patterns that affect the conditions conducive to extreme flood-generating storms in each region.‖ These changes, in Ely‘s view, ―are very plausibly related to global-scale changes in the climate system.‖ With respect to the Colorado River watershed, which integrates a large portion of the interior western United States, she writes, ―the largest floods tend to be from spring snowmelt after winters of heavy snow accumulation in the mountains of Utah, western Colorado, and northern New Mexico,‖ such as occurred with the ―cluster of floods from 5 to 3.6 ka,‖ which occurred in conjunction with ―glacial advances in mountain ranges throughout the western United States‖ during the ―cool, wet period immediately following the warm mid-Holocene.‖ The frequency of extreme floods also increased during the early and middle portions of the first millennium AD, many of which coincided ―with glacial advances and cool, moist conditions both in the western U.S. and globally.‖ Then came a ―sharp drop in the frequency of large floods in the southwest from AD 1100-1300,‖ which corresponded, in her words, ―to the widespread Medieval Warm Period, which was first noted in European historical records.‖ With the advent of the Little Ice Age, however, there was another ―substantial jump in the number of floods in the southwestern U.S.,‖ which was ―associated with a switch to glacial advances, high lake levels, and cooler, wetter conditions.‖ Distilling her findings down to a single succinct statement and speaking specifically of the southwestern United States, Ely writes, ―global warm periods, such as the Medieval Warm Period, are times of dramatic *decreases* in the number of high-magnitude floods in this region‖ [emphasis added].

**No flood**

**Idso et. al 11** (Craig, Center for Study of Carbon Dioxide and Global Change, CO2 Magazine, Robert Carter, paleontologist, stratiagrapher, geologist, research fellow at James Cook Univ., Fred Singer, Environmental Science @ UVA, Susan Crockford, PhD Anthropology @ Victoria, Joseph D'Aleo, Executive Director of ICECAP, Co-Chief Meteorologist, Indur Goklany, founded the Electronic Journal of Sustainable Development, Sherwood Idso, president of the Center for the Study of Carbon Dioxide and Global Change, Madhav Khandekarhas, PhD, Editorial Board Member of natural hazards, AR4 Climate Assessment, Anthony Lupo, PhD, Soil, Environmental and Atmospheric Sciences at Mizzou - Columbia, Willie Soon, PhD, Mitch Taylor, Geography @ Lakehead Univ., "Climate Change Reconsidered: 2011 Interim Report," NIPCC Rport http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf

Looking at the other side of the continent, Villarini and Smith (2010) ―examined the distribution of flood peaks for the eastern United States using annual maximum flood peak records from 572 U.S. Geological Survey stream gaging stations with at least 75 years of observations.‖ This work revealed, ―in general, the largest flood magnitudes are concentrated in the mountainous central Appalachians and the smallest flood peaks are concentrated along the lowgradient Coastal Plain and in the northeastern United States.‖ They also found ―landfalling tropical cyclones play an important role in the mixture of flood generating mechanisms, with the frequency of tropical cyclone floods exhibiting large spatial heterogeneity over the region.‖ They additionally write, ―warm season thunderstorm systems during the peak of the warm season and winter-spring extratropical systems contribute in complex fashion to the spatial mixture of flood frequency over the eastern United States.‖ Of greater interest to the climate change debate, however, were their more basic findings: (1) ―only a small fraction of stations exhibited significant linear trends,‖ (2) ―for those stations with trends, there was a split between increasing and decreasing trends,‖ and (3) ―no spatial structure was found for stations exhibiting trends.‖ Thus they concluded, (4) ―there is little indication that human-induced climate change has resulted in increasing flood magnitudes for the eastern United States.

**No droughts**

**Idso et. al 11** (Craig, Center for Study of Carbon Dioxide and Global Change, CO2 Magazine, Robert Carter, paleontologist, stratiagrapher, geologist, research fellow at James Cook Univ., Fred Singer, Environmental Science @ UVA, Susan Crockford, PhD Anthropology @ Victoria, Joseph D'Aleo, Executive Director of ICECAP, Co-Chief Meteorologist, Indur Goklany, founded the Electronic Journal of Sustainable Development, Sherwood Idso, president of the Center for the Study of Carbon Dioxide and Global Change, Madhav Khandekarhas, PhD, Editorial Board Member of natural hazards, AR4 Climate Assessment, Anthony Lupo, PhD, Soil, Environmental and Atmospheric Sciences at Mizzou - Columbia, Willie Soon, PhD, Mitch Taylor, Geography @ Lakehead Univ., "Climate Change Reconsidered: 2011 Interim Report," NIPCC Rport http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf)

As in the case of floods, the IPCC foresees drought as one of the many dangers of CO2-induced global warming. An examination of the pertinent scientific literature, however, demonstrates droughts are not becoming more frequent, more severe, or longerlasting. Springer et al. (2008) constructed a multidecadalscale history of east-central North America‘s hydroclimate over the past 7,000 years, based on Sr/Ca ratios and δ 13 C data obtained from a stalagmite in West Virginia, USA. Their results indicated the presence of seven significant mid- to late-Holocene droughts that ―correlate with cooling of the Atlantic and Pacific Oceans as part of the North Atlantic Ocean ice-rafted debris [IRD] cycle, which has been linked to the solar irradiance cycle,‖ as demonstrated by Bond et al. (1997, 2001). In addition, they found ―the Sr/Ca and δ 13 C time series display periodicities of ~200 and ~500 years,‖ and ―the ~200-year periodicity is consistent with the de Vries (Suess) solar irradiance cycle,‖ and that the ~500-year periodicity is likely ―a harmonic of the IRD oscillations.‖ They also reported ―cross-spectral analysis of the Sr/Ca and IRD time series yields statistically significant coherencies at periodicities of 455 and 715 years,‖ noting the latter values ―are very similar to the second (725-years) and third (480- years) harmonics of the 1450 ± 500-years IRD periodicity.‖ The five researchers concluded these findings ―corroborate works indicating that millennial-scale solar-forcing is responsible for droughts and ecosystem changes in central and eastern North America (Viau et al., 2002; Willard et al., 2005; Denniston et al., 2007)‖ and that their high-resolution time series ―provide much stronger evidence in favor of solar-forcing of North American drought by yielding unambiguous spectral analysis results.‖

**Greenhouse gases don’t affect droughts**

**Idso et. al 11** (Craig, Center for Study of Carbon Dioxide and Global Change, CO2 Magazine, Robert Carter, paleontologist, stratiagrapher, geologist, research fellow at James Cook Univ., Fred Singer, Environmental Science @ UVA, Susan Crockford, PhD Anthropology @ Victoria, Joseph D'Aleo, Executive Director of ICECAP, Co-Chief Meteorologist, Indur Goklany, founded the Electronic Journal of Sustainable Development, Sherwood Idso, president of the Center for the Study of Carbon Dioxide and Global Change, Madhav Khandekarhas, PhD, Editorial Board Member of natural hazards, AR4 Climate Assessment, Anthony Lupo, PhD, Soil, Environmental and Atmospheric Sciences at Mizzou - Columbia, Willie Soon, PhD, Mitch Taylor, Geography @ Lakehead Univ., "Climate Change Reconsidered: 2011 Interim Report," NIPCC Rport http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf)

Writing in the Journal of Quaternary Science, Cook et al. (2009) note ―IPCC Assessment Report 4 model projections suggest that the subtropical dry zones of the world will both dry and expand poleward in the future due to greenhouse warming‖ and ―the US southwest is particularly vulnerable in this regard and model projections indicate a progressive drying there out to the end of the 21st century.‖ They then note ―the USA has been in a state of drought over much of the West for about 10 years now,‖ but ―while severe, this turn of the century drought has not yet clearly exceeded the severity of two exceptional droughts in the 20th century.‖ Therefore, they conclude, ―while the coincidence between the turn of the century drought and projected drying in the Southwest is cause for concern, it is premature to claim that the model projections are correct.‖ We begin to understand this fact when we compare the turn-of-the-century-drought with the two ―exceptional droughts‖ that preceded it by a few decades. Based on gridded instrumental Palmer Drought Severity indices for tree-ring reconstruction that extend back to 1900, Cook et al. calculated the turn-of-the-century drought had its greatest Drought Area Index value of 59 percent in the year 2002, whereas the Great Plains/Southwest drought covered 62 percent of the United States in its peak year of 1954 and the Dust Bowl drought covered 77 percent of the United States in 1934. In terms of drought duration, things are not quite as clear. Stahle et al. (2007) estimated the first two droughts lasted for 12 and 14 years, respectively; Seager et al. (2005) estimated them to have lasted for eight and ten years; and Andreadis et al. (2005) estimated periods of seven and eight years. That yields means of nine and 11 years for the two exceptional droughts, compared to ten or so years for the turn-of-the-century drought. This, too, makes the latter drought not unprecedented compared with those that occurred in the twentieth century. Real clarity, however, comes when the turn-ofthe-century drought is compared to droughts of the prior millennium. Cook et al. write, ―perhaps the most famous example is the ‗Great Drouth‘ [sic] of AD 1276–1299 described by A.E. Douglass (1929, 1935).‖ This 24-year drought was eclipsed by the 38- year drought found by Weakley (1965) to have occurred in Nebraska from AD 1276 to 1313, which Cook et al. say ―may have been a more prolonged northerly extension of the ‗Great Drouth‘.‖ But even these multi-decade droughts pale in comparison with the ―two extraordinary droughts discovered by Stine (1994) in California that lasted more than two centuries before AD 1112 and more than 140 years before AD 1350.‖ Each of these megadroughts, as Cook et al. describe them, occurred, in their words, ―in the so-called Medieval Warm Period.‖ They add, ―all of this happened prior to the strong greenhouse gas warming that began with the Industrial Revolution.‖ In further ruminating about these facts in the ―Conclusions and Recommendations‖ section of their paper, Cook et al. again state the medieval megadroughts ―occurred without any need for enhanced radiative forcing due to anthropogenic greenhouse gas forcing‖—because, of course, there was none at that time—and therefore, they say, ―there is no guarantee that the response of the climate system to greenhouse gas forcing will result in megadroughts of the kind experienced by North America in the past.‖

## AT: War

**Climate change related disasters do not cause war**

Päivi Lujala (Department of Economics & Department of Geography NTNU) 2012 Climate-related natural disasters, economic growth, and armed civil conflict http://jpr.sagepub.com/content/49/1/147.full

By using ordinary least squares (OLS) and panel data on climate-related disasters and short-run economic growth,2 we confirm that climate-related disasters have a negative impact on growth. However, our analysis of disaster data and conflict onset shows that climate-related natural disasters do not have any direct effect on conflict onset. We then instrument economic growth using our disaster measure in a two-stage least squares (2SLS) analysis to study whether climate-related disasters have an indirect effect on conflict onset via slowdown in economic growth. By doing this, we also address the simultaneity problem between income and conflict: we recognize that slow and negative economic growth may cause conflict, but also that an approaching conflict may lead to slow growth, for example, when extractive industries withdraw from unstable countries that are on the brink of sliding into conflict. Instrumenting growth using climatic disasters allows us to impose exogenous variation in growth. However, we do not find any evidence that economic shocks caused by climate-related disasters have an effect on conflict onset. This result differs from the negative causal link between economic growth and conflict found in other studies, including Collier & Hoeffler (2004) and Miguel, Satyanath & Sergenti (2004). However, our findings are similar to those in the recent cross-country study by Ciccone (2011).

**Climate change does not lead to conflict- best model**

Koubi et al Vally Koubi, Thomas Bernauer, Anna Kalbhenn, Gabriele Spilker, Center for Comparative and International Studies 2012 Climate variability, economic growth, and civil conflict http://jpr.sagepub.com/content/49/1/113.full

Whether increasing local or regional climate variability due to large-scale, human-induced changes in the global atmosphere is associated with an increased risk of violent conflict remains contested, both among policymakers and in academic circles. In this article we contribute in two ways to the existing literature on the climate change–conflict nexus. First, we conceptualize this nexus in terms of a two-stage process in which climatic variability affects the probability of violent intrastate conflict via climate effects on economic growth, and where these effects may be contingent on political system characteristics. Second, we employ a measure of climatic variability that has advantages over those used in the existing literature, primarily because it takes into account the adaptation of economic activity to persistent climatic changes. Our results suggest that climate variability, measured as deviations in temperature and precipitation from their past, long-run levels (a 30-year moving average), does not affect violent intrastate conflict through economic growth. This finding is important because the causal pathway leading from climate variability via (deteriorating) economic growth to conflict is a key part of most theoretical models of the climate–conflict nexus. While our empirical results provide no support for the climate change–economic growth–conflict pathway, further research is required before we can move towards closure of the debate. In particular, it would be very useful to improve on existing indicators of climatic variability, adaptation to climate variability, and relevant (from the viewpoint of violent conflict) economic performance. For instance, in the absence of appropriate indicators for adaptation it remains difficult to estimate the effect of climatic variability on economic performance and hence on the probability of violent conflict.

## AT: Resource Wars

**Warming promotes peace – history and multiple studies prove**

 Liang Chen et al Karin A.F. Zonnevelda, b, Gerard J.M. Versteegh Fachbereich Geowissenschaften, Universität Bremen October 2011, Short term climate variability during “Roman Classical Period” in the eastern Mediterranean http://www.sciencedirect.com/science/article/pii/S0277379111003039

To date, there have been a lot of studies devoted to understand the relationship between climate change and ancient civilization. Most of these investigations suggest that cooling and drying climate might have played a significant role in the collapse of cultures as it might have caused crop failure and the enhancement of the occurrence of cultural conflicts caused by adverse environmentalconditions (e.g. [Hodell et al., 1995], [Binford et al., 1997], [Haug et al., 2003] and [Yancheva et al., 2007]). Our study shows that the investigated part of the Roman Period might have been warmer than the 20th century, and it is interesting to note that our study interval is more or less the same as the “Pax Romana” (27 BC to 180 AD), which denotes a long period of relative peace (Gibbon and Saunders, 2001). We speculate that the booming period “Pax Romana” might be related to this relatively warm and stable situation. Interestingly, wars between Roman and neighboring cultures became more frequent along with the subsequent Roman decline after 200 AD, shortly after our records show a declining temperature trend. It would therefore be extremely interesting to dedicate more studies to this time interval to be able to pinpoint the relationship between climate and civilization.

## AT: Flooding

**Warming causes reduced flooding-empirically proven**

Monique M. Stewart et al Martin Grosjeana, Franz G. Kuglitscha, Samuel U. Nussbaumerb, Lucien von Guntena 15 November 2011Reconstructions of late Holocene paleofloods and glacier length changes in the Upper Engadine, Switzerland (ca. 1450 BC–AD 420) http://www.sciencedirect.com/science/article/pii/S0031018211004597

Insight into the relationship between floods and climate, under a wide range of climate variability in Central Europe from ca. 1450 BC to AD 420, can be found in the sediments of Lake Silvaplana (Upper Engadine, Switzerland). The frequency of local paleofloods can be reconstructed from turbidite frequency. Long-term cool and/or wet and warm and/or dry climate phases can be reconstructed from anomalies in low-frequency Mass Accumulation Rates (MAR). This is because low-frequency MAR reflects glacier length changes in the Swiss Alps and glacier lengths are a response to long-term climate conditions. Transitions between cool and/or wet and warm and/or dry climate phases can be inferred from centennial trends in low-frequency MAR. Furthermore, quantitative absolute June-July–August (JJA) temperatures reconstructed from Biogenic Silica (BSi) flux and chironomids in the sediments of Lake Silvaplana are available from ca. 570 BC to AD 120 (Stewart et al., 2011). Comparison of turbidite frequency to MAR-inferred climate phases (ca. 1450 BC–AD 420) and JJA temperatures (ca. 570 BC–AD 120) suggests an increase in the frequency of paleofloods during cool and/or wet climates and windows of cooler JJA temperatures. Specifically, the frequency of turbidites was reduced during warm and/or dry climates of ca. 1450 BC to AD 420. Following the transition to cool and/or wet climates, the frequency of turbidites increased. However, no discernable relationship between the rate of transition from warm and/or dry to cool and/or wet climate and turbidite could be found.

## AT: Phytoplankton

**Climate change does not harm plankton, it makes them more resilient**

Pedro Cermeno Departamento de Ecología y Biología Animal, Universidad de Vigo July 20, 2011 Marine planktonic microbes survived climatic instabilities in the past http://rspb.royalsocietypublishing.org/content/279/1728/474.full

The results presented here demonstrate that the probability of extinction of microbial plankton species did not increase during periods of enhanced climatic instability over the past 65 Myr. Arguably, ubiquitous dispersal of marine planktonic microbes and their potential to revive after long periods of metabolic quiescence facilitated environmental tracking, habitat recolonization and community re-assembly, buffering species against extinction. Indeed, previous work has shown that communities of marine planktonic diatoms [10] and calcareous nannoplankton [34,35] recovered from climatic perturbations in the past and that their populations thrived later, once environmental conditions returned to previous-like states. However, my results also show that exceptional climatic contingencies such as those occurring across the Late Palaeocene–Eocene and the Eocene–Oligocene boundary transitions caused substantial morphological diversification. This signature is not manifest in the analysis of generic survivorship curves almost certainly because to a large extent these arising species were classified as new genera. It must be noted that only the evolutionary dynamics of species in pre-existing genera is considered in the survivorship analysis.

## AT: Natural Disasters

**Climate Change does not cause more natural disasters**

Ulf Buntgen et al Rudolf Brázdilc, d, Karl-Uwe Heussnere, Jutta Hofmannf, Raymond Konticg, Tomáš Kynclh, Christian Pfisterb, Kateřina Chromác, Willy Tegeli (Swiss Federal Research Institute) November 2011 Combined dendro-documentary evidence of Central European hydroclimatic springtime extremes over the last millennium http://www.sciencedirect.com/science/article/pii/S0277379111003246

A predicted rise in anthropogenic greenhouse gas emissions and associated effects on the Earth’s climate system likely imply more frequent and severe weather extremes with alternations in hydroclimatic parameters expected to be most critical for ecosystem functioning, agricultural yield, and human health. Evaluating the return period and amplitude of modern climatic extremes in light of pre-industrial natural changes is, however, limited by generally too short instrumental meteorological observations. Here we introduce and analyze 11,873 annually resolved and absolutely dated ring width measurement series from living and historical fir (Abies alba Mill.) trees sampled across France, Switzerland, Germany, and the Czech Republic, which continuously span the AD 962–2007 period. Even though a dominant climatic driver of European fir growth was not found, ring width extremes were evidently triggered by anomalous variations in Central European April–June precipitation. Wet conditions were associated with dynamic low-pressure cells, whereas continental-scale droughts coincided with persistent high-pressure between 35 and 55°N. Documentary evidence independently confirms many of the dendro signals over the past millennium, and further provides insight on causes and consequences of ambient weather conditions related to the reconstructed extremes. A fairly uniform distribution of hydroclimatic extremes throughout the Medieval Climate Anomaly, Little Ice Age and Recent Global Warming may question the common believe that frequency and severity of such events closely relates to climate mean stages. This joint dendro-documentary approach not only allows extreme climate conditions of the industrial era to be placed against the backdrop of natural variations, but also probably helps to constrain climate model simulations over exceptional long timescales.

## AT: Ocean Acidification

**No impact to acidification- real world examples trump their models**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Calcifying Marine Invertebrates "Living in the Future" http://co2science.org/articles/V14/N18/EDIT.php

Many are the doom-and-gloom prognostications for earth's calcifying marine invertebrates -- based on what Thomsen et al. (2010) describe as "short to intermediate (days to weeks) CO2 perturbation experiments" -- if the air's CO2 content continues to rise and the pH values of the world's ocean waters concomitantly decline, in a phenomenon that has come to be known by the fright-inducing moniker of ocean acidification. However, the eleven German researchers note that "as most laboratory experiments cannot account for species genetic adaptation potential, they are limited in their predictive power," and that "naturally CO2-enriched habitats have thus recently gained attention, as they could more accurately serve as analogues for future, more acidic ecosystems." Taking this latter course, Thomsen et al. studied the macrobenthic community in Kiel Fjord -- a naturally-CO2-enriched site in the Western Baltic Sea -- that is dominated by calcifying marine invertebrates, where they determined that in 34%, 23% and 9% of the 42 weeks they were there, the partial pressure (p) of CO2 in the water exceeded pre-industrial pCO2 (280 ppm) by a factor of three (>840 ppm), four (>1120 ppm) and five (>1400 ppm), respectively. And what did they find under these conditions? The team of German scientists reports that "the macrobenthic community in Kiel Fjord is dominated by calcifying invertebrates," such as the blue mussel (Mytilus edulis), the barnacle Amphibalanus improvisus and the echinoderm Asterias rubens; and they say that "juvenile mussel recruitment peaks during the summer months, when high water pCO2 values of ~1000 ppm prevail." In addition, they say their short-term laboratory research indicates that "blue mussels from Kiel Fjord can maintain control rates of somatic and shell growth at a pCO2 of 1400 ppm." At 4000 ppm pCO2, however, they say that both shell mass and extension rates were significantly reduced; but they found that "regardless of the decreased rates of shell growth at higher [1400] pCO2, all mussels increased their shell mass at least by 150% during the 8-week trial, even at Ωarg (Ωcalc) as low as 0.17 (0.28)," where Ω is the calcium carbonate saturate state of either aragonite (arg) or calcite (calc). In concluding the report of their field and laboratory work, as well as their mini-review of the pertinent scientific literature, Thomsen et al. state that it is likely that "long-term acclimation to elevated pCO2 increases the ability to calcify in Mytilus spp.," citing the studies of Michaelidis et al. (2005) and Ries et al. (2009) in addition to their own. And they say that they could find "no causal relationship between the acid-base status and metabolic depression in this species at levels of ocean acidification that can be expected in the next few hundred years (IPCC, 2007)," after discovering in the waters of Kiel Fjord (and demonstrating in the laboratory) that "communities dominated by calcifying invertebrates can thrive in CO2-enriched coastal areas."

**There is virtually no scientific understanding of ocean acidification, and it will probably be beneficial to organisms**

Sherwood, Keith, and Craig Idso et al 2012 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) The Unsettled Science of Ocean Warming and Acidification http://co2science.org/articles/V15/N19/EDIT.php

 The world's climate alarmists would have us believe that they know all they need to know about earth's climate system and its biological ramifications to justify an unbelievably expensive and radical restructuring of the way the industrialized world both obtains and utilizes energy. But is this really so? In an eye-opening "perspective" article published a couple of years ago in the 9 December 2009 issue of the Proceedings of the National Academy of Sciences of the United States of America, three researchers from the Marine Biogeochemistry Section of the Leibniz Institute of Marine Sciences in Kiel, Germany, describe their assessment of various possible responses of the global ocean's seawater carbonate system, plus its physical and biological carbon pumps, to ocean warming and associated changes in vertical mixing and overturning circulation, as well as the closely-allied phenomena of ocean acidification and carbonation. All of these phenomena, many of which are nonlinear and extremely complicated, are interlinked; and Riebesell and his colleagues thus conclude, from their objective review of the pertinent scientific literature, that the magnitude and even the sign of the global ocean's carbon cycle feedback to climate change are, in their words, "yet unknown." They note, for example, that "our understanding of biological responses to ocean change is still in its infancy." With respect to ocean acidification, in particular, they write that the impact it will have on marine life "is still uncertain," and that the phenomenon itself is but "one side of the story," the other side being what they call "ocean carbonation," which, as they describe it, "will likely be beneficial to some groups of photosynthetic organisms." Thus, they write that "our present understanding of biologically driven feedback mechanisms is still rudimentary," and that with respect to many of their magnitudes, "our understanding is too immature to even make a guess." What is more, they imply that even what we do think we know could well be wrong, because, as they elucidate, "our present knowledge of pH/CO2 sensitivities of marine organisms is based almost entirely on short-term perturbation experiments, neglecting the possibility of evolutionary adaptation."

**Adaptation solves**

Sherwood, Keith, and Craig Idso et al 2012 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) The Potential for Adaptive Evolution to Enable the World's Most Important Calcifying Organism to Cope with Ocean Acidification http://co2science.org/articles/V15/N28/EDIT.php

In an important paper published in the May 2012 issue of Nature Geoscience, Lohbeck et al. write that "our present understanding of the sensitivity of marine life to ocean acidification is based primarily on short-term experiments," which often depict negative effects. However, they go on to say that phytoplanktonic species with short generation times "may be able to respond to environmental alterations through adaptive evolution." And with this tantalizing possibility in mind, they studied, as they describe it, "the ability of the world's single most important calcifying organism, the coccolithophore Emiliania huxleyi, to evolve in response to ocean acidification in two 500-generation selection experiments." Working with freshly isolated genotypes from Bergen, Norway, the three German researchers grew them in batch cultures over some 500 asexual generations at three different atmospheric CO2 concentrations - ambient (400 ppm), medium (1100 ppm) and high (2200 ppm) - where the medium CO2 treatment was chosen to represent the atmospheric CO2 level projected for the beginning of the next century. This they did in a multi-clone experiment designed to provide existing genetic variation that they said "would be readily available to genotypic selection," as well as in a single-clone experiment that was initiated with one "haphazardly chosen genotype," where evolutionary adaptation would obviously require new mutations. So what did they learn? Compared with populations kept at ambient CO2 partial pressure, Lohbeck et al. found that those selected at increased CO2 levels "exhibited higher growth rates, in both the single- and multi-clone experiment, when tested under ocean acidification conditions." Calcification rates, on the other hand, were somewhat lower under CO2-enriched conditions in all cultures; but the research team reports that they were "up to 50% higher in adapted [medium and high CO2] compared with non-adapted cultures." And when all was said and done, they concluded that "contemporary evolution could help to maintain the functionality of microbial processes at the base of marine food webs in the face of global change [our italics]." In other ruminations on their findings, the marine biologists indicate that what they call the swift adaptation processes they observed may "have the potential to affect food-web dynamics and biogeochemical cycles on timescales of a few years, thus surpassing predicted rates of ongoing global change including ocean acidification." And they also note, in this regard, that "a recent study reports surprisingly high coccolith mass in an E. huxleyi population off Chile in high-CO2 waters (Beaufort et al., 2011)," which observation is said by them to be indicative of "across-population variation in calcification, in line with findings of rapid microevolution identified here."

