

The Costs of Inaction: Large Cities in Texas

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Purpose and Objectives

- Purpose: To assess the costs from inaction for large cities in Texas under the potential impacts from climate change
- Approach: Examine various aspects of five cities in Texas to construct a generic assessment.

General

- Large cities have larger populations and more economic activities, so impacts will be more severe in the aggregate.
- Potential to adapt is strongest due to significant human and infrastructural resources.
- But also fragile due to high maintenance needs, dependency on outside services and resources, and long-term planning needs and processes.

Areas of focus

- Water resources
- Energy
- Extreme weather
- Transportation
- Health
- Crime
- Insurance

Water Resources

- Temperature changes modeled by recent analysis show an increase 3.6°F (2°C) for the modeling cell that includes Texas, with a 5% percent decrease in precipitation by 2050.
- Water budget analysis was used to estimate the impacts on the Texas water system, including evaporation under these changed climate conditions.

Water resources

Central Region water budget components for various scenarios, as fraction (percent) of present normal^[1]

	Normal climate	Greenhouse-warmed normal	Drought	Greenhouse drought
Precipitation	100	95	80	76
Evapo-transpiration	100	96	85	81
Runoff	100	81	42	34
Recharge	100	95	80	76
Lake evaporation	100	120	110	132

^[1] Table 3.8, Chapter 3: Water Resources and Supply, George Ward, forthcoming book on Texas climate change; currently available at <http://www.harc.edu/OurWork/Projects/ChapterReview>.

Water Resources

- Increases in evaporation from surface water would mean that a portion of future demand would need to come from either expanded surface water projects or other measures (i.e. conservation, reuse, groundwater, etc.)

Water Resources

- Region H, which includes Houston,
 - urban water uses $> \frac{3}{4}$ of current demand
 - Urban uses will increase over the next 50 years amounting to more than 80% of total water demand.
 - The Houston region will almost triple its surface waters supplies from 2010 to 2050 to meet future needs.
 - The plan includes two new major reservoirs and transfers from other surface water supplies.
- Region K, which includes Austin,
 - Urban water uses = 41% of water demand
 - Urban water uses will increase over the next 50 years to more than 63% of total water demand.
 - The Austin region will have decreased its use of surface water by more than 10% by 2050, largely through conservation and water reuse.

Water Resources

- Region H water plan
 - Expand surface water by almost 400,000 acre-feet from 2010 to 2050.
 - Additional evaporation due to higher temperatures would increase this by 20% or roughly 80,000 acre-feet.
 - At \$3,000 per acre-foot for capital costs, the additional surface water supply would amount to over \$200 million.

Electricity

- Texas currently has about 70,200 MW of generating capacity.
- On August 17, 2006, Texas experienced record energy demand of 62,339 MW.
- Earlier in April 2006, ERCOT employed a series of rolling blackouts to avoid widespread outages.

Electricity

- Per capita energy use is higher than the national average
- In the residential and commercial sectors, energy use for heating and cooling account for 40% of energy demand
- Electricity is primary source of energy for cooling

Electricity

- For a 2°C rise in average summer temperatures, per capita residential consumption would rise by 20-70 kWh per month (10-20%).
- The study found that for changes from 1°C to 3°C in temperature, changes in annual per capita consumption rates would range between 2.6-9.1% for residential use and 1.1-3.7% for commercial use (Sailor, 2001)

Electricity

- A more recent study on Texas looked at a range of growth scenarios against increased energy demand due to climate change.
- The study assumed a growth rate in electricity demand of 2.1% per year to 2050.
- This study found that the cumulative cost of construction of the additional capacity will cost between \$21 billion and \$45 billion (Hazleton, forthcoming).

Extreme Weather

- Building codes, storm planning, etc. are generally based on historic climate data, including averages and extremes
- Highly susceptible to changes from historical climate patterns

Extreme weather

- El Paso floods in 2006 – destroyed up to 300 homes and cause \$100 million in damage
- Hurricane Ike in 2008 –
 - estimated to have caused a total of \$15 billion in damage
 - Cost to the State of Texas will run in the range of \$6-8 billion dollars in windstorm damage claims

Extreme weather

- The Galveston Seawall – costs are \$20 million for both beach restoration and seawall repairs.
- Texas City Dike, a five mile long dike popular with recreationalists. Total costs to repair are given as \$8.5 million including removal of debris.
 - FEMA, the federal insurer, has agreed to cover 75% of the costs leaving Texas city with a \$1.62 million bill. Even if funding is found, it will still take at least a year to repair the damage.

Transportation

- Critical for movement of goods and services to and from markets, as well as movement of people to and from jobs.
- Higher temperatures can accelerate or directly damage transportation infrastructure including roads and bridges.
- Climate change could increase the cost of transportation infrastructure through more frequent or more expensive maintenance requirements and/or more expensive construction methods.

Health

- Higher temperatures can worsen air quality
- Heat mortality will rise
- Infectious diseases, generally focused on mosquito borne diseases such as malaria, West Nile virus, and dengue may increase.

Crime

- Well known link between crime, both violent and non-violent, and temperature.
- Statistical analysis in one study showed that temperature was able to explain 10-15% of the variance in monthly growth rates of certain crimes
- Statistics from the National Institute of Corrections show that the cost per inmate in Texas is \$13,808 annually in 2001

Insurance

- Insurance coverage for loss of property is a key component of development. Insurance allows people to pool risk, so that in the event of loss, their level of coverage exceeds what they would have been able to achieve with their own resources.
- One insurer estimated total claims related to hurricanes Ike and Gustav as \$175 million
- The same insurance company estimated that the total loss to the insurance industry will be in the area of \$20 billion.
- For 2009, they reported increases in US reinsurance rates of between 15-25 percent

Wrap-Up

- All key areas show potential for negative impacts from climate change creating significant additional costs for large cities.
- If climate change is gradual, planning processes may be able to adapt, but it will not be cheap.