Observed Climate Change and the Negligible Global Effect of Greenhouse-gas Emission Limits in the State of Mississippi
Table of Contents

Summary for Policy Makers ................................................................. 3

Observed Climate Change in Mississippi ........................................... 4
  Annual Temperature ............................................................................. 4
  Seasonal Temperatures ........................................................................ 4
  Precipitation ....................................................................................... 5
  Drought ............................................................................................. 6
  Floods ............................................................................................... 7
  Crop Yields ....................................................................................... 9
  Sea Level Rise .................................................................................. 10
  Hurricanes ....................................................................................... 12
  Vector-borne Diseases ...................................................................... 18

Impacts of Climate-Mitigation Measures in Mississippi .................. 22

Costs of Federal Legislation .............................................................. 26

Mississippi Scientists Reject UN’s Global Warming Hypothesis ........ 27

References ......................................................................................... 28
Summary for Policy Makers

In this report we provide a review of Mississippi’s climate history and show that there is no observational evidence of unusual long-term climate changes taking place that could be linked to anthropogenic “global warming”—despite the frequent prognostications to the contrary, often accompanied by doom and gloom scenarios. Instead of rising temperatures, the state’s annual average temperature has declined over the past century. Instead of an increasing frequency of drought, the state’s moisture conditions have improved over the long run. Instead of failing crops, the state’s agricultural yields have been increasing. Natural cycles in the regional climate can largely explain changes in patterns of hurricane activity. Changes in flood characteristics owe more to artificial changes to the river’s natural flow channel than to changes in the weather. Vector-borne disease outbreaks are more a matter of extant climate and social conditions than climate change. And the rate of future sea level rise is not projected to be largely different from the on-going rate of sea level rise along Mississippi’s coast—a rise that has been well-adapted to as Mississippi rising coastal development and population attests.

Further, we also show that any efforts to mitigate future climate change by legislation to curtail greenhouse gas emissions from Mississippi are doomed to fail—no matter how great the proposed emissions reductions. Even a complete halt to all greenhouse gas emissions from Mississippi will result in no detectable change in the future rate of global temperature or sea level rise. In fact, the global year-over-year increase in greenhouse gas emissions is fifteen times the total annual emissions from Mississippi. This means that a complete cessation of all greenhouse gas emissions from Mississippi—now and forever—would be totally subsumed by global emissions growth in only about three week’s time. Clearly, any plans aimed at merely reducing emissions to some arbitrary level will fare even worse.

But what’s worse is that while emissions reduction plans will have no impact on the state’s climate, they will have a large and negative impact of the state’s economy. Such plans are a perfect recipe for disaster—they are all pain and no gain.
Observed Climate Change in Mississippi

Annual Temperature: The historical time series of statewide annual temperatures in Mississippi begins in 1895. Over the entire record, there has been an overall trend towards cooler temperatures. While temperatures in recent years are slightly warmer than the broad multi-decadal cool period extending from the late-1950s through the mid-1990s they are much cooler than the conditions typical of the state during the 1920s, 1930s, 1940s and early 1950s. Annual and decadal-scale variability are also clearly evident in the statewide temperature history as year-to-year and multi-year swings in temperature are quite evident. Evidence that “global warming” has lead to unusual temperature conditions in the state is completely lacking.

Evidence that “global warming” has lead to unusual temperature conditions in the state is completely lacking.

Mississippi Annual Temperatures, 1895-2008


Seasonal Temperatures: When the statewide average temperature history for Mississippi is broken down into the four seasons, it can be seen that the same general patterns persist throughout the year. The warmest decades were typically prior to the mid-20th century, and recent decades show nothing unusual—fluctuating from year to year on either side of the long-term average. Again, year-to-year and/or decade-to-decade
variability is quite pronounced. In no season does there appear to be any evidence of “global warming.”

**Mississippi Seasonal Temperatures, 1895-2008**

**Figure 2.** Seasonal statewide average temperature history of Mississippi. (Source: National Climatic Data Center, http://www.ncdc.noaa.gov oa/climate/research/cag3/ms.html.)

**Precipitation:** The statewide total annual precipitation history of Mississippi shows that although the past couple of years have been relatively dry, the long-term trend has been towards greater amounts of precipitation. In addition to the long-term trend—which has resulted in about 10-15% more annual precipitation at the end of the 20th century than at the beginning—precipitation can fluctuate greatly from year to year. For instance, the state’s wettest year on record, 1979, received 75.97 inches of precipitation—nearly twice the rainfall of the driest year, 1954, in which only 39.75 inches of precipitation fell. The variability from wet years to dry years is part of the general climate of the state and the precipitation pattern in recent decades does not depart in any way from natural expectations.
There has been a long-term trend towards a lessening of the statewide incidence of drought conditions. This trend is consistent with the state’s precipitation history.

**Mississippi Annual Precipitation, 1895-2008**

*Figure 3.* Total annual statewide precipitation history for Mississippi, 1895-2008 (source: National Climatic Data Center, http://www.ncdc.noaa.gov/oa/climate/research/cag3/ms.html).

Drought: Since 1895, there has been a long-term trend towards a lessening of the statewide incidence of drought conditions in Mississippi and increases in the overall soil moisture supply. This trend is consistent with the state’s precipitation history.

