Warming is a Benefit to Humans and the Biosphere

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ABSTRACT

- **Warmer temperatures lead to a decrease in temperature-related mortality, including deaths associated with cardiovascular disease, respiratory disease, and strokes. The evidence of this benefit comes from research conducted in every major country of the world.**
- **In the United States the average person who died because of cold temperature exposure lost in excess of 10 years of potential life, whereas the average person who died because of extreme heat related event lost no more than a few days or weeks of life because heat has a greater effect on more seriously debilitated and ill persons.**
- **Cold-related deaths are far more numerous than heat-related deaths in the United States and the world. Coronary (heart attack) and cerebral thrombosis (stroke) account for about half of all cold-related mortality, events that are directed related to blood vessel and blood viscosity effects of cool or cold environments.**
- **Global warming, if it did occur, even to the degree predicted in the extreme, will reduce the incidence of cardiovascular diseases related to low temperatures and wintry weather by a much greater degree than the warming might increase the incidence of deaths or illness attributable to heat. Heat illness primarily produces fluid and electrolyte disturbances, loss of core temperature control and organ dysfunction from dehydration, circulatory failure and heat caused stress, not clotting events.**
- **The heat wave deaths of 1995 in Chicago and 2003 in Europe are pointed to by advocates of the claim that heat stress deaths will increase with any warming that might occur, but a closer look at heat event death rates in some of the studies below show acclimation increased awareness have blunted any heat stress death increases. In the case of Chicago and Europe temperatures rose to over 100 but the availability of air conditioning and ventilation along with attention to the needs of elderly and disabled individuals was determined to be a major reason for heat deaths.**
- **The heat deaths that occur during severe heat events are the result of stress and inability to acclimate to maintain normal core temperature control and avoid dehydration. Acclimatization and proper attention to the vulnerable populations failed in Chicago in 1995 and Europe, particularly France in 2003, for example with hundreds of heat deaths in the former and 20,000 or more deaths in the later.**

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- **A large body of scientific examination and research contradicts and disproves the claim that malaria will expand across the globe and intensify as a result of CO_2–induced warming. Malaria is historically a disease that was endemic to cool and even cold climates like Finland and Russia but has been suppressed by hygienic and vector control measures.**
- **Concerns over large increases in vector-borne diseases such as dengue as a result of rising temperatures are unfounded and unsupported by the scientific literature, as climatic indices are poor predictors for dengue disease. The *Aedes Aegypti*, *Anopheles*, and Asian Tiger mosquitos all have been found at higher latitudes.**
- **While temperature and climate effect the geographical distribution of ticks, they are not among the significant factors determining the incidence of tick-borne diseases. Moreover the effect of small increases in climate temperature, if does occur with certainly not impact the range of ticks that now live in the high latitudes, even in the mountains of those high latitudes.**

Warming is a Benefit to Humans and the Biosphere

Monograph An Extended Resource for the presentation to
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The Intergovernmental Panel on Climate Change (IPCC) predicts a global temperature increase of 3C or more by 2100, but other experts believe the best guess is 1C or less. We assert that increases in average temperature of the planet from the current 60 degrees F. will be beneficial to human health and the biosphere.

IPCC's alarms have led to widespread fear of the health effects of global warming (Schulte, 2008) and even political attack ads claiming people are dying of "carbon pollution" (WMC, 2015). These statements have no basis in scientific research and in fact and based on the evidence, warming will be a benefit to all living things. Carbon Dioxide that increases to even 1000 PPM will be beneficial to the biosphere and make the planet more hospitable and arable.

In fact, the litany of climate extremes postulated by the IPCC has been falsified by the actual record of climate measurements and observations. None of the environmental disasters, human displacements and disruptions predicted have come to pass during the past ten years, even as atmospheric carbon dioxide has continued to increase. We all know of the temperature "pause" that has accompanied an increase in atmospheric Carbon Dioxide.

In this document the benefits of fossil fuel use, and even warming, if it did occur, are explained in greater detail.

A warmer planet is beneficial to humanity as warmer temperatures lead to decreases in temperature-related mortality, premature deaths due to cardiovascular and respiratory disease, and stroke occurrences, and has little if any influence on vector-borne diseases such as malaria and dengue fever since vectors generally are not respectful of the definition of "tropical diseases.

Cool and colder temperatures kill while warmer temperatures are beneficial. It is troubling that, in the face of this evidence, environmentalists and politicians continue to frighten people with predictions of "killer heat waves" in a slightly warmer world. And yet, such claims are made. Severe heat waves are a weather phenomenon, not causally linked to average global temperature. Deaths from heat waves are most dramatic in areas with lack of adaptation—or general medical care for the disabled—who suffer from poor housing and medical problems that make them more susceptible.

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Global Warming and Mortality Rates

- Medical research confirms and explains why cooler, colder temperatures cause increased disease and death rates. Warmer temperatures are associated with health benefits and decreased deaths.

- Population studies around the world show that warmer temperatures lead to a net *decrease* in mortality worldwide, even in those areas described as tropical.

- Carbon dioxide (CO_2) is invisible, odorless, nontoxic, and does not seriously affect human health until the CO_2 content of the air reaches approximately 15,000 ppm, more than 37 times greater than the current concentration of atmospheric CO_2 (Luft *et al.*, 1974). There is no reason to be concerned about any *direct* adverse human health consequences of the ongoing rise in the air's CO_2 content now or in the future, currently at about 400 parts per million (0.04%) since even extreme model predictions by warming advocates are for less than 2000 parts per million (2%).