## AT: Coral

**Coral will adapt to acidification and climate change**

Sherwood, Keith, and Craig Idso et al 2012 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) The Future of Earth's Coral Reefs Debated in Science http://co2science.org/articles/V15/N3/EDIT.php

In our editorial of 17 August 2011, we discussed the paper of Pandolfi et al. (2011a) that was published in Science on 22 July 2011, wherein we briefly reported the many ways in which they suggested Earth's coral reefs might successfully respond to the dual challenge of projected rapid increases in temperature and ocean acidification. As might have been expected, however, their optimistic analysis was not well received by the world's climate alarmists, who in the 16 December 2011 issue of Science - via the persons of Hoegh-Guldberg et al. (2011) - cast many aspersions on it. Fortunately, Pandolfi et al. (2011b) were given the opportunity of responding to them and deflating their arguments. The four researchers begin by rebutting Hoegh-Guldberg et al.'s claim that evolutionary responses of corals to global warming are highly improbable in light of the warming's IPCC-projected rapidity, noting that "the hypothesis that adaptation cannot occur over decadal time scales has been shown repeatedly to be incorrect." More specifically, they state that research has shown that "numerous and complex physiological, metabolic, and morphological changes can occur rapidly and repeatedly among independently evolving lineages," citing in this regard the studies of Hendry and Kinnison (1999), Levinton et al. (2003) and Tobler et al. (2011). Pandolfi and colleagues next rebut Hoegh-Guldberg et al.'s contention that characteristics of endosymbiosis will impede adaptation in corals. This they do by noting that "endosymbionts and hosts, if anything, evolve more rapidly than their free-living counterparts," citing in this regard the research findings of Woolfit and Bromham (2003) and Pal et al. (2007).

**Coral adapt to climate change**

Sherwood, Keith, and Craig Idso et al 2012 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Corals Dying from Weather-Induced Heating and Cooling ... But Surviving Climate-Induced Heating and Cooling http://co2science.org/articles/V15/N7/EDIT.php

In a paper published in Global Change Biology, Kemp et al. (2011) write that "considerable attention has been given to worldwide coral reef decline over the last several years with major emphasis placed on the negative effects of increased seawater temperatures," which typically lead to coral bleaching and subsequent death; but they also note that "imposed low-temperature stress can cause coral bleaching by inducing responses similar to elevated-temperature, including reduction in Symbiodinium cell density and chlorophyll a content, as well as photoinhibition," citing the work of Steen and Muscatine (1987), Saxby et al. (2003), Hoegh-Guldberg and Fine (2004) and Hoegh-Guldberg et al. (2005). And they go on to demonstrate this latter fact via an analysis of coral responses to two closely-spaced cold fronts that caused sudden and severe seawater cooling in February and March of 2010 in the upper Florida (USA) Keys that led to "a mass die-off of reef-building corals," thereby convincingly illustrating that both unusually warm and unusually cold temperatures, such as are caused by fluctuations in weather conditions, are equally adept at killing corals and their algal symbionts. Over the long term, however, when either warmer or cooler conditions are the result of much slower changes in climate, such need not be the case. Consider, for example, the Little Ice Age (LIA). In a study of the Atlantic Warm Pool (AWP) - which is defined by the >28.5°C isotherm and develops annually in the northern Caribbean during early summer (June) and expands into the Gulf of Mexico and western tropical North Atlantic through the late summer (July-October) - Richey et al. (2009) found that "geochemical proxy records from corals, sclerosponges and foraminifera in the region encompassed by the AWP show a large (2-3°C) cooling during the LIA," citing, in this regard, the work of Winter et al. (2000), Watanabe et al. (2001), Nyberg et al. (2002), Haase-Schramm et al. (2003), Black et al. (2007) and Kilbourne et al. (2008). And in reporting the results of a study of a large brain coral that lived throughout the 17th century on the shallow seafloor off the island of Bermuda, Cohen and Madin (2007) say that although seawater temperatures at that time and location were about 1.5°C colder than it is there today, "the coral grew faster than the corals there now." Other studies have shown earth's corals to be able to cope with climate-induced warmings as well as coolings. In a study of patch reefs of the Florida Keys, for example, Greenstein et al. (1998) found that Acropora cervicornis corals exhibited "long-term persistence" during both "Pleistocene and Holocene time," the former of which periods exhibited climatic changes of large magnitude, some with significantly greater warmth than currently prevails on earth; and these climate changes had almost no effect on this long-term dominant of Caribbean coral reefs. Hence, there is good reason to not be too concerned about long-term changes in climate possibly harming earth's corals. They apparently have the ability to handle whatever nature may throw at them in this regard.

## AT: Cyclones

**Co2 reduces destructive power of extratropical cyclones.**

Michaels & Balling 9 (Michaels has a Ph.D. in ecological climatology from the University of Wisconsin at Madison, Michaels holds A.B. and S.M. degrees in biological sciences and plant ecology from the University of Chicago, now a Senior Research Fellow for Policy and Economic Development at George Mason University, a contributing author and reviewer of the United Nations Intergovernmental Panel on Climate Change, which was awarded the Nobel Peace Prize in 2007, Balling is a professor of geography at Arizona State University, and the former director of its Office of Climatology. 2009 "Climate of Extremes : Global Warming Science They Don't Want You to Know" The Cato Institute. http://site.ebrary.com/lib/umich/Doc?id=10379650&ppg=20)

Every strong European cyclone in the last decade has prompted a similar outcry. If there’s a big storm, a reporter will find an ‘‘expert’’ who will conflate the wind with global warming. Just Google ‘‘news’’ after the next one to prove this to yourself. All of this seems a bit illogical. Although hurricanes are, in part, driven by the heat of the ocean, there’s a pretty strong debate, noted in chapter 3, about their relation to global warming. But the mechanism that creates and feeds extratropical cyclones is a lot different. They’re driven by the jet stream, a circumpolar vortex of high-energy westerly winds that undulates over all our hemisphere with the exception of the low latitudes. In fact, when the jet does manage to reach into the tropics and encounters a hurricane, the hurricane’s days, if not hours, are numbered because of massive wind shear. The top of the storm can be blown a hundred miles away from the bottom. Consequently, the same mechanism that causes extratropical cyclones is one that destroys hurricanes. You would think, then, if global warming were making extratropical storms stronger, there should be some concomitant weakening of hurricanes. The jet stream is nature’s way of dissipating the temperature difference between polar and tropical regions in the form of motion. The greater the temperature difference between the poles and the tropics, the stronger the jet, and, everything else being equal (dangerous words), the stronger extratropical storms can become. But the reverse is what should happen. As noted in chapter 1, changes in atmospheric carbon dioxide result in a preferential warming of the coldest days, and of cold, dry air more than warm, moist air. Changing the greenhouse effect then must reduce the temperature contrast between the (warm, moist) tropical and (dry, cold) polar regions, which reduces the temperature difference that drives the jet stream. In turn, this should tame the power of extratropical cyclones.

## AT: Nighttime Warming

**Nighttime warming has negligent effects on photosynthesis**

Albert et al. (K. R. ALBERT1, H. RO-POULSEN2, T. N. MIKKELSEN1, A. MICHELSEN2, L. VAN DER LINDEN1 & C. BEIER, 1Biosystems Division, Risø DTU, Frederiksborgvej 399, 4000 Roskilde and 2Terrestrial Ecology, Department of Biology, University of Copenhagen, Øster Farigmagsgade 2D, 1353 Copenhagen K, Denmark) 2011 (K.R., “Effects of elevated CO2, warming and drought episodes on plant carbon uptake in a temperate heath ecosystem are controlled by soil water status ,” Plant, Cell and Environment (2011) 34, 1207–1222 Pages 11-12) //CL

The night-time warming generally had limited effects on the leaf surface temperature, but did under some conditions increase vegetation surface temperature for up to 3–5 h after sunrise, although normally much less (Mikkelsen et al. 2008). This could potentially induce short-term stimulation of photosynthesis via more optimal growth temperatures (Sage & Kubien 2007). However, these direct effects were not detected in this study, for various reasons. Too few measurements were conducted during the early daytime hours where the night-time warming effects persisted. Further, such effects would most likely not influence the overall treatment effects reported here as the sampling pro- cedure with a large number of plots and the several hours of measuring time for a complete campaign would have con- strained this variation to the experimental blocks, causing it not to be detected as a treatment effect in the anova. Instead, the potential effect of the night-time warming on photosynthesis must be indirect. Warming increased the amount of GDDs (Mikkelsen et al. 2008), and increased photosynthesis and photosynthetic capacity in the early season (Pn in May, and Pmax in May and June). This suggests that the warming treatment may have caused an earlier onset of plant growth or faster development of the photo- synthetic machinery in the spring in accordance with other studies demonstrating earlier growth season start-up in response to warming (Harte & Shaw 1995; Menzel & Fabian 1999; Wan et al. 2005; Menzel et al. 2006). Later in the season, the maturation of photosynthetic capacity in the non-warmed treatments caught up and warming effects did not translate into significant effects on photosynthesis, except for marginal reductions of net photosynthesis in warmed plots in August. Furthermore, the night-time warming reduced SWC in most months, and reduced PWP in July and September, but only influenced net photosyn- thesis negatively in the dry midsummer (August). The reduced SWC indicates increased plant water consumption per ground area or increased soil evaporation in response to night-time warming, but apart from the midsummer, this reduction was not strong enough to induce a general reduc- tion in photosynthesis. Our finding of a small response of photosynthesis to warming in this relatively dry site may be further supported by previous findings from passive night- time warming studies across a European gradient indicating that photosynthetic plant carbon uptake may be more responsive on wet sites compared to dry sites (Llorens et al. 2004; Peñuelas et al. 2007). Thus, the primary effect of night-time warming on photosynthesis in our study was associated with earlier seasonal onset and maturation of the photosynthetic capacity.

## **AT: Migrations**

Climate change does not create refugees - empirically proven

Asian Correspondent April 11, 2011 What happened to the climate refugees? http://asiancorrespondent.com/52189/what-happened-to-the-climate-refugees/

In 2005, the United Nations Environment Programme predicted that climate change would create 50 million climate refugees by 2010. These people, it was said, would flee a range of disasters including sea level rise, increases in the numbers and severity of hurricanes, and disruption to food production. The UNEP even provided a handy map. The map shows us the places most at risk including the very sensitive low lying islands of the Pacific and Caribbean. It so happens that just a few of these islands and other places most at risk have since had censuses, so it should be possible for us now to get some idea of the devastating impact climate change is having on their populations. Let’s have a look at the evidence: Bahamas: Nassau, The Bahamas – The 2010 national statistics recorded that the population growth increased to 353,658 persons in The Bahamas. The population change figure increased by 50,047 persons during the last 10 years. St Lucia: The island-nation of Saint Lucia recorded an overall household population increase of 5 percent from May 2001 to May 2010 based on estimates derived from a complete enumeration of the population of Saint Lucia during the conduct of the recently completed 2010 Population and Housing Census. Seychelles: Population 2002, 81755 Population 2010, 88311 Solomon Islands: The latest Solomon Islands population has surpassed half a million – that’s according to the latest census results. It’s been a decade since the last census report, and in that time the population has leaped 100-thousand. Meanwhile, far from being places where people are fleeing, no fewer than the top six of the very fastest growing cities in China, Shenzzen, Dongguan, Foshan, Zhuhai, Puning and Jinjiang, are absolutely smack bang within the shaded areas identified as being likely sources of climate refugees. Similarly, many of the fastest growing cities in the United States also appear within or close to the areas identified by the UNEP as at risk of having climate refugees. More censuses are due to come in this year, and we await the results for Bangladesh and the Maldives - said to be places most at risk - with interest. However, a very cursory look at the first available evidence seems to show that the places identified by the UNEP as most at risk of having climate refugees are not only not losing people, they are actually among the fastest growing regions in the world. (Footnote: As requested, credit goes to the cartographer of the UNEP map, Emmanuelle Bournay.)

**Climate change does not create refugees or conflict - best study**

Sherwood, Keith, and Craig Idso et al 2010 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) War and Peace ... and Climate Change http://www.co2science.org/articles/V13/N13/EDIT.php

In an insightful new study recently published in Climatic Change, Richard Tol and Sebastian Wagner write that in "gloomier scenarios of climate change, violent conflict plays a key part," noting that in such visions of the future "war would break out over declining water resources, and millions of refugees would cause mayhem." In this regard, the two researchers state that "the Nobel Peace Prize of 2007 was partly awarded to the IPCC and Al Gore for their contribution to slowing climate change and thus preventing war." However, they say that "scenarios of climate-change-induced violence can be painted with abandon," citing the example of Schwartz and Randall (2003), because, as they continue, "there is "little research to either support or refute such claims." Consequently, and partly to fill this gaping research void, Tol and Wagner proceeded to go where but few had gone before, following in the footsteps of Zhang et al. (2005, 2006), who broke new ground in this area when they (1) constructed a dataset of climate and violent conflict in China for the last millennium, and (2) found that the Chinese were "more inclined to fight each other when it was cold," which propensity for violence they attributed to the reduced agricultural productivity that typically prevailed during cooler times. Hence, the two researchers essentially proceeded to do for Europe what Zhang et al. had done for China. The results of Tol and Wagner's analyses provide additional evidence that, as they describe it, "periods with lower temperatures in the pre-industrial era are accompanied by violent conflicts." However, they determined that "this effect is much weaker in the modern world than it was in pre-industrial times," which implies, in their words, "that future global warming is not likely to lead to (civil) war between (within) European countries." Therefore, they conclude that "should anyone ever seriously have believed that, this paper does put that idea to rest." In light of this refutation of the rational for the awarding of the 2007 Nobel Peace Prize, we are inclined to say to its most visible recipient -- in the spirit of the sentiment expressed by President Ronald Reagan on 12 June 1987 at the base of the Brandenburg Gate, near the Berlin wall -- Mr. Gore, give back that prize!

**Warming saves refugees lives – cold kills**

Sherwood, Keith, and Craig Idso et al 2k (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Temperature Trends -- Asia – Summary http://www.co2science.org/subject/a/summaries/asiantemptrends.php

The winter of 2000/2001 was bitterly cold in many parts of Asia; in fact, many cold-temperature records were set. According to NBC News correspondent Dana Lewis, extreme cold blasted Russia into the coldest winter in a century (see "The Planet is Warming Up!"). From Siberia to the Far East, bone-chilling temperatures some 30 degrees below normal made it "a battle just to survive." Similar information was obtained from a report by Red Cross staff writer Stephanie Kriner, who wrote about some other cold-induced disasters. She reported, for example, that in the first week of January 2001, many people died "as a result of a bitter cold front sweeping across northern India," which brought "the coldest temperatures to hit the region in several years." Kriner noted that the same cold front also swept into Pakistan, threatening the lives of hundreds of thousands of Afghan refugees. In China, she says that "the worst winter weather conditions in decades" left many people dead, and that Barbara Wetsig of the American Red Cross feared that thousands of other people were "at risk of frostbite, hypothermia and starvation," especially "the poor, homeless, elderly and children." In fact, Kriner says that the Inner Mongolian Branch of the Russian Red Cross estimated that up to 1.35 million people were affected. She also reports that "the worst snowstorm in 50 years" stranded "tens of thousands of herders and their livestock" in Inner Mongolia, and that blizzards paralyzed South Korea in what weather forecasters there described as "the worst snowstorm in 20 years," adding that the Central Asian state of Kazakhstan was subjected to "its coldest winter weather in 40 years." At a time when we’re told the world is hotter than it’s ever been in the past thousand years, this information is not exactly what one would expect to hear, unless, of course, this claim is wrong. And indeed it may be; for a number of recent papers provide evidence that Asian temperatures during the past century and beyond were at times much warmer than they are presently. Furthermore, some of them suggest that temperature trends of the past few decades have been negative, rather than positive.

**Climate change is not the root cause of refugees, and they don’t solve for the institutions that actually cause displacement**

Betsy Hartmann professor of development studies and director of the Population and Development Program , B.A. from Yale University, Ph.D. from the London School of Economics 23 FEB 2010 Rethinking climate refugees and climate conflict: Rhetoric, reality and the politics of policy discourse http://onlinelibrary.wiley.com/doi/10.1002/jid.1676/abstract

The narrative ignores basic elements of Sudanese political economy that helped create and sustain the conﬂict. These include gross inequalities in wealth and power between the elite in the capital and the rural population; government agricultural policies that favour large mechanised farms and irrigation schemes over rain-fed, small farmer agriculture, causing both political grievances and land degradation; forced migration, such as the 1990s removal of Nuba farmers from their lands into so-called ‘peace villages’ where they became a source of captive labour for mechanised farms; and what Alex de Waal calls ‘militarised tribalism’ (de Waal, 2007). In particular, the nationalisation of land in 1970, by which customary laws were set aside and people could obtain access only through lease agreements with the government, set the stage for widespread land-grabbing by elites and the marginalisation of pastoralists. As one scholar of the region notes, ‘. . .not all resource conﬂicts are based on a situation of resource scarcity; rather, they are political in nature and have to do with the workings of the Sudanese state’ (Manger, 2005, p. 135). The discovery but rather to heighten it, if the government controls the water for its own interests (Polgreen, 2007). The construction of Darfur as a climate conﬂict should serve as canary in the coal mine that something is amiss when environmental determinism overrides serious analysis of power relations. This is not to deny that environmental changes due to global warming could in some instances exacerbate already existing economic and political divisions. However, whether or not violent conﬂict and mass migrations result depends on so many other factors that it is far too simplistic to see climate change as a major cause or trigger. Moreover, such threat scenarios ignore the way many poorly resourced communities manage their affairs without recourse to violence. Brown et al. (2007) cite the case of the semi-arid regions of Northern Nigeria where conﬂicts between pastoralists and agricultural communities occur over water and fodder, but seldom spread because of the existence of traditional conﬂict resolution institutions. They argue that helping these communities adapt to climate change should involve strengthening such institutions.

## Alt Cause - Forest Sinks

Forests contribute to global warming

Power 8 (Matt Power is a staff writer for Wired Magazine. 5/19/8. “Old-Growth Forests Can Actually Contribute to Global Warming” http://www.wired.com/science/planetearth/magazine/16-06/ff\_heresies\_04forests/)

Ronald Reagan's infamous claim that "trees cause more pollution than automobiles" contained a grain of truth. In warm weather, trees release volatile chemicals that act as catalysts for smog. But the Gipper didn't mention another point that's even more likely to make nature lovers blanch. When it comes to fighting climate change, it's more effective to treat forests like crops than like majestic monuments to nature. Over its lifetime, a tree shifts from being a vacuum cleaner for atmospheric carbon to an emitter. A tree absorbs roughly 1,500 pounds of CO2 in its first 55 years. After that, its growth slows, and it takes in less carbon. Left untouched, it ultimately rots or burns and all that CO2 gets released. Last year, the Canadian government commissioned a study to determine the quantity of carbon sequestered by the country's woodlands, which account for a tenth of global forests. It hoped to use the CO2-gathering power of 583 million acres of woods to offset its Kyoto Protocol-mandated responsibility to cut greenhouse gas emissions. No such luck. The report found that during many years, Canadian forests actually give up more carbon from decomposing wood than they lock down in new growth.

## No Extinction - Empirics

**Climate change does not lead to extinction- empirically proven**

Sherwood, Keith, and Craig Idso et al 2012 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Plant Responses to Significant and Rapid Global Warming http://co2science.org/articles/V15/N24/EDIT.php

In an impressive and enlightening review of the subject, Willis and MacDonald (2011) begin by noting that key research efforts have focused on extinction scenarios derived from "a suite of predictive species distribution models (e.g., Guisan and Thuiller, 2005)" - which are most often referred to as bioclimatic envelope models - that "predict current and future range shifts and estimate the distances and rates of movement required for species to track the changes in climate and move into suitable new climate space." And they write that one of the most-cited studies of this type - that of Thomas et al. (2004) - "predicts that, on the basis of mid-range climatic warming scenarios for 2050, up to 37% of plant species globally will be committed to extinction owing to lack of suitable climate space." In contrast, the two researchers say that "biotic adaptation to climate change has been considered much less frequently." This phenomenon - which is sometimes referred to as evolutionary resilience - they describe as "the ability of populations to persist in their current location and to undergo evolutionary adaptation in response to changing environmental conditions (Sgro et al., 2010)." And they note that this approach to the subject "recognizes that ongoing change is the norm in nature and one of the dynamic processes that generates and maintains biodiversity patterns and processes," citing MacDonald et al. (2008) and Willis et al. (2009). The aim of Willis and MacDonald's review, therefore, was to examine the effects of significant and rapid warming on earth's plants during several previous intervals of the planet's climatic history that were as warm as, or even warmer than, what climate alarmists typically predict for the next century. These intervals included the Paleocene-Eocene Thermal Maximum, the Eocene climatic optimum, the mid-Pliocene warm interval, the Eemian interglacial, and the Holocene. And it is important to note that this approach, in contrast to the approach typically used by climate alarmists, relies on empirical (as opposed to theoretical) data-based (as opposed to model-based), reconstructions (as opposed to projections) of the past (as opposed to the future). And what were the primary findings of the two researchers? As they describe them, in their own words, "persistence and range shifts (migrations) seem to have been the predominant terrestrial biotic response (mainly of plants) to warmer intervals in Earth's history," while "the same responses also appear to have occurred during intervals of rapid climate change." In addition, they make a strong point of noting that "evidence for global extinctions or extinctions resulting from reduction of population sizes on the scale predicted for the next century owing to loss of suitable climate space (Thomas et al., 2004) is not apparent." In fact, they state that sometimes an actual increase in local biodiversity is observed, the case for which we lay out in Section II (Physiological Reasons for Rejecting the CO2-Induced Global Warming Extinction Hypothesis) of our Major Report The Specter of Species Extinction: Will Global Warming Decimate Earth's Biosphere? Read it and rejoice!

**No extinction- their models don’t account for TGP**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Transgenerational Plasticity: A Third Way of Adapting to Climate Change http://co2science.org/articles/V15/N16/EDIT.php

In introducing their intriguing new study, two U.S. scientists, Salinas and Munch (2012), write that historical attempts to address the issue of organismal responses to changing temperature have focused almost exclusively on evolutionary change and phenotypic plasticity; but they turn their attention to a third way: transgenerational plasticity or TGP. This phenomenon, as they describe it, "occurs when the environment experienced by the parents prior to fertilization directly translates, without DNA sequence alteration, into significant changes in the shape of offspring reaction norms (Fox and Mousseau, 1998), resulting in a significant interaction between parental and offspring environment effects." Such effects have been observed in many traits of several species; yet they note that "TGP in thermal growth physiology has never been demonstrated for vertebrates," which is consequently what they set out to do for sheepshead minnows (Cyprinodon variegatus), a small fish that is common to nearshore marine and estuarine waters along the east coast of the United States and throughout the Caribbean. Working with fish they had raised from the egg stage to adults in aquaria they had maintained at constant temperatures of either 24, 29 or 34°C, Salinas and Munch allowed the soon-to-become parent fish to spawn, after which they collected the newly fertilized eggs from each of the three temperature treatments and allowed a third of each group to develop within each of a new set of aquaria maintained at the same three standard temperatures, during which time the growth rates of the new sets of juveniles were determined. So what did they learn? The two researchers report that offspring from high (34°C) and low (24°C) temperature-raised parents grew best at high and low temperature, respectively, "suggesting an adaptive response," with growth rates differing by as much as 32% (0.60 vs. 0.46 mm/day, when both sets of offspring were maintained at 34°C). And in discussing this result, Salinas and Munch say that the rate of adaptive response change that they observed "is roughly two orders of magnitude greater than the median rate of phenotypic change found in a review of the subject (Hendry and Kinnison, 1999)." In terms of the range of applicability of the TGP phenomenon, the two scientists say that it has so far "only been demonstrated for milkweed bugs (Groeters and Dingle, 1988), butterflies (Steigenga and Fischer, 2007), and thale cress (Blodner et al., 2007; Whittle et al., 2009)," but they note that "in all cases, offspring growth is maximized at the temperature experienced by the parents." As for the importance of TGP, Salinas and Munch write that it "may allow for a rapid response to environmental changes," citing Bossdorf et al. (2008), while specifically noting that "changes in precipitation may be counteracted via TGP in desiccation tolerance in invertebrates (Yoder et al., 2006) or drought tolerance in plants (Sultan et al., 2009)," and more especially noting that "higher CO2 concentrations have been shown to elicit a TGP response in three plant species (Lau et al., 2008) and to alter predator-induced TGP responses in aphids (Mondor et al., 2004)." All in all, therefore, Salinas and Munch say of this exciting new "area of active current research" that it "may qualitatively change projections for extinction risk and other climate impacts" ... and, we might add, change them for the better.

## Aerosols = Cooling

**Aerosols lead to long term cooling**

**Tian et. al 10** (Feng, Laboratory for Atmospheric and Space Physics at U Colorado, Mark Cliare, Virtual Planetary Laboratory and Astrobiology @ U Washington, Jacob Haqq-Misra, Meteorology @ Penn State, Megan Smith, Meteorology @ Penn State, David Crisp, NASA Jet Propulsion Laboratory, Caltech, David Catling, Earth and Space Sciences at U Washington, Kevin Zahnle, NASA Ames Research Center, James F. Kastin, Geosciences @ Penn State, 2010, "Photochemical and climate consequences of sulfur outgassing on early Mars," *Earth and Planetary Science Letters*, Vol. 250)

On modern Earth, SO2 produced by volcanic eruptions cools the surface by creating highly reﬂective sulfate aerosols that persist for months to years in the stratosphere (Turco et al., 1982; Robock, 2000). Models for the anoxic early Earth atmosphere also predict that a signiﬁcant fraction of outgassed SO2 would still have been converted to sulfate aerosols (Pavlov and Kasting, 2002; Zahnle et al., 2006). Plescia (1993) estimated the volatile release from Elysium volcanism on Mars and suggested that the short-term effect of SO2 volcanic outgassing would have been to warm the climate but the long term effect would have been surface cooling, because of the formation of sulfate aerosols. As the sulfate aerosols settled from the atmosphere, the climate could have returned to its pre-eruption equilibrium.