**Mississippi Drought Severity, 1895-2008**

*Figure 4.* Monthly statewide average values of the Palmer Drought Severity Index (PDSI) for the state of Mississippi, 1895-2008. (Source: National Climate Data Center, www.ncdc.noaa.gov.)
According to records compiled by the National Climatic Data Center since 1895, statewide monthly average Palmer Drought Severity Index (PDSI) values—a standard measure of moisture conditions that takes into account both inputs from precipitation and losses from evaporation—show a trend towards wetter conditions and away from drier ones during past 114 years. In addition to the long-term trend, short-term variations lasting from years to multiple years are evident in Mississippi’s moisture record. Multi-year droughts in the mid-1920s and mid-1950s stand out, as do multi-year wet periods in the mid-1970s and early 21st century. Dry conditions which characterize the past couple of years are a natural part of the region’s climate and not an unusual occurrence that could be related to “global warming.”

**Floods:** It is often suggested that global warming will lead to an increase in flood events as the frequency of heavy rainfall is projected to increase. Recent flood events and increases in flood damages along the Mississippi River are often pointed to as evidence supporting this supposition. However, several scientific studies indicate that it is not a changing climate that is responsible for these observed changes, but instead, it is changes in population and wealth as well as changes to the river itself that are the primary causes.

Downton et al. (2005) examined the historical record of flood damage throughout the country as compiled by the National Weather Service including looking at archived information, interviewing the folks who collect the data, identifying potential error sources, and performing a variety of analyses in an effort to produce a dataset that would be useful to the greater community of researchers and policy makers for understanding the character of damaging floods across the United States.

**U.S. Flood Damages, 1934-2000**
Climate change has little, if anything, to do with the observed increases in flood events along the Mississippi River.

After compilation of the flood damage record, the researchers plotted up the annual flood damage total for the United States from 1934-2000. What they found was a trend towards more and more damage by floods. But when the researchers controlled for changes in the population and wealth that occurred over the same period, the upwards trend disappeared and instead become slightly negative. In other words, the increase in damage from flood events is primarily caused by more and more people living in harm’s way (i.e. in areas prone to flooding) rather than from climate change producing either an increase in the frequency or intensity of flood events themselves.

And more recently Pinter et al. (2008) examined all the changes that have been made to the Mississippi River channel over the past century or more to control the flow, make the river more navigable, and reduce the risk of flooding and how these modifications to the natural river channel have impacted the river’s ability to handle high flow rates and on occurrence of flooding events. The researchers sought to “quantify changes in flood levels…in response to construction of wing dikes, bendway weirs, meander cutoffs, navigational dams, bridges, and other modifications.” They concluded that “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” and that while “significant climate- and/or land use-driven increases in flow were detected,” that “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 other words, climate change has little, if anything, to do with the observed increases in flood events along the Mississippi River.
Crop Yields: Across Mississippi, the annual yields from leading cash crops such as corn, soybeans, and cotton have risen during the past 50 years. Factors other than climate are largely responsible for the yield rise.

Crop yields increase primarily as a result of technology—better fertilizer, irrigation, more resistant crop varieties, improved tilling practices, modern equipment, and so on. The level of atmospheric carbon dioxide, a constituent that has proven benefits for plants, has increased as well. The relative influence of weather can be large from one growing season to the next, but over the long-term, it is relatively small compared with the technological advances. The fluctuations of temperature and precipitation from one season to the next and are responsible for some of the year-to-year variation in crops yields evident in the illustration above, but are responsible for little of the long-term upward trend. Through the use of technology, farmers are adapting to the climate conditions that traditionally dictate what they do and how they do it and producing more output than ever before. There is no reason to think that such adaptations and advances will not continue into the future—with or without any climate change that may occur.

Mississippi Major Crop Yields, 1950-2008

Figure 6. Annual statewide average yields of major crops in Mississippi. (Source: National Agricultural Statistics Service, http://www.nass.usda.gov/.)
Sea Level Rise: The relative sea level along the coast of Mississippi has changed as a result of an increase in global sea levels, along with an additional contribution from land subsidence resulting from on-going geologic processes. While land subsidence dominates the relative rate of sea level rise further west along the Gulf Coast, the shores of Mississippi have a fairly secure geologic bedding such that the rates of land subsidence there are relatively small. The total rate of sea level rise along the Mississippi Gulf Coast has been about 3mm/yr (or about 1 foot per 100 years) over the past half-century or so, increasing towards Louisiana. As the rising population of Mississippi’s coastal communities attests, the residents of Mississippi have adapted to this on-going rate of sea level rise.

Projected Population Change in Gulf of Mexico Coastal Counties, 2003-2008

![Projected Population Change in Gulf of Mexico Coastal Counties, 2003-2008](image)

Figure 7. Projected population change in the coastal counties of the U.S. Gulf Coast (top) from 2003-2008 and expected percentage change in population (bottom). (Source: U.S. Department of Commerce.)

Mississippi’s coastal counties are experiencing relatively high growth and development rates and are projected to continue to grow. So, it would seem that Mississippi’s coastal residents have successfully adapted to this rise in sea level and there seems little evidence that the ongoing and/or potential future sea level rise is enough of a concern to quell the influx of new inhabitants. A primary reason for this is likely that a dispassionate look at future sea level rise projections finds them to be less than alarming.
The latest projections of future sea level rise, as given in the *Fourth Assessment Report* (AR4) of the Intergovernmental Panel on Climate Change (IPCC), suggest a potential sea level rise in the coming century of between 7 and 23 inches—occurring at a rate not much different than the on-going rate of sea level rise along the Mississippi coastline. The actual rise over the next century will depend on the total amount of global warming that occurs. The IPCC links a lower sea level rise with lower future warming. The established warming rate of the earth is 0.18°C per decade, which is near the low end of the IPCC range of projected warming for the 21st century (which is from 0.11 to 0.64°C per decade). Therefore, since we observe that the warming rate is tracking near the low end of the IPCC projections, we should also expect that the rate of sea level rise should track near the low end of the range given by the IPCC—in this case, a future rise much closer to 7 inches than to 23 inches. Thus, the reasonably expected rate of sea level rise in the coming decades is not much different to the rate of sea level rise that Mississippi’s coastline have been experiencing for more than a century—and have adapted to.