The Intergovernmental Panel on Climate Change (IPCC), however, sees looming health threats. The Summary for Policymakers of IPCC's Working Group II's report for the Fifth Assessment Report (AR5) identified **eight "key risk factors"** regarding the effect of climate change on human wellbeing, all of them allegedly "identified with high confidence" (IPCC, 2014, emphasis in original). They are:

i) Risk of death, injury, ill-health, or disrupted livelihoods in low-lying coastal zones and small island developing states and other small islands, due to storm surges, coastal flooding, and sea level rise. 37[RFC1-5]

ii) Risk of severe ill-health and disrupted livelihoods for large urban populations due to inland flooding in some regions. 38 [RFC 2 and 3]

iii) Systemic risks due to extreme weather events leading to breakdown of infrastructure networks and critical services such as electricity, water supply, and health and emergency services. 39 [RFC 2-4]

iv) Risk of mortality and morbidity during periods of extreme heat, particularly for vulnerable urban populations and those working outdoors in urban or rural areas. 40 [RFC 2 and 3]

v) Risk of food insecurity and the breakdown of food systems linked to warming, drought, flooding, and precipitation variability and extremes, particularly for poorer populations in urban and rural settings. 41 [RFC 2-4]

vi) Risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions. 42 [RFC 2 and 3]

vii) Risk of loss of marine and coastal ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide for coastal livelihoods, especially for fishing communities in the tropics and the Arctic. 43 [RFC 1, 2, and 4]

viii) Risk of loss of terrestrial and inland water ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide for livelihoods. 44 [RFC 1, 3, and 4]

There is no scientific basis for believing global temperatures will rise to levels high enough to bring about any of these risks. Indeed, there is sound scientific support for believing warming will be a net positive rather than negative.

Here, we summarize only research on the effects of rising global temperatures on human health and the medical literature shows warmer temperatures and a smaller difference between daily high and low temperatures that results from some rising temperatures as occurred during the twentieth and early twenty-first centuries, reduce mortality rates (the subject of this section) as well as illness and mortality due to cardiovascular and respiratory disease and stroke occurrence.

Similarly, the research is quite clear that climate has exerted only a minimal influence on recent trends in vector-borne diseases such as malaria, dengue fever, and tick-borne diseases. Other factors, many of them related to economic and technological setbacks or progress and not to weather, are far more important in determining the transmission and presence of these “tropical” diseases that are not so tropical at all.

Warmer Temperature Impacts on Human Health

- Warmer temperatures lead to a decrease in temperature-related mortality, including deaths associated with cardiovascular disease, respiratory disease, and strokes. The evidence of this benefit comes from research conducted in every major country of the world.

- In the United States the average person who died because of cold temperature exposure lost in excess of 10 years of potential life, whereas the average person who died because of extreme heat related event lost no more than a few days or weeks of life because heat has a greater effect on more seriously debilitated and ill persons.

- In the U.S., some 4,600 deaths are delayed each year as people move from cold northeastern states to warm southwestern states. Between 3 and 7% of the gains in longevity experienced over the past three decades was due simply to people moving to warmer states.

- Cold-related deaths are far more numerous than heat-related deaths in the United States and the world. Coronary (heart attack) and cerebral thrombosis (stroke) account for about half of all cold-related mortality, events that are directed related to blood vessel and blood viscosity effects of cool or cold environments.

- Global warming, if it did occur, even to the degree predicted in the extreme, will reduce the incidence of cardiovascular diseases related to low temperatures and wintry weather by a much greater degree than the warming might increase the incidence of deaths or illness attributable to heat. Heat illness primarily produces fluid and electrolyte disturbances, loss of core temperature control and organ dysfunction from dehydration, circulatory failure and heat caused stress, not clotting events.

- The heat wave deaths of 1995 in Chicago and 2003 in Europe are pointed to by advocates of the claim that heat stress deaths will increase with any warming that might occur, but a closer look at heat event death rates in some of the studies below show acclimation increased awareness have blunted any heat stress death increases. In the case of Chicago and Europe temps rose to over 100 but the availability of air conditioning and ventilation along with attention to the needs of elderly and disabled individuals was determined to be a major reason for heat deaths.

- The heat deaths that occur during severe heat events are the result of stress and inability to acclimate to maintain normal core temperature control and avoid dehydration. Acclimatization and proper attention to the vulnerable populations failed in Chicago in 1995 and Europe, particularly France in 2003, for example with hundreds of heat deaths in the former and 20,000 or more deaths in the later.

- A large body of scientific examination and research contradicts and disproves the claim that malaria will expand across the globe and intensify as a result of CO_2-induced warming. Malaria is historically a disease that was endemic to cool and even cold climates like Finland and Russia but has been suppressed by hygienic and vector control measures.

- Concerns over large increases in vector-borne diseases such as dengue as a result of rising temperatures are unfounded and unsupported by the scientific literature, as climatic indices are poor predictors for dengue disease. The Aedes Aegypti Anopheles and Asian Tiger mosquitos all have been found at higher latitudes.
- While temperature and climate effect the geographical distribution of ticks, they are not among the significant factors determining the incidence of tick-borne diseases. Moreover the effect of small increases in climate temperature, if does occur with certainly not impact the range of ticks that now live in the high latitudes, even in the mountains of those high latitudes.

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Basis in Medical Science

Medical science explains why colder temperatures often cause diseases and sometimes fatalities whereas warmer temperatures are associated with health benefits.

Wang et al. collected daily mortality and meteorological data from 66 communities across China over the period 2006-2011. They then subjected these data to a series of analyses to elucidate the relationship between cold spell characteristics and human mortality. And what did those analyses reveal? Not surprisingly, cold spells significantly increased human mortality risk in China.

Antonio Gasparinni (2015) was lead author for a large international group of researchers who studied the effect of temperature extremes on death rates. Gasparrini and his co-authors analyzed data from 384 locations including the countries of

Australia, Brazil, Canada, China, Italy, Japan, South Korea, Spain, Sweden, Taiwan, Thailand, the United Kingdom and the United States of America.

And what did they thereby learn?

Based on data pertaining to a total of 74,225,200 human deaths that occurred between 1985 and 2012, the 23 researchers determined that 7.71% of the lives lost were caused by non-optimum temperatures; and among this group they found that "more temperature-attributable deaths were caused by cold (7.29%) than by heat (0.42%)" which makes cold in excess of seventeen times more deadly than heat. The Gasparrini research provides a compelling confirmation of the reality that warmer temperatures are better for human welfare than cooler or colder temperatures. (Gasparrini Lancet 2015)

Keating and Donaldson (2001) explain that "cold causes mortality mainly from arterial thrombosis and respiratory disease, attributable in turn to cold-induced hemoconcentration and hypertension [in the first case] and respiratory infections [in the second case]."

