Observed Climate Change and the Negligible Global Effect of Greenhouse-gas Emission Limits in the State of Texas
Annual Rainfall

Annual Maximum Temperature
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Summary for Policy Makers

Variations in climate from year to year and decade to decade play a greater role in the Texan climate than any long-term trends. Short-term variability will continue to dominate the climate in future. The Texas climate shows no statically significant long-term trend in mean annual temperature, rainfall, floods, droughts, heatwaves, tornadoes, or hurricanes – still less any trend that could reasonably be attributed to “global warming”.

Agricultural yields in Texas will continue to increase. Record crop yields will continue to be set every couple of years. The climate is not the driving reason for the improvement: but it has not prevented it in the past and will not prevent it in the future.

The climate has little impact on the health of Texas’ population. Public health measures aimed at combating the health impacts of heat waves and vector-borne diseases are more cost-effective than the many expensive and largely untested proposals for mitigating “global warming”.

Overwhelmingly, observational scientific evidence demonstrates that “global warming” does not have and will not have any appreciable impact on the climate of Texas.

A cessation of all of Texas’s CO₂ emissions would result in a climatically-irrelevant global temperature reduction by the year 2100 of less than two hundredths of a degree Celsius.

A complete cessation of all anthropogenic emissions from Texas will result in a global sea-level rise savings by the year 2100 of an estimated 0.32 cm, or just over one-tenth of an inch. Again, this value is climatically irrelevant.

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 Texas would be extravagantly pointless.
A Naturally Variable Climate

In Texas, the largest of the contiguous United States and one of the most geographically diverse, the climate varies naturally and greatly by region and season. Intense heatwaves, droughts, floods, tornadoes, and hurricanes occur. In 1979 the Texas Department of Water Resources wrote:

“From the blizzards that traditionally pound the Panhandle each winter to the enduring heat that scorches vast sections of Texas later in the summer, Texas in the meteorological sense truly is the "land of contrast." Perennially the State perseveres through frequent bombardments of hail, high winds, and flash floods, often with the accompaniment of tornadoes – as well as the threat of being struck on its coastal flank by a hurricane or intense tropical cyclone.

“Inevitably each year some sector of Texas suffers from the effects of a tornado strike, a blinding snowstorm, a violent hail-bearing thunderstorm, or a raging sandstorm or dust storm. In many years at least some portions of the Lone Star State experience destruction or severe damage from an untimely freeze, a debilitating drought, or a lengthy spell of excessive rains.

“Assuredly, no two years weatherwise in Texas are even remotely similar, for the community that reeled one year from a capricious dry spell likely is the recipient of plenty of rain in the following year, while a not-too-distant neighboring locale that hurt from a disastrous hailstorm one Spring experiences relative calm during the following year's storm season.”

Observed Climate Change in Texas

Texas Annual Mean Temperatures, 1895-2006

![Temperature Graph]
Temperature

Since 1998 Texas has experienced several warm years. However, since the US National Climatic Data Center first kept records 112 years ago, there has been no long-term annual or seasonal trend of temperature change in Texas, and 1900-1950 was warmer than it has been since. Even the worldwide warming caused by the exceptional 1998 El Nino Southern Oscillation had no more effect in Texas than to restore temperatures that were typical until the mid-1950s, when a 40-year period of relatively cooler weather set in.

Seasonally, there has been a little warming in the spring (2007 was a record) and a little cooling in the other seasons. These changes are neither statistically significant nor abnormal.

Though globally many of the last ten years were among the hottest recorded, in Texas only 4 of the 20 hottest years recorded were in the past decade. The hottest year in Texas was 1956. On the evidence, “global warming” has had little impact on annual or seasonal mean temperatures in Texas.

Texas Temperatures by Season, Winter 1895 to Summer 2007

Rainfall

As with temperature, so with rainfall, there has been no uptrend since records began 112 years ago. The average is 30 inches per year. Rainfall is variable from year to year, ranging
from a low of 15 inches in 1917 to a high of 42 inches just two years later. Recent rainfall is well within normal variability.

Texas Mean Annual Rainfall, 1895-2006

Seasonal rainfall can sometimes deviate sharply from the average. For instance, there was record spring rainfall in 1957, and record summer rainfall in 2007, but almost as much summer rain fell around 1920, 1940, and 1960. The fall was wet in 1913 and 1919. The winter was wet in 1932 and 1992. These fluctuations are evidence of normal climate variability, not of manmade “global warming”.

Texas Rainfall by Season, Winter 1895 to Summer 2007

Source: U.S. National Climatic Data Center.
Drought

Series of dry years leading to drought often occur in Texas. The most severe were in the mid-1910s and mid-1950s. But there has been no long-term change in drought frequency or severity.

A dust storm approaching Spearman, Texas, April 1935. Source: NOAA Photo Library.