**IPCC Projections of 21st Century Sea Level Rise**

![Graph showing IPCC projections of 21st century sea level rise](image)

*Figure 8. Range of sea level rise projections (and their individual components) for the year 2100 made by the IPCC AR4 for its six primary emissions scenarios. (Source: IPCC, 2007.)*

There are a few individuals who argue that sea level rise will accelerate precipitously in the future and raise the level of the ocean to such a degree that it inundates portions of coastal Mississippi and other low-lying areas around the world and they clamor that the IPCC was far too conservative in its projections. However, these rather alarmist views are not based upon the most reliable scientific information, and in fact, ignore what our best understanding of how a warmer world will impact ice loss/gain on Greenland and Antarctica and correspondingly, global sea level. It is a fact, that all of the extant models of the future of Antarctica indicate that a warmer climate leads to more snowfall there (the majority of which remains for hundreds to thousands of years because it is so cold)
which acts to slow the rate of global sea level rise (because the water remains trapped in ice and snow). And new data suggest that rapid rates of ice loss from Greenland in the future are not likely (Joughin et al., 2008; van de Wal et al. 2008). Scenarios of disastrous rises in sea level are predicated on Antarctica and Greenland losing massive amounts of snow and ice in a very short period of time—an occurrence with virtual zero likelihood.

In fact, an author of the IPCC AR4 chapter dealing with sea level rise projections, Dr. Richard Alley, recently testified before the House Committee on Science and Technology concerning the state of scientific knowledge of accelerating sea level rise and pressure to exaggerate what it known about it. Dr. Alley told the Committee:

This document [the IPCC AR4] works very, very hard to be an assessment of what is known scientifically and what is well-founded in the refereed literature and when we come up to that cliff and look over and say we don’t have a foundation right now, we have to tell you that, and on this particular issue, the trend of acceleration of this flow with warming we don’t have a good assessed scientific foundation right now. [Emphasis added.]

Thus the IPCC projections of future sea level rise, which average only about 15 inches for the next 100 years, stand as the best projections that can be made based upon our current level of scientific understanding. These projections are far less severe that the alarming projections of many feet of sea level rise that have been made by a few individuals whose views lie outside of the scientific consensus.

Hurricanes: Perhaps one of the greatest concerns of Mississipians with regards to climate change is what impact it may have on the frequency and intensity of Atlantic hurricanes, or more specifically, hurricanes making landfall near the Mississippi coast. As Hurricane Katrina demonstrated, the potential impacts of a major hurricane direct strike are almost unimaginable. And even tropical storms or hurricanes in the near vicinity can spark a major societal upheaval. Consequently, the state’s interest in the potential influence of global warming on the past, present, and future trends in hurricane frequency and/or intensity is high. Fortunately, our best scientific understanding is that global warming will have a minor, if at all detectable, impact on Atlantic and Gulf hurricanes.

Since 1995 there has been an increase in both the frequency and intensity of tropical storms and hurricanes in the Atlantic basin at large. While some scientists have attempted to link this increase to anthropogenic global warming, others have pointed out that Atlantic hurricanes exhibit long-term cycles, and that this latest upswing is simply a return to conditions that characterized earlier decades in the 20th century.
In fact, natural cycles dominate the observed record of Atlantic tropical cyclones, which dates back into the 18th and 19th centuries (e.g., Chylek and Lesins, 2008). Multi-decadal oscillations are obvious in the long-term record of hurricane activity in the Atlantic basin—hurricane activity was quiet in the 1910s and 1920s, elevated in the 1950 and 1960s, quiet in the 1970s and 1980s, and has picked up again since 1995.

**Atlantic Hurricane Activity, 1900-2008**

![Atlantic Hurricane Activity, 1900-2008](image)

*Figure 9. Annual number of tropical cyclones and major hurricanes observed in the Atlantic basin, 1900-2008. Bars depict number of named systems (light gray) and major (category 3 or greater) hurricanes (dark gray). (Source: National Hurricane Center.)*

These timing of these oscillations matches well with the oscillations of a phenomenon known as the Atlantic Multidecadal Oscillation (AMO) which reflects changes in large-scale patterns of sea surface temperatures in the Atlantic Ocean. And much research has shown a connection between the AMO and Atlantic hurricane activity (e.g., Goldenberg et al., 2001; Knight et al., 2006, Zhang and Delworth, 2006; Chylek and Lesins, 2008; Klotzbach and Gray, 2008). Warmer cycles of the AMO—such the one we are in currently—are associated with enhanced tropical cyclone activity in the Atlantic Ocean and Gulf of Mexico, while the cold phase of the AMO is associated with lessened storm activity. Analyzing patterns in paleoclimate datasets coupled with model simulations, the AMO can be simulated back for more than 1,400 years (Knight et al., 2005). This is strong evidence that the AMO is part of the earth’s natural climate variations and cycles, and not a consequence of recent “global warming” a point further emphasized in modeling and observations studies by Zhang et al. (2008).
Atlantic Multidecadal Oscillation (AMO)

**Figure 10.** The observed historical timeseries of the Atlantic Multidecadal Oscillation (AMO) with period of high (+) and low (-) Atlantic hurricane activity noted (from Klotzbach and Gray, 2008).