Wang *et al.* (2013) write, "A large change in temperature within one day may cause a sudden change in the heart rate and circulation of elderly people, which all may act to increase the risk of cardiopulmonary and other diseases, even leading to fatal consequences." This is significant for the climate change debate because, as Wang *et al.* also observe, "it has been shown that a rise of the minimum temperature has occurred at a rate three times that of the maximum temperature during the twentieth century over most parts of the world, which has led to a decrease of the diurnal temperature range (Karl *et al*., 1984, 1991)." Robeson (2002) demonstrated, based on a 50-year study of daily temperatures at more than 1,000 U.S. weather stations that daily (diurnal) temperature variability declines with warming and at a very substantial rate, so this aspect of a warmer world would lead to a reduction in temperature- related deaths.

Clearly, cold spells kill; and as has been found in almost every study of the subject, the risk of death from cold spells far exceeds that from heat waves. As such, therefore, a little global warming would likely result in a net saving of lives by reducing the number of deaths that occur at the cold end of the temperature spectrum.

Keatinge and Donaldson (2004) report coronary and cerebral thrombosis account for about half of all cold-related deaths, and respiratory diseases account for approximately half of the rest. They say cold stress causes an increase in arterial thrombosis "because the blood becomes more concentrated, and so more liable to clot during exposure to cold."

With respect to the implications of global warming for human mortality, Keatinge and Donaldson state "since heat-related deaths are generally much fewer than cold-related deaths, the overall effect of global warming on health can be expected to be a beneficial one." They report, "The rise in temperature of 3.6°F expected over the next 50 years would increase heat-related deaths in Britain by about 2,000 but reduce cold-related deaths by about 20,000."

Keatinge and Donaldson's reference to deaths that typically would have occurred shortly even without excess heat is a phenomenon researchers call "displacement" or "harvesting." A study from Germany found "cold spells lead to excess mortality to a relatively small degree, which lasts for weeks," while "the mortality increase during heat waves is more pronounced, but is followed by lower than average values in subsequent weeks" (Laschewski and Jendritzky, 2002). The authors say the latter observation suggests people who died from short-term exposure to heat possibly "would have died in the short term anyway."

The US EPA web site discussion of heat wave deaths referenced below reveals that the EPA recognizes heat wave deaths are not reliably counted because of loose death certificate definitions of heat caused versus heat related. Cardiovascular deaths is used as a catch all descriptor Although the deaths attributed to severe heat waves are described as Cardiovascular, the mechanism is metabolic and physiologic dysfunction and a collapse of the systems that maintain temperature equilibrium in endotherms like humans. The victims don't die of a heart attack, a coronary ischemic event caused by clots and narrowed coronary arteries, an occlusive event, they die of temperature effects and the failure of internal systems, including lung and cardiovascular system, solid organ, and brain malfunctions in the face of heat stress, dehydration, and rising core temperatures, along with dehydration and loss of mechanisms to maintain normal temperature. The victims are debilitated, and live in a stressfully hot environment and succumb for failure to acclimate and maintain normal body physiology.

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Observational Research in Asia

Behar (2000) studied sudden cardiac death (SCD) and acute myocardial infarction (AMI) in Israel, concentrating on the role temperature may play in the incidence of these health problems. Behar notes "most of the recent papers on this topic have concluded that a peak of SCD, AMI and other cardiovascular conditions is usually observed in low temperature weather during winter."

Kan *et al*. (2003) investigated the association between temperature and daily in Shanghai, China, finding a V-like relationship between total mortality and temperature that had a minimum mortality risk at 26.7°C. Above this optimum temperature, they observe, "total mortality increased by 0.73% for each degree Celsius increase; while for temperatures below the optimum value, total mortality decreased by 1.21% for each degree Celsius increase." The net effect of a warming in Shanghai, China, therefore, would likely be reduced mortality on the order of 0.5% per degree Celsius increase in temperature, or perhaps more.

Wu *et al*. (2013) assessed the health effects of temperature on mortality in four subtropical cities of China (Changsha, Kunming, Guangzhou, and Zhuhai). The 11 researchers report a U-shaped relationship between temperature and mortality was found in the four cities, indicating "mortality is usually lowest around a certain temperature and higher at lower or higher temperatures." Although "both low and high temperatures were associated with increased mortality in the four subtropical Chinese cities," Wu *et al*. state the "cold effect was more durable and pronounced than the hot effect."

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Observational Research in Europe

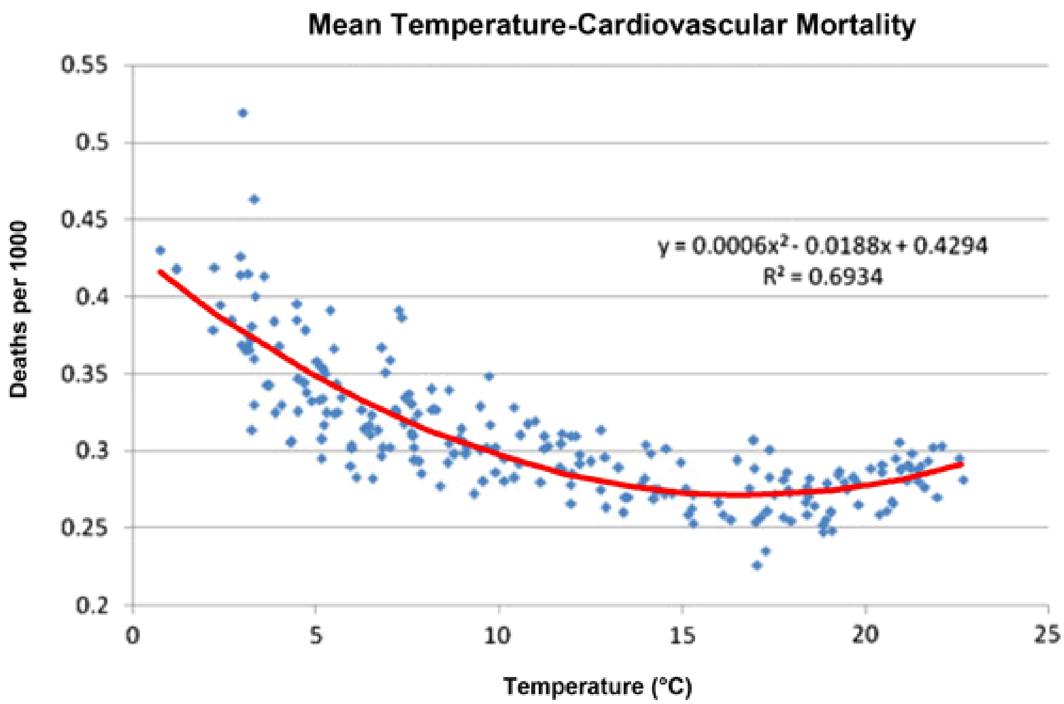
Keatinge and Donaldson (2001) analyzed the effects on human mortality of temperature, wind, rain, humidity, and sunshine during high pollution days in the greater London area over the period 1976–1995. They conclude “the large, delayed increase in mortality after low temperature is specifically associated with cold and is not due to associated patterns of wind, rain, humidity, sunshine, SO_2, CO, or smoke.”