The Palmer drought-severity index, which balances rainfall against evaporation, confirms the absence of any trend. Instead, short-term variations reflect natural variability in rainfall:

Texas Palmer Drought-Severity Index, 1895-2007

From tree-ring patterns, Cook et al. (1999; 2004) reconstructed a 1200-year summer drought-severity index for central Texas. Alternating wet and dry periods lasting several decades have often occurred, demonstrating that droughts are normal in Texas. They do not indicate “global warming”.
Central Texas Summer Drought-Severity Index, 838-2003 AD

Floods

Rainfall in summer 2007 set a 112-year record. On several occasions that summer, many days of heavy rain caused widespread flooding and some damage. However, such floods are not unusual. The Flood Safety Education Project describes Texas as the state that leads the nation almost every year in flood fatalities and property damage:

“Flooding from large storms has affected Texas throughout its history, causing many deaths and much economic loss and hardship. Floods occur regularly in Texas, and destructive floods occur somewhere in the State every year. Many of these floods are destructive because they often occur in areas where extreme flooding had not occurred for many years. These floods often are perceived as unexpected or even unprecedented because their peak water-surface elevations (stages) can greatly exceed those of past floods.”

Source: Flood Safety Education Project.

Guadalupe River flood at Comfort, Texas, July 13-18, 1900.

Source: Flood Safety Education Project.
Colorado River flood at Ballinger, Texas, August 5-6, 1906, after 8 in. of rain.

Source: Flood Safety Education Project.

San Antonio River flood, Texas, Sept. 8-19, 1921. Taylor, TX, had 2 ft. of rain in 24 hours. Thrall had 32 in. in 12 hours. Source: Flood Safety Education Project.
Colorado River flood at Wharton, Texas, June 9-15, 1935, after 18in. of rain fell in six days.  
**Source:** Flood Safety Education Project.

West Clear Fork Trinity River flood, Fort Worth, May 17, 1949 after 1ft. of rain fell over Village Creek.  
**Source:** Flood Safety Education Project.
The heavy rain in 2007 had a benefit: much-enhanced plant growth. Over much of Texas, there was 50% more vegetation growth than usual:

**Texas Vegetation Growth Anomaly, Summer 2007**

Source: NASA / National Geographic

**Tornadoes**

Texas is partly within “tornado alley” and ranks among the most twister-frequented states:

Source: National Climatic Data Center.
In Texas, as in the U.S. as a whole, the recent apparent increase in tornado observations owes nothing to “global warming”. It arises because the National Weather Service uses Doppler radar more widely, there are more storm-chasers, and population density has grown. Small tornadoes that were once missed are now more often detected. The number of strong tornadoes across Texas—those less likely to have been missed previously—has declined since 1950:

### All Tornadoes Up, Strong Tornadoes Down, 1950-2006

![Graph showing the increase in all tornadoes and the decrease in strong tornadoes from 1950 to 2006.](image)

**Source:** NOAA Storm Prediction Center

Though the number of severe (F3-F5) tornadoes impacting Texas is falling, the threat remains real. On May 11, 1953, a violent F5 tornado touched down 10 miles south of Waco and cut a swath of destruction a third of a mile wide through the heart of the city, killing 114 and injuring 600. In the deadliest tornado in Texas’ history and the 10th deadliest ever to strike the U.S, more than 600 businesses, 850 homes and 2,000 cars were destroyed or severely damaged. Losses were $41 million ($300 million today).
On April 10, 1979, in the Red River Valley Tornado Outbreak, 13 tornadoes touched down in north-western Texas and southern Oklahoma, killing 56 people, all but three of them Texans. The most damaging tornado that day was an F4 monster than hit Wichita Falls, TX, just before 6pm and was on the ground for almost an hour. It cut a swathe a mile and a half wide—one of the widest paths on record. The Texas Department of Water Resources wrote:

“Forty-two people were killed outright by the storm, while 3 others died of heart attacks. Twenty-five of the deaths were auto-related; 16 of that total died while in their autos trying to flee the storm, and 11 of that number abandoned homes not touched by the tornado.

“3095 homes were destroyed, while roofs of many other buildings were sheared away. More than 1700 injuries occurred within Wichita Falls. 1062 apartment units and condominiums were destroyed, and 93 mobile homes were demolished. Wrecked cars were smashed against bridge abutments, a power plant was knocked out, and part of a high school was destroyed.

“Total damage in the city was estimated at $400 million; five thousand families (or about 20,000 people) were left homeless. This most damaging tornado in Texas history was not finished, however. It sped into Clay County, causing no deaths but 40 injuries and damage in the communities of Dean and Petrolia that amounted to $15 million. Golf-ball-size hail fell prior to and immediately after the tornado passed along a track that took it into Oklahoma (where it dissipated near Waurika).”
The Wichita tornado of April 10, 1979. **Source:** National Weather Service.

**Hurricanes**

Texas is also prone to hurricanes. Many of the worst tropical cyclones to hit the U.S. since 1900 struck Texas, including the all-time deadliest U.S. hurricane (Galveston, 1900) as well as two of the costliest (Rita, 2005 and Allison, 1999). Texas, with 7 million coastal residents, is more vulnerable to tornadoes today than ever. So, is “global warming” causing more frequent or more intense hurricanes?