Hurricane Tracks During Cold Phases of the AMO (left) and Warm Phases (right)

**Figure 11.** Contrast of Caribbean and Gulf of Mexico hurricane occurrences between colder (left) and warmer (right) values of the Atlantic Multidecadal Oscillation. The solid red lines indicate where the storms were at major hurricane intensity (from Goldenberg et al., 2001).

Further, not only is there evidence that the AMO has been operating for at least many centuries (prior to any possible human influence on the climate), but there is also growing evidence that there have been active and inactive periods in the Atlantic hurricane frequency and strength extending many centuries into the past. For instance, Chenoweth and Devine (2008) scoured ship logbooks, newspaper accounts, state reports, official government gazettes, meteorological registers, and consulate office reports to construct a hurricane
The recent increase in hurricane activity is part of the natural oscillation and not a strong manifestation of human-induced climate change. Research by Miller et al. (2006) using oxygen isotope information stored in tree-rings in the southeastern United States, found distinct periods of activity/inactivity in a record dating back 220 years. And in research that examined sediment records deposited from beach overwash in a lagoon in Puerto Rico, scientists Donnelly and Woodruff (2007) identified patterns of Atlantic tropical cyclone activity extending back 5,000 years.

So clearly, there is strong evidence for natural oscillations in the frequency and intensity of tropical cyclone activity in the Atlantic basin. Hurricane researchers have known this fact for many years and they expected the coming of the period of enhanced activity that began in 1995. Further, they recognize that the heighten activity levels are likely here to stay awhile, as the oscillations usually last several decades.

It is again worth noting that the recent increase in hurricane activity is part of the natural oscillation and not a strong manifestation of human-induced climate change. In fact, a strong manifestation of human-induced climate change on current and/or future Atlantic hurricane frequency or intensity is unlikely.

Some expect that human activity will lead to an overall climate warming. A warming climate is reasonably expected to lead to higher sea surface temperatures in the tropical Atlantic spawning grounds of hurricanes. And sea surface temperatures play an important role in the processes of formation and intensification of tropical cyclones. Therefore, some researchers (e.g., Knutson and Tuleya, 2004; Emanuel, 2005; Webster et al. 2005) suggest that hurricanes will become stronger in a warmer world. However, at the same time, some of the climate changes that are projected to occur as the levels of atmospheric carbon dioxide continue to grow into the future, are ones that act to hinder tropical cyclone formation and development. This includes projections of increased vertical wind shear (Vecchi and Soden, 2007a, b) and increasing atmospheric stability (Knutson and Tuleya, 2004). Thus, when all of the projected changes are incorporated into climate models, the models generally predict only small increases in intensity (maximum winds increase by just 6%) over the course of the next coming century (Knutson and Tuleya, 2004), and decreases in frequency of storms (Bengtsson et al., 2006; Knutson et al., 2008). And the small intensity increases are produced by a climate model which was driven by scenarios of future carbon dioxide increases that are much greater than current trends suggest that they will be (Michaels et al., 2006). Thus, even the small projected intensity increases may be overestimates.

Some claims are being made that the current period of elevated hurricane activity is the result of human-induced climate changes which have led to a long-term increase in the number and intensity of hurricanes during recent decades (e.g., Hoyos et al., 2006; Webster et al., 2005; Emanuel, 2005) as well as over the longer term (Holland and Webster, 2007). However, analytical errors (Landsea, 2005), the lack of strike (Landsea, 2005) and damage (Pielke Jr., 2005; Pielke Jr. et al., 2008) trends in the United States, changes in observational technology (Landsea et al., 2006; Landsea, 2007), among other issues (Klotzbach, 2006; Landsea, 2007), coupled with climate models simulations that project only minor intensity increases and
frequency decreases that are not anticipated to be detectable towards the end of the 21st century, combine to argue against those who have claimed to have detected anthropogenic-induced trends (Knutson et al., 2008).

The bottom line is that the balance of the evidence leans away from a strong influence of human-induced climate change on future Atlantic hurricane behavior and towards the continued dominance of natural variability (Vecchi et al., 2008).

Inevitably though, a hurricane will make a direct strike on Mississippi shores again in the future, and when it does, it will encounter a state whose coastal development, population, and wealth has been growing. A direct or indirect strike from a hurricane now will likely lead to more damage and destruction than it did in the past. While this gives the impression that storms are getting worse, in fact, it simply may be that there are a greater number of assets that lie in their path.

An example of this can be found in research by a team of researchers led by Dr. Roger Pielke Jr. (2008) which sheds some light on how population changes underlay hurricane damage statistics. Dr. Pielke’s research team examined the historical damage amounts from tropical cyclones in the United States from 1900 to 2005. What they found when they adjusted the reported damage estimates only for inflation was a trend towards increased amounts of loss, peaking in the years 2004 and 2005, which include Hurricane Katrina as the record holder for the most costliest storm, causing $81 billion in damage.