## Warming Solves Itself - Algae

**Warming causes increased algal blooms**

Moore et al 08

Stephanie K. Moore et al, associate scientist for the NOAA, November 7 2008, Impacts of climate variability and future climate change on harmful algal blooms and human health, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2586717/

Anthropogenically-derived increases in atmospheric greenhouse gas concentrations have been implicated in recent climate change, and are projected to substantially impact the climate on a global scale in the future. For marine and freshwater systems, increasing concentrations of greenhouse gases are expected to increase surface temperatures, lower pH, and cause changes to vertical mixing, upwelling, precipitation, and evaporation patterns. The potential consequences of these changes for harmful algal blooms (HABs) have received relatively little attention and are not well understood. Given the apparent increase in HABs around the world and the potential for greater problems as a result of climate change and ocean acidification, substantial research is needed to evaluate the direct and indirect associations between HABs, climate change, ocean acidification, and human health. This research will require a multidisciplinary approach utilizing expertise in climatology, oceanography, biology, epidemiology, and other disciplines. We review the interactions between selected patterns of large-scale climate variability and climate change, oceanic conditions, and harmful algae.

Warming causes algae growth that will solve warming

Williams 9 — Andrew Williams, writer for clean technical a website dedicated to environmental news, JANUARY 4, 2009, Clean technical, Green Algae Bloom Process Could Stop Global Warming, http://cleantechnica.com/2009/01/04/green-algae-bloom-process-could-stop-global-warming/

The researchers, aboard the Royal Navy’s HMS Endurance, have found that melting icebergs off the coast of Antarctica are releasing millions of tiny particles of iron into the southern Ocean, helping to create huge ‘blooms’ of algae that absorb carbon emissions. The algae then sinks to the icy depths, effectively removing CO2 from the atmosphere for hundreds of years. According to lead researcher, Prof. Rob Raiswell of Leeds University, “The Earth itself seems to want to save us.” Scientists have known for some time that artificially created algal blooms could be used to absorb greenhouse gases, but the technique has been banned for fear of causing unforeseen side effects in fragile ecosystems. However, based on the UK team’s evidence that the process has been occurring naturally for millions of years, and on a wide scale, the UN has given the green light for a ground-breaking experiment later this month. The team will seek to create a massive algae bloom by releasing several tons of iron sulphate into the sea off the coast of the British island of South Georgia. The patch will apparently be large enough to be visible from space. If successful, the technique could be rolled out across vast swathes of the Great Southern Ocean. Scientists calculate that if the whole 20 million square miles was treated, it could remove up to three and a half Gigatons of C02, equivalent to one eighth of all global annual emissions from fossil fuels. It would be a huge irony if melting icebergs, until now a powerful symbol of the damage caused by global warming, reveal a process that may enable scientists to take steps that might drastically reduce, and potentially even halt, the threat of environmental catastrophe.

## Climate =/= Weather

No warming - evidence conflates weather with climate

Keating 12 (Joshua Keating, associate editor of Foreign Policy, 7/5/12, "Atmosphere of Distortion," Foreign Policy, http://www.foreignpolicy.com/articles/2012/07/05/atmosphere\_of\_distortion?page=0,1)

But while the planet is undoubtedly getting warmer, attributing a particular weather phenomenon to this shift is a bit problematic. Although the science may be on the side of climate change, blaming one particular weather incident on global warming is just as misleading as saying that a cold winter disproves it. "I don't think anybody in the climate change community had even heard the word 'derecho' before last week," says Gavin Schmidt, a climate modeler at NASA's Goddard Institute for Space Studies. "If you really want the nation to be aware of climate change, severe weather outbreaks are certainly a way to get people's attention. But to attribute a specific one to climate change is, at this stage of the game, impossible," says Otis Brown of NOAA's National Climatic Data Center. According to Brown, by 2100 Chicago is projected to have the kind of temperatures we now associate with Dallas, but the change will be gradual and far more difficult for the public to comprehend than a two-week spell of 100-degree days that may or may not have anything to do with global warming. As the late science fiction author Robert Heinlein famously put it, "climate is what you expect, weather is what you get." But that's often unsatisfying for a public that wants tangible evidence of climate change before they're willing to fully buy into the concept or support policies aimed at mitigating it. "Most people don't assimilate global statistics or long-term trends -- you feel what's going on by the weather," says NASA's Schmidt. "When weird weather happens, a lot of people just instinctively think its climate change."

## Oceans Check

**Warming would be slow – ocean absorption solves**

**Roe & Bauman 11 (Gerald Roe,** Department of Earth and Space Sciences, University of Washington, AND **Yoram Bauman,** Professor, Program on the Environment, University of Washington, 1-1-20**11**, “Should the climate tail wag the policy dog?”)

A key player in the physical system is the enormous thermal inertia represented by the deep ocean. The whole climate system cannot reach a new equilibrium until the deep ocean has also reached equilibrium. In response to a positive climate forcing (i.e., a warming tendency), the deep ocean draws heat away from the surface ocean, and so buffers the surface temperature changes, making them less than they would otherwise be. The deep ocean is capable of absorbing enormous amounts of heat and not until this reservoir has been exhausted can the surface temperatures attain their full equilibrium values. A second key player is the inherent relationship between feedbacks and adjustment time scales in physical systems. If it transpires that we do in fact, live on a planet with a high climate sensitivity, it will be because we live on a planet with strong positive feedbacks. In other words, the net effect of all of the dynamic processes (clouds, water vapor, ice reflectivity, etc.) is to strongly amplify the planet's response to radioactive forcing. In this event, it would mean that we live on a planet that is inefficient in eliminating energy perturbations: a positive feedback reflects a tendency to retain energy within the system, inhibiting its ultimate emission to space, and therefore requiring a larger temperature response in order to achieve energy equilibrium. Moreover. it is generally true that, all else being equal, an inefficient system takes longer to adjust than an efficient one. A useful rule of-thumb is that the relevant response time of the climate system is given by the effective thermal inertia of the deep ocean multiplied by the climate sensitivity parameter (defined as AEX/AR" , see. eg., Roe. 2009). This behavior is absolutely fundamental and widely appreciated (e.g., Hansen et al.. 1985: Vlligley and Schlessinger. 1985). As time progresses, more and more of the ocean abyssal waters become involved in the warming, and so the effective thermal inertia of the climate system increases. Hansen et al. (1985) solve a simple representation of this effect and show that the adjustment time of climate is proportional to the square of climate sensitivity. In other words, if it takes 50 yrs to equilibrate with a climate sensitivity of 1.5°C, it would take 100 times longer, or 5,000 yrs to equilibrate if the climate sensitivity is 15°C. Although Nature is of course more complicated than this (see eg., Gregory, 2000), the basic picture described here is reproduced in models with a more realistic ocean circulation. In particular see results Held et al. (2010) for results from fully-coupled global climate models. In the context of the PDF of climate sensitivity, its effects have been reviewed in Baker and Roe (2009).

## Oceans Check - AT: They Run Out

**Reaching ocean carbon sink capacities take centuries**

Cherubini et al. (FRANCESCO CHERUBINI\*, GLEN P. PETERSw, TERJE BERNTSENwz, ANDERS H. STRØMMAN\*andEDGAR HERTWICH\* \*Department of Energy and Process Engineering, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway, wCenter for International Climate and Environmental Research – Oslo (CICERO), Oslo, Norway, zDepartment of Geosciences, University of Oslo, Norway) 2011 (Francesco, “CO2 emissions from biomass combustion for bioenergy: atmospheric decay and contribution to global warming,” GCB Bioenergy (2011) 3, <http://onlinelibrary.wiley.com/doi/10.1111/j.1757-1707.2011.01102.x/full>, Page 415) //CL

\*Note in this article “C” refers to carbon as indicated by the author at the beginning

C cycle climate models. CO2 emissions play a key role in the earth’s C cycle and climate system. Those which are classified as anthropogenic (i.e. from fossil fuel combustion, cement production, deforestation and land-use change) are one of the main responsible for anthropogenic climate change (Forster et al., 2007). Complex C cycle climate (CC) models, which establish the link between atmospheric CO2 concentration and anthropogenic C emissions by modeling uptake and exchange fluxes of the atmosphere with the oceans and the terrestrial biosphere, are used to model the time evolution of airborne CO2. In order to make analysis easier for smaller case studies, such as LCA, impulse response functions (IRF) are often used to represent CO2 atmospheric decay under given assumptions (Tubiello & Oppenheimer, 1995; Joos & Bruno, 1996; Enting et al., 2001). The oceans play an important role for the removal of anthropogenic C. They are generally distinguished into the upper layer, which has a very fast turnover rate (Wanninkhof, 1992), and the deep ocean, to which C is transported through oceanic circulation (Joos, 2003). This latter process is the limiting factor for the ocean’s uptake capacity, which is determined by ocean volume and sea water chemistry. This uptake capacity is only reached after several centuries, and it takes millennia to equilibrate ocean water and sediments after a perturbation in oceanic C content. Changes in the land biosphere and in the upper ocean influence atmospheric CO2 concentrations on seasonal to century time scales. Several models dealing with the C cycle in the oceans have been formulated (Oeschger et al., 1975; Siegenthaler & Joos, 1992; Blanke & Delecluse, 1993; Caldeira & Kasting, 1993).

## Sulfur Dioxide Turn

**Emissions removal causes warming – so2 cools the earth
Prinn et al 5** — (Ronald G. Prinn, John Reilly, Marcus Sarofim, Chien Wang and Benjamin Felzer, MIT Joint Program on the Science and Policy of Global Change, January 2005, <http://18.7.29.232/bitstream/handle/1721.1/7510/MITJPSPGC_Rpt118.pdf?sequence=1>)

The impact of these various pollutant caps on global and hemispheric mean surface temperature and sea level changes from 2000 to 2100 are shown in Figure 6 as percentages relative to the global-average reference case changes of 2.7°C and 0.4 meters respectively. The largest increases in temperature and sea level occur when SOx alone is capped due to the removal of reflecting (cooling) sulfate aerosols. Because most SOx emissions are in the northern hemisphere, the temperature increases are greatest there. For the NOx caps, temperature increases in the southern hemisphere (driven by the CH4 increases), but decreases in the northern hemisphere (due to the cooling effects of the O3 decreases exceeding the warming driven by the CH4 increases). For CO and VOC reductions, there are small decreases in temperature driven by the accompanying aerosol increases and CH4 reductions, with the greatest effects being in the northern hemisphere where most of the CO and VOC emissions (and aerosol production) occur. When NOx, CO, and VOCs are all capped, the nonlinearity in the system is evidenced by the fact that the combined effects are not simple sums of the effects from the individual caps. Ozone decreases and aerosol increases (offset only slightly by CH4 increases) lead to even less warming and sea level rise than obtained by adding the CO/VOC and NOx capping cases. Finally the capping of all emissions yields temperature and sea level rises that are smaller but qualitatively similar to the case where only SOx is capped, but the rises are greater than expected from simple addition of the SOx-capped and CO/VOC/NOx-capped cases. Nevertheless, the capping of CO, VOC and NOx serves to reduce the warming induced by the capping of SOx. Note that these climate calculations in Figure 6 omit the cooling effects of the CO2 reductions caused by the lessening of the inhibition of the land sink by ozone (Figure 5). This omission is valid if we presume that anthropogenic CO2 emissions, otherwise restricted by a climate policy, are allowed to increase to compensate for these reductions. This was the basis for our economic analysis in the previous section. To illustrate the lowering of climate impacts if we allowed the sink-related CO2 reductions to occur, we show a sixth case in Figure 6 (“allcap+sink”) which combines the capping of all air pollutant emissions with the enhanced carbon sink from Figure 5. Now we see that the sign of the warming and sea level rise seen in the “allcap” case is reversed in the “allcap+sink” case. If we could value this lowering of climate impacts, it would provide an alternative to the economic analysis in section 4.3.

**That SO2 is key to global cooling
OSU 92** (Department of Geoscience, Oregon State University, http://volcano.oregonstate.edu/book/export/html/156)

Symonds, Rose, Bluth, and Gerlach concluded that stratospheric injection of sulfur dioxide (SO2) is the principal atmospheric and global impact of volcanic eruptions via SO2 + OH + 3H2O -> H2SO4 (l) + HO2 The SO2 converts to sulfuric acid aerosols that block incoming solar radiation and contribute to ozone destruction. The blocked solar radiation can cause global cooling. The amount of SO2 released by volcanoes is much less compared to man-made sources but the impact of some eruptions might be disproportionately large. The gases emitted by most eruptions and by man-made sources never leave the troposphere, the layer in the atmosphere from the surface to about 10 km. However, volcanic gases reach the stratosphere, a layer in the atmosphere from about 10 km to about 50 km in altitude, during large eruptions. This relationship is complicated by the fact that the elevation between the volcano summit and the distance to the troposphere/stratosphere decreases with latitude. So, some smaller eruptions at higher latitudes can eject as much SO2 gas into the stratosphere as larger eruptions closer to the equator. Factors influencing the amounts of SO2 in the stratosphere were described and modeled by Bluth and others (1997). For eruptions in the last 25 years, El Chichon and Mount Pinatubo emitted the greatest amounts of SO2 into the stratosphere. El Chichon produced 7 Mt of SO2 and Mount Pinatubo produced 20 Mt. Both of these volcanoes are at low latitudes but they both had high eruption rates. The importance of latitude is obvious for four of the next five volcanoes that had a major influence on SO2 amounts in the stratosphere. Hudson, St. Helens, Alaid, and Redoubt are all at latitudes greater than 45 degrees, where the distance to the stratosphere is less. The eruption rate of Hudson was comparable to El Chichon and Mount Pinatubo. However, the eruption rates of St. Helens, Alaid, and Redoubt where an order of magnitude less. These volcanoes emitted 1, 1.1, and 0.2 Mt of SO2. The other eruption was at Ruiz, which had a high eruption rate, comparable to El Chichon and Mount Pinatubo, but is near the equator. Ruiz emitted 0.7 Mt of SO2. Bluth and others (1997) used the changes in aerosol optical depth as a measure of the impact of the eruptions. The impact of eruptions may not last very long. The aerosols in the stratosphere from mid-range eruptions (St. Helens, Alaid) settled back to the troposphere in about 5-8 months (Kent and McCormick, 1984). For large eruptions like El Chichon it takes about 12 months for SO2 levels in the stratosphere to return to pre-eruption levels. Pinto and others (1989) suggested that at high eruption rates aerosols tend to make larger particles, not greater numbers of same size aerosol particles. Larger particles have smaller optical depth per unit mass, relative to smaller particles, and settle out of the stratosphere faster. These self-limiting effects may restrict the total number of particles in the stratosphere and may moderate the impact of volcanic clouds (Rampino and Self, 1982; Pinto and others,1989). More complicated patterns of warming and cooling have been found on regional scales. Robock and Mao (1992) found warming over Eurasia and North America and cooling over the Middle East and northern Africa during the winters after the 12 largest volcanic eruptions from 1883-1992. For eruptions in the tropics the temperature changes were noted in the first winter after the eruption. For eruptions in the mid-latitudes changes were observed in the first or second winter after the eruption. For eruptions in high latitudes changes were observed in the second winter after the eruption. Robock and Mao (1992) proposed that heating of the tropical stratosphere by the volcanic aerosols led to an enhanced zonal winds. The zonal winds heated some areas while blocking of solar radiation cooled other areas.

**So2 is key to offset warming – studies prove
Biello 11** — (David Biello, reporter for scientific american, science news agency, July 22, 2011, <http://www.scientificamerican.com/article.cfm?id=stratospheric-pollution-helps-slow-global-warming>)

Despite significant pyrotechnics and air travel disruption last year, the Icelandic volcano Eyjafjallajokull simply didn't put that many aerosols into the stratosphere. In contrast, the eruption of Mount Pinatubo in 1991, put 10 cubic kilometers of ash, gas and other materials into the sky, and cooled the planet for a year. Now, research suggests that for the past decade, such stratospheric aerosols—injected into the atmosphere by either recent volcanic eruptions or human activities such as coal burning—are slowing down global warming.¶ "Aerosols acted to keep warming from being as big as it would have been," says atmospheric scientist John Daniel of the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory, who helped lead the research published online in Science on July 21. "It's still warming, it's just not warming as much as it would have been."¶ Essentially, sulfur dioxide gets emitted near the surface, either by a coal-fired power plant's smokestack or a volcano. If that SO2 makes it to the stratosphere—the middle layer of the atmosphere 10 kilometers up—it forms droplets of diluted sulfuric acid, known as aerosols. These aerosols reflect sunlight away from the planet, shading the surface and cooling temperatures. And some can persist for a few years, prolonging that cooling.¶ By analyzing satellite data and other measures, Daniel and his colleagues found that such aerosols have been on the rise in Earth's atmosphere in the past decade, nearly doubling in concentration. That concentration has reflected roughly 0.1 watts per meter squared of sunlight away from the planet, enough to offset roughly one-third of the 0.28 watts per meter squared of extra heat trapped by rising atmospheric concentrations of greenhouse gases such as carbon dioxide. The researchers calculate that the aerosols prevented 0.07 degrees Celsius of warming in average temperatures since 2000.

**Coal burning emits SO2 which cools the earth**

Biello (Environmental specialist staff writer for the Scientific American) 2011 (David, “Stratospheric Pollution Helps Slow Global Warming,” Energy & Sustainability, July 22, 2011, <http://www.scientificamerican.com/article.cfm?id=stratospheric-pollution-helps-slow-global-warming>) //CL

Particles of sulfuric acid--injected by volcanoes or humans--have slowed the pace of climate change in the past decade Despite significant pyrotechnics and air travel disruption last year, the Icelandic volcano Eyjafjallajokull simply didn't put that many aerosols into the stratosphere. In contrast, the eruption of Mount Pinatubo in 1991, put 10 cubic kilometers of ash, gas and other materials into the sky, and cooled the planet for a year. Now, research suggests that for the past decade, such stratospheric aerosols—injected into the atmosphere by either recent volcanic eruptions or human activities such as coal burning—are slowing down global warming. "Aerosols acted to keep warming from being as big as it would have been," says atmospheric scientist John Daniel of the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory, who helped lead the research published online in Science on July 21. "It's still warming, it's just not warming as much as it would have been." Essentially, sulfur dioxide gets emitted near the surface, either by a coal-fired power plant's smokestack or a volcano. If that SO2 makes it to the stratosphere—the middle layer of the atmosphere 10 kilometers up—it forms droplets of diluted sulfuric acid, known as aerosols. These aerosols reflect sunlight away from the planet, shading the surface and cooling temperatures. And some can persist for a few years, prolonging that cooling. By analyzing satellite data and other measures, Daniel and his colleagues found that such aerosols have been on the rise in Earth's atmosphere in the past decade, nearly doubling in concentration. That concentration has reflected roughly 0.1 watts per meter squared of sunlight away from the planet, enough to offset roughly one-third of the 0.28 watts per meter squared of extra heat trapped by rising atmospheric concentrations of greenhouse gases such as carbon dioxide. The researchers calculate that the aerosols prevented 0.07 degrees Celsius of warming in average temperatures since 2000. The question is: why the increase in such aerosols? There have been plenty of smaller volcanic eruptions in recent years, such as the continuously erupting Soufriere Hills on Montserrat and Tavurvur on Papua New Guinea, which may have exploded enough SO2 into the atmosphere. And there has been plenty of coal burning in countries such as China, which now burns some 3 billion metric tons of the fuel rock per year, largely without the pollution controls that would scrub out the SO2, as is sometimes done in the U.S. In fact, a computer model study published July 5 in Proceedings of the National Academy of Sciences suggested that such SO2 pollution in China has cancelled out the warming effects of rising greenhouse gas concentrations globally since 1998. Determining whether humans or volcanoes explain more of the increase in stratospheric aerosols is the focus of ongoing research, says PhD candidate Ryan Neely of the University of Colorado, who contributed to the NOAA research. Combined with a decrease in atmospheric water vapor and a weaker sun due to the most recent solar cycle, the aerosol finding may explain why climate change has not been accelerating as fast as it did in the 1990s. The effect also illustrates one proposal for so-called geoengineering—the deliberate, large-scale manipulation of the planetary environment—that would use various means to create such sulfuric acid aerosols in the stratosphere to reflect sunlight and thereby hopefully forestall catastrophic climate change. But that points up another potential problem: if aerosol levels, whether natural or human-made, decline in the future, climate change could accelerate—and China is adding scrubbing technology to its coal-fired power plants to reduce SO2 emissions and thereby minimize acid rain. In effect, fixing acid rain could end up exacerbating global warming. China "could cause some decreases [in stratospheric aerosols] if that is the source," Neely says, adding that growing SO2 emissions from India could also increase cooling if humans are the dominant cause of injecting aerosols into the atmosphere. On the other hand, "if some volcanoes that are large enough go off and if they are the dominant cause [of increasing aerosols], then we will probably see some increases" in cooling.

**This is consistent with the conclusion of their studies
Robock 8** (Alan Robock1, Luke Oman2, and Georgiy L. Stenchikov1 1Department of Environmental Sciences, Rutgers University, New Brunswick, New Jersey 2Department of Earth and Planetary Sciences, Johns Hopkins University, Baltimore, Maryland March, 2008, [**http://www.see.ed.ac.uk/~shs/Climate%20change/Geo-politics/GeoengineeringJGR9inPress.pdf**](http://www.see.ed.ac.uk/~shs/Climate%20change/Geo-politics/GeoengineeringJGR9inPress.pdf))

Anthropogenic stratospheric aerosol production, so as to reduce solar insolation and cool Earth, has been suggested as an emergency response to geoengineer the planet in response to global warming. While volcanic eruptions have been suggested as innocuous examples of stratospheric aerosols cooling the planet, the volcano analog actually argues against geoengineering because of ozone depletion and regional hydrologic and temperature responses. To further investigate the climate response, here we simulate the climate response to both tropical and Arctic stratospheric injection of sulfate aerosol precursors using a comprehensive atmosphere-ocean general circulation model, the National Aeronautics and Space Administration Goddard Institute for Space Studies ModelE. We inject SO and the model converts it to sulfate aerosols, transports the aerosols and removes them through dry and wet deposition, and calculates the climate response to the radiative forcing from the aerosols. We conduct simulations of future climate with the Intergovernmental Panel on Climate Change A1B business-as-usual scenario both with and without geoengineering, and compare the results. We find that 2if there were a way to continuously inject SO2 into the lower stratosphere, it would produce global cooling. Tropical SO2 injection would produce sustained cooling over most of the world, with more cooling over continents. Arctic SO2 injection would not just cool the Arctic. Both tropical and Arctic SO2 injection would disrupt the Asian and African summer monsoons, reducing precipitation to the food supply for billions of people. These regional climate anomalies are but one of many reasons that argue against the implementation of this kind of geoengineering.

# Ice Age

## Warming Good - Ice Age

**Current CO2 levels prevent an ice age**

Science Daily, 2007 — (Science Daily “Next Ice Age Delayed By Rising Carbon Dioxide Levels.” August 30 2007. http://www.sciencedaily.com/releases/2007/08/070829193436.htm)

Future ice ages may be delayed by up to half a million years by our burning of fossil fuels. That is the implication of recent work by Dr Toby Tyrrell of the University of Southampton's School of Ocean and Earth Science at the National Oceanography Centre, Southampton.Arguably, this work demonstrates the most far-reaching disruption of long-term planetary processes yet suggested for human activity.Dr Tyrrell's team used a mathematical model to study what would happen to marine chemistry in a world with ever-increasing supplies of the greenhouse gas, carbon dioxide.The world's oceans are absorbing CO2 from the atmosphere but in doing so they are becoming more acidic. This in turn is dissolving the calcium carbonate in the shells produced by surface-dwelling marine organisms, adding even more carbon to the oceans. The outcome is elevated carbon dioxide for far longer than previously assumed. Computer modelling in 2004 by a then oceanography undergraduate student at the University, Stephanie Castle, first interested Dr Tyrrell and colleague Professor John Shepherd in the problem. They subsequently developed a theoretical analysis to validate the plausibility of the phenomenon.The work, which is part-funded by the Natural Environment Research Council, confirms earlier ideas of David Archer of the University of Chicago, who first estimated the impact rising CO2 levels would have on the timing of the next ice age.Dr Tyrrell said: 'Our research shows why atmospheric CO2 will not return to pre-industrial levels after we stop burning fossil fuels. It shows that it if we use up all known fossil fuels it doesn't matter at what rate we burn them. The result would be the same if we burned them at present rates or at more moderate rates; we would still get the same eventual ice-age-prevention result.'Ice ages occur around every 100,000 years as the pattern of Earth's orbit alters over time. Changes in the way the sun strikes the Earth allows for the growth of ice caps, plunging the Earth into an ice age. But it is not only variations in received sunlight that determine the descent into an ice age; levels of atmospheric CO2 are also important.Humanity has to date burnt about 300 Gt C of fossil fuels. This work suggests that even if only 1000 Gt C (gigatonnes of carbon) are eventually burnt (out of total reserves of about 4000 Gt C) then it is likely that the next ice age will be skipped. Burning all recoverable fossil fuels could lead to avoidance of the next five ice ages.