Natural variations, on timescales of years to decades, dominate any small impact that a warming climate may have on the frequency and intensity of Atlantic hurricanes. It is not changes to the hurricanes themselves, but changes to the population and built infrastructure of the Texas coast that will determine whether hurricane damage grows. The US Department of Commerce reported in 2004 that the coastal communities of Texas have grown by more than half in just 25 years.

Since 1995 there have been stronger and more frequent hurricanes in the Atlantic basin. While some scientists have attempted to link this increase to “global warming”, others have pointed out that Atlantic basin hurricanes follow long-term cycles, and that this latest upswing is simply a return to conditions that characterized earlier decades in the 20th century. Along the Texas coast, according to the National Hurricane Center, the number of hurricane strikes varies from decade to decade and, in the long term, there is a statistically-insignificant decline. Dr. Chris Landsea of the National Hurricane Center has found no trends in hurricane frequency or intensity when they strike the U.S. The frequency of major hurricanes in the past decade is similar to that in the 1940s and 1950s, long before anthropogenic “global warming” could have had any effect. The number of hurricanes impacting Texas during the 10 years 1998-2007 is normal:
There has also been no long-term trend towards greater hurricane damage, once changes in inflation and population demographics are taken into account. Pielke et al. (2007) examined the inflation-adjusted costs of damage from tropical cyclones in the U.S. from 1900 to 2005. They found a rising trend, peaking in 2004-5 with Hurricanes Rita (in Texas) and Katrina:

**Annual Atlantic Tropical Cyclone Damage Costs, 1900-2005**

*2005 dollars (billions): 11-year centered average*
However, the population and infrastructure in harm’s way along the coast of Texas has grown in size and wealth. When Pielke et al. allowed for these factors, they found no long-term change in damage costs.

Even the heavy losses in 2004-5, while high, were not historically high. The most damaging storm in history, had it hit in 2005, would have been the Great Miami hurricane of 1926, which they estimated would have cost $157 billion.

After the Great Miami hurricane and Katrina (in second place) came Galveston 1 (1900), Galveston 2 (1915), Andrew (1992), New England (1983), unnamed (1944), Lake Okeechobee 4 (1928), Donna/Florida (1960), and Camille/Mississippi (1969). There is no obvious bias towards recent years. The combination of the 1926 and 1928 hurricanes caused losses in 1926-35 that were nearly 15% higher than those in 1996-2005:

**Annual Atlantic Tropical Cyclone Damage Costs, 1900-2005**

*2005 dollars (bn.): 11-year centered average, normalized for population growth*

Pielke writes: “The lack of trend in 20th-century hurricane losses is consistent with what one would expect to find given the lack of trends in hurricane frequency or intensity at landfall.”

Natural cycles, rather than a long-term trend, dominate the 250-year record of Atlantic tropical cyclones:
Decades-long oscillations are obvious in this record. 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. Research (Knight et al., 2006, Zhang and Delworth, 2006; Gray, 2007; and see Mann and Emanuel, 2006, for the contrary view) shows that these oscillations coincide with the Atlantic Multidecadal Oscillation, a cycle of large-scale changes in Atlantic sea surface temperatures. From paleoclimate datasets coupled with model simulations, the Atlantic Multidecadal Oscillation can be reconstructed for more than 1,400 years (Knight et al., 2005).

**Cycle of Atlantic Sea Surface Temperature Anomalies (1875-2000)**

The evidence is that the Atlantic Multidecadal Oscillation has been operating for at least several centuries, and certainly since long before any possible human influence on the
climate. There is also growing evidence for similar cycles in the frequency and strength of Atlantic hurricanes over recent centuries.

Miller et al. (2006), analyzing oxygen isotopes from tree-rings in the southeastern United States, found cycles dating back 220 years. Donnelly and Woodruff (2007), examining sediments from beach overwash in a Puerto Rico lagoon, found cycles of Atlantic tropical cyclone activity reaching back 5,000 years. Therefore hurricane researchers expected the period of enhanced hurricane activity that began in 1995. And they expect it to continue. A typical oscillation usually lasts several decades.

There is no scientific consensus on the question whether human-induced climate changes will affect hurricane frequency or intensity. If the warming that began in 1700 and ended in 1998 resumes, the sea surface in the shallow Caribbean basin, where hurricanes form, will rise. Therefore some researchers (e.g., Knutson and Tuleya, 2004; Emanuel, 2005; Webster et al. 2005) suggest that hurricanes will become more intense.

However, Bengtsson et al. (2006) say hurricane frequency will decrease. Also, countervailing effects may cancel the effect of greater warming. Vecchi and Soden (2007) project that increased vertical wind-shear will tend to reduce hurricane intensity. Knutson and Tuleya (2004) say that increasing atmospheric stability will do likewise, so that peak winds will increase by just 6% in 100 years. Michaels et al. (2006) say that even these small increases in projected hurricane intensity may be overestimates, because the models assumed far greater increases in carbon dioxide concentration than current trends suggest.