Total U.S. Losses from Tropical Cyclones

Figure 12. U.S. tropical cyclone damage (in 2005 dollars) when adjusted for inflation, 1900-2005 (from Pielke Jr., et al., 2008).
However, many changes have occurred in hurricane prone areas since 1900 besides inflation. These changes include a coastal population that is growing in size as well as wealth. When the Pielke Jr.’s team made adjustments considering all of these factors, they found no long-term change in damage amounts. And, in fact, the loss estimates in 2004 and 2005, while high, were not historically high. The new record holder, for what would have been the most damaging storm in history had it hit in 2005, was the Great Miami hurricane of 1926, which they estimated would have caused 157 billion dollars worth of damage. After the Great Miami hurricane and Katrina (which fell to second place), the remaining top-ten storms (in descending order) occurred in 1900 (Galveston 1), 1915 (Galveston 2), 1992 (Andrew), 1983 (New England), 1944 (unnamed), 1928 (Lake Okeechobee 4), 1960 (Donna/Florida), and 1969 (Camille/Mississippi). There is no obvious bias towards recent years. In fact, the combination of the 1926 and 1928 hurricanes places the damages in 1926-35 nearly 15% higher than 1996-2005, the last decade Pielke Jr. and colleagues studied.

**Normalized Total U.S. Losses from Tropical Cyclones**

This result by the Pielke Jr. team, that there has not been any long-term increase in tropical cyclone damage in the United States, is consistent with other science concerning the history of Atlantic hurricanes. One of Dr. Pielke co-authors, Dr. Chris Landsea, from the National Hurricane Center, has also found no trends in hurricane frequency or intensity when they strike the U.S. While there has been an increase in the number of strong storms in the past decade, there were also a similar number of major hurricanes in the 1940s and 1950s, long before such activity could be attributed to global warming.
As Pielke writes, “The lack of trend in twentieth century hurricane losses is consistent with what would expect to find given the lack of trends in hurricane frequency or intensity at landfall.”

Even in the absence of any long-term trends in hurricane landfalls along the U.S. coast, or damage to U.S. coastlines when population demographics are taken into account, the impact from a single storm can be enormous as residents of Mississippi know well. The build-up of the coastline has vastly raised the potential damage that a storm can inflict. Recently, a collection of some of the world’s leading hurricane researchers issued the following statement that reflects the current thinking on hurricanes and their potential impact (http://wind.mit.edu/~emanuel/Hurricane_threat.htm):

As the Atlantic hurricane season gets underway, the possible influence of climate change on hurricane activity is receiving renewed attention. While the debate on this issue is of considerable scientific and societal interest and concern, it should in no event detract from the main hurricane problem facing the United States: the ever-growing concentration of population and wealth in vulnerable coastal regions. These demographic trends are setting us up for rapidly increasing human and economic losses from hurricane disasters, especially in this era of heightened activity. Scores of scientists and engineers had warned of the threat to New Orleans long before climate change was seriously considered, and a Katrina-like storm or worse was (and is) inevitable even in a stable climate.

Rapidly escalating hurricane damage in recent decades owes much to government policies that serve to subsidize risk. State regulation of insurance is captive to political pressures that hold down premiums in risky coastal areas at the expense of higher premiums in less risky places. Federal flood insurance programs likewise undercharge property owners in vulnerable areas. Federal disaster policies, while providing obvious humanitarian benefits, also serve to promote risky behavior in the long run.

We are optimistic that continued research will eventually resolve much of the current controversy over the effect of climate change on hurricanes. But the more urgent problem of our lemming-like march to the sea requires immediate and sustained attention. We call upon leaders of government and industry to undertake a comprehensive evaluation of building practices, and insurance, land use, and disaster relief policies that currently serve to promote an ever-increasing vulnerability to hurricanes.

Vector-borne Diseases: “Tropical” diseases such as malaria and dengue fever have been erroneously predicted to spread due to global warming. In fact, they are related less to climate than to living conditions. These diseases are best controlled by direct application of sound, known public health policies.
The two tropical diseases most commonly cited as spreading as a result of global warming, malaria and dengue fever, are not in fact “tropical” at all and thus are not as closely linked to climate as many people suggest. For example, malaria epidemics occurred as far north as Archangel, Russia, in the 1920s, and in the Netherlands. Malaria was common in most of the United States prior to the 1950s (Reiter, 1996). In fact, in the late 1800s, a period when it was demonstrably colder in the United States than it is today, malaria was endemic in most of the United States east of the Rocky Mountains—a region including all of Mississippi. In 1878, about 100,000 Americans were infected with malaria; about one-quarter of them died. By 1912, malaria was already being brought under control, yet persisted in the southeastern United States well into the 1940s. In fact, in 1946 the Congress created the Communicable Disease Center (the forerunner to the current U.S. Centers for Disease Control and Prevention) for the purpose of eradicating malaria from the regions of the U.S. where it continued to persist. By the mid-to-late 1950s, the Center had achieved its goal and malaria was effectively eradicated from the United States. This occurred not because of climate change, but because of technological and medical advances. Better anti-malaria drugs, air-conditioning, the use of screen doors and windows, and the elimination of urban overpopulation brought about by the development of suburbs and automobile commuting were largely responsible for the decline in malaria (Reiter, 1996; Reiter, 2001). Today, the mosquitoes that spread malaria are still widely present in the United States, but the transmission cycle has been disrupted and the pathogen leading to the disease is absent. Climate change is not involved.

The effect of technology is also clear from statistics on dengue fever outbreaks, another mosquito-borne disease. In 1995, a dengue pandemic hit the Caribbean and Mexico. More than 2,000 cases were reported in the Mexican border town of Reynosa. But in the town of Hidalgo, Texas, located just across the river, there were only seven reported cases of the disease (Reiter, 1996). This is just not an isolated example, for data collected over the past several decades has shown a similarly large disparity between the high
number of cases of the disease in northern Mexico and the rare occurrences in the southwestern United States (Reiter, 2001). There is virtually no difference in climate between these two locations, but a world of difference in infrastructure, wealth, and technology—city layout, population density, building structure, window screens, air-conditioning and personal behavior are all factors that play a large role in the transmission rates (Reiter, 2001).