Diaz *et al*. (2005) examined the effect of extreme winter temperature on mortality in Madrid, Spain for people older than 65, using data from 1,815 winter days over the period 1986– 1997, during which time 133,000 deaths occurred. They found that as maximum daily temperature dropped below 6°C, which they describe as an unusually cold day (UCD), "the impact on mortality also increased significantly." They also found the impact of UCDs increased as the winter progressed, with the first UCD of the season producing an average of 102 deaths/day at a lag of eight days and the sixth UCD producing an average of 123 deaths/day at a lag of eight days.

Laaidi *et al*. (2006) conducted an observational population study in six regions of France between 1991 and 1995 to assess the relationship between temperature and mortality in areas of widely varying climatic conditions and lifestyles. In all cases they found "more evidence was collected showing that cold weather was more deadly than hot weather."

Analitis *et al*. (2008) analyzed short-term effects of cold weather on mortality in 15 major European cities using data from 1990–2000, and found "a 1°C decrease in temperature was associated with a 1.35% increase in the daily number of total natural deaths and a 1.72%, 3.30% and 1.25% increase in cardiovascular, respiratory, and cerebro-vascular deaths, respectively." In addition, they report "the increase was greater for the older age groups," and the cold effect "persisted up to 23 days, with no evidence of mortality displacement."

Monthly deaths in the Castile-Leon region of Spain attributable to cardiovascular disease.



Source: Adapted from Fernandez-Raga *et al*. (2010).

During the warm half of the year (April–September), they found a rise in temperature had an inverse or protective effect with respect to CVD mortality (a 1% decrease in death in response to a 1°C increase in apparent temperature). This finding is unusual but also has been observed in Dublin, Ireland, as reported by Baccini *et al*. (2008, 2011). Wichmann *et al.* found no association with RD and CBD mortality. At the other end of the thermal spectrum, during the cold half of the year, all three associations were inverse or protective. This finding, according to the researchers, is "consistent with other studies (Eurowinter Group, 1997; Nafstad *et al*., 2001; Braga *et al*., 2002; O'Neill *et al*., 2003; Analitis *et al*., 2008)."

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Observational Research in North America

Goklany and Straja (2000) examined trends in United States death rates over the period 1979– 1997 due to excessive hot and cold weather. They report there were no trends in deaths due to either extreme heat or cold in the entire population or in the older, more-susceptible age groups, those aged 65 and over, 75 and over, and 85 and over. Deaths due to extreme cold in these older age groups exceeded those due to extreme heat by as much as 80% to 125%. With respect to the absence of trends in death rates attributable to either extreme heat or cold, Goklany and Straja say this "suggests that adaptation and technological change may be just as important determinants of such trends as more obvious meteorological and demographic factors."

Davis *et al*. (2004) examined the seasonality of mortality due to all causes, using monthly data for 28 major U.S. cities from 1964 to 1998, and then calculated the consequences of a future 1°C warming of the conglomerate of those cities. At all locations studied, they report "warmer months have significantly lower mortality rates than colder months." **They calculate "a uniform 1°C warming results in a net mortality *decline* of 2.65 deaths (per standard million) per metropolitan statistical area**" (emphasis added). The primary implication of Davis *et al*.'s findings, in their words, "is that the seasonal mortality pattern in US cities is largely independent of the climate and thus insensitive to climate fluctuations, including changes related to increasing greenhouse gases."

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Global Warming and Cardiovascular Disease

The key findings are that

- Global warming, if it does occur, would reduce the incidence of fatal coronary events related to low temperatures and wintry weather by a much greater degree than it increases the incidence of death or serious heat related events associated with high temperatures and summer heat waves.

- Non-fatal myocardial infarction is also less frequent during unseasonably warm periods than during unseasonably cold periods.

- Any cost-benefit analysis that attributes an increase in cardiovascular events to warming is incorrect. Heat illness injures and kills by other means and has a much lesser death toll proportionately than cold related events. Heat illness injury and death in heat waves affects the debilitated and chronically ill in hot unventilated environments and the mechanism is dehydration and loss of core body temperature control.

Cardiovascular diseases affect the heart and or the blood vessels. They include arrhythmia, arteriosclerosis, congenital heart disease, coronary artery disease, diseases of the aorta and its branches, disorders of the peripheral vascular system, endocarditis, heart valve disease, hypertension, orthostatic hypotension, and shock. According to IPCC, exposure to rising temperatures and especially heat waves can cause premature deaths due to heat-induced illness. The claims that it causes stroke or myocardial infarctions are not correct except to concede that ultimately most deaths are cardiovascular in nature.

Empirical research suggests that heat illness can cause collapse and death, but the mechanism is fluid and circulatory collapse, not stroke or heart attack. Heat stroke is severe heat illness with loss of temperature control that produces brain dysfunction; it’s not a cerebral thrombosis or hemorrhage, a true stroke.

That aside, the IPCC overlooks the fact that cooler temperatures cause an even larger number of premature deaths, with the result that a warmer world would experience fewer deaths in total due to cardiovascular disease.

Global Warming and Respiratory Disease

The key findings of this section include the following:

- Global warming, if it did occur would reduce incidence of death due to respiratory disease around the world, for example the Americas, Spain, Canada, Shanghai, and even on the subtropical island of Taiwan.