Hoyos et al. (2006), Webster et al., (2005), and Emanuel (2005) say that anthropogenic “global warming” has increased the frequency and intensity of hurricanes over recent decades. Holland and Webster (2007) say our impact might have been longer-term. However, analytical errors (Landsea, 2005), the lack of strikes (Landsea, 2005); the absence of damage trends (Pielke Jr., 2005; Pielke Jr. et al., 2007); changes in observational technology (Landsea et al., 2006; Landsea, 2007); and other factors (Klotzbach, 2006; Landsea, 2007), tend to confirm the models in indicating that any anthropogenic effect is likely to be insignificant.

Certainly, there is neither strong current evidence, nor any reliable future projections, to support the idea that the frequency or intensity of Atlantic basin tropical cyclones—including those affecting Texas—have increased or will increase detectably as a result of human influences on climate.

However, the impact of even a single intense storm can be enormous, as residents of Texas know all too well. Extensive development of the coastline has vastly increased the potential damage that a storm can inflict. Recently, a gathering of some of the world’s leading hurricane researchers (Emanuel, 2007) issued the following statement that reflects the current scientific thinking on hurricanes and their potential impact in coming years:
“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.”

**Sea Level**

Along the Texas coast, apparent sea level has risen dramatically in the last 100 years—in some areas as much as half an inch per year. However, most of this change is due to a drop in the land level caused by the extraction of groundwater and petroleum, not to climate change (Aubrey and Emery, 1991).

**Annual Mean Gulf Coast Land Subsidence Rate (mm/yr)**

*Source: Aubrey and Emery (1991).*
Land subsidence leads to a relative sea-level rise several times the true rate. Since Texas will continue to extract water and petroleum, trends in apparent sea-level rise and land subsidence during the past 100 years will persist, with or without an increase in the atmospheric carbon dioxide level.

The rise in global sea level began at the end of the last Ice Age and has averaged 4ft per century over the past 10,000 years. In the 20th century, however, global sea level rose by less than 8 inches. Texas’ residents have successfully adapted to this slow change: between 1980 and 2003 the coastal population grew by more than half, 2.5 million people, a rate of growth second only to California and Florida:

**Gulf of Mexico Coastal Population Change, 1980-2003**

![Gulf of Mexico Coastal Population Change, 1980-2003](image)

*Source: U.S. Department of Commerce.*

The IPCC (2007) projects a sea level rise in the coming century of 7-23 inches. The observed warming rate of the earth is 0.18°C per decade, near the low end of the IPCC’s 0.11-0.64 °C/decade range of 21st century warming. Therefore sea level rise this century may well be closer to 7 than 23 inches (Moerner, 2004). Coastal communities will have no difficulty adjusting to this rate of change.
There is no scientific basis for the notion that sea-level rise will accelerate precipitously and inundate coastlines such as that of Texas. Climate models indicate that a warmer climate leads to more snowfall in Antarctica, slowing the rate of global sea level rise as the snow accumulates and becomes ice. Also, Howat et al. (2007) suggest that the rate of ice loss from Greenland observed over the past few years has started to decline. Between 1993 and 2003 the average thickness of the vast Greenland ice sheet increased by 2 inches a year through accumulation of snow.

In 2007 Dr. Richard Alley, an author of the IPCC sea-level chapter, told the House Committee on Science and Technology:

This document [IPCC, 2007] 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.

Public Health Impacts of Warmer Weather

Heat Waves

There is little scientific foundation for the notion that “global warming” will lead to increased mortality during heat waves. Heatwaves affect people less than before, thanks to air-conditioning and social programs to protect high-risk individuals, despite rising urban temperatures:
Several studies (e.g. Davis et al., 2003ab) show that U.S. urban populations are better adapted to heatwaves than formerly. For nearly all U.S. cities, heat-related deaths are declining. The number of heat-related deaths in the 1990s was negligible. This successful adaptation is the result of improvements in medical technology, air-conditioning, better public awareness, and proactive responses by municipalities to extreme weather events.

In the southern states, where heatwaves are more common, heat-related mortality is much lower than in regions where heatwaves are rarer, such as the north-eastern U.S – further evidence that populations adapt to their prevailing climate. If heatwaves become more common, adaptations will occur without difficulty.

As is the case for most cities in the southern U.S., for the two Texas cities included in the Davis et al. studies, Dallas and Houston, there were very few heat-related deaths in the 1990s.

Davis et al. (2004) focused on deaths from cold as well as from heat. In Texas’ cities, as in most U.S. cities, heat-related deaths in July and August were offset by cold-related deaths in other months:
Mean Temperature vs. Mean Mortality in Dallas & Houston, Texas

Houston has more negative than positive bars. In Dallas, the pattern is not as clear. Generally, if winters continue to warm more than summers, as they have in the past 50 years, there would probably be fewer temperature-related deaths in Texas than today. Besides, temperature-related deaths are no more than a minuscule fraction of total mortality. In the United States, only one death in 850 is from heat or cold. This fraction will remain small, no matter how the climate evolves.