This result is confirmed by a large review of the causes of the increase in dengue fever transmission throughout the world. Wilder-Smith and Gubler (2008) reported that during the past two decades there was an unprecedented geographic expansion of dengue fever, but that “climate has rarely been the principal determinant of [dengue's] prevalence or range,” and that “human activities and their impact on local ecology have generally been much more significant.” They concluded that “population dynamics and viral evolution offer the most parsimonious explanation for the observed epidemic cycles of the disease, far more than climatic factors.” In other words, climate and climate change, has little to do with changes in dengue fever transmission.

**Dengue Fever at the Texas/Mexico Border from 1980 to 1999**

![Map of Texas and Mexico showing cases of dengue fever from 1980 to 1999.](image)

*Figure 15. Number of cases of Dengue Fever at the Texas/Mexico border from 1980 to 1999. During these 20 years, there were 64 cases reported in all of Texas, while there were nearly 1,000 times that amount in the bordering states of Mexico. (Source: Reiter, 2001.)*

Another “tropical” disease that is often (falsely) linked to climate change is the West Nile Virus. The claim is often made that a warming climate is allowing the mosquitoes that carry West Nile Virus to spread into Mississippi. However, nothing could be further from the truth.

West Nile Virus was introduced to the United States through the port of New York City in the summer of 1999. Since its introduction, it has spread rapidly across the country, reaching Mississippi by 2001 and the West Coast by 2002 and has now been documented in every state as well as most provinces of Canada. This is not a sign that the U.S. and
Canada are progressively warming. Rather, it is a sign that the existing environment is naturally primed for the virus.

**Spread of the West Nile Virus across the United States after its Introduction in New York City in 1999**

![Spread of the West Nile Virus across the United States after its Introduction in New York City in 1999](http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surve&control07Maps.htm)

*Figure 16. Spread of the occurrence of the West Nile Virus from its introduction to the United States in 1999 through 2007. By 2003, virtually every state in the country had reported the presence of virus. (Source: [http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surve&control07Maps.htm](http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surve&control07Maps.htm)).*

The vector for West Nile is mosquitoes; wherever there is a suitable host mosquito population, an outpost for West Nile virus can be established. And it is not just one mosquito species that is involved. Instead, the disease has been isolated in over 40 *mosquito species* found throughout the United States. So the simplistic argument that climate change is allowing a West Nile carrying mosquito species to move into Mississippi is simply wrong. The already-resident mosquito populations of Mississippi are appropriate hosts for the West Nile virus—as they are in every other state.

Clearly, as is evident from the establishment of West Nile virus in every state in the contiguous U.S., climate has little, or nothing, to do with its spread. The annual average temperature from the southern part of the United States to the northern part spans a range of more than 40ºF, so clearly the virus exists in vastly different climates. In fact, West
Nile virus was introduced in New York City—hardly the warmest portion of the country—and has spread westward and southward into both warmer and colder and wetter and drier climates. This didn’t happen because climate changes allowed its spread, but because the virus was introduced to a place that was ripe for its existence—basically any location with a resident mosquito population (which describes basically anywhere in the U.S).

West Nile virus now exists in Mississippi because the extant climate/ecology of Mississippi is one in which the virus can thrive. The reason that it was not found in Mississippi in the past was simply because it had not been introduced. Climate change in Mississippi has absolutely nothing to do with it. By following the virus’ progression from 1999 through 2007, one clearly sees that the virus spread from NYC southward and westward, it did not invade slowly from the (warmer) south, as one would have expected if warmer temperatures were the driver.

Since the disease spreads in a wide range of both temperature and climatic regimes, one could raise or lower the average annual temperature in Mississippi by many degrees or vastly change the precipitation regime and not make a bit of difference in the aggression of the West Nile Virus. Science-challenged claims to the contrary are not only ignorant but also dangerous, serving to distract from real epidemiological diagnosis which allows health officials critical information for protecting the citizens of Mississippi.

**Impacts of Climate-Mitigation Measures in the State of Mississippi**

Globally, in 2005, humankind emitted 28,485 million metric tons of carbon dioxide (mmtCO₂), of which emissions from Mississippi accounted for 63.1 mmtCO₂, or a mere 0.22% (EIA, 2007; EIA, 2008). The proportion of manmade CO₂ emissions from Mississippi will decrease over the 21st century as the rapid demand for power in developing countries such as China and India rapidly outpaces the growth of Mississippi’s CO₂ emissions (EIA, 2007).

Even a complete cessation of all CO₂ emissions in Mississippi will be completely subsumed by global emissions growth in about three week’s time! During the past 5 years, global emissions of CO₂ from human activity have increased at an average rate of 3.5%/yr (EIA, 2007), meaning that the annual increase of anthropogenic global CO₂ emissions is more than 15 times greater than Mississippi’s total emissions. This means that even a complete cessation of all CO₂ emissions in Mississippi will be completely subsumed by global emissions growth in about three week’s time!

In fact, China alone adds about nine Mississippi’s-worth of new emissions to its emissions total each and every year. Clearly, given the magnitude of the global emissions and global emission growth, regulations prescribing a reduction,
rather than a complete cessation, of Mississippi’s CO₂ emissions will have absolutely no effect on global climate.