- Lower minimum temperatures are a strong risk factor for outpatient visits for respiratory diseases. Warmer temperatures reduce rates of respiratory disease.

- Any cost-benefit analysis that attributes increases in deaths or disease and disability or loss of work/school time to warming is incorrect and not a reliable guide for public policy.

Respiratory diseases are diseases affecting the organs and tissues that make gas exchange possible in humans and other higher organisms. They range from the common cold, allergies, asthma, and bronchiolitis to life-threatening conditions including pneumonia, pulmonary embolism, and lung cancer. Acute respiratory disease is a condition in which breathing becomes difficult and oxygen levels in the blood drop lower than normal. Respiratory diseases are widespread. For example, childhood asthma affects more than 300 million people worldwide (Baena-Cagnani and Badellino, 2011). Non-fatal respiratory diseases impose enormous social costs due to days lost from work and school (Mourtzoukou and Falagas, 2007).

According to IPCC, rising atmospheric carbon dioxide concentrations due to the combustion of fossil fuels causes global warming, and this temperature increase causes increased deaths due to respiratory disease. However, examination of real-world data reveals unassailable evidence that colder temperatures cause more deaths and hospital admissions due to respiratory disease than do warmer temperatures.

Some of the studies cited earlier in this chapter on lower death rates due to warmer temperatures and cardiovascular disease also identified specific reductions in fatalities due to respiratory diseases, so their research also appears in this section. Keatinge and Donaldson (2001), for example, studied of the effects of temperature on mortality in people over 50 years of age in the greater London area over the period 1976–1995.

Nafstad *et al*. (2001) studied the association between temperature and daily mortality in citizens of Oslo, Norway over the period 1990 to 1995. The results showed the mean daily number of respiratory-related deaths was considerably higher in winter (October–March) than in summer (April–September). Winter deaths associated with respiratory diseases were 47% more numerous than summer deaths. They conclude, "A milder climate would lead to a substantial reduction in average daily number of deaths." Read milder as warmer.

Hajat and Haines (2002) examined the relationship between cold temperatures and the number of visits by the elderly to general practitioners for asthma, lower respiratory diseases other than asthma, and upper respiratory diseases other than allergic rhinitis as obtained for registered patients aged 65 and older from several London practices between

January 1992 and September 1995. They found the mean number of consultations was higher in cool-season months (October–March) than in warm-season months (April–September) for all respiratory diseases. At mean temperatures below 5°C, the relationship between respiratory disease consultations and temperature was linear, and stronger at a time lag of six to 15 days A 1°C decrease in mean temperature below 5°C was associated with a 10.5% increase in all respiratory disease consultations.

Nakaji *et al*. (2004) evaluated seasonal trends in deaths due to various diseases in Japan, using nationwide vital statistics from 1970 to 1999 and concurrent mean monthly air temperature data. They found the numbers of deaths due to respiratory diseases, including pneumonia and influenza, rise to a maximum during the coldest time of the year.

Bartzokas *et al*. (2004) "examined the relationship between hospital admissions for cardio-vascular (cardiac in general including heart attacks) and/or respiratory diseases (asthma etc.) in a major hospital in Athens [Greece] and meteorological parameters for an 8-year period." Over the whole year, they found, "there was a dependence of admissions on temperature," and low temperatures were "responsible for a higher number of admissions."

Xu *et al*. (2013) examined the relationship between diurnal temperature range (DTR) and emergency department admissions for childhood asthma in Brisbane, Australia, from January 1st 2003 to December 31st 2009. The six scientists report "childhood asthma increased above a DTR of 10°C" and "was the greatest for lag 0–9 days, with a 31% increase in [hospital] emergency department admissions per 5°C increment of DTR," further noting, "male children and children aged 5–9 years appeared to be more vulnerable to the DTR effect than others."

Lin *et al*. (2013) used data on daily area-specific deaths from all causes, circulatory diseases, and respiratory diseases in Taiwan, developing relationships between each of these cause-of-death categories and a number of cold-temperature related parameters for 2000–2008. The five researchers discovered "mortality from [1] all causes and [2] circulatory diseases and [3] outpatient visits of respiratory diseases has a strong association with cold temperatures in the subtropical island, Taiwan." In addition, they found "minimum temperature estimated the strongest risk associated with outpatient visits of respiratory diseases."

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Global Warming and Strokes

The key findings of this section include the following:

- Any warming would reduce the incidence of death due to stroke in many parts of the world, including Russia, Korea, Japan, Africa, Asia, Europe, Latin America, and the Caribbean.

- Low minimum temperatures are a stronger risk factor than high temperatures for stroke incidence and hospitalization.

- Any cost-benefit analysis that attributes increased strokes to a prediction of global warming is incorrect and not a reliable guide for public policy.

A stroke occurs when blood flow to an area in the brain is cut off. *Ischemic* stroke occurs when clots form in the brain's blood vessels, in blood vessels leading to the brain, or in blood vessels elsewhere in the body and then travel to the brain.

According to IPCC, rising atmospheric carbon dioxide concentrations due to the combustion of fossil fuels causes global warming, and this temperature increase causes increased deaths due to strokes. Not true. Examination of real-world data reveals unseasonable cold temperatures cause more deaths and hospital admissions due to stroke than do unseasonable warm temperatures.

Feigin *et al*. (2000) examined the relationship between the incidence of stroke and ambient temperatures over the period 1982-1993 in Novosibirsk, Siberia, which has one of the highest stroke incidence rates in the world. Based on analyses of 2,208 patients with sex and age distributions similar to those of Russia as a whole, they found a statistically significant association between stroke and low ambient temperature. There is no reason to believe that temperature variations would have a discernible effect on hemorrhagic strokes that occur because of vascular pathology, not occlusion.

Hong *et al*. (2003) investigated the association between the onset of ischemic stroke and prior episodic decreases in temperature in 545 patients who suffered strokes in Incheon, Korea from January 1998 to December 2000. They report "decreased ambient temperature was associated with risk of acute ischemic stroke." Finally, they explain the reason for the 24- to 48-hour lag between exposure to cold and the onset of stroke "might be that it takes some time for the decreasing temperature to affect blood viscosity or coagulation.