**This causes extinction by 2020**

Chapman, geophysicist and astronautical engineer, 2008

(Phil Chapman. April 23 2008 “Sorry to ruin the fun, but an ice age cometh.” http://www.theaustralian.news.com.au/story/0,25197,23583376-7583,00.html)

It is time to put aside the global warming dogma, at least to begin contingency planning about what to do if we are moving into another little ice age, similar to the one that lasted from 1100 to 1850. There is no doubt that the next little ice age would be much worse than the previous one and much more harmful than anything warming may do. There are many more people now and we have become dependent on a few temperate agricultural areas, especially in the US and Canada. Global warming would increase agricultural output, but global cooling will decrease it. Millions will starve if we do nothing to prepare for it (such as planning changes in agriculture to compensate), and millions more will die from cold-related diseases. There is also another possibility, remote but much more serious. The Greenland and Antarctic ice cores and other evidence show that for the past several million years, severe glaciation has almost always afflicted our planet. The bleak truth is that, under normal conditions, most of North America and Europe are buried under about 1.5km of ice. This bitterly frigid climate is interrupted occasionally by brief warm interglacials, typically lasting less than 10,000 years. The interglacial we have enjoyed throughout recorded human history, called the Holocene, began 11,000 years ago, so the ice is overdue. We also know that glaciation can occur quickly: the required decline in global temperature is about 12C and it can happen in 20 years. The next descent into an ice age is inevitable but may not happen for another 1000 years. On the other hand, it must be noted that the cooling in 2007 was even faster than in typical glacial transitions. If it continued for 20 years, the temperature would be 14C cooler in 2027. By then, most of the advanced nations would have ceased to exist, vanishing under the ice, and the rest of the world would be faced with a catastrophe beyond imagining. Australia may escape total annihilation but would surely be overrun by millions of refugees. Once the glaciation starts, it will last 1000 centuries, an incomprehensible stretch of time.

## AT: Warming = Ice Age

**Warming cannot cause ice ages—the North Atlantic Current is not the key regulator and it could only shut down after an ice age has already begun**

Marsh (retired physicist from the Argonne National Laboratory and a former consultant to the Department of Defense on strategic nuclear technology), 2008

(Gerald Marsh, retired physicist from the Argonne National Laboratory and a former consultant to the Department of Defense on strategic nuclear technology, “Climate Stability and Policy: A Synthesis” http://www.winningreen.com/site/epage/59619\_621.htm)

There has been much speculation in both the scientific and popular literature that increased warming as a consequence of anthropogenic carbon dioxide emissions could lead to an increased flow of fresh water into the north Atlantic that would shut down the thermohaline circulation, known alternately as the meridional overturning circulation or the Atlantic heat conveyor [21]. This in turn it is argued, could initiate a new ice age in Europe. There are two major misconceptions behind such speculation: First, the Gulf Stream is not responsible for the transport of most of the heat that gives Europe its mild climate [22]; and while the shut down of the thermohaline circulation does appear to play an important role in the dramatic drop in temperature due to Heinrich and Dansgaard- Oeschger events [23], such shutdowns can only occur during an ice age. Indeed, Broecker [24], who first linked the thermohaline circulation to the ice ages, now discounts the fear that a shutdown of the thermohaline circulation could trigger an ice age. He has pointed out that for that scenario to work feedback amplification from extensive sea ice is required [25]. The possibility that global warming could trigger an ice age through shutdown of the thermohaline circulation may therefore be discounted.

## AT: Warming Kills Gulf Stream

**Global warming makes the ocean saltier – stabilizing the Gulf Stream**

Brahic 07 — (New Scientist’s environmental reporter , Saltier North Atlantic should give currents a boost.” http://environment.newscientist.com/article/dn12528)

The surface waters of the North Atlantic are getting saltier, suggests a new study of records spanning over 50 years. And this might actually be good news for the effects of climate change on global ocean currents in the short-term, say the study's researchers. This is because saltier waters in the upper levels of the North Atlantic ocean may mean that the global ocean conveyor belt – the vital piece of planetary plumbing which some scientists fear may slow down because of global warming – will remain stable. The global ocean conveyor belt is the crucial circulation of ocean waters around the Earth. It helps drive the Gulf Stream and keeps Europe warm. The density of waters which drives the flow of ocean currents is dependent on temperature and salinity, so any change in saltiness may have an impact. Tim Boyer of the US National Oceanographic Data Center and colleagues compiled salinity data gathered by fisheries, navy and research ships travelling across the North Atlantic between 1955 and 2006. They found that during this time, the layer of water that makes up the top 400 metres has gradually become saltier. The seawater is probably becoming saltier due to global warming, Boyer says. "We know that upper ocean is warming in the North Atlantic, so it stands to reason that there should be more evaporation, making waters more salty," he says. Polar 'pulse' The global ocean conveyor belt is in part driven by salty and relatively dense subpolar waters sinking and flowing south to the equator. So when a huge "pulse" of less dense freshwater was found to have been dumped into the sub-polar waters of the North Atlantic in the mid-1960s, researchers speculated the sub-polar waters might just stay floating where they were and cause circulation to stagnate. The freshwater pulse probably came from a combination of increased rainfall and melting ice, as well as big chunks of ice suddenly pushing through the Fram Straight into the Atlantic. When in their recent study Boyer and his colleagues zoomed in on the subarctic Atlantic, they found that the waters there became much less salty in the 1960s, as expected. But since the 1990s, they have been getting saltier again, and are now about as salty as they were in the 1970s. Backing up this finding, when the team looked at the salinity of deeper waters, those flowing more than 1300 metres beneath the surface, they found that these have been getting less salty since the late 1980s. They see this as a sign that the pulse of freshwater has been slowly making its way south. It takes roughly 10 to 15 years for subpolar water to move away from the Arctic and down to the equator.

**Even if they’re right only minor climate changes will occur, Global warming won’t lead to an ice age or a collapse of the AMO**

Weaver and Hillaire 2004 — (Andrew Weaver and Claud Hillaire, Gordon head of the School of Earth and Ocean Sciences at the University of Victoria and a Canadian geoscientist of great distinction and a world leader in Quaternary research. He is known for his groundbreaking research on the environment, climate change, and oceanography. He is a Fellow of the Royal Society of Canada and professor at l'Université du Québec à Montréal, 4/16/2004, “Global Warming and the next Ice Age,” http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2)

Models that eventually lead to a collapse of the AMO under global warming conditions typically fall into two categories: (i) flux-adjusted coupled general circulation models, and (ii) intermediate-complexity models with zonally averaged ocean components. Both suites of models are known to be more sensitive to freshwater perturbations. In the first class of models, a small perturbation away from the present climate leads to large systematic errors in the salinity fields (as large flux adjustments are applied) that then build up to cause dramatic AMO transitions. In the second class of models, the convection and sinking of water masses are coupled (there is no horizontal structure). In contrast, newer non — flux-adjusted models find a more stable AMO under future conditions of climate change ( [11](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2#bib11), [13](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2" \l "bib13" \o "13), [14](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2" \l "bib14" \o "14)). Even the recent observations of freshening in the North Atlantic ( [15](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2" \l "bib15" \o "15)) (a reduction of salinity due to the addition of freshwater) appear to be consistent with the projections of perhaps the most sophisticated non — flux-adjusted model ( [11](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2#bib11)). Ironically, this model suggests that such freshening is associated with an increased AMO ( [16](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2" \l "bib16" \o "16)). This same model proposes that it is only Labrador Sea Water formation that is susceptible to collapse in response to global warming. In light of the paleoclimate record and our understanding of the contemporary climate system, it is safe to say that global warming will not lead to the onset of a new ice age. These same records suggest that it is highly unlikely that global warming will lead to a widespread collapse of the AMO — despite the appealing possibility raised in two recent studies ( [18](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2" \l "bib18" \o "18), [19](http://web.ebscohost.com/ehost/detail?vid=1&hid=14&sid=5e63d5e2-5a5a-4141-a53a-7826e5e7c1bb%40sessionmgr2" \l "bib19" \o "19)) — although it is possible that deep convection in the Labrador Sea will cease. Such an event would have much more minor consequences on the climate downstream over Europe.

## Ice Age - CO2 Key

**CO2 emissions are the only thing preventing the next ice age**

P. C. Tzedakis, et al J. E. T. Channell,D. A. Hodell,H. F. Kleiven & L. C. January 2012 Skinner Determining the natural length of the current interglacial http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo1358.html

Climate modelling studies show that a reduction in boreal summer insolation is the primary trigger for glacial inception, with CO2 playing a secondary role3, 5. Lowering CO2 shifts the inception threshold to higher insolation values1, but modelling experiments indicate that preindustrial concentrations of 280 ppmv would not be sufficiently low to lead to new ice growth given the subdued insolation minimum2, 3, 4. However, the extent to which preindustrial CO2 levels were ‘natural’ has been challenged10, 11 by the suggestion that anthropogenic interference since the mid-Holocene led to increased greenhouse gas (GHG) concentrations, which countered the natural cooling trend and prevented a glacial inception. The overdue glaciation hypothesis has been tested by climate simulations using lower preindustrial GHG concentrations, with contrasting results, ranging from no ice growth5 to a linear increase in ice volume4 to large increases in perennial ice cover6. Empirical evidence from intervals characterized by similar boundary conditions to the current interglacial may also be used to infer the timing of the next ‘natural’ glacial inception, assuming that, for a given insolation and CO2 forcing, ice-volume responses between two periods are also similar. Here, we limit the search for potential Holocene analogues to the past 800 kyr, for which ice-core records of atmospheric GHG concentrations are available12, 13. We then explore approaches to constraining the timing of glacial inception and assess the relevance of this information to the current interglacial.

## Ice Age - Impact Calc

**Ice age makes every impact scenario inevitable**

Stipp (Staff writer for CNN) 04

(David Stipp. Staff writer. “The Pentagon's Weather Nightmare The climate could change radically, and fast. That would be the mother of all national security issues.” February 9. 2004 http://money.cnn.com/magazines/fortune/fortune\_archive/2004/02/09/360120/index.htm)

For planning purposes, it makes sense to focus on a midrange case of abrupt change. A century of cold, dry, windy weather across the Northern Hemisphere that suddenly came on 8,200 years ago fits the bill-its severity fell between that of the Younger Dryas and the Little Ice Age. The event is thought to have been triggered by a conveyor collapse after a time of rising temperatures not unlike today's global warming. Suppose it recurred, beginning in 2010. Here are some of the things that might happen by 2020: At first the changes are easily mistaken for normal weather variation, allowing skeptics to dismiss them as a "blip" of little importance and leaving policymakers and the public paralyzed with uncertainty. But by 2020 there is little doubt that something drastic is happening. The average temperature has fallen by up to five degrees Fahrenheit in some regions of North America and Asia and up to six degrees in parts of Europe. (By comparison, the average temperature over the North Atlantic during the last ice age was ten to 15 degrees lower than it is today.) Massive droughts have begun in key agricultural regions. The average annual rainfall has dropped by nearly 30% in northern Europe, and its climate has become more like Siberia's. Violent storms are increasingly common as the conveyor becomes wobbly on its way to collapse. A particularly severe storm causes the ocean to break through levees in the Netherlands, making coastal cities such as the Hague unlivable. In California the delta island levees in the Sacramento River area are breached, disrupting the aqueduct system transporting water from north to south. Megadroughts afflict the U.S., especially in the southern states, along with winds that are 15% stronger on average than they are now, causing widespread dust storms and soil loss. The U.S. is better positioned to cope than most nations, however, thanks to its diverse growing climates, wealth, technology, and abundant resources. That has a downside, though: It magnifies the haves-vs.-have-nots gap and fosters bellicose finger-pointing at America. Turning inward, the U.S. effectively seeks to build a fortress around itself to preserve resources. Borders are strengthened to hold back starving immigrants from Mexico, South America, and the Caribbean islands, waves of boat people pose especially grim problems. Tension between the U.S. and Mexico rises as the U.S. reneges on a 1944 treaty that guarantees water flow from the Colorado River into Mexico. America is forced to meet its rising energy demand with options that are costly both economically and politically, including nuclear power and onerous Middle Eastern contracts. Yet it survives without catastrophic losses. Europe, hardest hit by its temperature drop, struggles to deal with immigrants from Scandinavia seeking warmer climes to the south. Southern Europe is beleaguered by refugees from hard-hit countries in Africa and elsewhere. But Western Europe's wealth helps buffer it from catastrophe. Australia's size and resources help it cope, as does its location. The conveyor shutdown mainly affects the Northern Hemisphere. Japan has fewer resources but is able to draw on its social cohesion to cope. Its government is able to induce population-wide behavior changes to conserve resources. China's huge population and food demand make it particularly vulnerable. It is hit by increasingly unpredictable monsoon rains, which cause devastating floods in drought-denuded areas. Other parts of Asia and East Africa are similarly stressed. Much of Bangladesh becomes nearly uninhabitable because of a rising sea level, which contaminates inland water supplies. Countries whose diversity already produces conflict, such as India and Indonesia, are hard-pressed to maintain internal order while coping with the unfolding changes. As the decade progresses, pressures to act become irresistible. History shows that whenever humans have faced a choice between starving or raiding, they raid. Imagine Eastern European countries, struggling to feed their populations, invading Russia, which is weakened by a population that is already in decline, for access to its minerals and energy supplies. Or picture Japan eyeing nearby Russian oil and gas reserves to power desalination plants and energy-intensive farming. Envision nuclear-armed Pakistan, India, and China skirmishing at their borders over refugees, access to shared rivers, and arable land. Or Spain and Portugal fighting over fishing rights, fisheries are disrupted around the world as water temperatures change, causing fish to migrate to new habitats. Growing tensions engender novel alliances. Canada joins fortress America in a North American bloc. (Alternatively, Canada may seek to keep its abundant hydropower for itself, straining its ties with the energy-hungry U.S.) North and South Korea align to create a technically savvy, nuclear-armed entity. Europe forms a truly unified bloc to curb its immigration problems and protect against aggressors. Russia, threatened by impoverished neighbors in dire straits, may join the European bloc.) Nuclear arms proliferation is inevitable. Oil supplies are stretched thin as climate cooling drives up demand. Many countries seek to shore up their energy supplies with nuclear energy, accelerating nuclear proliferation. Japan, South Korea, and Germany develop nuclear-weapons capabilities, as do Iran, Egypt, and North Korea. Israel, China, India, and Pakistan also are poised to use the bomb.

## Ice Age - Checks Warming

Melting Icebergs dump iron into the ocean - solves catastrophic effects of warming

Williams 9 — Andrew Williams, writer for clean technical a website dedicated to environmental news, JANUARY 4, 2009, Clean technical, Green Algae Bloom Process Could Stop Global Warming, http://cleantechnica.com/2009/01/04/green-algae-bloom-process-could-stop-global-warming/

The researchers, aboard the Royal Navy’s HMS Endurance, have found that melting icebergs off the coast of Antarctica are releasing millions of tiny particles of iron into the southern Ocean, helping to create huge ‘blooms’ of algae that absorb carbon emissions. The algae then sinks to the icy depths, effectively removing CO2 from the atmosphere for hundreds of years. According to lead researcher, Prof. Rob Raiswell of Leeds University, “The Earth itself seems to want to save us.” Scientists have known for some time that artificially created algal blooms could be used to absorb greenhouse gases, but the technique has been banned for fear of causing unforeseen side effects in fragile ecosystems. However, based on the UK team’s evidence that the process has been occurring naturally for millions of years, and on a wide scale, the UN has given the green light for a ground-breaking experiment later this month. The team will seek to create a massive algae bloom by releasing several tons of iron sulphate into the sea off the coast of the British island of South Georgia. The patch will apparently be large enough to be visible from space. If successful, the technique could be rolled out across vast swathes of the Great Southern Ocean. Scientists calculate that if the whole 20 million square miles was treated, it could remove up to three and a half Gigatons of C02, equivalent to one eighth of all global annual emissions from fossil fuels. It would be a huge irony if melting icebergs, until now a powerful symbol of the damage caused by global warming, reveal a process that may enable scientists to take steps that might drastically reduce, and potentially even halt, the threat of environmental catasrophe

**Increased oceanic iron levels solve CO2 emissions**

Nature12 **—** Quirin Schiermeier, 18 July 2012, Dumping iron at sea does sink carbon, http://www.nature.com/news/dumping-iron-at-sea-does-sink-carbon-1.11028

In the search for methods to limit global warming, it seems that stimulating the growth of algae in the oceans might be an efficient way of removing excess carbon dioxide from the atmosphere after all. Despite other studies suggesting that this approach was ineffective, a recent analysis of an ocean-fertilization experiment eight years ago in the Southern Ocean indicates that encouraging algal blooms to grow can soak up carbon that is then deposited in the deep ocean as the algae die. In February 2004, researchers involved in the European Iron Fertilization Experiment (EIFEX) fertilized 167 square kilometres of the Southern Ocean with several tonnes of iron sulphate. For 37 days, the team on board the German research vessel Polarstern monitored the bloom and demise of single-cell algae (phytoplankton) in the iron-limited but otherwise nutrient-rich ocean region Each atom of added iron pulled at least 13,000 atoms of carbon out of the atmosphere by encouraging algal growth which, through photosynthesis, captures carbon. In a paper in Nature today, the team reports that much of the captured carbon was transported to the deep ocean, where it will remain sequestered for centuries1 — a 'carbon sink'. “At least half of the bloom was exported to depths greater than 1,000 metres,” says Victor Smetacek, a marine biologist at the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany, who led the study. The team used a turbidity meter — a device that measures the degree to which water becomes less transparent owing to the presence of suspended particles — to establish the amount of biomass, such as dead algae, that rained down the water column towards the sea floor. Samples collected outside the experimental area showed substantially less carbon being deposited in the deep ocean. Iron findings The EIFEX results back up a hypothesis by the late oceanographer John Martin, who first reported in 1988 that iron deficiency limits phytoplankton growth in parts of the subarctic Pacific Ocean2. Martin later proposed that vast quantities of iron-rich dust from dry and sparsely vegetated continental regions may have led to enhanced ocean productivity in the past, thus contributing to the drawdown of atmospheric carbon dioxide during glacial climates3 — an idea given more weight by the EIFEX findings. Some advocates of geoengineering think that this cooling mechanism might help to mitigate present-day climate change. However, the idea of deliberately stimulating plankton growth on a large scale is highly controversial. After noting that there were gaps in the scientific knowledge about this approach, the parties to the London Convention — the international treaty governing ocean dumping — agreed in 2007 that ‘commercial’ ocean fertilization is not justified (see 'Convention discourages ocean fertilization'). The finding that ocean fertilization does work, although promising, is not enough to soothe concerns over potentially harmful side effects on ocean chemistry and marine ecosystems, says Smetacek. Some scientists fear that massive ocean fertilization might produce toxic algal blooms or deplete oxygen levels in the middle of the water column. Given the controversy over another similar experiment (see 'Ocean fertilization experiment draws fire'), which critics said should not have been approved in the first place, the Alfred Wegener Institute will not conduct any further artificial ocean-fertilization studies, according to Smetacek. “We just don’t know what might happen to species composition and so forth if you were to continuously add iron to the sea,” says Smetacek. “These issues can only be addressed by more experiments including longer-term studies of natural blooms that occur around some Antarctic islands.” But some experts argue that artificial ocean-fertilization studies should not be abandoned altogether. “We are nowhere near the point of recommending ocean fertilization as a geoengineering tool,” says Ken Buesseler, a geochemist at the Woods Hole Oceanographic Institution in Massachusetts. “But just because we don't know all the answers, we shouldn't say no to further research.”

## Russia Oil - Shell

**Continued global warming is key to melting the Arctic and opening new resources**

Armour et al (Department of Physics, University of Washington) 11

K. C. Armour,1 I. Eisenman,2,3 E. Blanchard‐Wrigglesworth,3 K. E. McCusker,3 and C. M. Bitz3, climate scientists, The reversibility of sea ice loss in a state‐of‐the‐art climate model, http://www.agu.org/journals/gl/gl1116/2011GL048739/2011GL048739.pdf

Rapid Arctic sea ice retreat has fueled speculation about the possibility of threshold (or ‘tipping point’) behavior and irreversible loss of the sea ice cover. We test sea ice reversibility within a state‐of‐the‐art atmosphere– ocean global climate model by increasing atmospheric carbon dioxide until the Arctic Ocean becomes ice‐free throughout the year and subsequently decreasing it until the initial ice cover returns. Evidence for irreversibility in the form of hysteresis outside the envelope of natural variability is explored for the loss of summer and winter ice in both hemispheres. We find no evidence of irreversibility or multiple ice‐cover states over the full range of simulated sea ice conditions between the modern climate and that with an annually ice‐free Arctic Ocean. Summer sea ice area recovers as hemispheric temperature cools along a trajectory that is indistinguishable from the trajectory of summer sea ice loss, while the recovery of winter ice area appears to be slowed due to the long response times of the ocean near the modern winter ice edge. The results are discussed in the context of previous studies that assess the plausibility of sea ice tipping points by other methods. The findings serve as evidence against the existence of threshold behavior in the summer or winter ice cover in either hemisphere.

**Russian oil production has peaked, new arctic fields are key to preventing Russian economic collapse**

Weir (Correspondent for CSM) 08

Fred Weir, May 28, 2008, Has Russian oil output peaked?, http://www.csmonitor.com/World/Asia-South-Central/2008/0528/p01s04-wosc.html

The Kremlin often touts Russia's image as an "energy superpower," but now the country's oil production is declining. Some say Russia may have already reached peak oil output. Underscoring the urgency of the issue, Prime Minister Vladimir Putin's new cabinet made its first order of business on Monday the approval of a package of measures to relieve the oil-production crisis. "It's a good first step," says Natalia Milchakova, an oil and gas analyst for Otkritiye, a Moscow-based brokerage firm. But she adds that "rapidly slowing" oil production, which was growing by more than 10 percent five years ago, isn't "something that can be quickly fixed with political declarations." As the world's second-largest oil exporter, Russia joins a growing number of top oil suppliers wrestling with how to address declining or peaking production. Like Venezuela and Mexico, Russia is heavily dependent on oil, which accounts for more than two-thirds of government revenue and 30 percent of the country's gross domestic product. Now, Moscow is trying to remedy a situation caused in part by outdated technology, heavy taxation of oil profits, and lack of investment in oil infrastructure. The Presidium of the Cabinet, as it is officially known, in its inaugural meeting Monday approved tax holidays of up to 15 years for Russian companies that open new oil fields and proposed raising the threshold at which taxation begins from the current $9 per barrel to $15. Oil companies welcomed the measures, but experts say that after almost two decades of post-Soviet neglect, which have seen little new exploration, it may be too little, too late. After rising steadily for several years to a post-Soviet high of 9.9 million barrels per day (bpd) in October, Russian oil production fell by 0.3 percent in the first four months of this year, while exports fell 3.3 percent - the first Putin-era drop. Russia's proven oil reserves are a state secret, but the Oil & Gas Journal, a US-based industry publication, estimates it has about 60 billion barrels - the world's eighth largest - which would last for 17 years at current production rates. Energy Minister Viktor Khristenko recently admitted the decline, but suggested it might be overcome by fresh discoveries in underexplored eastern Siberia or in new Arctic territories recently claimed by Russia. "The output level we have today is a plateau, or stagnation," he said. But Leonid Fedun, vice president of Russia's largest private oil company LUKoil, went one step further in an interview with the Financial Times last month. "Russian oil production has peaked and may never return to current levels," he said. That poses problems for Russia, which has talked of expanding beyond its main oil market - Europe - to China, Japan, and the US. In 2006, then-President Putin approved construction of an $11 billion pipeline across Siberia to the Pacific Ocean to carry eastward exports. Putin and his successor, Dmitri Medvedev, have insisted Russia can meet demand by increasing output but oil analysts around the globe are pessimistic that oil supplies can meet rising consumption in the coming decade.

**Extinction**

**Filger 9** (Sheldon Filger, columnist, writer for Globaleconomiccrisis.com, 2009, "Russia's Economy Faces a Disastrous Free Fall Contraction," Huffington Post)

In Russia historically, economic health and political stability are intertwined to a degree that is rarely encountered in other major industrialized economies. It was the economic stagnation of the former Soviet Union that led to its political downfall. Similarly, Medvedev and Putin, both intimately acquainted with their nation’s history, are unquestionably alarmed at the prospect that Russia’s economic crisis will endanger the nation’s political stability, achieved at great cost after years of chaos following the demise of the Soviet Union. Already, strikes and protests are occurring among rank and file workers facing unemployment or non-payment of their salaries. Recent polling demonstrates that the once supreme popularity ratings of Putin and Medvedev are eroding rapidly. Beyond the political elites are the financial oligarchs, who have been forced to deleverage, even unloading their yachts and executive jets in a desperate attempt to raise cash. Should the Russian economy deteriorate to the point where economic collapse is not out of the question, the impact will go far beyond the obvious accelerant such an outcome would be for the Global Economic Crisis. There is a geopolitical dimension that is even more relevant then the economic context. Despite its economic vulnerabilities and perceived decline from superpower status, Russia remains one of only two nations on earth with a nuclear arsenal of sufficient scope and capability to destroy the world as we know it. For that reason, it is not only President Medvedev and Prime Minister Putin who will be lying awake at nights over the prospect that a national economic crisis can transform itself into a virulent and destabilizing social and political upheaval. It just may be possible that U.S. President Barack Obama’s national security team has already briefed him about the consequences of a major economic meltdown in Russia for the peace of the world. After all, the most recent national intelligence estimates put out by the U.S. intelligence community have already concluded that the Global Economic Crisis represents the greatest national security threat to the United States, due to its facilitating political instability in the world.

## Russia Oil - Warming k2 Arctic

**Global warming will melt the arctic**

Schneider 04

SCHNEIDER 2004 (Doug, NewsVOA.com, October 22, http://www.voanews.com/english/archive/2004-10/2004-10-22-voa61.cfm?CFID=12777931&CFTOKEN=29167729)

More than 250 scientists from around the Arctic spent four years compiling the report for the Arctic Council, an organization of government officials, scientists and indigenous people from Canada, Denmark, Finland, Sweden, Iceland, Norway, Russia and the United States. The report is expected to conclude that the Arctic is undergoing dramatic environmental change as a result of a climate that has warmed an average of five degrees in recent decades. Among the changes are disappearing sea ice, melting permafrost and glaciers, and the colonization of the tundra by trees and shrubs. The report also draws on five separate computer models to predict the Arctic's future climate. Weller says that while each model offers somewhat different scenarios, they all point to an Arctic with much less ice and snow in coming decades.