“Tropical” Disease

Vector-borne Diseases: Malaria, dengue fever, and West Nile Virus, which have been erroneously predicted to spread owing to “global warming”, are not tropical diseases. Climate change will have a negligible effect on their transmission rates. They are readily controlled by well-known public health policies. 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 until the 1950s (Reiter, 1996). In the late 1800s, when the United States was colder than today, malaria was endemic east of the Rocky Mountains—a region stretching from Texas on the Gulf Coast all the way up into northern Minnesota.
**Malaria Distribution in the United States, 1882 and 1912**

In 1878, 100,000 Americans were infected with malaria. Some 25,000 died. Malaria was eradicated from the United States in the 1950s not because of climate change (it was warmer in the 1950s than in the 1880s), but because of technological as well as medical advances. 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, 2001).

**U.S. Malaria Mortality per 100,000, 1900-1949**

*Source: Health Sentinel.*
The effect of technology is also clear from statistics on dengue fever, another mosquito-borne disease. In 1995, a dengue pandemic hit the Caribbean and Mexico, where 2,000 cases were reported in the border town of Reynosa. But in Hidalgo, Texas, just across the river, there were only seven cases (Reiter, 1996). This is not an isolated example. Decades of data show similar disparities between high prevalence in northern Mexico and rare occurrences in the south-western U.S. (Reiter, 2001). There is virtually no difference in climate, but a world of difference in infrastructure, wealth, and technology. City layout, population density, building design, window screens, air-conditioning and personal behavior all influence transmission rates (Reiter, 2001). From 1980 to 1999 there were more than 62,000 cases of dengue in north-eastern Mexico, but just 64 cases in all of Texas:

**Dengue Prevalence on the Texas/Mexico Border, 1980-1999**

![Map of dengue prevalence](image)

*Source: Reiter (2001).*

**Agriculture**

In Texas, though the climate has scarcely changed for 30 years, staple-crop yields have risen dramatically. Factors other than climate are largely responsible for the rapid yield rise.
Yields of staples grown in Texas – cotton, winter wheat, and corn – have shown strong increases over the past 30 years (and longer). Yields increased primarily as a result of technology—better fertilizer, widespread irrigation, more resistant crop varieties, improved tilling practices, modern equipment. The atmospheric concentration of carbon dioxide, which is not a pollutant but a naturally-occurring plant-food, has also helped to increase crop yields, and is predicted to continue to do so.

Climate influences – which have scarcely changed in Texas for a century – are minimal compared with these advances. Temperature and precipitation fluctuate but show no long-term trend; they merely account for some of the year-to-year variation in the trend. Even under the worst of circumstances, minimum crop yields continue to increase. Through technology, farmers are successfully adapting to the climate as necessary. It is likely that such adaptations and advances will continue in future.

**Impacts of Climate-Mitigation Measures in Texas**

Globally, in 2003, humankind emitted 25,780 million metric tons of carbon dioxide (mmtCO₂: EIA, 2007a), of which Texas accounted for 670.2 mmtCO₂, or only 2.6% (EIA, 2007b). The proportion of manmade CO₂ emissions from Texas will decrease over the 21st century as the rapid demand for power in developing countries such as China and India outpaces the growth of Texas’s CO₂ emissions (EIA, 2007b).
During the past 5 years, global emissions of CO₂ from human activity have increased at an average rate of 3.5%/yr (EIA, 2007a), meaning that the annual increase of anthropogenic global CO₂ emissions is greater than Texas’s total emissions. This means that even a complete cessation of all CO₂ emissions in Texas will be undetectable globally, and would be entirely subsumed by rising global emissions in less than 10 month’s time. A fortiori, regulations prescribing a reduction, rather than a complete cessation, of Texas’s CO₂ emissions will have 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. A complete cessation of CO₂ emissions in Texas 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.

We now apply Dr. Wigley’s results to CO₂ emissions in Texas, 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% 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 contributed by human activity in the United States will decline. Finally, we assume that the proportion of total U.S. CO₂ emissions in Texas – now 11.6% – 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>Texas (11.6% of U.S.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>26,609</td>
<td>14,934</td>
<td>5,795</td>
<td>670</td>
</tr>
<tr>
<td>2025</td>
<td>41,276</td>
<td>18,308</td>
<td>7,103</td>
<td>824</td>
</tr>
<tr>
<td>2050</td>
<td>50,809</td>
<td>18,308</td>
<td>7,103</td>
<td>824</td>
</tr>
<tr>
<td>2100</td>
<td>75,376</td>
<td>21,534</td>
<td>8,355</td>
<td>969</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 Texas emissions.

In Table 2, we compare the total CO₂ emissions saving that would result if Texas’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>Texas</th>
<th>Kyoto Const.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>824</td>
<td>4,697</td>
</tr>
<tr>
<td>2050</td>
<td>824</td>
<td>4,697</td>
</tr>
<tr>
<td>2100</td>
<td>969</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 Texas’s CO₂ emissions (calculated as column 2 in Table 2 divided by column 3 in Table 2).