Nakaji *et al*. (2004) evaluated seasonal trends in deaths due to various diseases in Japan using nationwide vital statistics from 1970 to 1999 together with mean monthly temperature data. They found the peak mortality rate due to stroke was two times greater in winter (January) than at the time of its yearly minimum (August and September).

Chang *et al*. (2004) analyzed data from the World Health Organization (WHO) Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception (WHO, 1995) to determine the effects of monthly mean temperature on rates of hospitalization for arterial stroke and acute myocardial infarction among women aged 15–49 from 17 countries in Africa, Asia, Europe, Latin America, and the Caribbean. They found among these women, a 5°C reduction in mean air temperature was associated with a 7% increase in the expected hospitalization rate due to stroke, and this effect was relatively acute, within a period of about a month, the scientists write.

Gill *et al*. (2012) write, "in the past two decades, several studies reported that meteorologic changes are associated with monthly and seasonal spikes in the incidence of aneurysmal subarachnoid hemorrhage (aSAH)," and "analysis of data from large regional databases in both hemispheres has revealed increased seasonal risk for aSAH in the fall, winter and spring," citing among other sources Feigin *et al*. (2001), Abe *et al*. (2008), and Beseoglu *et al*. (2008). Gill *et al*. identified the medical records of 1,175 patients at the Johns Hopkins Hospital in Baltimore, Maryland (USA) who were admitted with a radiologically confirmed diagnosis of aSAH between 1 January 1991 and 1 March 2009. The six scientists report both "a one-day decrease in temperature and colder daily temperatures were associated with an increased risk of incident aSAH," and "these variables appeared to act synergistically" and were "particularly predominant in the fall, when the transition from warmer to colder temperatures occurred." **Gill *et al*. add their study "is the first to report a direct relationship between a temperature decrease and an increased risk of aSAH,"** and "it also confirms the observations of several reports of an increased risk of aSAH in cold weather or winter," citing Nyquist *et al*. (2001) and other sources. Authors' note: This study and others the authors of the study reference are outliers in the sense that they tally aneurysmal sub arachnoid hemorrhage, a different kind of stroke than ischemic strokes, so there is no "mechanism" of coagulation and clot formation that would relate to temperature that might be hypothesized as a cause of cold or cool to cause hemorrhagic stroke.

The reader should be informed that hemorrhagic stroke is because of a different mechanism, the rupture of a weakened wall of a blood vessel, often associated with a bulge called an aneurysm, as opposed to ischemic stroke discussed above that occur because of a blood clot in the brain blood vessel. However the temperature appears to be a negative effect of cooler or cold temperatures that produces an increase in hemorrhagic strokes separate from the negative effect on ischemic strokes. Vascular irritability appears to go hand in hand with increased coagulability and sludging.

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Global Warming and Insect-borne Diseases

The key findings of this section include the following:

- Research contradicts the claim that malaria will expand across the globe and intensify as a result of any possible warming.
- Concerns over large increases in dengue fever as a result of rising temperatures are unfounded and unsupported by the scientific literature, as climatic indices are poor predictors for dengue fever infection rates.
- Climate change has not been a significant factor driving the recent temporal patterns in the epidemiology of tick-borne diseases. Ticks are endemic at many latitudes.

The latest IPCC report, the Fifth Assessment Report (AR5) backs down from previous predictions that global warming would facilitate the spread of insect-borne diseases including malaria, dengue fever, and tick-borne diseases. The full report from Working Group II on the subject (IPCC, 2014a, Chapter 11, pp. 722-726) repeatedly admits there is no evidence that climate change has affected the range of vector-borne diseases including tick-borne diseases. However, the Summary for Policymakers inexplicably warns "Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (*high confidence*)." Among the "examples" given is "vector-borne diseases (*medium confidence*)" (IPCC, 2014b, pp. 19-20). Such predictions are not supported by the evidence.

In a research report in *Science*, Rogers and Randolph (2000) note "predictions of global climate change have stimulated forecasts that vector-borne diseases will spread into regions that are at present too cool for their persistence." However, the effect of warmer temperatures on insect-borne diseases is complex, sometimes working in favor of and sometimes against the spread of a disease. For example, ambient temperature has historically not determined the range of insect-borne diseases, hotter weather shortens the lifespan of mosquitos, and human adaptation as well as vector control measures can neutralize any detrimental effect of warming,

to overwhelm the role of climate. Even those who support IPCC, such as Marm Kilpatrick, an assistant professor in ecology and evolutionary biology at the University of California, Santa Cruz, admits "It's a little bit tricky to make a solid prediction" (Irfan, 2011).

Gething *et al.* (2010), writing specifically about malaria, may have put it best when they said there has been "a decoupling of the geographical climate-malaria relationship over the twentieth century, indicating that non-climatic factors have profoundly confounded this relationship over time." They note "non-climatic factors, primarily direct disease control and the indirect effects of a century of urbanization and economic development, although spatially and temporally variable, have exerted a substantially greater influence on the geographic extent and intensity of malaria worldwide during the twentieth century than have climatic factors." As for the future, they conclude climate-induced effects "can be offset by moderate increases in coverage levels of currently available interventions."

This section investigates the reliability of IPCC's claim with respect to the three main kinds of insect-borne diseases: malaria, dengue fever, and tick-borne diseases According to the results of a vast body of scientific examination and research on this topic, there is little support for the claims appearing in the latest IPCC Summary for Policymakers.

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Malaria

A vast body of scientific examination and research contradict the claim that malaria will expand across the globe and intensify as a result of CO_2-induced warming.

Jackson *et al*. (2010) say "malaria is one of the most devastating vector-borne parasitic diseases in the tropical and subtropical regions of the world," noting it affects more than 100 countries.

According to the World Health Organization, Africa carries the highest infection burden of any continent, with nearly 200 million cases reported in 2006, and the Centers for Disease Control and

Prevention estimates between 700,000 and 2.7 million people each year die from the dreaded disease (Suh *et al*., 2004). In addition, Jackson *et al*. report "the African region bears 90% of these estimated worldwide deaths," and "three-quarters of all malaria related deaths are among African children," citing Breman (2001).