Wigley (1998) examined the climate impact of adherence to the emissions controls agreed under the Kyoto Protocol by participating nations, and found that, if all developed countries meet their commitments in 2010 and maintain them through 2100, with a mid-range sensitivity of surface temperature to changes in CO₂, the amount of warming “saved” by the Kyoto Protocol would be 0.07°C by 2050 and 0.15°C by 2100. The global sea level rise “saved” would be 2.6 cm, or one inch. Even a complete cessation of CO₂ emissions in Mississippi is only a tiny fraction of the worldwide reductions assumed in Dr. Wigley’s global analysis, so its impact on future trends in global temperature and sea level will be only a minuscule fraction of the negligible effects calculated by Dr. Wigley.

To demonstrate the futility of emissions regulations in Mississippi, we apply Dr. Wigley’s results to the state, assuming that the ratio of U.S. CO₂ emissions to those of the developed countries which have agreed to limits under the Kyoto Protocol remains constant at 39% (25% of global emissions) throughout the 21st century. We also assume that developing countries such as China and India continue to emit at an increasing rate. Consequently, the annual proportion of global CO₂ emissions from human activity that is contributed by human activity in the United States will decline. Finally, we assume that the proportion of total U.S. CO₂ emissions in Mississippi – now 1.1% – remains constant throughout the 21st century. With these assumptions, we generate the following table derived from Wigley’s (1998) mid-range emissions scenario (which itself is based upon the IPCC’s scenario “IS92a”):

<table>
<thead>
<tr>
<th>Year</th>
<th>Global emissions: Wigley, 1998</th>
<th>Developed countries: Wigley, 1998</th>
<th>U.S. (39% of developed countries)</th>
<th>Mississippi (1.1% of U.S.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>26,609</td>
<td>14,934</td>
<td>5,795</td>
<td>63</td>
</tr>
<tr>
<td>2025</td>
<td>41,276</td>
<td>18,308</td>
<td>7,103</td>
<td>78</td>
</tr>
<tr>
<td>2050</td>
<td>50,809</td>
<td>18,308</td>
<td>7,103</td>
<td>78</td>
</tr>
<tr>
<td>2100</td>
<td>75,376</td>
<td>21,534</td>
<td>8,355</td>
<td>92</td>
</tr>
</tbody>
</table>

*Note:* Developed countries’ emissions, according to Wigley’s assumptions, do not change between 2025 and 2050: neither does total U.S or Mississippi emissions.

In Table 2, we compare the total CO₂ emissions saving that would result if Mississippi’s CO₂ emissions were completely halted by 2025 with the emissions savings assumed by Wigley (1998) if all nations met their Kyoto commitments by 2010, and then held their emissions constant throughout the rest of the century. This scenario is “Kyoto Const.”
Table 2

*Projected Annual CO₂ Emissions Savings (mmtCO₂)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Mississippi</th>
<th>Kyoto Const.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>78</td>
<td>4,697</td>
</tr>
<tr>
<td>2050</td>
<td>78</td>
<td>4,697</td>
</tr>
<tr>
<td>2100</td>
<td>92</td>
<td>7,924</td>
</tr>
</tbody>
</table>

Table 3 shows the proportion of the total emissions reductions in Wigley’s (1998) case that would be contributed by a complete halt of all Mississippi’s CO₂ emissions (calculated as column 2 in Table 2 divided by column 3 in Table 2).

Table 3

*Mississippi’s Percentage of Emissions Savings*

<table>
<thead>
<tr>
<th>Year</th>
<th>Mississippi</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.0%</td>
</tr>
<tr>
<td>2025</td>
<td>1.7%</td>
</tr>
<tr>
<td>2050</td>
<td>1.7%</td>
</tr>
<tr>
<td>2100</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Using the percentages in Table 3, and assuming that temperature change scales in proportion to CO₂ emissions, we calculate the global temperature savings that will result from the complete cessation of anthropogenic CO₂ emissions in Mississippi:

Table 4

*Projected Global Temperature Savings (°C)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Kyoto Const</th>
<th>Mississippi</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>0.03</td>
<td>0.0005</td>
</tr>
<tr>
<td>2050</td>
<td>0.07</td>
<td>0.001</td>
</tr>
<tr>
<td>2100</td>
<td>0.15</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Accordingly, a cessation of all of Mississippi’s CO₂ emissions would result in a climatically-irrelevant and undetectable global temperature reduction by the year 2100 of about two *thousandths* of a degree Celsius. This number is so low that it is effectively equivalent to zero. Results for sea-level rise are also negligible.
Even if the entire Western world were to close down its economies completely and revert to the Stone Age, without even the ability to light fires, the growth in emissions from China and India would replace our entire emissions in little more than a decade. In this context, any cuts in emissions from Mississippi would be extravagantly pointless. Mississippi’s carbon dioxide emissions, if their sum total, effectively do not impact world climate in any way whatsoever.