Table 3

*Texas’s Percentage of Emissions Savings*

<table>
<thead>
<tr>
<th>Year</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.0%</td>
</tr>
<tr>
<td>2025</td>
<td>17.5%</td>
</tr>
<tr>
<td>2050</td>
<td>17.5%</td>
</tr>
<tr>
<td>2100</td>
<td>12.2%</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 Texas:

Table 4

*Projected Global Temperature Savings (°C)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Kyoto Const</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>0.03</td>
<td>0.005</td>
</tr>
<tr>
<td>2050</td>
<td>0.07</td>
<td>0.012</td>
</tr>
<tr>
<td>2100</td>
<td>0.15</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Accordingly, a cessation of all of Texas’s CO₂ emissions would result in a climatically-irrelevant global temperature reduction by the year 2100 of less than two hundredths of a degree Celsius. Results for sea-level rise are also negligible.
A complete cessation of all anthropogenic emissions from Texas will result in a global sea-level rise savings by the year 2100 of an estimated 0.32 cm, or just over one-tenth of an inch. Again, this value is climatically irrelevant.

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 Texas would be extravagantly pointless.

Table 5
Projected Global Sea-level Rise Savings (cm)

<table>
<thead>
<tr>
<th>Year</th>
<th>Kyoto Const</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>0.2</td>
<td>0.04</td>
</tr>
<tr>
<td>2050</td>
<td>0.9</td>
<td>0.16</td>
</tr>
<tr>
<td>2100</td>
<td>2.6</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Table 6
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>Global Growth</td>
<td>China Growth</td>
<td>2050</td>
<td>2100</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>
<tr>
<td>MI</td>
<td>189.9</td>
<td>0.70</td>
<td>72</td>
<td>114</td>
<td>0.0034</td>
</tr>
<tr>
<td>MN</td>
<td>102.8</td>
<td>0.38</td>
<td>39</td>
<td>62</td>
<td>0.0018</td>
</tr>
<tr>
<td>MO</td>
<td>139.8</td>
<td>0.51</td>
<td>53</td>
<td>84</td>
<td>0.0025</td>
</tr>
<tr>
<td>MS</td>
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<td>25</td>
<td>39</td>
<td>0.0012</td>
</tr>
<tr>
<td>MT</td>
<td>35.1</td>
<td>0.13</td>
<td>13</td>
<td>21</td>
<td>0.0006</td>
</tr>
<tr>
<td>NC</td>
<td>152.3</td>
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<td>58</td>
<td>91</td>
<td>0.0027</td>
</tr>
<tr>
<td>ND</td>
<td>49.9</td>
<td>0.18</td>
<td>19</td>
<td>30</td>
<td>0.0009</td>
</tr>
<tr>
<td>NE</td>
<td>43.6</td>
<td>0.16</td>
<td>17</td>
<td>26</td>
<td>0.0008</td>
</tr>
<tr>
<td>NH</td>
<td>22.0</td>
<td>0.08</td>
<td>8</td>
<td>13</td>
<td>0.0004</td>
</tr>
<tr>
<td>NJ</td>
<td>128.6</td>
<td>0.47</td>
<td>49</td>
<td>77</td>
<td>0.0023</td>
</tr>
<tr>
<td>NM</td>
<td>59.0</td>
<td>0.22</td>
<td>22</td>
<td>35</td>
<td>0.0011</td>
</tr>
</tbody>
</table>
President Obama’s Cap and Trade Proposal

President Obama has promised to “bankrupt” the coal industry with the most draconian cap and trade scheme in the world.

Under his announced greenhouse gas emissions reduction plan, he proposes to reduce the U.S.’s annual greenhouse house gas emissions total such that the U.S. total emissions in the year 2020 are the same as what the U.S. total emissions were in the year 1990. Even further, he vows to reduce total greenhouse gas emissions from the U.S. to 80% below what they were in 1990 by the year 2050.

The numbers look something like this (all numbers are in million metric tons CO₂):

<table>
<thead>
<tr>
<th>Year</th>
<th>U.S. CO₂ Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>5013</td>
</tr>
<tr>
<td>2007</td>
<td>5984</td>
</tr>
</tbody>
</table>

Obama’s Proposed Target:

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ Emissions</th>
<th>Savings from 2007 level</th>
<th>Savings/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>5013</td>
<td>971</td>
<td>75</td>
</tr>
<tr>
<td>2050</td>
<td>1003</td>
<td>4981</td>
<td>116</td>
</tr>
</tbody>
</table>

Now, let’s compare the total emissions savings (under the Obama plan) to annual growth in CO₂ emissions from countries besides the United States.

Averaged over the last 5 years, the growth rate in global CO₂ emissions (not including the U.S.) has been about 920 mmtCO₂ per year. That means, if Obama’s entire goal of limiting U.S. CO₂ emissions to a level that is 80% below 1990 levels, or to a value of 1003 mmtCO₂/year, could be met tomorrow—the entire emissions savings under his plan
(4981 mmtCO₂/yr) would be completely replaced by new emissions in the rest of the world in less than 5 and a half years.