According to Reiter (2000), claims that malaria resurgence is the product of CO_2-induced global warming ignore other important factors and disregard known facts. A **historical analysis of malaria trends, for example, reveals this disease was an important cause of illness and death in England during a period of colder-than-present temperatures throughout the Little Ice Age.** Its transmission began to decline only in the nineteenth century, during a warming phase, when, according to Reiter, "temperatures were already much higher than in the Little Ice Age." In short, malaria was prevalent in Europe during some of the coldest centuries of the past millennium, and it has only recently undergone widespread decline, when temperatures have been warming.

Clearly, there are other factors at work in regards to malaria that are more important than temperature. Such factors include the quality of public health services, irrigation and agricultural activities, land use practices, civil strife, natural disasters, ecological change, population change, use of insecticides, and the movement of people (Reiter, 2000; Reiter, 2001; Hay *et al*., 2002).

Nevertheless, concerns have lingered about the possibility of widespread future increases in malaria due to global warming. These concerns are generally rooted in climate models that typically use only one, or at most two, climate variables in making their predictions of the future distribution of the disease over Earth, and they generally do not include any of the non-climatic factors listed in the preceding paragraph. When more variables are included, a less-worrisome future is projected.

In one modeling study, for example, Rogers and Randolph (2000) employed five climate variables and obtained very different results. Briefly, they used the present-day distribution of malaria to determine the specific climatic constraints that best define that distribution, after which the multivariate relationship they derived from this exercise was applied to future climate scenarios derived from state-of-the-art climate models, in order to map potential future geographical distributions of the disease.

Kuhn *et al*. (2003) analyzed the determinants of temporal trends in malaria deaths within England and Wales in 1840–1910 and found "a 1°C increase or decrease was responsible for an increase in malaria deaths of 8.3% or a decrease of 6.5%, respectively," which explains "the malaria epidemics in the 'unusually hot summers' of 1848 and 1859." Nevertheless, the long- term near-linear temporal decline in malaria deaths over the period of study, the researchers write, "**was probably driven by nonclimatic factors**," among which they identify increasing livestock populations (which tend to divert mosquito biting from humans), decreasing acreages of marsh wetlands (where mosquitoes breed), as well as "improved housing, better access to health care and medication, and improved nutrition, sanitation, and hygiene." Kuhn *et al*. say "the projected increase in proportional risk is clearly insufficient to lead to the reestablishment of endemicity."

Childs *et al*. (2006) present a detailed analysis of malaria incidence in northern Thailand based on a quarter-century monthly time series (January 1977 through January 2002) of total malaria cases in the country's 13 Northern provinces. Noting "**there has been a steady reduction through time of total malaria incidence in northern Thailand, with an average decline of 6.45% per year," they say this result "reflects changing agronomic practices and patterns of immigration**, as well as the success of interventions such as vector control programs, improved availability of treatment and changing drug policies."

Reiter (2008) came to similar conclusions, writing "simplistic reasoning on the future prevalence of malaria is ill-founded; malaria is not limited by climate in most temperate regions, nor in the tropics, and in nearly all cases, 'new' malaria at high altitudes is well below the maximum altitudinal limits for transmission

Hulden and Hulden (2009) analyzed malaria statistics collected in Finland from 1750 to 2008 via correlation analyses between malaria frequency per million people and all variables that have been used in similar studies throughout other parts of Europe, including temperature data, animal husbandry, consolidation of land by redistribution, and household size. Over the entire period, "malaria frequency decreased from about 20,000–50,000 per 1,000,000 people to less than 1 per 1,000,000 people," they report. The two Finnish researchers conclude, "Indigenous malaria in Finland faded out evenly in the whole country during 200 years with limited or no counter measures or medication," making that situation "one of the very few opportunities where natural malaria dynamics can be studied in detail." Their study indicates "malaria in Finland basically was a sociological disease and that malaria trends were strongly linked to changes in the human household size and housing standard."

Effects of climate and socioeconomic factors on the projected future global distribution of malaria.

Model type	Population at Risk 2030 [billions]	Population at Risk 2050 [billions]
Socioeconomic changes only (no climate change)	3.52	1.74
Socioeconomic and climatic changes (A1B scenario)	3.58 [3.55–3.60]	1.95 [1.93–1.96]
Socioeconomic changes and CC (slower growth scenario)	3.82 [3.39–3.84]	3.42 [3.28–3.45]
No growth scenario , only CC	4.61 [4.54–4.67]	5.20 [5.11–5.25]
Pessimistic growth scenario and CC	5.18 [5.07–5.30]	6.27 [6.19–6.32]

Source: Béguin *et al*. (2011).

The many findings described above make it clear a vast body of scientific examination and research contradict the claim that malaria will expand across the globe and intensify as a result of CO_2-induced warming.

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Dengue Fever

Concerns over large increases in dengue fever as a result of rising temperatures are unfounded and unsupported by the scientific literature, as climatic indices are poor predictors for dengue

fever.

Dengue /dengue hemorrhagic fever is the most important vector-borne viral disease globally," with more than half the world's population living in areas deemed to be at risk of infection. Four serotypes exist and Dengue has increased dramatically in the past 50 years with tens of millions of cases and hundreds of thousands of cases of hemorrhagic fever variant that has a high mortality and morbidity.

Paul Reiter (2001, 2003, 2010a, 2010b), one of the world's premier authorities on the subject analyzed the history of malaria and dengue fever in an attempt to determine whether the incidence and range of influence of these diseases would indeed increase in response to CO_2-induced global warming. His reviews established what is now widely accepted among experts in the field, that the natural history of these vector-borne diseases is highly complex, and the **interplay of climate, ecology, vector biology, and a number of other factors defy definition by the simplistic analyses utilized in the computer models relied on by environmental activists and the IPCC.**

That there has in fact been a resurgence of these diseases in parts of the world is true, but as Reiter (2001) notes; it is "facile to attribute this resurgence to climate change." This he shows via a number of independent analyses that clearly demonstrate factors associated with politics, economics, and human activity is the principal determinants of the spread of these diseases. He describes these factors as being "much more significant" than climate in promoting disease expansion. Two years later, Reiter took up the subject again, this time with 19 other scientists as coauthors (Reiter *et al*., 2003), and yet again in 2010. Reiter's work remains the most comprehensive critique of the claims of the Intergovernmental Panel on Climate Change.