## Russia Oil - Arctic k2 Oil

**Melting Arctic will allow Russia access to new oil fields**

CSM 07 — Fred Weir, writer for the Christian Science monitor, July 31, 2007, As icecaps melt, Russia races for Arctic's resources, http://www.csmonitor.com/2007/0731/p01s01-woeu.html

As milder temperatures make exploration of the Arctic sea floor possible for the first time, Russia's biggest-ever research expedition to the region is steaming toward the immense scientific prestige of being the first to explore the seabed of the world's crown. In the next few days, two manned minisubs will be launched through a hole blasted in the polar ice to scour the ocean floor nearly three miles below. They will gather rock samples and plant a titanium Russian flag to symbolize Moscow's claim over 460,000 square miles of hitherto international territory – an area bigger than France and Germany combined in a region estimated to contain a quarter of the world's undiscovered oil and gas reserves. The issue of who owns the North Pole, now administered by the International Seabed Authority, has long been regarded as academic since the entire region is locked in year-round impenetrable ice. But with global warming thinning the icecaps, the question has vaulted to the front burner. "The No. 1 reason for the urgency about this is global warming, which makes it likely that a very large part of the Arctic will become open to economic exploitation in coming decades," says Alexei Maleshenko, an expert with the Carnegie Center in Moscow. "The race for the North Pole is becoming very exciting." The US Geological Survey estimates that 25 percent of the world's undiscovered oil and gas reserves lie beneath the Arctic Ocean. Experts at the Russian Institute of Oceanology calculate that the saddle-shaped territory that Russia is planning to claim may contain up to 10 billion tons of petroleum, plus other mineral resources and vast, untapped fishing stocks. Russia stakes its claim The 1982 Law of the Sea Convention establishes a 12-mile offshore territorial limit for each country, plus a 200-mile "economic zone" in which it has exclusive rights. But the law leaves open the possibility that the economic zone can be extended if it can be proved that the seafloor is actually an extension of a country's geological territory. In 2001, Russia submitted documents to the United Nations (UN) claiming that the Lomonosov Ridge, which underlies the Arctic Ocean, is actually an extension of the Siberian continental shelf and should therefore be treated as Russian territory. The case was rejected. But a group of Russian scientists returned from a six-week Arctic mission in June insisting that they had uncovered solid evidence to support the Russian claim. That paved the way for the current expedition, which includes the giant nuclear-powered icebreaker Rossiya, the huge research ship Akademik Fyodorov, two Mir deep-sea submersibles – previously used to explore the wreck of the Titanic – and about 130 scientists. The subs were tested Sunday, near Franz-Joseph Land in the frozen Barents Sea, and found to be working well. "It was the first-ever dive of manned vehicles under the Arctic ice," Anatoly Sagelevich, one of the pilots, told the official ITAR-Tass agency. "We now know that we can perform this task." The upcoming dive beneath the North Pole will be far more difficult, and involve collecting evidence about the age, sediment thickness, and types of rock, as well as other data – all of which will be presented to the United Nations Commission on the Limits of the Continental Shelf (a body of scientists chosen by parties to the Law of the Sea Convention) to support Russia's claim to the territory.

**Specifically melting now is aiding Russia**

The Economist, 2012,

The Economist, Jun 16th 2012 “The melting north”, (http://www.economist.com/node/21556798)

Yet the melting Arctic will have geostrategic consequences beyond helping a bunch of resource-fattened countries to get fatter. An obvious one is the potentially disruptive effect of new trade routes. Sailing along the coast of Siberia by the north-east passage, or Northern Sea Route (NSR), as Russians and mariners call it, cuts the distance between western Europe and east Asia by roughly a third. The passage is now open for four or five months a year and is getting more traffic. In 2010 only four ships used the NSR; last year 34 did, in both directions, including tankers, refrigerated vessels carrying fish and even a cruise liner.¶ Asia’s big exporters, China, Japan and South Korea, are already investing in ice-capable vessels, or planning to do so. For Russia, which has big plans to develop the sea lane with trans-shipment hubs and other infrastructure, this is a double boon. It will help it get Arctic resources to market faster and also, as the NSR becomes increasingly viable, diversify its hydrocarbon-addicted economy.

## Russia Oil - AT: SQ Solves

Russian oil deposits can’t keep up with demand. Need to spread to the Arctic

Konończuk (head of the department of eastern European studies and a major researcher in eastern European politics) 12

Wojciech Konończuk, April 2012 , RUSSIA’S BEST ALLY THE SITUATION OF THE RUSSIAN OIL SECTOR AND FORECASTS FOR ITS FUTURE, http://www.osw.waw.pl/sites/default/files/PRACE\_39\_en.pdf

As production levels in the traditional oil fields are regularly falling, the development of new regions is a problem. Eastern Siberia with the northern part of Krasnoyarsk Krai and the Far East (and the Arctic shelf in the longer term) stand the greatest chance of becoming major production sources. Production has already started in some of these regions, although its level is still low. An increase in output is also expected on the Caspian and the Black Sea continental shelves, which will however have less impact on the Russian oil sector. What these regions have in common is that they all have been explored geologically to only a small extent so far, which makes it difficult to assess the volume of the oil deposits there. Furthermore, investments in geological and exploration research are at low levels, the discovered fields are at the initial stage of development and most of them are classified as medium in terms of confirmed deposits. What makes Eastern Siberia, the Far East and the Arctic shelf different from the present chief production centres are the much harsher climate conditions; this significantly raises the costs of investment and requires the application of new, often still undeveloped technologies (as in the case of the Arctic shelf). Another crucial aspect regarding the new fields is the feasibility of production, while in 80% of them production is unprofitable, given the present fiscal situation.

## AT: Ice Age

No ice age for another 130,000 years
Brock 11 (Chris Brock, TIMES STAFF WRITER, SATURDAY, MARCH 19, 2011, http://www.watertowndailytimes.com/article/20110319/CURR04/303199998/?loc=interstitialskip)

PAUL SMITHS — Chalk one up for the humans: we staved off an ice age.¶ That's one conclusion ecologist and paleoclimatalogist Curt Stager makes in his book "Deep Future: The Next 100,000 Years of Life on Earth," released Tuesday by St. Martin's Press.¶ And we have it in our power to prevent another ice age, which, compared to global warming, would be much worse for humans. "An ice age is to global warming as thermonuclear war is to a bar brawl," Mr. Stager writes in "Deep Future."¶ Most of the scholarly studies about humans and global warming deal with the issue within the next century or so. But Mr. Stager looks ahead dozens of centuries.¶ Mr. Stager takes a deep look at climate and its long-term patterns.¶ "I try to make the point that we have a whole lot of power as to what the future holds," said Mr. Stager, a professor at Paul Smith's College and a research associate at the University of Maine's Climate Change Institute.¶ In "Deep Future," he looks at the bright and dark sides of what is at stake on Earth thousands of years from now. The book has received a starred review in the journal Kirkus Reviews, which called it "essential reading."¶ One of the bottom lines in "Deep Future" is that each generation should realize what we're doing to Earth and pay attention to the cumulative effect.¶ "Along with power comes responsibility," Mr. Stager said in a phone interview from Paul Smith's campus, located near Saranac Lake. "Without sounding like a preacher and 'Thou shalt do this,' I think it's important for people to realize the consequences of our actions are going to last a lot longer than folks had anticipated."¶ He writes in "Deep Future": "Our very existence at this pivotal moment in history gives us the amazing ability — some might say the honor — to set the world's thermostat for hundreds of thousands of years."¶ Mr. Stager writes that most climate models predict another ice age at the year 50,000. Humans, he said, have stopped that "in its tracks" because of carbon dioxide emissions. The next ice age will arrive around the year 130,000. But not if "we burn through all our remaining coal reserves during the next century or so," Mr. Stager writes. If we do that, he said, the next ice age won't hit for the next half million years.

**Your evidence is wrong – cooling is a factor of warming
SAMARDŽIĆ 10** — (LJILJANA SAMARDŽIĆ, Reporter on interntational news, <http://www.wavemagazine.net/arhiva/40/topic/false-ice-age.htm>)

"Despite cool temperatures over most of the Arctic Ocean in January, Arctic sea ice extent continued to track below normal." This means that the alleged states about mini ice age are far from truth¶ By LJILJANA SAMARDŽIĆ (ljiljana.samardzic@wavemagazine.net)¶ from Sombor, SERBIA¶ During UN's World Climate Conference in 2009 Mr. Mojib Latif, a climate expert at the Leibniz Institute at Kiel University in Germany, held a speech about climate predictions, which were concluded from his research. However, New Scientist, along with few others medias, reported that Mr. Latif research shows that we are entering new little ice age, which is supposed to last for next 20 or 30 years. With reports, speeches, surveys available online even laics could see that words of Mr. Latif were misinterpreted. After this misquoting, he gave a statement in which he refutes his alleged conclusions and sayings.¶ Next decade turned into several decades¶ The confusion was about a final line of the abstract: "Our results suggest that global surface temperature may not increase over the next decade, as natural climate variations in the North Atlantic and tropical Pacific temporarily offset the projected anthropogenic warming."¶ First of all, the scientist said that this "may" happen, which means that this climate phenomenon is not something that will surely happen. There is only a possibility and lots of factors might influence on the final result. Secondly, the author said "over the next decade" and that, somehow, turn into "decade or two" and even "several decades".¶ Besides, Mr. Latif said that "we don't trust our forecast beyond 2015" which means that their model is not precise when it comes to one specific year.¶ Global warming on hold¶ The National Snow and Ice Data Center reported that "sea ice extent increased at a fairly steady rate in the early part of the month and then slowed towards the end of January. A brief slowdown in ice growth is not unusual during winter." In comparison to January of few past years "ice extent averaged for January 2010 was the fourth lowest for the month since the beginning of satellite records".¶ It is also concluded by analyzing data from last three decades that "the summer Arctic sea ice melt season now lasts nearly a month longer than it did in the 1980s. A later start of freeze-up and an earlier start to the melt season both contribute to the change." Those statements refute the headlines that brought confusion among settlers of the Earth which tend to make us believe that global warming will be shortly postponed. According to Mr. Latif, the warming had been only slowed down and acceleration might happen again in period between 2015 and 2020:¶ "We did only forecasts for the time until 2015. However, if we look further, then we have some indications that there are after, say after 2015 or 2020, you know, global warming will accelerate again."¶ So, the global warming is not postponed, stopped or anything alike. Due to natural fluctuations it happens only to be on hold for the "another 10 years or so".

**The earth is warming – proves ice age is false
LDEO 10** (Lamont Doherty Earth Observatory, Study Adds New Clue to How Last Ice Age Ended, September 8, 2010, <http://www.ldeo.columbia.edu/news-events/study-adds-new-clue-how-last-ice-age-ended>)

As the last ice age was ending, about 13,000 years ago, a final blast of cold hit Europe, and for a thousand years or more, it felt like the ice age had returned. But oddly, despite bitter cold winters in the north, Antarctica was heating up. For the two decades since ice core records revealed that Europe was cooling at the same time Antarctica was warming over this thousand-year period, scientists have looked for an explanation.¶ A new study in Nature brings them a step closer by establishing that New Zealand was also warming, indicating that the deep freeze up north, called the Younger Dryas for the white flower that grows near glaciers, bypassed much of the southern hemisphere.¶ “Glaciers in New Zealand receded dramatically at this time, suggesting that much of the southern hemisphere was warming with Antarctica,” said study lead author, Michael Kaplan, a geochemist at Columbia University’s Lamont-Doherty Earth Observatory. “Knowing that the Younger Dryas cooling in the northern hemisphere was not a global event brings us closer to understanding how Earth finally came out of the ice age.”¶ Ice core records show that warming of the southern hemisphere, starting 13,000 years ago, coincided with rising levels of the heat-trapping gas, carbon dioxide. The study in Nature is the first to link this spike in CO2 to the impressive shrinking of glaciers in New Zealand. The scientists estimate that glaciers lost more than half of their extent over a thousand years, and that their creep to higher elevations was a response to the local climate warming as much as 1 degree C.¶ Samples of glacial debris, like this boulder, lets researchers retrace the path of ancient glaciers. Credit: Mike Kaplan. (Alice Doughty, University of Maine pictured)¶ .¶ To reconstruct New Zealand’s past climate, the study’s authors tracked one glacier’s retreat on South Island’s Irishman Basin. When glaciers advance, they drag mounds of rock and dirt with them. When they retreat, cosmic rays bombard these newly exposed ridges of rock and dirt, called moraines. By crushing this material and measuring the build-up of the cosmogenic isotope beryllium 10, scientists can pinpoint when the glacier receded. The beryllium-10 method allowed the researchers to track the glacier’s retreat upslope through time and indirectly calculate how much the climate warmed.¶ Rock samples were flown out of Irishman Basin by helicopter and shipped¶ to the U.S. for analysis. Credit: Mike Kaplan.¶ The overall trigger for the end of the last ice age came as Earth’s orientation toward the sun shifted, about 20,000 years ago, melting the northern hemisphere’s large ice sheets. As fresh melt water flooded the North Atlantic Ocean, the Gulf Stream weakened, driving the north back into the ice age. During this time, temperatures in Greenland dropped by about 15 degrees C. For years, scientists have tried to explain how the so-called Younger Dryas cooling fit with the simultaneous warming of Antarctica that eventually spread across the globe.¶ The Nature paper discusses the two dominant explanations without taking sides. In one, the weakening of the Gulf Stream reconfigures the planet’s wind belts, pushing warm air and seawater south, and pulling carbon dioxide from the deep ocean into the air, causing further warming. In the other, the weakened Gulf Stream triggers a global change in ocean currents, allowing warm water to pool in the south, heating up the climate.¶ Bob Anderson, a geochemist at Lamont-Doherty who argues the winds played the dominant role, says the Nature paper adds another piece to the puzzle. “This is one of the most pressing problems in paleoclimatology because it tells us about the fundamental processes linking climate changes in the northern and southern hemispheres,” he said. “Understanding how regional changes influence global climate will allow scientists to more accurately predict regional variations in rain and snowfall.”¶ Other researchers involved in the study: Joerg Schaefer and Roseanne Schwartz, also of Lamont-Doherty; George Denton and Aaron Putnam, University of Maine; David Barrell, GNS Science, New Zealand; Trevor Chinn, Alpine and Polar Processes Consultancy, New Zealand; Bjørn Andersen, University of Oslo; Robert Finkel, University of California, Berkeley; Alice Doughty, Victoria University of Wellington."

**No ice age and warming outweighs**

**Chameides 8** — Professor of Environment @ Duke (Bill, PhD, Yale University, “Pulse of the Planet: A New Ice Age IS Coming ... but Don't Hold Your Breath,” 11-17-2008, http://www.nicholas.duke.edu/thegreengrok/iceage-nature)

Skeptics have been arguing that we should forget about global warming -- a new ice age is imminent. Maybe, some say, it's already started. In fact, a new study does predict the coming of an ice age, one promising to be more permanent than others. Is it imminent? Depends on how you characterize 10,000 years. It may surprise you to know that in our current climate, ice ages are more the norm than not. Over the past three million years, covering the end of the Pliocene and the present Pleistocene epoch, the Earth’s climate has oscillated between cold times (called ice ages or glaciations) and warmer times, interglaciations. In the recent past (the last one million years or so) the ice ages have lasted for about 100,000 years, and the warmer periods tens of thousands of years. The last ice age ended about 12,000 years ago. The questions most relevant to us are: when will the next ice age occur and should we be concerned about a global cold wave or the current global warming? The answers lie in the mechanism behind the climate swings. The oscillations between ice ages and warm periods can be qualitatively explained by the Milankovitch theory (for more details see here). The theory's basic tenet is that the ice age–interglacial swings are triggered by changes in the Earth’s orbit about the sun (eccentricity), rotational changes of the Earth on its axis (precession), and changes in the tilt of the axis (obliquity, which is what causes the seasons). The orbital changes affect how much sunlight reaches the Earth at different latitudes. These changes in solar radiation are then amplified by feedbacks involving carbon dioxide and other greenhouse gases, the ice albedo, and the large temperature swings inferred between ice ages and interglacials. One of the major puzzles in the Milankovitch theory is the so-called Mid-Pleistocene transition. Before about one million years ago, the glacial periods lasted about 40,000 years (which corresponds to the frequency of obliquity changes). Then the glaciations transitioned to a 100,000-year cycle (which corresponds to the frequency of changes in eccentricity). Why this transition? Scientists continue to discuss the cause. Now Tom Crowley of the University of Edinburgh (previously at Duke University) and William Hyde of the University of Toronto have added a new wrinkle to the debate in a paper just published in Nature. Using a simplified, coupled climate-ice sheet model, they conclude that the shift in the ice age cycling kicked off a slow transition to a new climate regime, one that will be characterized by a permanent ice sheet in the northern mid-latitudes. They argue that this transition is being driven by snow-ice albedo effects. A permanent ice sheet in the mid-latitudes of the North Hemisphere sounds like bad news. But panic is a little premature. Tom Crowley states that "our model predicts a rapid transition [to an ice age] beginning in the 10,000-100,000 years. But the timing of this transition is surely model dependent -- it could easily be a quarter of million years or so -- still short from the context of geology but almost infinite from the viewpoint of society. Our results in no way can be interpreted as justification for continued use of fossil fuels, as that problem is near term and very significant."

# CO2 Agriculture

## Warming Bad - Empirics

**Warming kills argiculture – 4 reasons**

Hatfield 9/15/11 (Jeremy Hatfield, PHD, Laboratory Director and Supervisory Plant Physiologist @ Agricultural Research Service, <http://www.ars.usda.gov/pandp/people/people.htm?personid=2378>)

Climate change over the next 30 to 50 years will place new stresses on agricultural production because of the increasing temperatures, increased variability in precipitation, enhanced potential for more extreme storms, and more differences within the growing season. There have been several assessments of the potential scenarios for climate change and Meehl et al. (2007) summarized that on a global basis “it is very likely that heat waves will be more intense, more frequent and longer lasting in a future warmer climate. Cold episodes are projected to decrease significantly in a future warmer climate. Almost everywhere, daily minimum temperatures are projected to increase faster than daily maximum temperatures, leading to a decrease in diurnal temperature range. Decreases in frost days are projected to occur almost everywhere in the middle and high latitudes, with a comparable increase in growing season length.” In terms of precipitation, they stated that “For a future warmer climate, the current generation of models indicates that precipitation generally increases in the areas of regional tropical precipitation maxima (such as the monsoon regimes) and over the tropical Pacific in particular, with general decreases in the subtropics, and increases at high latitudes as a consequence of a general intensification of the global hydrological cycle. Globally averaged mean water vapor, evaporation and precipitation are projected to increase” (Meehl et al., 2007). These summaries point out the expected global change in temperature and precipitation. Across North America there are expected changes in climate mirroring the worldwide changes. These have been summarized recently by Karl et al. (2009) where temperature and precipitation patterns across the United States for the next 50 years show a warming trend for most of the United States of 1.5 to 2.0°C and a slight increase in precipitation over most of the United States. Their projections of an increase in the number of days which the temperature will be higher than the climatic normals by 5°C (heat-waves) will impact agricultural systems. They also project an increase in warm nights, defined as occurring when the minimum temperature is above the 90th percentile of the climatological distribution for the day (Tebaldi et al., 2006; Karl et al., 2009). Coupled with these changes is the decrease in the number of frost days by 10% in the eastern half of the U.S. and an increase in the length of the growing season by over 10 days. Karl et al. (2009) showed that precipitation events would change in frequency and intensity with a projected increase in spring precipitation, particularly in the Northeast and Midwest of the United States, and a decline in the Southwestern U.S.. The increase in extreme temperature events, warm nights, and more variable precipitation will impact agriculture and agricultural production. A trend for warmer winters will affect perennial crops and weeds, and also expand the potential habitable range of some insect and disease pests. Although there is uncertainty about the absolute magnitude of the changes over the next 50 years, there is general agreement that CO2 levels will increase to near 450 μmol mol-1 (ppm), temperatures will increase by 0.8 to 1.0°C, and precipitation will become more variable as defined in the IPCC AR4 analysis (IPCC, 2007). Changes in temperature have caused longer growing seasons and directly impacted phenological phases (Schwartz et al., 2006; Wolfe et al., 2005, Xiao et al., 2008; Karl et al., 2009). There are changes occurring in climate and these will directly and indirectly affect plant growth and ultimately biofuel production. In this paper we summarize some of the potential scenarios in climate change and relate these to plant production in order to demonstrate the impact of climate change on biofuel production.

**Warming hurts plants – new long term study proves**

Science Daily 12 (4/9/12, “Climate Change Helps, Then Quickly Stunts Plant Growth, Decade-Long Study Shows” Science Daily, www.sciencedaily.com/releases/2012/04/120409103253.htm)

Global warming may initially make the grass greener, but not for long, according to new research conducted at Northern Arizona University. The study, published this week in Nature Climate Change, shows that plants may thrive in the early stages of a warming environment but begin to deteriorate quickly. n"We were really surprised by the pattern, where the initial boost in growth just went away," said Zhuoting Wu, NAU doctoral graduate in biology. "As the ecosystems adjust, the responses changed." Researchers subjected four grassland ecosystems to simulated climate change during the decade-long study. Plants grew more the first year in the global warming treatment, but this effect progressively diminished over the next nine years, and finally disappeared. The research reports the long-term effects of global warming on plant growth, the plant species that make up the community, and the changes in how plants use or retain essential resources like nitrogen. The team transplanted four grassland ecosystems from higher to lower elevation to simulate a future warmer environment, and coupled the warming with the range of predicted changes in precipitation -- more, the same, or less. The grasslands studied were typical of those found in northern Arizona along elevation gradients from the San Francisco Peaks down to the great basin desert. The researchers found that long-term warming resulted in loss of native species and encroachment of species typical of warmer environments, pushing the plant community toward less productive species. The warmed grasslands also cycled nitrogen more rapidly, an effect that should make more nitrogen available to plants, helping them grow more. But instead much of the nitrogen was lost, converted to nitrogen gases lost to the atmosphere or leached out with rainfall washing through the soil. Bruce Hungate, senior author of the study and NAU Biological Sciences professor, said the research findings challenge the expectation that warming will increase nitrogen availability and cause a sustained increase in plant productivity. "Faster nitrogen turnover stimulated nitrogen losses, likely reducing the effect of warming on plant growth," Hungate said. "More generally, changes in species, changes in element cycles -- these really make a difference. It's classic systems ecology: the initial responses elicit knock-on effects which here came back to bite the plants. These ecosystem feedbacks are critical. You just can't figure this out with plants grown in a greenhouse. " The findings caution against extrapolating from short-term experiments, or experiments in a greenhouse, where experimenters cannot measure the feedbacks from changes in the plant community and from nutrient cycles. The research will continue at least five more years with current funding from the National Science Foundation and, Hungate said, hopefully for another five years after that. "The long-term perspective is key. We were surprised, and I'm guessing there are more surprises in store." Additional coauthors include George Koch, NAU professor of Biological Sciences, and Paul Dijkstra, assistant research professor of Biological Sciences.

## Warming Bad - Nutrition

**Higher CO2 levels decreases the nutritional value of plants**

Khan 10 (Amina Khan,5/15/10, “Global warming bad for plant life” Calgary Herald, ProQuest)

Some biologists had theorized earlier that rising greenhouse gas levels would encourage plant growth over the long term because of the increased amount of carbon dioxide in the atmosphere. Plant physiologists from the University of California, Davis, may have further dashed those hopes. They've shown that too much carbon dioxide, which plants need for energy, actually can inhibit a plant's ability to assimilate nitrates -- nitrogen-based nutrients pulled from the soil that plants use to make enzymes and other essential proteins. Without those essential proteins, plant health -- and food quality -- may suffer, the researchers say in a study published online Thursday in the journal Science. Scientists had previously observed that a rise in carbon dioxide levels -- 39 per cent globally since 1800, according to the Intergovernmental Panel on Climate Change -- would boost photosynthesis, the sunlight-fuelled process by which plants make sugar. But previous studies showed that after an initial spike in sugar-making activity, photosynthesis appeared to level off, even if the carbon dioxide rate remained high. "Here we have this quandary where we thought rising carbon dioxide levels might actually have some benefit, but it proves to be wrong. ... Over a period of time, be it weeks or years, that stimulation disappears," said lead author Arnold Bloom, a professor in the department of plant sciences at UC Davis. Other studies showed that after plants were exposed to excess carbon dioxide, their protein content also dropped. In a series of five experiments, Bloom and his colleagues found an explanation. The team exposed plants to high carbon dioxide (or low oxygen), fertilized them with nitrates and tracked how much nitrogen they successfully incorporated into their systems. In each case, the researchers found that the more carbon dioxide exposure, the less plants were able to assimilate nitrogen. Without enough nitrogen, the plants could not make as many proteins, including those enzymes used in photosynthesis -- and thus, would be unable to take advantage of all that extra carbon dioxide in the air anyway. The findings have significant implications for agriculture, biologists said. They suggest that, **as global warming continues and carbon dioxide levels rise, food may become poorer in quality and less nutritious**, and farmers may have to worry about lower-quality crop yields that could perhaps be more prone to pest infestations (as plant eaters may have to eat more to get the same nutritional value as before).

## Warming Bad - Pests

**Plant pests and diseases increase with warming**

Roos et al. (Jonas Roos1, Richard Hopkins2, Anders Kvarnheden1 and Christina Dixelius1,1Department of Plant Biology and Forest Genetics, Uppsala BioCenter, 2Department of Ecology, Agricultural Entomology Division) 2011 (Jonas, “The impact of global warming on plant diseases and insect vectors in Sweden,” European Journal of Plant Pathology. Volume: 129 Number: 1, <http://dx.doi.org/10.1007/s10658-010-9692-z>, page 5)

It has been put forward that diseases and pests will be more favoured than crops due to changed environmental conditions and prolonged growing seasons in Sweden and Finland (Fågelfors et al. 2009; Peltonen-Sainio et al. 2009). Plant diseases and pests that are expected to increase in their importance are summarised in table 1. However, there are uncertainties in this prediction and several unexpected problems may occur. Also, whether new resistance breeding efforts will be successful is unclear. A milder climate will in general favour insects and thereby also a range of virus diseases. Various rust diseases (brown, yellow) on wheat and barley are expected to increase due to the extended growing seasons (SJV 2007) and more aggressive strains might be introduced, e.g. stem rust on wheat (Chakraborty et al. 2010). Willows grown for biofuel are also expected to face increased leaf rust (*Melampsora*) problems (Karnosky et al. 2002; Rönnberg-Wästljung et al. 2008). Not all plant diseases are expected to cause significant damages. For example, scald (*Rhynchosporium secalis*), powdery mildew (caused by different fungi within the Erysiphales) and Septoria leaf blotch (*Mycosphaerella graminicola*) are predicted to decrease in importance in areas with dry summers (SJV 2007). However, the future impact of leaf blotch diseases is difficult to foresee but it may become important in northern areas concurrently with the moving limit of cultivation and increase of humidity. Similarly, snow mould fungi and other pathogens causing over wintering diseases will decrease in importance due to milder winters and less snow cover (SJV 2007).