### State CO₂ Mitigation Plans: Futility and Projected Climate “Savings”

<table>
<thead>
<tr>
<th>State</th>
<th>2004 Emissions (million metric tons CO₂)</th>
<th>Percentage of Global Total</th>
<th>Time until Total Emissions Cessation Subsumed by Foreign Growth (days)</th>
<th>Temperature “Savings” (ºC)</th>
<th>Sea Level “Savings” (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Global Growth</td>
<td>China Growth</td>
<td>2050</td>
</tr>
<tr>
<td>AK</td>
<td>47.0</td>
<td>0.17</td>
<td>18</td>
<td>28</td>
<td>0.0008</td>
</tr>
<tr>
<td>AL</td>
<td>140.3</td>
<td>0.52</td>
<td>53</td>
<td>84</td>
<td>0.0025</td>
</tr>
<tr>
<td>AR</td>
<td>63.7</td>
<td>0.23</td>
<td>24</td>
<td>38</td>
<td>0.0011</td>
</tr>
<tr>
<td>AZ</td>
<td>96.9</td>
<td>0.36</td>
<td>37</td>
<td>58</td>
<td>0.0017</td>
</tr>
<tr>
<td>CA</td>
<td>398.9</td>
<td>1.47</td>
<td>152</td>
<td>239</td>
<td>0.0071</td>
</tr>
<tr>
<td>CO</td>
<td>93.1</td>
<td>0.34</td>
<td>35</td>
<td>56</td>
<td>0.0017</td>
</tr>
<tr>
<td>CT</td>
<td>45.5</td>
<td>0.17</td>
<td>17</td>
<td>27</td>
<td>0.0008</td>
</tr>
<tr>
<td>DC</td>
<td>4.0</td>
<td>0.01</td>
<td>2</td>
<td>2</td>
<td>0.0001</td>
</tr>
<tr>
<td>DE</td>
<td>16.9</td>
<td>0.06</td>
<td>6</td>
<td>10</td>
<td>0.0003</td>
</tr>
<tr>
<td>FL</td>
<td>258.0</td>
<td>0.95</td>
<td>98</td>
<td>155</td>
<td>0.0046</td>
</tr>
<tr>
<td>GA</td>
<td>175.7</td>
<td>0.65</td>
<td>67</td>
<td>105</td>
<td>0.0031</td>
</tr>
<tr>
<td>HI</td>
<td>22.7</td>
<td>0.08</td>
<td>9</td>
<td>14</td>
<td>0.0004</td>
</tr>
<tr>
<td>IA</td>
<td>81.8</td>
<td>0.30</td>
<td>31</td>
<td>49</td>
<td>0.0015</td>
</tr>
<tr>
<td>ID</td>
<td>15.6</td>
<td>0.06</td>
<td>6</td>
<td>9</td>
<td>0.0003</td>
</tr>
<tr>
<td>IL</td>
<td>244.5</td>
<td>0.90</td>
<td>93</td>
<td>146</td>
<td>0.0044</td>
</tr>
<tr>
<td>IN</td>
<td>239.9</td>
<td>0.88</td>
<td>91</td>
<td>144</td>
<td>0.0043</td>
</tr>
<tr>
<td>KS</td>
<td>77.8</td>
<td>0.29</td>
<td>30</td>
<td>47</td>
<td>0.0014</td>
</tr>
<tr>
<td>KY</td>
<td>151.5</td>
<td>0.56</td>
<td>58</td>
<td>91</td>
<td>0.0027</td>
</tr>
<tr>
<td>LA</td>
<td>180.5</td>
<td>0.66</td>
<td>69</td>
<td>108</td>
<td>0.0032</td>
</tr>
<tr>
<td>MA</td>
<td>83.6</td>
<td>0.31</td>
<td>32</td>
<td>50</td>
<td>0.0015</td>
</tr>
<tr>
<td>MD</td>
<td>80.6</td>
<td>0.30</td>
<td>31</td>
<td>48</td>
<td>0.0014</td>
</tr>
<tr>
<td>ME</td>
<td>23.3</td>
<td>0.09</td>
<td>9</td>
<td>14</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

A complete cessation of all anthropogenic emissions from Mississippi will result in a global sea-level rise savings by the year 2100 of an estimated 0.03 cm, or about one one-hundredth of an inch. Again, this value is climatically irrelevant and virtually zero.
And what would be the potential costs to Mississippi of legislative actions designed to cap greenhouse gas emissions? An analysis was recently completed by the Science Applications International Corporation (SAIC), under contract from the American Council for Capital Formation and the National Association of Manufacturers (ACCF and NAM), using the National Energy Modeling System (NEMS); the same model employed by the US Energy Information Agency to examine the economic impacts.

For a complete description of their findings please visit: [http://www.accf.org/pdf/NAM/fullstudy031208.pdf](http://www.accf.org/pdf/NAM/fullstudy031208.pdf)

To summarize, SAIC found that by the year 2020, average annual household income in Mississippi would decline by $770 to $2,496 and by the year 2030 the decline would increase to between $3,280 and $5,980. The state would stand to lose between 10,000 and 16,000 jobs by 2020 and between 27,000 and 36,000 jobs by 2030. At the same time gas prices could increase by more than $5 a gallon by the year 2030 and the states’ Gross Domestic Product could decline by then by as much as $4.3 billion/yr.

And all this economic hardship would come with absolutely no detectable impact on the course of future climate. This is the epitome of a scenario of all pain and no gain.
Mississippi Scientists Reject UN’s Global Warming Hypothesis

At least 232 Mississippi scientists have petitioned the US government that the UN’s human caused global warming hypothesis is “without scientific validity and that government action on the basis of this hypothesis would unnecessarily and counterproductively damage both human prosperity and the natural environment of the Earth.”

They are joined by over 31,477 Americans with university degrees in science – including 9,021 PhDs.

The petition and entire list of US signers can be found here: http://www.petitionproject.org/signers_by_state_main.php.

**CO₂ Science Updates**

For accurate, authoritative analysis for today’s policymakers, see SPPI’s Monthly CO₂ Report: http://scienceandpublicpolicy.org/monthly_report/.
References