If, instead of reaching the desired goal tomorrow, it was met by reducing our annual CO₂ emissions by 116 mmtCO₂/year for the next 43 years (quite a feat considering that for the past 10 years we have averaged a year-over-year increase of about 41 mmtCO₂/yr), each year’s annual savings would be replaced by global emissions growth within about the first 6 weeks of each year. That’s a lot of continuing struggle every year to be simply swept away in six weeks by emissions growth in the rest of the world (primarily China and India who make up about 2/3rds of the current annual emissions growth).

The result of all of this would be negligible supposed climate gain in the face of irreparable social, political and economic outcomes.

That is to say, assuming the UN’s mid-range sensitivity for a doubling of CO₂, the modeled result of an 80% below 1990 level reduction of U.S. emissions by the year 2050 would have the effective impact of simply delaying the total rise in global temperature and global sea levels by about 6 to 7 years. Differently put, the global average temperature in the year 2050 under Obama’s plan would be less than two-tenths of a degree F lower than it otherwise would have been in the year 2050. The global sea level would be about one-half an inch lower than where it otherwise would have been.

These impacts on the climate [even if scientifically believable] are, for all intents and purposes scientifically and physically meaningless.

**Impact of the European Union Actions – and other Nations**

Oftentimes, the actions of the European Union aimed towards reducing carbon dioxide emissions are held up as an example of how to combat climate change through decisive government action. But as with the U.S., the EU has proven quite ineffective when it comes to actually making a difference on global climate by regulating CO₂.
It is no secret that the EU talks the talk about climate change, but it doesn't walk the walk. Most EU countries will fail to meet their Kyoto emissions-reduction targets. While the much-reviled US administration succeeded in quietly cutting total US carbon emissions in recent years, the EU's carbon emissions have increased. Also, the EU's first attempt at carbon trading ended in characteristic farce when all member-states except the UK awarded themselves emissions rights that comfortably exceeded previous emissions. Result: the "price" of carbon emissions per ton of CO₂ fell below 50 cents, rendering the entire scheme useless. No climatic benefit ensued, and none will ensue from the EU's current scheme, which is nothing more than a purposeless extra cost to already hard-pressed businesses, many of which are finding it simpler to move out of the EU altogether.

In fact, even if the entirety of the EU-27 nations were to completely and forever cease all CO₂ emissions from this day forward, it would have an insignificant impact on the course of the world’s future climate (Table 7). In 50 years, the global temperature “savings” produced by an immediate cessation of all EU-27 CO₂ emissions is estimated to be less than one-tenth of a degree Celsius, and increasing to just a bit more than a tenth of a degree by centuries end. The impacts of future sea level would be equally miniscule.

Needless to say, the efforts to simply reduce CO₂ emissions from individual countries within the EU-27 produce even less of an impact—effectively no climate moderation…no lessening of the global temperature rise, no slowing of global sea level rise, nothing. Worse, all of their efforts will be quickly subsumed by new CO₂ emissions resulting from the rapid development and accompanying growth in emissions from the rest of the world, primarily China and India. In fact, a complete cessation of all EU-27 CO₂ emissions would be subsumed by new emissions from the rest of the world in fewer than 4 ½ years. For individual EU countries, the timing is even more disheartening. For example, growth in emissions from China would replace the entirety of Austria’s annual emissions in just 47 days, those from Denmark in 31, Spain’s in less than 8 months, and those from the U.K. in just under a year. Monumental efforts gone within a relative blink of an eye. Ditto for Australia, New Zealand and Japan.

### Table 7: European Union Country-by-Country Analysis of the Impacts of a Complete Cessation of Carbon Dioxide Emissions

<table>
<thead>
<tr>
<th>Country</th>
<th>2005 Emissions (mmt CO₂)</th>
<th>% Global Total</th>
<th>Time until Total Emissions Cessation Subsumed by Growth (days)</th>
<th>Temperature “Savings” (°C)</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>Year 2050</td>
</tr>
<tr>
<td>Austria</td>
<td>78</td>
<td>0.28</td>
<td>30</td>
<td>47</td>
<td>0.0013</td>
</tr>
<tr>
<td>Belgium</td>
<td>136</td>
<td>0.48</td>
<td>52</td>
<td>81</td>
<td>0.0023</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>51</td>
<td>0.18</td>
<td>19</td>
<td>30</td>
<td>0.0019</td>
</tr>
<tr>
<td>Cyprus</td>
<td>9</td>
<td>0.03</td>
<td>5</td>
<td>5</td>
<td>0.0002</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>113</td>
<td>0.40</td>
<td>43</td>
<td>68</td>
<td>0.0019</td>
</tr>
<tr>
<td>Denmark</td>
<td>51</td>
<td>0.18</td>
<td>19</td>
<td>31</td>
<td>0.0009</td>
</tr>
<tr>
<td>Estonia</td>
<td>19</td>
<td>0.07</td>
<td>7</td>
<td>11</td>
<td>0.0003</td>
</tr>
<tr>
<td>Finland</td>
<td>52</td>
<td>0.19</td>
<td>20</td>
<td>31</td>
<td>0.0009</td>
</tr>
<tr>
<td>France</td>
<td>415</td>
<td>1.47</td>
<td>158</td>
<td>249</td>
<td>0.0072</td>
</tr>
<tr>
<td>Germany</td>
<td>844</td>
<td>2.99</td>
<td>321</td>
<td>505</td>
<td>0.0145</td>
</tr>
</tbody>
</table>
Table 8: Japan, Australia, New Zealand, Canada: Analysis of the Impacts of a Complete Cessation of Carbon Dioxide Emissions