## Warming Bad - Viruses

**Warming causes aphid and plant virus populations to explode**

Roos et al. (Jonas Roos1, Richard Hopkins2, Anders Kvarnheden1 and Christina Dixelius1,1Department of Plant Biology and Forest Genetics, Uppsala BioCenter, 2Department of Ecology, Agricultural Entomology Division) 2011 (Jonas, “The impact of global warming on plant diseases and insect vectors in Sweden,” European Journal of Plant Pathology. Volume: 129 Number: 1, <http://dx.doi.org/10.1007/s10658-010-9692-z>, page 7) //CL

There are two distinct mechanisms by which climate change can impact the relationship between pests and crop plants. Firstly, changes in climate have a direct impact on the biology of insects, including vectors, leading to differences in their survival, reproduction and spread. Secondly, there are the likely changes in agricultural practice that will take place as a result of climate change, and the influence of these changes on the availability of host plants for the pest species; e.g. the introduction of new crop species and plant genotypes, and changes in husbandry practice. Insects cause damage and crop loss in a range of ways, and are mostly associated with the direct impact of their feeding in the form of yield loss and fall in harvest quality due to cosmetic damage. However, sucking insects, such as aphids, are also associated with the transmission of viruses, which can lead to major economic crop losses. The insect transmission of plant viruses can be classified as persistent, semi-persistent or non-persistent. Persistent transmission requires sustained feeding by the insect, while non-persistent transmission is dependent on a more superficial relationship between the insect and the plant. Amongst the insects that are commonly associated with virus transmission, aphids are of particular interest in the Nordic region for a number of reasons. Aphids generally have a low developmental temperature threshold and a short generation time, so that when they continuously reproduce in a parthenogenetic manner they achieve 18 generations a year in British conditions (Harrington 1994; Harrington 2007). Yamamura and Kiritani (1998) suggested that aphids are amongst the insects best adapted to take advantage of a warming climate, and could go through an extra five generations a year following a warming of 2°C. Others have suggested that besides increases in CO2 concentration, differences in soil nitrogen content and population density also play a part for aphid abundance (Newman et al. 2003), but nevertheless they are expected to increase in importance as pests in Sweden (Fågelfors et al. 2009). Aphids show a considerable variation in their life-cycle traits, and even within species variation can be very high. Some species, termed holocyclic, respond to the oncoming winter with a sexual phase, often placing eggs on woody plants. Anholocyclic aphids on the other hand, do not go through the sexual phase and continue with parthenogenetic and viviparous reproduction throughout the year. Some species are a mix of holocyclic and anholocyclic clones. Within a species, the proportion of individuals that are holocyclic tends to be greater in colder regions, as the eggs resulting from sexual reproduction are very much more cold-hardy than the active, viviparous forms which persist year round in anholocyclic clones. Research from Poland suggests that there has been a radical reduction in the proportion of holocyclic clones of some aphid species in recent years (Ruszkowska et al. 2010). If this trend is reflected in Sweden, then aphids may soon be reproducing asexually all year round. This biological change may take place simultaneously with man-mediated changes in the availability of host plants. Autumn sowing for example will become more common, and autumn sown cereals have doubled in acreage in Sweden from 1981 to 2009 (Svensson 2010). This leads to the risk of a so-called “green bridge”, when winter crops may emerge sufficiently early to receive insects migrating from maturing crops, which can be especially important for vectors such as aphids and the transmission of virus.

## Warming Bad - Winter Crops

**Increased viruses due to warming will devastate winter crops**

Roos et al. (Jonas Roos1, Richard Hopkins2, Anders Kvarnheden1 and Christina Dixelius1,1Department of Plant Biology and Forest Genetics, Uppsala BioCenter, 2Department of Ecology, Agricultural Entomology Division) 2011 (Jonas, “The impact of global warming on plant diseases and insect vectors in Sweden,” European Journal of Plant Pathology. Volume: 129 Number: 1, <http://dx.doi.org/10.1007/s10658-010-9692-z>, pages 7-8) //CL

Warmer autumns and winters will increase the risk for insect transmission of viruses into winter crops, such as winter wheat, winter barley and winter oilseed rape. They are now sown when the number of active insect vectors has decreased significantly. Wheat dwarf virus (WDV) is transmitted in a persistent manner by the leafhopper Psammotettix alienus. Already at the beginning of the last century (1912, 1915 and 1918), a disease presumed to be caused by WDV severely affected wheat in central Sweden (Lindsten & Lindsten 1999). It has since then periodically damaged winter wheat in the central parts of Sweden. The periodic re-appearance of the disease has been associated with changes in agricultural practices (Lindsten & Lindsten 1999; Lindblad & Waern 2002). The host range of WDV includes many common grasses, and a recent study has shown that grasses growing in vicinity to WDV-affected wheat fields are infected (Ramsell et al. 2008). These grasses may act as a long-term reservoir for the virus. The leafhoppers acquire WDV from infected volunteer plants or grasses and then transmit the virus into winter wheat at the beginning of the autumn. They overwinter as nymphs and in spring, wingless nymphs transmit WDV from the infected wheat plants in the field (Lindblad & Sigvald 2004). A study in Sweden showed that the catches in autumn of adult P. alienus in fields of winter wheat increased with higher temperatures. During weeks with an average maximum temperature below 10°C only few leafhoppers were caught in yellow water traps, but during weeks above 10°C, the numbers increased with temperature, with high insect numbers noted above 15°C (Lindblad & Arenö 2002). When the crop is not infected in the autumn, the damage from WDV will be very limited. Wheat shows mature plant resistance against WDV with resistance becoming evident at growth stage DC31, when the first node is detectable (Lindblad and Sigvald 2004). Therefore, when the winged adult form of P. alienus is ready to transmit WDV between wheat fields, the wheat has already reached the resistant stage. In continental and southern Europe, winter barley is affected by the barley strain of WDV. This strain is distinct from the wheat strain infecting wheat in Sweden and other parts of Europe and Asia (Ramsell et al. 2009). There is now a risk that the barley strain of WDV may appear also in Sweden. Similar problems with autumn infection of winter crops are expected with Barley yellow dwarf virus- PAV (BYDV-PAV) and BYDV-MAV, which are persistently transmitted by different aphid species. With increased temperatures in temperate regions, disease epidemics caused by aphid- borne viruses are likely to be more severe (Jones 2009). In Germany, a clear relation was recently found between the number of infection days in autumn and BYDV-attack in winter barley fields (Habekuß et al. 2009).

## Warming Bad - Yields

**Warming cuts into crop yields – causes price spikes**

Gillis (Environmental specialist staff writer for the New York Times) 2011 (Justin, “Global Warming Reduces Expected Yields of Harvests in Some Countries, Study Says,” May 5, 2011, <http://www.nytimes.com/2011/05/06/science/earth/06warming.html>) //CL

Global warming is already cutting substantially into potential crop yields in some countries — to such an extent that it may be a factor in the food price increases that have caused worldwide stress in recent years, researchers suggest in a new study. Wheat yields in recent years were down by more than 10 percent in Russia and by a few percentage points each in India, France and China compared with what they probably would have been without rising temperatures, according to the study. Corn yields were off a few percentage points in China, Brazil and France from what would have been expected, said the researchers, whose findings were published in Friday’s issue of the journal Science.

**Warming kills crops & leads to price hikes – 60 billion dollars of losses**

Gillis (Environmental specialist staff writer for the New York Times) 2011 (Justin, “Global Warming Reduces Expected Yields of Harvests in Some Countries, Study Says,” May 5, 2011, <http://www.nytimes.com/2011/05/06/science/earth/06warming.html>) //CL

But the authors of the study — David Lobell and Justin Costa-Roberts of Stanford University, and Wolfram Schlenker of Columbia University — pointed out that temperature increases were expected to accelerate in coming decades, making it likely that the challenges to food production will grow in an era when demand is expected to rise sharply. Over the period covered by the study, 1980 to 2008, temperatures increased briskly in many of the world’s important agricultural regions. A notable exception was the United States: for reasons climate scientists do not fully understand, temperatures in the Midwestern corn and soybean belt during the summer crop-growing season have not increased in recent decades. “One way to think of it is that we got a pass on the first round of global warming,” Dr. Lobell said. However, the study found that in virtually all of Europe, large parts of Asia and some parts of Africa and South America, temperatures during the growing season have warmed by an average of several degrees since 1980, increasing the likelihood of extremely hot summer days. The study also looked at rainfall, but changes were relatively minor compared with the temperature increases. Plants are known to be sensitive to high temperatures, especially if the hot days occur when they are flowering. “In many of these countries, a typical year now is like a very warm year back in 1980,” Dr. Lobell said. Wheat, rice, corn and soybeans account for the majority of calories consumed by the human race, either directly or as meat from animals raised on grains. Because demand for these grains is inflexible and rising, the losses from climate change probably accounted for price increases of about 6 percent in the four major commodities, the study’s authors found. At today’s grain prices, that calculation implies that climate change is costing consumers, food companies and livestock producers about $60 billion a year. “We aren’t talking about the sky falling,” Dr. Lobell said. “But we are talking about billions of dollars of losses. Every little bit of production is valuable when we’re trying to feed the world.”

**Their CO2 args are false – warming kills crop yields
Sinclair 1/31/12**

(Peter Sinclair, climate advocate, Studies: Climate Change will threaten Global Wheat Harvest, January 31, 2012, <http://climatecrocks.com/2012/01/31/studies-climate-change-will-threaten-wheat-harvest/>

A tired and recycled shibboleth dear to the hearts of aging climate deniers, as clueless about agriculture as they are about climate - “CO2 is good for plants…” - covered in the video above. The real world continues to provide tangible evidence of how wrong headed this is…. The Economic Times: PARIS: More intense heat waves due to global warming could diminish wheat crop yields around the world through premature ageing, according to a study published Sunday in Nature Climate Change. Nature Asia-Pacific: Extreme heat can accelerate wheat aging — an effect that reduces crop yields and is currently underestimated in most crop models — according to a study published online this week in Nature Climate Change. These findings imply that climate warming presents even greater challenges to wheat production than current models predict. An important source of uncertainty in anticipating the effects of climate change on agriculture is limited understanding of crop responses to extremely high temperatures. David Lobell and co-workers used satellite measurements of wheat growth in northern India to monitor the rates of wheat aging — known as senescence — following exposure to temperatures greater than 34 °C (93.2° F) New Scientist: In India’s breadbasket, the Ganges plain, winter wheat is planted in November and harvested as temperatures rise in spring. David Lobell of Stanford University in California used nine years of images from the MODIS Earth-observation satellite to track when wheat in this region turned from green to brown, a sign that the grain is no longer growing. He found that the wheat turned brown earlier when average temperatures were higher, with spells over 34 ºC having a particularly strong effect. [...] Lobell’s work suggests losses could be sooner and greater. “This is an early indication that a situation that was already bad could be even worse,” says Andy Challinor of the University of Leeds, UK. Meanwhile, the New York Times is reporting on a separate Indian study with similar implications. NYTimes: China and India, which constitute about 37 percent of the world’s population, face a future of sharply lower crop yields as a consequence of climate change, leading scientists in both nations warned recently. Yields from rain-irrigated wheat could drop by 44 percent by 2050 under warmer conditions forecasted by climate models, the Indian farm scientist M.S. Swaminathan told reporters during the 97th Indian Science Congress last week. Mr. Swaminathan is considered the architect of India’s “Green Revolution” for his work in the 1960s developing high-yield grain varieties that ended decades of severe famine. India continues to suffer from high inflation in food prices and widespread chronic hunger. Such problems will be vastly worse if global temperatures continue to rise, Mr. Swaminathan said. “For every one degree Celsius rise in mean temperature, the wheat loss is estimated to be of the order of six million tons per year,” he said, according to The Hindu newspaper. India’s total wheat production was about 75 million metric tons in 2009. China could face a similar climate-induced grain crisis, Zheng Guoguang, director of the China Meteorological Administration, the official weather forecasting agency in China, warned in a December essay in an influential Communist party journal. Yields of rice, wheat and corn could fall as much as 37 percent by 2050 due to increased drought conditions and other climate impacts, Mr. Zheng estimated. Citing Mr. Zheng’s essay, a statement by the Chinese Meteorological Association urged the country’s leaders to focus on adapting to, rather than mitigating, climate change. “Since climate change is an objective fact, it is more realistic and urgent for China, a big developing country, to adapt to than mitigate climate change,” the statement’s author concluded. “So China should put adaptation as top strategy of addressing climate change and put enhancing grain production and ensuring food security as first task.”

## Warming Bad - "Even If"

**Framing issue – warming kills yeilds of crops produced by CO2 increase – prefer our comparative evidence
EPA 11**

(Enviormental Protection Agency, US government program to preserve the enviorment, Agriculture and Food Supply Impacts & Adaptation, <http://www.epa.gov/climatechange/impacts-adaptation/agriculture.html>)

Crops grown in the United States are critical for the food supply here and around the world. U.S. exports supply more than 30% of all wheat, corn, and rice on the global market. [2] Changes in temperature, amount of carbon dioxide (CO2), and the frequency and intensity of extreme weather could have significant impacts on crop yields. Warmer temperatures may make many crops grow more quickly, but warmer temperatures could also reduce yields. Crops tend to grow faster in warmer conditions. However, for some crops (such as grains), faster growth reduces the amount of time that seeds have to grow and mature. [1] This can reduce yields (i.e., the amount of crop produced from a given amount of land). For any particular crop, the effect of increased temperature will depend on the crop's optimal temperature for growth and reproduction. [1] In some areas, warming may benefit the types of crops that are typically planted there. However, if warming exceeds a crop's optimum temperature, yields can decline. Higher CO2 levels can increase yields. The yields for some crops, like wheat and soybeans, could increase by 30% or more under a doubling of CO2 concentrations. The yields for other crops, such as corn, exhibit a much smaller response (less than 10% increase). [3] However, some factors may counteract these potential increases in yield. For example, if temperature exceeds a crop's optimal level or if sufficient water and nutrients are not available, yield increases may be reduced or reversed. More extreme temperature and precipitation can prevent crops from growing. Extreme events, especially floods and droughts, can harm crops and reduce yields. For example, in 2008, the Mississippi River flooded just before the harvest period for many crops, causing an estimated loss of $8 billion for farmers. [1] Dealing with drought could become a challenge in areas where summer temperatures are projected to increase and precipitation is projected to decrease. As water supplies are reduced, it may be more difficult to meet water demands. Many weeds, pests and fungi thrive under warmer temperatures, wetter climates, and increased CO2 levels. Currently, farmers spend more than $11 billion per year to fight weeds in the United States. [1] The ranges of weeds and pests are likely to expand northward. This would cause new problems for farmers' crops previously unexposed to these species. Moreover, increased use of pesticides and fungicides may negatively affect human health. [1]

**Co2 root cause of decreasing crop yields
Cao et al 12**

(Pongratz, J., Lobell, D. B., Cao L. and Caldeira, K. (2012), Stanford University. Crop yields in a geoengineered climate. Nature Climate Change. DOI: 10.1038/NCLIMATE1373, <http://ec.europa.eu/environment/integration/research/newsalert/pdf/279na3.pdf>)

Unless emissions of CO2 from human activities are reduced, climate change will affect crop yields, particularly through changes in rainfall and temperature. The impact will vary across regions and there is the risk that food supply, particularly in already vulnerable areas, could be threatened. One short-term measure proposed in the fight against climate change is to reflect back some of the sun’s radiation before it reaches the Earth, thereby counteracting global warming. An example of such an approach, called solar radiation management (SRM), is to deflect sunlight off sulphate particles that have been injected into the stratosphere (upper atmosphere). However, there are concerns that such ‘sunshade’ geoengineering schemes could reduce crop yields and lower the global production of food by causing changes in precipitation. This study compared large-scale changes in crop yields under two future climate scenarios. Changes in global temperatures and precipitation relative to today were modelled first for: a) a doubling of the atmospheric concentration of CO2 compared with current levels (‘2 x CO2 scenario’) and b) a doubling of the atmospheric concentration of CO2, but with a climate modified by SRM to maintain average global temperatures at current levels (‘SRM scenario’). These two climate change scenarios were then used to estimate changes in the yields and production of three major crops: wheat, maize and rice. In addition to the effects of temperature and precipitation on crop yields, the impact of elevated levels of CO2 on crop productivity was included in the analysis, as previous studies have found that higher levels of atmospheric CO2 act like a fertiliser and can increase yields. For the 2 x CO2 scenario, overall small changes in global yields of the three crops were found. There was a slight fall in yield for maize and a slight increase for wheat and rice. These were caused by the combined negative effects of climate change and the positive impact of increased fertilisation by CO2. Higher temperatures, rather than changes in precipitation, were responsible for most of the reduction in crop yields. Under the SRM scenario, the yields of all three crops increased at all latitudes, mainly through the beneficial influence of higher CO2 levels, compared with current conditions, but lower temperatures compared with the 2 x CO2 scenario. Nevertheless, changes in yields and production are not uniform across all regions and it is likely that the current pattern of food production and global food markets will be altered. Although on a large regional scale SRM is simulated to increase yields compared to the 2xCO2 scenario, individual small regions may exhibit losses in yields due to local climate change. In particular when these regions are areas of subsistence farming, this may cause local food insecurity. In addition, the researchers point out that SRM does not modify other harmful effects of higher CO2 levels, such as ocean acidification, which could also affect marine food supplies. Given the anticipated and unknown consequences of modifying the climate by SRM, the researchers point out that the reduction of CO2 emissions is the most certain way to reduce risks of dangerous climate change impacts.

**Elevated CO2 increases photosynthesis**

Albert et al. (K. R. ALBERT1, H. RO-POULSEN2, T. N. MIKKELSEN1, A. MICHELSEN2, L. VAN DER LINDEN1 & C. BEIER, 1Biosystems Division, Risø DTU, Frederiksborgvej 399, 4000 Roskilde and 2Terrestrial Ecology, Department of Biology, University of Copenhagen, Øster Farigmagsgade 2D, 1353 Copenhagen K, Denmark) 2011 (K.R., “Effects of elevated CO2, warming and drought episodes on plant carbon uptake in a temperate heath ecosystem are controlled by soil water status ,” Plant, Cell and Environment (2011) 34, 1207–1222 Pages 10-11) //CL

Elevated CO2 increased photosynthesis and WUE during most of the growing season. The increased photosynthesis was associated with, or driven by, increased intercellular CO2 concentration (Fig. 5) generating higher substrate availability for Rubisco, in line with, for example Ainsworth & Long (2005) and Ainsworth & Rogers (2007), and thus stimulation of photosynthesis also led to increased leaf C/N ratios. Surprisingly, no general reduc- tion in stomatal conductance was seen in elevated CO2, although this is often reported (e.g. Ainsworth & Long 2005; Ainsworth & Rogers 2007). This suggests that the improved WUE observed in our elevated CO2 plots was caused by increased photosynthesis. The soil water savings observed under elevated CO2 were not clearly coupled to reductions in stomatal conductance, which, together with LAI adjustments, have been the primary water-saving mechanisms in other elevated CO2 studies (Niklaus, Spinnler & Körner 1998; Morgan et al. 2004; Leuzinger & Körner 2007). However, the conserva- tion of soil water in our study may have been associated with reduced stomatal conductance, as shown by the marginally significant effects seen in August and October. The robust detection of these responses may have been hindered by the lesser statistical power provided by the monthly measurements of leaf gas exchange, compared to the greater statistical power provided by the half-hourly measurements of SWC. Further, heterogeneous structural conditions may prevail within the Calluna canopy, and we cannot exclude that shoots, other than the uppermost shoots selected for measurement, may have responded to the elevated CO2 by reducing stomatal conductance. This demonstrates that more frequent measurements of leaf gas exchange may be necessary to fully monitor changes in stomatal conductance through periods of water scarcity, but also that Calluna seems to take advantage of the soil water savings occurring to sustain photosynthesis in elevated CO2 during dry periods. Because rewetting clearly increased photosynthesis, leaf-to-shoot ratio and the C/N ratio in elevated CO2 plots, it seems that the photosynthetic stimu- lation is closely dependent on water availability, with low photosynthesis stimulation during dry periods and high photosynthesis stimulation when water availability is high. Interestingly, soil water savings were not detected over the upper 0–20 cm, but only over 0–60 cm. This suggests that intensive competition for water in the upper 0–20cm occurred and that the species with the largest capacity for water uptake in the 20–60 cm compartment, for example via a deeper and more extensive roots system, are likely to be the primary species causing the water saving. Reduced water consumption, via stomatal conductance or biomass reduction in the co-occuring grass Deschampsia flexuosa, could potentially also influence the SWC. In Calluna, the rooting systems may extend down to 84 cm (Gimingham 1960), while the co-occuring Deschampsia extends down to 58 cm (Scurfield 1954). On the CLIMAITE field site, total root biomass in 0–15 cm was reported not to differ between species, but fine root biomass were magnitudes higher in Deschampsia (Andresen et al. 2009). This may indicate larger capacity for water uptake in Calluna in the deeper soil layers, but more information taking into account both above- and below-ground biomass distributions, as well as stomatal conductance, are needed to investigate these issues.

## Warming Bad - Productivity

**Warming increases plant productivity**

Albert et al. (K. R. ALBERT1, H. RO-POULSEN2, T. N. MIKKELSEN1, A. MICHELSEN2, L. VAN DER LINDEN1 & C. BEIER, 1Biosystems Division, Risø DTU, Frederiksborgvej 399, 4000 Roskilde and 2Terrestrial Ecology, Department of Biology, University of Copenhagen, Øster Farigmagsgade 2D, 1353 Copenhagen K, Denmark) 2011 (K.R., “Effects of elevated CO2, warming and drought episodes on plant carbon uptake in a temperate heath ecosystem are controlled by soil water status ,” Plant, Cell and Environment (2011) 34, 1207–1222 Pages 1-2) //CL

Climate is changing, and the anthropogenic forcing has been thoroughly documented (IPCC 2007). The level of atmospheric CO2 has increased from a pre-industrial level of 270 ppm to current values around 380 ppm, and is expected to increase to around 700 ppm (IPCC 2007). This will lead to temperature increases of 1.4–5.8 °C during the next 100 years, with more pronounced warming during night-time relative to daytime (IPCC 2001). Precipitation changes with prolonged summer droughts, heavy precipita- tion events and higher frequency of extremes are also expected (IPCC 2007). This has attracted focus on ecosys- tem responses to climatic changes and on ecosystem feedbacks to climate, and much effort is invested in under- standing these complex impacts (Rustad 2006, 2008; Heimann & Reichstein 2008). Photosynthetic carbon uptake is controlled directly by the factors that are predicted to change in the future, atmospheric CO2 concentration, temperature and water availability (Morison & Lawlor 1999; Sage & Kubien 2007; Lawlor & Tezara 2009), and will therefore almost certainly be affected by climate change. It is likely that the relative importance of the factors limiting carbon uptake may change as climate change affects various regulators of photosynthesis and ecosystems adjust to the new condi- tions. Carbon demand for storage, growth, metabolism or export also influences the residence time in the carbon pools and the flux rates between them (Körner 2006); this may interact with the factors that control carbon uptake. Elevated CO2 decreases stomatal conductance and increases intercellular CO2 concentration, light saturated net photosynthesis and plant WUE (Curtis & Wang 1998; Ainsworth & Long 2005; Ainsworth & Rogers 2007). Elevated CO2 often down-regulates photosynthetic capac- ity via the maximal velocity of ribulose 1·5-bisphosphate carboxylase/oxygenase (Rubisco) carboxylation, Vcmax and to lesser degree the maximal rate of RuBP regeneration, Jmax which may decrease the maximal light and CO2 satu- rated net photosynthesis, Pmax (Drake, Gonzalez-Meler & Long 1997; Moore et al. 1999; Ainsworth & Rogers 2007). This is in part caused by the build-up of carbon compounds produced in the Calvin cycle, and in part caused by limita- tions in the nitrogen supply (Drake et al. 1997; Ainsworth & Rogers 2007). Leaf carbon uptake may be sustained in elevated CO2 if photosynthetic down-regulation does not occur, as reported from grasslands (Hungate et al. 1997a) and forests (Körner et al. 2005). In the long term, however, nutrient availability is likely to be of increasing importance for sustained productivity in elevated CO2 (Oren et al. 2001; Lou et al. 2004; Reich et al. 2006; Menge & Field 2007). Plant water status also affects the magnitude of plant carbon uptake in elevated CO2 (Körner 2000; Volk, Niklaus & Körner 2000; Knapp et al. 2002; Morgan et al. 2004). Elevated CO2 often results in reduced plant water consump- tion and leads to reduced soil water depletion, so-called water savings caused by reduced stomatal conductance (Morison & Gifford 1984; Hungate et al. 1997b; Leuzinger & Körner 2007; Robredo et al. 2007). This enables maintained plant carbon uptake in dry periods in elevated CO2 relative to ambient CO2 (Morison & Gifford 1984; Hungate et al. 1997b; Leuzinger & Körner 2007; Robredo et al. 2007). Changes in plant water availability affect photosynthesis, particularly during dry conditions that limit photosynthesis because of metabolic impairments, as well as diffusion limi- tations (Jones 1985; Chaves 1991; Flexas & Medrano 2002; Lawlor 2002; Lawlor & Cornic 2002; Flexas et al. 2006a). The responsiveness is highly species specific (Knapp et al. 2002; Heisler & Weltzin 2006). However, the carbon balance of a plant enduring a water stress period not only depends on the degree of photosynthetic decline during water deple- tion, but also on the rate and degree of photosynthetic recovery, although information on these aspects is scarce (Flexas et al. 2006b; Galmes, Medrano & Flexas 2007; Lawlor & Tezara 2009). Warming has been demonstrated to increase productivity (Arft et al. 1999; Rustad et al. 2001; Shaw et al. 2002; Dukes et al. 2005; Sage & Kubien 2007), but the impacts of this driver are complex; the confounding of direct and indirect effects can make it difficult to elucidate the underlying mechanisms of the responses of plants and ecosystems (Shaver et al. 2000; Peñuelas & Filella 2001). Warming can directly stimulate photosynthesis via provision of more optimal growth temperatures (e.g. Sage & Kubien 2007), and may be of particular importance in temperate ecosys- tems during periods of sub-optimal temperatures. Increased daytime respiration or changes in temperature acclimation can occur and may reduce the photosynthetic plant carbon uptake (Atkin & Tjoelker 2003). Indirect stimulation of daytime photosynthesis has been demonstrated in response to night-time warming, where an increased night-time plant respiration increased the carbon sink strength and in turn stimulated the following daytime net photosynthesis (Turnbull, Murthy & Griffin 2002; Turnbull et al. 2004). Warming may also affect photosynthesis and plant carbon uptake indirectly through increased length of the growing season (Menzel & Fabian 1999; White, Running & Thornton 1999; Walther et al. 2002; Cleland et al. 2006; Piao et al. 2007), plant phenology changes (Harte & Shaw 1995; Wan et al. 2005) and increased nutrient availability (Rustad et al. 2001). Some authors have argued that the indirect effects, via changes in nutrient and soil water availability, are more important than direct effects (Körner 2000; Shaver et al. 2000; Volk et al. 2000; Morgan et al. 2004; Wan et al. 2005; Lou 2007). Clearly, the effects of warming on plants and ecosystems are not straightforward and depend on the out- comes of the individual effects on many processes.