Wilder-Smith and Gubler (2008) conducted a review of the scientific literature, noting "the past two decades saw an unprecedented geographic expansion of dengue" and "global climate change is commonly blamed for the resurgence of dengue," but they add, "There are no good scientific data to support this conclusion." The two researchers report, "Climate has rarely been the principal determinant of [their] prevalence or range," and "human activities and their impact on local ecology have generally been much more significant." They cite as contributing factors "urbanization, deforestation, new dams and irrigation systems, poor housing, sewage and waste management systems, and lack of reliable water systems that make it necessary to collect and store water," further noting "disruption of vector control programs, be it for reasons of

political and social unrest or scientific reservations about the safety of DDT, has contributed to the resurgence of dengue around the world."

In addition, Wilder-Smith and Guble write "Population dynamics and viral evolution offer the most parsimonious explanation for the observed epidemic cycles of the disease, far more than climatic factors."

Russell *et al*. (2009) showed the dengue vector (the *Aedes Aegypti* mosquito) "was previously common in parts of Queensland, the Northern Territory, Western Australia and New South Wales," and it had, "in the past, covered most of the climatic range theoretically available to it," adding "the distribution of local dengue transmission has [historically] nearly matched the geographic limits of the vector."

Reiter (2010a) observed "the introduction and rapidly expanding range of *Aedes Albopictus* in Europe is an iconic example of the growing risk of the globalization of vectors and vector-borne diseases," and "the history of yellow fever and dengue in temperate regions confirms that transmission of both diseases could recur, particularly if *Aedes Aegypti*, a more effective vector, were to be re-introduced."

Carbajo *et al*. (2012) evaluated the relative contributions of geographic, demographic, and climatic variables to the recent spread of dengue in Argentina. They found dengue spatial occurrence "**does not fully describe the distribution of dengue occurrence at the country scale," and "when taken separately, climatic variables performed worse than geographic or demographic variables."**

These several observations indicate concerns over large increases in dengue fever as a result of rising temperatures are unfounded and unsupported by the scientific literature, as climatic indices are poor predictors for dengue fever.

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Tick-borne Diseases

Climate change has not been the most significant factor driving the recent temporal patterns in the epidemiology of tick-borne diseases.

Sarah Randolph of the University of Oxford's Department of Zoology is a leading scholar on tick-borne diseases. She and fellow Oxford faculty member David Rogers observed in 2000 that tick-borne encephalitis (TBE)

"Like many vector-borne pathogen cycles that depend on the interaction of so many biotic agents with each other and with their abiotic environment, enzootic cycles of TBEV have an inherent fragility," so "their continuing survival or expansion cannot be predicted from simple univariate correlations."

Randolph (2010) **states "the inescapable conclusion is that the observed climate change alone cannot explain the full heterogeneity in the epidemiological change, either within the Baltic States or amongst Central and Eastern European countries," citing Sumilo *et al*.** (2007). Instead, she writes, "a nexus of interrelated causal factors—abiotic, biotic and human—has been identified," and "each factor appears to operate synergistically, but with differential force in space and time, which would inevitably generate the observed epidemiological heterogeneity."

Randolph concludes "there is increasing evidence from detailed analyses that rapid changes in the incidence of tick-borne diseases are driven as much, if not more, by human behavior that determines exposure to infected ticks than by tick population biology that determines the abundance of infected ticks," as per Sumilo *et al*. (2008a) and Randolph *et al*. (2008). She ends her analysis by stating, "While nobody would deny the sensitivity of ticks and tick-borne disease systems to climatic factors that largely determine their geographical distributions, the evidence is that climate change has not been the most significant factor driving the recent temporal patterns in the epidemiology of tick-borne diseases."

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Conclusion

IPCC fails to acknowledge the human health benefits of a warming world, claiming instead that the net effect of warming is a cost rather than a benefit.

Fossil fuels have benefited human health by making possible the dramatic increase in human prosperity since the first Industrial Revolution, making investments possible in goods and services that are essential to protecting human health and prolonging human life. Fossil fuels further improve human health by making environmental protection both valued and financially possible and by powering technologies and production of goods and services, transportation, communication that all improve quality of life, and protect human health and welfare, extend lifespans.

If the combustion of fossil fuels leads to some amount of global warming, then the positive as well as negative health effects of that warming should be included in any cost-benefit analysis of fossil fuels. Medical science explains why colder temperatures often cause diseases and sometimes fatalities whereas warmer temperatures are associated with health benefits. Empirical research confirms that warmer temperatures lead to a net *decrease* in temperature-related mortality in virtually all parts of the world, even those with tropical climates. The evidence of this benefit comes from research conducted in nearly every major country of the world.

Global warming is reducing the incidence of fatal coronary events related to low temperatures and wintry weather by a much greater degree than it increases the incidence of heat related illness or death attributable to heat waves. Respiratory illness, strokes and myocardial infarction are less frequent during unseasonably warm periods than during unseasonably cold periods.

Global warming is reducing the incidence of death due to respiratory disease in many parts of the world, including Spain, Canada, Shanghai, and even on the subtropical island of Taiwan. Low minimum temperatures have been found to be a stronger risk factor than high temperatures for outpatient visits for respiratory diseases. Warm weather reduces the incidence of death due to stroke around the world.

A vast body of scientific examination and research contradicts and refutes the claim that malaria will expand across the globe or intensify in some regions as a result of any predicted CO2-induced warming. Concerns over large increases in mosquito-transmitted dengue fever as a result of rising temperatures are unfounded and unsupported by the scientific literature.

While climatic factors largely determine the geographical distribution of ticks, temperature and climate change are not among the significant factors determining the incidence of tick-borne diseases.

In the face of this extensive evidence of the *positive* effects of fossil fuels on human health, IPCC continues to claim the net impact on human health of fossil fuels will be negative. Because virtually all cost-benefit analyses incorporate the IPCC's incorrect assumptions into their calculation of the social cost of fossil fuels, they are unreliable guides to policymakers.

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