<table>
<thead>
<tr>
<th>Country</th>
<th>2006 Emissions (mmt CO2)</th>
<th>% Global Total</th>
<th>Time until Total Emissions Cessation Subsumed by Growth (days)</th>
<th>Temperature “Savings” (ºC) Year 2050</th>
<th>Temperature “Savings” (ºC) Year 2100</th>
<th>Sea Level “Savings” (cm) Year 2050</th>
<th>Sea Level “Savings” (cm) Year 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>417</td>
<td>1.43</td>
<td>159</td>
<td>0.0072</td>
<td>0.0108</td>
<td>0.0929</td>
<td>0.1872</td>
</tr>
<tr>
<td>Japan</td>
<td>1247</td>
<td>4.27</td>
<td>474</td>
<td>0.0216</td>
<td>0.0323</td>
<td>0.2778</td>
<td>0.5595</td>
</tr>
<tr>
<td>New Zealand</td>
<td>38</td>
<td>0.13</td>
<td>15</td>
<td>0.0007</td>
<td>0.0010</td>
<td>0.0085</td>
<td>0.0172</td>
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<tr>
<td>Canada</td>
<td>614</td>
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<td>234</td>
<td>0.0101</td>
<td>0.0159</td>
<td>0.1369</td>
<td>0.2757</td>
</tr>
</tbody>
</table>

This is a scenario that — just as in the U.S. — is best described as one which produces no climate gain for incredible economic, social and political pain. Social unrest has already begun.

**Costs of Federal Legislation**

And what would be the potential costs to Texas 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 these and other related findings please visit: [http://www.instituteforenergyresearch.org/cost-of-climate-change-policies/](http://www.instituteforenergyresearch.org/cost-of-climate-change-policies/).
Texas Scientists Reject UN’s Global Warming Hypothesis

At least 3,566 Texas 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 31,072 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/index.html.

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**SPPI: Additional Readings in Climate Science**

Environmental Effects of Increased Atmospheric Carbon Dioxide  
http://scienceandpublicpolicy.org/other/increasedco2effects.html.

35 Inconvenient Truths: The errors in Al Gore’s movie  

Hockey Stick? What Hockey Stick?  

An unscientific “Science Brief” by the Pew Center on “The Causes of Global Climate Change”  
http://scienceandpublicpolicy.org/originals/pew_center_science_brief.html.

Letter to Senator McCain  

Sherwood and Craig Idso examine James Hansen’s Senate testimony  
http://scienceandpublicpolicy.org/other/sherwood_and_craig_idso_examine_james_hansen_s_recent_senate_testimony.html.
Appendix

Recent global temperatures\(^1\): As the global temperature graphs below show, a decline in temperatures have now persisted for seven years. The fall in temperatures between January 2007 and January 2008 was the greatest January-January fall since records began in 1880.

The year 2008 turned out to have been no warmer than 1980 – 28 years ago. This is not a short-run change: the cooling trend set in as far back as late 2001, seven full years ago, and there has been no net warming since 1995 on any measure.

\(^1\) For complete updates on CO\(_2\) and Temperature, see: [http://scienceandpublicpolicy.org/monthly_report/](http://scienceandpublicpolicy.org/monthly_report/).
References


Flood Safety Education Project ([www.floodsafety.com](http://www.floodsafety.com)) is a non-profit organization that “promotes flood safety to driver education programs, home-buyers, those living in or near flood-plains, the general public, and decision-makers”.


National Climatic Data Center (NCDC):
- Climate data: www.ncdc.noaa.gov/oa/climate/climatedata.html
- Texas climate data: www.ncdc.noaa.gov/oa/climate/research/cag3/tex.html
- Palmer drought index: cdo.ncdc.noaa.gov/CDO/CDODimensionalSelect.jsp
- Central TX drought index: www.ncdc.noaa.gov/paleo/pdsi.html
- Tornado frequency: lwf.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html


National Weather Service, Norman, OK:
- The Wichita tornado: www.srh.noaa.gov/oun/wxevents/19790410/.

National Oceanographic and Atmospheric Administration (NOAA):
- Spearman, TX, dust storm: www.photolib.noaa.gov/index.html
- Tornado graphs: www.spc.noaa.gov/climo/historical.html