## Warming Bad - Trees

Global warming kills trees

Pennisi 9 (Elizabeth Pennisi is a staff writer for Science Magazine with a focus on biology. She has an undergraduate degree in biology from Cornell University and a master's degree in science writing from Boston University. 1/23/9 “Western U.S. Forests Suffer Death by Degrees” Science Magazine, Volume 323, p. 447 http://www.sciencemag.org/content/323/5913/447.full.pdf?sid=49a55c00-2c7a-49cf-8e97-c99c265e0371)

An insidious problem has taken hold in the forests of the American West, quietly thinning their ranks. Mortality rates in seemingly healthy conifer stands have doubled in the past several decades. Often, new trees aren’t replacing dying ones, setting the stage for a potentially dramatic change in forest structure, says Phillip J. van Mantgem, a forest ecologist at the U.S. Geological Survey (USGS) in Arcata, California. Warmer temperatures and subsequent water shortfalls are the likely cause of the trees’ increased death rate, he and his colleagues report on page 521. “This is a stunningly important paper,” says David Breshears, an ecologist at the University of Arizona, Tucson. For years, he and others have lamented massive diebacks that occur when fungal and insect pests ravage stands of trees. “What’s harder to detect,” he explains, is any subtle but significant shift in the trees’ background death rate. “They have done a very thorough job” of documenting it. In 2005, mortality rates weren’t even on van Mantgem’s radar. But while he was evaluating long-term data about forests in California’s Sierra Nevada mountains for changes in species composition and other forest characteristics, he noticed an upward trend in tree deaths. At first he thought it was an artifact. Once he and his colleagues became convinced that the trend was real, they looked to see how widespread it might be. Forest ecologist Nathan Stephenson of USGS in Three Rivers, California, combed the literature and canvassed his colleagues for long-term sites in the western United States where forest experts had tracked mortality and other parameters at regular intervals. They considered only old-growth forests, as these well-established communities would be less likely to undergo changes that could confound the analysis. “They were extremely rigorous in site selection,” says Nate McDowell, an ecologist at Los Alamos National Laboratory in New Mexico. All told, they wound up with 76 sites in the Pacific Northwest, California, Idaho, Colorado, and Arizona. They found that in the Pacific Northwest, mortality rates jumped to 1.3% today from 0.3% in the 1970s; in California, that percentage went to 1.7% from 1% in 1983; mortality in the interior forests climbed to 0.6% from 0.2% in roughly the same period. “It’s not just one local spot,” says van Mantgem. In contrast, they detected no trends in recruitment, the number of seedlings that survive to become mature trees. New growth is often failing to replace dying trees, he notes. Oliver Phillips, a tropical ecologist at the University of Leeds in the United Kingdom, says mortality rates have similarly increased in the tropics, but forest growth rates have increased there, more than compensating for the loss. At first glance, a shift of a percent or less may seem insignificant. “The change in forests is subtle so far,” says Stephenson. But just as a small percent difference in interest rates can compound the cost of a loan, a small difference in mortality rates can have a big effect over time. As the forest thins, ever smaller trees become dominant, affecting the land’s carbon storage capacity and ability to support wildlife. Next, the researchers evaluated the possible causes of the increased mortality rate. No matter how they sliced and analyzed the tree data—by size, type, elevation, and location—they still detected the increase in mortality. Air pollution couldn’t be blamed because the increase occurred in pristine as well as polluted areas. Ultimately, “the finger seems to be pointed to warming.” says Breshears. Temperatures in the United States have risen about 0.4˚C per decade in the past 40 years. Snowpack of the regions examined diminished over the time period they studied and is melting earlier, effectively lengthening the summer drought. Warmer air also leads to more evaporative loss, exacerbating the effect. Michael Goulden, an ecosystem ecologist at the University of California, Irvine, thinks the data fall short of pinning the problem on global warming, as regional warming related to natural climatic variation could be to blame. But Julio Betancourt of USGS in Tucson, Arizona, disagrees. “Models suggest that most of this change was due to the buildup of greenhouse gases,” he says. Moreover, local Pacific Northwest and Southwest climates tend to fluctuate in opposite directions. However, Betancourt, who is not a coauthor of the paper, stresses that forest researchers need to focus on seedlings, not mortality, in these threatened ecosystems. “If there is an affordable point of intervention, a way to adaptively manage for climate change,” he points out, “it may be in how we manage seedlings, not mature forests and adult trees.”

## Warming Good - Crop Gains

**Warming good – crop gains, CO2 fertilizer, negligible losses**

Gillis (Environmental specialist staff writer for the New York Times) 2011 (Justin, “Global Warming Reduces Expected Yields of Harvests in Some Countries, Study Says,” May 5, 2011, <http://www.nytimes.com/2011/05/06/science/earth/06warming.html>) //CL

Some countries saw small gains from the temperature increases, however. And in all countries, the extra carbon dioxide that humans are pumping into the air acted as a fertilizer that encouraged plant growth, offsetting some of the losses from rising temperatures caused by that same greenhouse gas. Consequently, the study’s authors found that when the gains in some countries were weighed against the losses in others, the overall global effect of climate change has been small so far: losses of a few percentage points for wheat and corn from what they would have been without climate change. The overall impact on production of rice and soybeans was negligible, with gains in some regions entirely offsetting losses in others.

## Warming Good - Oceans

Turn—warming is key to oceans

**Idso, '10**—President of the CO2 Magazine, PhD in Botany (Craig, "Study: Global Warming Will Benefit Marine Life," Heartland Newspaper, October)

Seventeen Australian and Canadian scientists have published a study in the peer-reviewed journal Global Change Biology concluding global warming will benefit marine life. The study finds "climate change is altering the rate and distribution of primary production in the world's oceans," which in turn "plays a fundamental role in structuring marine food webs” which are "critical to maintaining biodiversity and supporting fishery catches." Hence, the study’s authors write they are keen to examine what the future might hold in this regard, noting, "effects of climate-driven production change on marine ecosystems and fisheries can be explored using food web models that incorporate ecological interactions such as predation and competition.” The scientists first used the output of an ocean general circulation model driven by a "plausible" greenhouse gas emissions scenario (IPCC 2007 scenario A2) to calculate changes in climate over a 50-year time horizon. The results were then fed into a suite of models for calculating primary production of lower trophic levels (phytoplankton, macroalgae, seagrass, and benthic microalgae), after which the results of the latter set of calculations were used as input to "twelve existing Ecopath with Ecosim (EwE) dynamic marine food web models to describe different Australian marine ecosystems." The protocol predicted positive "changes in fishery catch, fishery value, biomass of animals of conservation interest, and indicators of community composition. The 17 scientists state under the IPCC's "plausible climate change scenario, primary production will increase around Australia" with "overall positive linear responses of functional groups to primary production change," and "generally this benefits fisheries catch and value and leads to increased biomass of threatened marine animals such as turtles and sharks." The calculated responses "are robust to the ecosystem type and the complexity of the model used," In the concluding sentence of their paper, the authors state the primary production increases their work suggests will result from future IPCC-envisioned greenhouse gas emissions and their calculated impacts on climate "will provide opportunities to recover overfished fisheries, increase profitability of fisheries and conserve threatened biodiversity." Those highly positive consequences are a great contrast to climate alarmists’ claims that global warming would be an unmitigated climate catastrophe.

## AT: "Even If"

**Warm climates are empirically more peaceful and more prosperous**

Sherwood, Keith, and Craig Idso et al 2011 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) Two-and-a-Half Millennia of European Climate Variability and Societal Responses http://co2science.org/articles/V14/N17/EDIT.php

Buntgen et al. (2011) recently developed a set of tree ring-based reconstructions of central European summer precipitation and temperature variability over the past 2500 years, which suggests, in their opinion, that "recent warming is unprecedented, but modern hydroclimatic variations may have at times been exceeded in magnitude and duration." Although we question their claim about recent warming being unprecedented within this context (see both our Medieval Warm Period Project and the materials we have archived under Roman Warm Period (Europe) in our Subject Index), we will not argue this subject further here. Instead, we will concentrate on the primary conclusion that Buntgen et al. draw from their work, which is that their data "may provide a basis for counteracting the recent political and fiscal reluctance to mitigate projected climate change." In the abstract of their paper, the twelve researchers state that "wet and warm summers occurred during periods of Roman and medieval prosperity," which is indeed correct; and in the body of their paper they write that "average precipitation and temperature showed fewer fluctuations during the period of peak medieval and economic growth, ~1000 to 1200 C.E. (Kaplan et al., 2009; McCormick, 2001), which is also correct, but which is something that suggests to us that warmer is better than colder, especially when it comes to assessing what could be called the wellness-state of humanity. Support for this point of view is provided by Buntgen et al.'s description of what happened as temperatures declined and the Medial Warm Period gave way to the Little Ice Age, with its onset "likely contributing," in their words, "to widespread famine across central Europe," when they say that "unfavorable climate may have even played a role in debilitating the underlying health conditions that contributed to the devastating economic crisis that arose from the second plague pandemic, the Black Death, which reduced the central European population after 1347 C.E. by 40 to 60% (Buntgen et al., 2010; Kaplan et al., 2009; Kausrud et al., 2010)." In addition, the team of Austrian, German, Swiss and U.S. scientists notes that this period "is also associated with a temperature decline in the North Atlantic and the abrupt desertion of former Greenland settlements (Patterson et al., 2010)," and that "temperature minima in the early 17th and 19th centuries accompanied sustained settlement abandonment during the Thirty Years' War and the modern migrations from Europe to America." And a quick trip to the heading of War and Social Unrest in our Subject Index will provide many more real-world examples of cold times typically leading to bad times in terms of the wellness-state of humanity in many other parts of the planet. Clearly, maintaining the planet's current level of warmth is a good thing for earth's inhabitants, as is maintaining -- and actually increasing -- the atmosphere's CO2 concentration, because of CO2's impressive aerial fertilization effect and its anti-transpiration effect, which working together significantly boost the water use efficiencies of nearly all plants, including those that supply us and the rest of the planet's animal life with the food we need to sustain ourselves. And since there is no compelling reason to attribute the planet's current level of warmth to its current level of atmospheric CO2 -- seeing there was much less CO2 in the air during the comparable (or even greater) warmth of the Roman and Medieval Warm Periods -- there is no reason to believe that attempting to reduce the air's CO2 content (which we can't do anyway) or even slow its rate-of-rise (which we cannot do to any significant degree) would alter the planet's temperature to any significant degree. In addition, the planet's temperature has remained essentially level for the past decade or more; and some scientists believe we are facing a future cooling. Consequently, we believe that the work of Buntgen et al. "may provide a basis for [not] counteracting the recent political and fiscal reluctance to mitigate projected climate change," as those mitigating efforts are known to likely have but a miniscule thermal impact even if successful, and they would come at an ungodly economic cost at a time when the world's economy is in an ungodly world of hurt.

**Lol no**

**Jackson 2009** – Research molecular biologist @ USDA (Eric, 2009, “The international food system and the climate crisis,” The Panama News, Lexis)

A major weakness in the forecasts of the IPCC and others when it comes to agriculture is that their predictions accept a theory of “carbon fertilisation”, which argues that higher levels CO2 in the atmosphere will enhance photosynthesis in many key crops, and boost their yields. Recent studies show that this is a mirage. Not only does any initial acceleration in growth slow down significantly after a few days or weeks, but the increase in CO2 reduces nitrogen and protein in the leaves by more than 12 per cent. This means that, with climate change, there will be less protein for humans in major cereals such as wheat and rice. There will also be less nitrogen in the leaves for bugs, which means that bugs will eat more leaf, leading to important reductions in yield.

## Ag Good - Impact Calc

**Resource wars and food conflicts outweigh warming—reversibility and magnitude**

**Idsos 1** (Craig Idso, President of the CO2 Magazine, PhD Botany AND Keith Idso, VP of the CO2 Magazine, PhD in Botany, *CO2 Science Magazine*, Vol 4(24), June 2001, “Two Crises of Unbelievable Magnitude: Can We Prevent One Without Exacerbating the Other?”)

Two potentially devastating environmental crises loom ominously on the horizon. One is catastrophic global warming, which many people claim will occur by the end of the next century. The other is the need to divert essentially all usable non-saline water on the face of the earth to the agricultural enterprises that will be required to meet the food and fiber needs of humanity's growing numbers in but half a century (Wallace, 2000; Tilman et al., 2001). This necessary expansion of agriculture will also require the land that currently supports a full third of all tropical and temperate forests, savannas and grasslands, according to Tilman, et al., who also correctly state that the destruction of that important natural habitat will lead to the extinction of untold numbers of plant and animal species. How do the magnitudes of the two crises compare? Tilman et al. suggest that the coming agriculturally-driven crisis is likely to rival that of predicted climate change, placing the two disasters on pretty much an equal footing. Wallace, however, is unequivocal in his contention that the agricultural crisis dwarfs the climate crisis. "There can be," he says, "no greater global challenge today on which physical and social scientists can work together than the goal of producing the food required for future generations." It is our judgment that the conclusion of Wallace is the more robust of the two, based on the simple fact that the agriculturally-driven crisis is almost certain to occur, whereas there is still doubt about the climate crisis. We also believe that Tilman et al. would probably not dispute this contention; for it is their own conclusion that "even the best available technologies, fully deployed, cannot prevent many of the forecasted problems," meaning the future scarcity of food, fiber, land and water described above. This conclusion as to the unavoidability of the agricultural crisis is further buttressed by the fact that Tilman et al.'s analysis even assumed a reasonable rate of advancement in technological expertise, as we also assumed in an earlier analysis of the identical problem that arrived at essentially the same conclusion (Idso and Idso, 2000).

## CO2 Good - Solves Warming

**Negative feedback means that CO2 solves warming—plants act as a carbon sink which slows down warming**

**Idsos 1** (Craig Idso, President of the CO2 Magazine, Researcher at the National Science Foundation, Director of Environmental Science at Peabody Energy, PhD Botany AND Keith Idso, VP of the CO2 Magazine, PhD in Botany, Member of the Arizona Advisory Council on Environmental Education, Vol. 7, 2001, “Recent Studies Show Global Warming May Enhance Soil Carbon Storage and Thereby Slow Its Own Progression”)

The amount of carbon stored above and beneath a unit area of land is basically a function of two biochemical processes, photosynthesis and respiration. During photosynthesis, plants remove CO2 from the atmosphere and utilize it to construct their tissues, where it is safely retained until it is respired back to the atmosphere. Thus, if the total amount of photosynthesis occurring over a given area of land is greater than the total amount of respiration occurring above and beneath its surface, that area of land is said to be a carbon sink. Conversely, if the amount of photosynthesis is less than the amount of respiration, the area is said to be a carbon source. For many years, theoretical models of ecosystem dynamics suggested that global warming would reduce both the magnitude and number of terrestrial carbon sinks by increasing ecosystem respiration more than it increased ecosystem photosynthesis. If true, this result would dash all hopes of mitigating CO2-induced global warming via biological carbon sequestration. However, like model-based predictions of climate change, there are a number of problems with this prediction as well. The primary problem is the simple fact that most observational evidence does not support the model predictions of reduced soil carbon storage under elevated temperatures. Fitter et al. (1999), for example, evaluated the effect of temperature on plant decomposition and soil carbon storage, finding that upland grass ecosystem soils artificially heated by nearly 3°C increased both root production and root death by equivalent amounts. Hence, they concluded that in these ecosystems, elevated temperatures "will have no direct effect on the soil carbon store." Similarly, Johnson et al. (2000) warmed Arctic tundra ecosystems by nearly 6°C for eight full years and still found no significant effect of that major temperature increase on ecosystem respiration. Furthermore, Liski et al. (1999) showed that carbon storage in soils of both high- and low-productivity boreal forests in Finland actually increased with warmer temperatures along a natural temperature gradient. Why the big discrepancy between model predictions and reality? According to a recent paper in the Annals of Botany, there are two potential explanations: (1) ecosystem modelers are over-estimating the temperature dependency of soil respiration, and (2) warming may increase the rate of certain physico-chemical processes that transfer organic carbon to more stable soil organic matter pools, thereby enabling the protected carbon to avoid or more strongly resist decomposition (Thornley and Cannell, 2001). That the first of these explanations is viable is demonstrated by the results of the studies just described. The second explanation is also reasonable. Thornley and Cannell hypothesize, for example, that the pertinent physico-chemical processes require a certain amount of activation energy to attach organic materials onto soil minerals or bring them together into aggregates that are less subject to decomposition; and they suggest that higher temperatures can provide that energy. Taking their hypothesis one step further, Thornley and Cannell developed a dynamic soil model in which they demonstrate that if their thinking is correct, "long-term soil carbon storage will appear to be insensitive to a rise in temperature, even if the respiration rates of all [soil carbon] pools respond to temperature as assumed by [most models]," which is, in fact, what experimental and real-world data clearly indicate to be the case. The upshot of these several observations is that global warming does not cause terrestrial carbon sinks to release additional CO2 to the atmosphere and thereby exacerbate the warming, as was fervently believed up until the last few years. In fact, it is much more likely that rising temperatures may do just the opposite, inducing a negative feedback phenomenon that enables greater amounts of carbon to be sequestered, which would tend to decrease the rate of CO2-induced warming. Clearly, the biosphere is well adapted to responding to environmental challenges; and this one is no exception. When the going gets hot, the earth knows how to keep its cool.

**CO2 increases biomass production—negative feedback means that emissions actually solve warming**

**Idso, et. al 3** (Craig Idso, *et al*., Research Physicist with the U.S. Department of Agriculture's Agricultural Research Service, Vice President of the Center for the Study of Carbon Dioxide and Global Change with a PhD in Botany, former Director of Environmental Science at Peabody Energy in St. Louis, Missouri and is a member of the American Association for the Advancement of Science, American Geophysical Union, American Meteorological Society, Arizona-Nevada Academy of Sciences, Association of American Geographers, Ecological Society of America, and The Honor Society of Phi Kappa Phi 2003,[10-15, C02 Science Magazine, Vol. 6, No. 42, The Center for the Study of Carbon Dioxide and Global Change])

In light of these observations, plus the fact that Saxe *et al*. (1998) have determined that a doubling of the air's CO2content leads to *more* than a doubling of the biomass production of coniferous species, it logically follows that the ongoing rise in the atmosphere's CO2 concentration is increasing carbon sequestration rates in the soils upon which conifers grow and, hence, is producing a significant negative feedback phenomenon that slows the rate of rise of the air's CO2 content, which would be assumed by many to be reducing the rate of global warming.

## CO2 Good - Agriculture

Food crises are coming now - only CO2 can sustain agricultural growth

Parry & Hawkesford 11 — Retired Sargeant AND Fellow at Rothamstead Research for Environmental Research (M.A.J. and M.J., "Meeting the Food Needs of a Growing World Population," NIPCC Report, July)

Parry and Hawkesford (2010) introduce their study of the global problem by noting that "food production needs to increase 50% by 2030 and double by 2050 to meet projected demands," and they note that at the same time the demand for food is increasing, production is progressively being limited by "non-food uses of crops and cropland," such as the production of biofuels, stating that in their homeland of the UK, "by 2015 more than a quarter of wheat grain may be destined for bioenergy production," which surely must strike one as both sad and strange, when they also note that "currently, at least one billion people are chronically malnourished and the situation is deteriorating," with more people "hungrier now than at the start of the millennium."So what to do about it: that is the question the two researchers broach in their review of the sad situation. They begin by describing the all-important process of photosynthesis, by which the earth's plants "convert light energy into chemical energy, which is used in the assimilation of atmospheric CO2 and the formation of sugars that fuel growth and yield," which phenomena make this natural and life-sustaining process, in their words, "a major target for improving crop productivity both via conventional breeding and biotechnology." Next to a plant's need for carbon dioxide comes its need for water, the availability of which, in the words of Parry and Hawkesford, "is the major constraint on world crop productivity." And they state that "since more than 80% of the [world's] available water is used for agricultural production, there is little opportunity to use additional water for crop production, especially because as populations increase, the demand to use water for other activities also increases." Hence, they rightly conclude that "a real and immediate challenge for agriculture is to increase crop production with less available water."Enlarging upon this challenge, they give an example of a success story: the Australian wheat variety 'Drysdale', which gained its fame "because it uses water more efficiently." This valued characteristic is achieved "by slightly restricting stomatal aperture and thereby the loss of water from the leaves." They note, however, that this ability "reduces photosynthetic performance slightly under ideal conditions," but they say it enables plants to "have access to water later in the growing season thereby increasing total photosynthesis over the life of the crop." Of course, Drysdale is but one variety of one crop; and the ideal goal would be to get nearly all varieties of all crops to use water more efficiently. And that goal can actually be reached by doing nothing, by merely halting the efforts of radical environmentalists to deny earth's carbon-based life forms -- that's all of us and the rest of the earth's plants and animals -- the extra carbon we and they need to live our lives to the fullest. This is because allowing the air's CO2 content to rise in response to the burning of fossil fuels naturally causes the vast majority of earth's plants to progressively reduce the apertures of their stomata and thereby lower the rate at which water escapes through them to the air. And the result is even better than that produced by the breeding of Drysdale, because the extra CO2 in the air more than overcomes the photosynthetic reduction that results from the partial closure of plant stomatal apertures, allowing even more yield to be produced per unit of water transpired in the process. Yet man can make the situation better still, by breeding and selecting crop varieties that perform better under higher atmospheric CO2 concentrations than the varieties we currently rely upon, or he can employ various technological means of altering them to do so. Truly, we can succeed, even where "the United Nations Millennium Development Goal of substantially reducing the world's hungry by 2015 will not be met," as Parry and Hawkesford accurately inform us. And this truly seems to us the moral thing to do, when "at least one billion people are chronically malnourished and the situation is deteriorating," with more people "hungrier now than at the start of the millennium."

**Mass crop and water scarcities are coming—increasing atmospheric CO2 is key to divert these crises**

**Idsos 7** (Sherwood Idso, Research Physicist with the US Department of Agriculture’s Agricultural Research Service AND Craig Idso, President of the CO2 Magazine, PhD in Botany, 2007, <http://co2science.org/education/reports/hansen/HansenTestimonyCritique.pdf> p. 17-19)

Finally, with respect to the third effort – increasing crop yield per unit of water used – Tilman et al. note that “water is regionally scarce,” and that “many countries in a band from China through India and Pakistan, and the Middle East to North Africa either currently or will soon fail to have adequate water to maintain per capita food production from irrigated land.” Increasing crop water use efficiency, therefore, is also a must. Although the impending man vs. nature crisis and several important elements of its potential solution are thus well defined, Tilman and his first set of collaborators concluded that “even the best available technologies, fully deployed, cannot prevent many of the forecasted problems.” This was also the finding of Idso and Idso (2000), who concluded that although “expected advances in agricultural technology and expertise will significantly increase the food production potential of many countries and regions,” these advances “will not increase production fast enough to meet the demands of the even faster-growing human population of the planet.” How can we prevent this unthinkable catastrophe from occurring, especially when it has been concluded by highly-credentialed researchers that earth possesses insufficient land and freshwater resources to forestall it, while simultaneously retaining any semblance of the natural world and its myriad animate creations? Although the task may appear next to impossible to accomplish, it can be done; for we have a powerful ally in the ongoing rise in the atmosphere’s CO2 concentration that can provide what we can't. Since atmospheric CO2 is the basic “food” of nearly all plants, the more of it there is in the air, the better they function and the more productive they become. For a 300-ppm increase in the atmosphere's CO2 concentration above the planet’s current base level of slightly less than 400 ppm, for example, the productivity of earth's herbaceous plants rises by something on the order of 30% (Kimball, 1983; Idso and Idso, 1994), while the productivity of its woody plants rises by something on the order of 50% (Saxe et al., 1998; Idso and Kimball, 2001). Thus, as the air's CO2 content continues to rise, so too will the productive capacity or land-use efficiency of the planet continue to rise, as the aerial fertilization effect of the upward-trending atmospheric CO2 concentration boosts the growth rates and biomass production of nearly all plants in nearly all places. In addition, elevated atmospheric CO2 concentrations typically increase plant nutrient-use efficiency in general – and nitrogen-use efficiency in particular – as well as plant water-use efficiency, as may be verified by perusing the many reviews of scientific journal articles we have produced on these topics and archived in the Subject Index of our website ([www.co2science.org](http://www.co2science.org/)). Consequently, with respect to fostering all three of the plant physiological phenomena that Tilman et al. (2002) contend are needed to prevent the catastrophic consequences they foresee for the planet just a few short decades from now, a continuation of the current upward trend in the atmosphere's CO2 concentration would appear to be essential. In the case we are considering here, for example, the degree of crop yield enhancement likely to be provided by the increase in atmospheric CO2 concentration expected to occur between 2000 and 2050 has been calculated by Idso and Idso (2000) to be sufficient – but only by the slightest of margins – to compensate for the huge differential that is expected to otherwise prevail between the supply and demand for food earmarked for human consumption just 43 years from now. Consequently, letting the evolution of technology take its natural course, with respect to anthropogenic CO2 emissions, would appear to be the only way we will ever be able to produce sufficient agricultural commodities to support ourselves in the year 2050 without the taking of unconscionable amounts of land and freshwater resources from nature and decimating the biosphere in the process.

**Warming key to food production—statistics prove**

**Avery & Burnett 5** (Dennis T. Avery, director of the Center for Global Food Issues at Hudson AND H. Sterling Burnett, PhD, Senior Fellow at the National Center for Policy Analysis, Brief Analyses, No. 517, 5-19-2005, “Warming: Famine — or Feast?”)

The available evidence undermines Brown's claims. Indeed, a warmer planet has beneficial effects on food production. It results in longer growing seasons - more sunshine and rainfall - while summertime high temperatures change little. And a warmer planet means milder winters and fewer crop-killing frosts. Global warming also increases carbon dioxide (CO2), which acts like fertilizer for plants. As the planet warms, oceans naturally release huge tonnages of additional CO2. (Cold water can hold much more of a gas than warmer water.) Since 1950, in a period of global warming, these factors have helped the world's grain production soar from 700 million to more than 2 billion tons last year.

**CO2 emissions are key to a second green revolution—solves food crises globally**

**CEW 6** (Climate and Environment Weekly, peer-reviewed journal by multiple experts writing for the Center for Science and Public Policy, a non-partisan policy group, Issue 34, 1-12-2006, “Agriculture—Our Greatest Challenge” ff.org)

Also writing about the need to increase global food production near the close of the 20th century were the Rockefeller Foundation's Conway and Toenniessen (1999), who stated that "the Green Revolution was one of the great technological success stories of the second half of the twentieth century," but that its benefits were dropping and that a number of arguments "point to the need for a second Green Revolution." It is enlightening to consider the arguments made by Conway and Toenniessen. First, they note that the world already produces more than enough food to feed everyone on the planet, but that it is not evenly distributed, due to "notoriously ineffective" world markets that leave 800 million people chronically undernourished. Hence, it would seem that requirement number one for the second Green Revolution should be that the agricultural benefits to be reaped should be equitably distributed among all nations. Second, the Rockefeller representatives say that food aid programs designed to help countries most in need "are also no solution," as they reach "only a small portion of those suffering chronic hunger." In addition, they say that such programs, if prolonged, "have a negative impact on local food production." Hence, it would seem that requirement number two for the second Green Revolution should be that local food production should be enhanced worldwide. Third, Conway and Toenniessen state that 650 million of the world's poorest people live in rural areas and that many of them live in "regions where agricultural potential is low and natural resources are poor." Hence, it would seem that requirement number three for the second Green Revolution should be that regions of low agricultural potential lacking in natural resources should be singled out for maximum benefits. All three of these requirements represent noble causes; but if mankind already produces more than enough food to feed everyone on the planet and we don't do it, i.e., we don't feed everyone, it is clear that mankind must not be noble enough to rise to the challenge currently confronting us. So why does anyone think we will do any better in the future? Based on humanity's prior track record, it would seem to us that the second Green Revolution envisioned by the Rockefeller Foundation will also fall short of its noble goal, depending, as it were, on a less-than-noble humanity to see it through.

## CO2 Good - Water Wars

**CO2 key to preventing water wars and famine**

Sherwood, Keith, and Craig Idso et al 2010 (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) The World's Looming Food and Water Shortage http://co2science.org/articles/V13/N49/EDIT.php

This water deficiency, according to Hanjra and Qureshi, "will lead to a food gap unless concerted actions are taken today." Some of the things they propose, in this regard, are to conserve water and energy resources, develop and adopt climate-resilient crop varieties, modernize irrigation, shore up domestic food supplies, reengage in agriculture for further development, and reform the global food and trade market. And to achieve these goals, they say that "unprecedented global cooperation is required," which by the looks of today's world is an even more remote possibility than that implied by the proverbial wishful thinking. So, on top of everything else they suggest (a goodly portion of which will not be achieved), what can we do to defuse the ticking time-bomb that is the looming food and water crisis? We suggest doing nothing. But not just any "nothing." The nothing we suggest is to not mess with the normal, unforced evolution of civilization's means of acquiring energy. We suggest this, because on top of everything else we may try to do to conserve both land and freshwater resources, we will still fall short of what is needed to be achieved unless the air's CO2 content rises significantly and thereby boosts the water use efficiency of earth's crop plants, as well as that of the plants that provide food and habitat for what could be called "wild nature," enabling both sets of plants to produce more biomass per unit of water used in the process. And to ensure that this happens, we will need all of the CO2 that will be produced by the burning of fossil fuels, until other forms of energy truly become more cost-efficient than coal, gas and oil. In fact, these other energy sources will have to become much more cost-efficient before fossil fuels are phased out; because the positive externality of the CO2-induced increase in plant water use efficiency provided by the steady rise in the atmosphere's CO2 concentration due to the burning of fossil fuels will be providing a most important service in helping us feed and sustain our own species without totally decimating what yet remains of wild nature.

## CO2 Good - Disease

**Increased CO2 emissions key to curing a laundry list of diseases**

Craig and Keith Idso and Idso (Craig, PhD in geography @Arizona State, M.S. in Agronomy from U Nebraska) 2012 Here's to Your Health! ... Courtesy of Carbon Dioxide http://co2science.org/articles/V15/N18/EDIT.php

At the turn of the last millennium, when our father was still an actively-working researcher, he and five colleagues grew common spider lily (Hymenocallis littoralis) plants out-of-doors at the U.S. Water Conservation Laboratory in Phoenix, Arizona. This they did for two consecutive two-year cycles, within clear-plastic-wall open-top chambers that had their atmospheric CO2 concentrations continuously maintained at either the normal concentration, which at their urban site was about 400 ppm, or at an enriched level of 700 ppm. Then, at the ends of each of the two-year periods, they harvested the bulbs produced by the plants and measured their biomass, along with the concentrations of several substances they contained that had previously been proven to be effective in fighting various human maladies. In doing so, they found that the 75% increase in the air's CO2 concentration resulted in a 48% increase in aboveground plant biomass and a 56% increase in belowground bulb biomass. In addition, the extra CO2 also increased the concentrations of five bulb constituents that possessed anti-cancer and anti-viral properties. These substances are listed in table below, along with the percentage increases they each exhibited, which when considered in their totality yield a mean increase of 12%. And combined with the 56% increase in bulb biomass, the net result was a mean active-ingredient increase of 75% due to the 75% increase in the air's CO2 concentration. What is especially exciting about these findings is that the substances the six scientists studied have been demonstrated to be effective in fighting a number of debilitating human diseases, including leukemia, ovary sarcoma, melanoma, brain cancer, colon cancer, lung cancer, renal cancer, Japanese encephalitis, yellow fever, dengue fever, Punta Tora fever and Rift Valley fever, as reported (with pertinent supporting citations) in their paper. Furthermore, there is reason to believe that many other such substances in other medicinal plants may also be benefited by atmospheric CO2 enrichment. See, for example, Health Effects (CO2 - Health-Promoting Substances: Medicinal Plants in our Subject Index. This larger body of work also points to the tantalizing possibility that there may be a number of still other health-promoting substances in the tissues of the foods we regularly eat that may additionally have their concentrations enhanced by the ongoing rise in the air's CO2 concentration. And indeed there are, as may readily be seen by perusing the items archived under Health Effects (CO2 - Health-Promoting Substances: Common Food Plants in our Subject Index. And these findings lead to our speculation that the ever-lengthening life-span of people all around the world may well be due, at least in part, to the historical - and still ongoing - rise in the air's CO2 content. So here's to our health ... and the health of our children's children ... courtesy (in part) of the atmosphere's steadily rising carbon dioxide concentration; for if the world's climate alarmists can attribute nearly everything bad that happens nowadays, to the ongoing rise in the air's CO2 content, surely we can point out a possible benefit or two. And the potential benefit we describe here is a huge one.

## CO2 Good - Photosynthesis

**CO2 increases photosynthesis and plant growth**
**Kirschbaum 11** (Miko U.F. Kirschbaum, Ph.D. (Environmental Biology) and B.Sc. (Agricultural Science), Plant Physiology, “Does Enhanced Photosynthesis Enhance Growth? Lessons Learned from CO2 Enrichment Studies” http://www.plantphysiol.org/content/155/1/117.short)

Plants typically convert only 2% to 4% of the available energy in radiation into new plant growth. This low efficiency has provided an impetus for trying to genetically manipulate plants in order to achieve greater efficiencies. But to what extent can increased photosynthesis be expected to increase plant growth? This question is addressed by treating plant responses to elevated CO2 as an analog to increasing photosynthesis through plant breeding or genetic manipulations. For plants grown under optimal growth conditions and elevated CO2, photosynthetic rates can be more than 50% higher than for plants grown under normal CO2 concentrations. This reduces to 40% higher for plants grown under the average of optimal and suboptimal conditions, and over the course of a full day, average photosynthetic enhancements under elevated CO2 are estimated to be about 30%. The 30% enhancement in photosynthesis is reported to increase relative growth rate by only about 10%. This discrepancy is probably due to enhanced carbohydrate availability exceeding many plants’ ability to fully utilize it due to nutrient or inherent internal growth limitations. Consequently, growth responses to elevated CO2 increase with a plant’s sink capacity and nutrient status. However, even a 10% enhancement in relative growth rate can translate into absolute growth enhancements of up to 50% during the exponential growth phase of plants. When space constraints and self-shading force an end to exponential growth, ongoing growth enhancements are likely to be closer to the enhancement of relative growth rate. The growth response to elevated CO2 suggests that increases in photosynthesis almost invariably increase growth, but that the growth response is numerically much smaller than the initial photosynthetic enhancement. This lends partial support to the usefulness of breeding plants with greater photosynthetic capacity, but dramatic growth stimulation should not be expected. The usefulness of increasing photosynthetic capacity can be maximized through changes in management practices and manipulation of other genetic traits to optimize the conditions under which increased photosynthesis can lead to maximal growth increases.

## CO2 Good - Harvests

**CO2 increases plant harvest**

(Idso et al. '11 Craig D. Idso is the founder, former president and current chairman of the board of the Center for the Study of Carbon Dioxide and Global Change. Robert M. Carter is a palaeontologist, stratigrapher, marine geologist and adjunct professorial research fellow in earth sciences at James Cook University. Fred Singer is a physicist and emeritus professor of environmental science at the University of Virginia. Susan Crockford has a Ph.D. and in the Department of Anthropology at the University of Victoria. Joseph D‘Aleo is the Executive Director of ICECAP Co-Chief Meteorologist at WeatherBell Analytics and Fellow of the American Meteorological Society. Indur Goklany has a Ph. D., an Independent Scholar and the founder and co-editor of Electronic Journal of Sustainable Development. Sherwood Idso is the president of the Center for the Study of Carbon Dioxide and Global Change. Madhav Khandekarhas a Ph.D and is an Editorial Board Member of natural Hazards and an Expert Reviewer IPCC AR4 Climate Change assessment. Anthony Lupo has a Ph. D and is in the Department of Soil, Environmental, and Atmospheric Sciences at the University of Missouri-Columbia. Willie Soon has a Ph. D and is an Independent Scientist. Mitch Taylor has a Ph.D. and is in the Department of Geography at Lakehead University. 2011. “Climate Change Reconsidered 2011 Interim Report” http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf)

We begin our review of atmospheric CO2 enrichment effects on Earth‘s vegetation with a consideration of C3 plants—those in which the enzyme RuBisCO is involved in the uptake of CO2 and the subsequent photosynthetic process, which results in its incorporation into a 3-carbon compound—starting with the study of Norikane et al. (2010). They focused on the genus Cymbidium, which comprises about 50 species distributed throughout tropical and subtropical Asia and Oceania. The four researchers worked with shoots of Music Hour ‗Maria,‘ a type of orchid, possessing two to three leaves, which they obtained from a mass of protocorm-like bodies they derived from shoot-tip culture. They grew them in vitro on a modified Vacin and Went medium in air augmented with either 0, 3,000, or 10,000 ppm CO2 under two photosynthetic photon flux densities (either 45 or 75 µmol m -1 s -1 ) provided by cold cathode fluorescent lamps for a period of 90 days. They then transferred the plants to ex vitro culture for 30 more days. Relative to plants grown in vitro in ambient air, the percent increases in shoot and root dry weight due to enriching the air in which the plants grew by 3,000 ppm CO2 were, respectively, 216 percent and 1,956 percent under the low-light regime and 249 percent and 1,591 percent under the high-light regime, while corresponding increases for the plants grown in air enriched with an extra 10,000 ppm CO2 were 244 percent and 2,578 percent under the low-light regime and 310 percent and 1,879 percent under the high-light regime. Similarly, in the ex vitro experiment, the percent increases in shoot and root dry weight due to enriching the air in which the plants grew by 3,000 ppm CO2 were 223 percent and 436 percent under the low-light regime and 279 percent and 469 percent under the high-light regime, while corresponding increases for the plants grown in air enriched with an extra 10,000 ppm CO2 were 271 percent and 537 percent under the low-light regime and 332 percent and 631 percent under the high-light regime. Consequently, the Japanese scientists concluded, ―super-elevated CO2 enrichment of in vitro-cultured Cymbidium could positively affect the efficiency and quality of commercial production of clonal orchid plantlets.‖ Turning from ornamental plants to food crops, Vanaja et al. (2010) note grain legumes ―provide much needed nutritional security in the form of proteins to the predominant vegetarian populations of India and also the world.‖ They further state that legumes—of which pigeon peas are an important example—―have the potential to maximize the benefit of elevated CO2 by matching stimulated photosynthesis with increased N2 fixation,‖ citing Rogers et al. (2009). Therefore, they grew pigeon peas (Cajanus cajan L. Millsp.) from seed to maturity outdoors at Hyderabad, India within open-top chambers maintained at atmospheric CO2 concentrations of either 370 or 700 ppm. They then harvested the plants and measured pertinent productivity parameters. This work revealed, according to the team of nine Indian scientists, that in the higher of the two CO2 concentrations, ―total biomass recorded an improvement of 91.3%, grain yield 150.1% and fodder yield 67.1%.‖ They also found ―the major contributing components for improved grain yield under elevated CO2 were number of pods, number of seeds and test weight,‖ with these items exhibiting increases of 97.9 percent, 119.5 percent, and 7.2 percent, respectively. In addition, they found there was ―a significant positive increase of harvest index at elevated CO2 with an increment of 30.7% over ambient values,‖ which they say was due to the crop‘s ―improved pod set and seed yield under enhanced CO2 concentration.‖ These multiple positive findings, according to the scientists from India‘s Central Research Institute for Dryland Agriculture, illustrate the importance of pigeon peas for ―sustained food with nutritional security under a climate change scenario.‖ This work revealed, according to the team of nine Indian scientists, that in the higher of the two CO2 concentrations, ―total biomass recorded an improvement of 91.3%, grain yield 150.1% and fodder yield 67.1%.‖ They also found ―the major contributing components for improved grain yield under elevated CO2 were number of pods, number of seeds and test weight,‖ with these items exhibiting increases of 97.9 percent, 119.5 percent, and 7.2 percent, respectively. In addition, they found there was ―a significant positive increase of harvest index at elevated CO2 with an increment of 30.7% over ambient values,‖ which they say was due to the crop‘s ―improved pod set and seed yield under enhanced CO2 concentration.‖

## CO2 Good - Rice

**CO2 increases rice growth**

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These multiple positive findings, according to the scientists from India‘s Central Research Institute for Dryland Agriculture, illustrate the importance of pigeon peas for ―sustained food with nutritional security under a climate change scenario.‖ In much the same vein, Yang et al. (2009) declared, ―rice is unequivocally one of the most important food crops that feed the largest proportion of the world‘s population,‖ that ―the demand for rice production will continue to increase in the coming decades, especially in the major rice-consuming countries of Asia, Africa and Latin America,‖ and that ―accurate predictions of rice yield and of the ability of rice crops to adapt to high CO2 environments are therefore crucial for understanding the impact of climate change on the future food supply.‖ In fact, they forcefully state—and rightly— that ―there is a pressing need to identify genotypes which could optimize harvestable yield as atmospheric CO2 increases.‖Climate Change Reconsidered – 2011 Interim Report 200 They set out to do that in a standard paddy culture free-air CO2 enrichment (FACE) experiment conducted at Yangzhou, Jiangsu, China over the period 2004–2006. The team of eight researchers grew a two-line inter-subspecific hybrid rice variety (Liangyoupeijiu) at ambient and elevated atmospheric CO2 concentrations of 376 and 568 ppm, respectively, at two levels of field nitrogen (N) application: low N (12.5 g N m -2 ) and high N (25 g N m -2 ), measuring numerous aspects of crop growth, development, and final yield production in the process. The Chinese scientists found the 51 percent increase in atmospheric CO2 concentration employed in their study increased the final grain yield of the low N rice crop by 28 percent and that of the high N rice crop by 32 percent. As a result, and ―compared with the two prior rice FACE experiments (Kim et al., 2003; Yang et al., 2006),‖ they state, ―hybrid rice appears to profit much more from CO2 enrichment than inbred rice cultivars (c. +13 percent).‖ Yang et al. describe Liangyoupeijiu as ―one of the most popular ‗super‘ hybrid rice varieties in China (Peng et al., 2004),‖ and it appears it will become increasingly ―super‖ as the air‘s CO2 content continues to rise, helping China to lead the way in future food production.

**Fossil fuels help environment**

**Idso et. al 11** (Craig, Center for Study of Carbon Dioxide and Global Change, CO2 Magazine, Robert Carter, paleontologist, stratiagrapher, geologist, research fellow at James Cook Univ., Fred Singer, Environmental Science @ UVA, Susan Crockford, PhD Anthropology @ Victoria, Joseph D'Aleo, Executive Director of ICECAP, Co-Chief Meteorologist, Indur Goklany, founded the Electronic Journal of Sustainable Development, Sherwood Idso, president of the Center for the Study of Carbon Dioxide and Global Change, Madhav Khandekarhas, PhD, Editorial Board Member of natural hazards, AR4 Climate Assessment, Anthony Lupo, PhD, Soil, Environmental and Atmospheric Sciences at Mizzou - Columbia, Willie Soon, PhD, Mitch Taylor, Geography @ Lakehead Univ., "Climate Change Reconsidered: 2011 Interim Report," NIPCC Rport http://nipccreport.org/reports/2011/pdf/2011NIPCCinterimreport.pdf)

What, then, can we do to defuse the ticking timebomb of this looming food and water crisis? One option is to do nothing: don‘t mess with the normal, unforced evolution of civilization‘s means of acquiring energy. This is because on top of everything else we may try to do to conserve both land and freshwater resources, we will still fall short of what is needed to be achieved unless the air‘s CO2 content rises significantly and thereby boosts the water use efficiency of Earth‘s crop plants and that of the plants that provide food and habitat for what could be called Climate Change Reconsidered – 2011 Interim Report 268 ―wild nature,‖ enabling both sets of plants to produce more biomass per unit of water used. To ensure this happens, we will need all of the CO2 that will be produced by the burning of fossil fuels, until other forms of energy truly become more cost-efficient than coal, gas, and oil. In fact, these other energy sources will have to become much more cost-efficient before fossil fuels are phased out, because the positive externality of the CO2-induced increase in plant water use efficiency provided by the steady rise in the atmosphere‘s CO2 concentration due to the burning of fossil fuels will be providing a most important service in helping us feed and sustain our own species without totally decimating what yet remains of wild nature

## CO2 Good - Trees

Increased tree growth from CO2 releases carbon from the soil

Science Daily 11 (8/15/11, “Increased Tropical Forest Growth Could Release Carbon from the Soil” Science Daily http://www.sciencedaily.com/releases/2011/08/110814141445.htm)

A new study shows that as climate change enhances tree growth in tropical forests, the resulting increase in litterfall could stimulate soil micro-organisms leading to a release of stored soil carbon. The research was led by scientists from the Centre for Ecology & Hydrology and the University of Cambridge, UK. The results are published online in the journal Nature Climate Change. The researchers used results from a six-year experiment in a rainforest at the Smithsonian Tropical Research Institute in Panama, Central America, to study how increases in litterfall -- dead plant material such as leaves, bark and twigs which fall to the ground -- might affect carbon storage in the soil. Their results show that extra litterfall triggers an effect called 'priming' where fresh carbon from plant litter provides much-needed energy to micro-organisms, which then stimulates the decomposition of carbon stored in the soil. Lead author Dr Emma Sayer from the UK's Centre for Ecology & Hydrology said, "Most estimates of the carbon sequestration capacity of tropical forests are based on measurements of tree growth. Our study demonstrates that interactions between plants and soil can have a massive impact on carbon cycling. Models of climate change must take these feedbacks into account to predict future atmospheric carbon dioxide levels." The study concludes that a large proportion of the carbon sequestered by greater tree growth in tropical forests could be lost from the soil. The researchers estimate that a 30% increase in litterfall could release about 0.6 tonnes of carbon per hectare from lowland tropical forest soils each year. This amount of carbon is greater than estimates of the climate-induced increase in forest biomass carbon in Amazonia over recent decades. Given the vast land surface area covered by tropical forests and the large amount of carbon stored in the soil, this could affect the global carbon balance. Tropical forests play an essential role in regulating the global carbon balance. Human activities have caused carbon dioxide levels to rise but it was thought that trees would respond to this by increasing their growth and taking up larger amounts of carbon. However, enhanced tree growth leads to more dead plant matter, especially leaf litter, returning to the forest floor and it is unclear what effect this has on the carbon cycle. Dr Sayer added, "Soils are thought to be a long-term store for carbon but we have shown that these stores could be diminished if elevated carbon dioxide levels and nitrogen deposition boost plant growth." Co-author Dr Edmund Tanner, from the University of Cambridge, said, "This priming effect essentially means that older, relatively stable soil carbon is being replaced by fresh carbon from dead plant matter, which is easily decomposed. We still don't know what consequences this will have for carbon cycling in the long term."

## Aerosols Check

**Aerosols prevent warming**

Science Daily (Scientific news source) 2012 (“Geoengineering for Global Warming: Increasing Aerosols in Atmosphere Would Make Sky Whiter,” Science News, May 31st 2012, <http://www.sciencedaily.com/releases/2012/05/120531112614.htm>) //CL

ScienceDaily (May 31, 2012) — One idea for fighting global warming is to increase the amount of aerosols in the atmosphere, scattering incoming solar energy away from Earth's surface. But scientists theorize that this solar geoengineering could have a side effect of whitening the sky during the day. New research from Carnegie's Ben Kravitz and Ken Caldeira indicates that blocking 2% of the sun's light would make the sky three-to-five times brighter, as well as whiter. Their work is published June 1st in Geophysical Research Letters, a journal of the American Geophysical Union. Carbon dioxide emissions from the burning of coal, oil, and gas have been increasing over the past decades, causing Earth to get hotter and hotter. Large volcanic eruptions cool the planet by creating lots of small particles in the stratosphere, but the particles fall out within a couple of years, and the planet heats back up. The idea behind solar geoengineering is to constantly replenish a layer of small particles in the stratosphere, mimicking this volcanic aftermath and scattering sunlight back to space.

## Politics Link (?)

**Warming policies are massively unpopular - GOP obstructionism**

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Political leaders in European nations continue to mouth support for climate alarmism, but that support appears to be crumbling in the face of a financial crisis, the high price and small impact of renewable energy sources, and the refusal by the United States, China, and India to participate in an emissions control regime. Japan, Canada, and Russia are abandoning negotiations for a future Kyoto Protocol, while there is still uncertainty in Australia. But one thing is certain: The Kyoto Protocol is dead. At national and state levels in the United States, there have been major changes since 2009. The United States has never ratified the Kyoto Protocol, but there have been unilateral efforts to impose similar mandates. Those efforts peaked in 2009 when a Democrat-controlled House of Representatives passed a cap-and-trade bill. The November 2009 elections, however, put an end to Democratic control of the House, and more. Republicans gained more seats in the House than in any election since 1938, leaving Democrats with the party‘s fewest seats in the House since 1946. Even more important in terms of its impact on climate change policy were Republican gains at the state level. A record number of freshmen state legislators—1,765 out of 7,300—were elected. Republicans replaced Democrats in eight governors‘ mansions and at least 675 seats in state legislatures. The number of Republican governors rose from 22 to 29, and the number of states with Republican majorities in both houses rose from 14 to 26. The political realignment in the United States, combined with the slowest economic recovery among the world‘s developed countries, means there is little chance of passing cap-and-trade legislation or a treaty for the coming two years, and probably longer. The White House and Environmental Protection Agency (EPA) seek to impose equivalent restrictions on the economy by the Clean Air Act, but EPA‘s ―endangerment finding,‖ necessary if the agency is to proceed in its regulatory efforts, is being challenged in the courts on the grounds that it is based on faulty IPCC science. Appeals are likely to continue into 2012. Meanwhile, the Republican majority in the House is doing what it can to restrict appropriations to EPA that would be used to implement greenhouse gas regulations.