

KANSAS

ASSESSING THE COSTS OF CLIMATE CHANGE

CLIMATE TRENDS IN KANSAS

During the last century, Kansas experienced changes in precipitation accompanied by more severe storms and higher temperatures. The average winter temperature statewide increased 2.1° F, and the average summer temperature increased 0.3° F.¹ Precipitation also has increased by 10 percent to 20 percent in the eastern part of the state.² These trends are predicted to continue due to climate change, and climate models predict that changes in temperature and precipitation may be larger if greenhouse gas emissions are not reduced.

The Kansas climate varies from the east to west—the east receives more moisture from the Gulf of Mexico, and the west has a drier, semiarid climate. The warming climate is likely to increase precipitation in the east by up to 11 inches annually by the end of the century and to reduce it in the west.³ The change in precipitation pattern could have significant implications for future water management practices in the state.⁴

OVERVIEW

In the coming decades, a changing climate could result in increased economic impacts on Kansas and the nation. The most recent climate modeling predicts warmer temperatures and potential reductions in water resources for much of Kansas and that these changes will be more pronounced if global emissions of greenhouse gases are not reduced. Water resources and agriculture are likely to be affected in various ways, and Kansas could see losses of more than \$1 billion. Since state economies are directly linked to the economies of neighboring states and regions, policymakers may wish to consider both state and regional policies to address climate change.

MAJOR ECONOMIC IMPACTS

Water Resources

Today, Kansas grapples to allocate scarce water resources between irrigated farms and growing urban areas. Most of western Kansas relies on groundwater from the Ogallala Aquifer for irrigation and potable water. Increasing demands from agriculture for irrigation water, however, are depleting aquifer reserves. This has caused a drop in groundwater levels of more than 60 feet in parts of western Kansas since 1980.⁵ Eastern Kansas, which contains most of the urban areas and livestock farms in the state, relies mainly on surface water—reservoirs and the Missouri River—for its water supply.⁶

A drier and warmer climate in western Kansas will elevate tension among water rights holders.⁷ Conflict already has arisen between Kansas and its neighbors over water: Colorado paid Kansas \$29 million in damages for taking too much water

Figure 1. Water Level Change in the Ogallala Aquifer in Feet, 1980-1999



Source: USGS, 2001.



from the Arkansas River in 2001, and Kansas has threatened Nebraska with a similar lawsuit for violating Republican River water agreements.^{8,9} In addition, intense irrigation over the past 50 years has caused the water level in the Ogallala Aquifer to decline.¹⁰

Flooding

On average, floods cause \$33 million worth of damage in Kansas annually.¹¹ The economic damages from floods have increased as urban and agricultural developments have encroached on known floodplains.¹² Flash floods pose serious threats to dry land that cannot absorb water quickly and the western part of the state will be increasingly susceptible to flash flooding as its climate becomes drier.¹³ Since climate change is likely to increase the likelihood of extreme precipitation events, it may result in more frequent flooding. More flooding could negatively affect water quality, since flooding increases the pollution and fertilizer levels in surface water and groundwater near urban areas and farms.¹⁴ Purifying water for drinking is likely to become more costly if pollution in drinking water sources increases.

Agriculture

Agricultural exports accounted for \$3.29 billion, or about 3 percent of the Kansas gross domestic product (GDP). The agriculture industry provides 40,000 jobs, employing about 2 percent of the state workforce.¹⁵ Although the government and manufacturing sectors represent the largest shares of the state GDP, the cultural and traditional significance of Kansas farming reaches beyond crops and agricultural workers.

Increased flooding would be destructive to the agricultural sector and could cost as much as \$150 million annually by 2032.¹⁶ More destructive flooding would have effects that extend beyond the agricultural sector. Economic models predict an additional loss of \$87 million and more than 700 jobs per year.¹⁷

Changes in winter temperatures and precipitation create favorable conditions for invasive species. Kansas crop losses due to invasive species are estimated at approximately \$871 million annually.¹⁸ A 1 percent per year increase in the persistence of invasive species could cause \$58 million in damages to other economic sectors and a loss of more than 400 jobs in agricultural and other economic sectors by 2017.¹⁹

OTHER ECONOMIC IMPACTS

Health

The warmer weather brought by climate change is likely to increase the formation of ground level ozone, which can cause respiratory inflammation, damage lungs and worsen asthma. According to a 1998 EPA report, “A 2° F warming in the Midwest, with no other change in weather or emissions, could increase concentrations of ozone, a major component of smog, by as much as 8 percent.”²⁰ Higher temperatures also mean more use of air conditioners, resulting in higher electricity consumption. The cities of Overland Park and Kansas City spend more than \$13 million annually on the treatment of asthma.²¹

Increased temperatures will increase electricity use since air conditioners will be working harder to keep homes and buildings cool. Since most household energy in Kansas comes from coal-fired power plants that emit air pollutants, increased energy consumption would drive up emissions, increasing the health risks for those with respiratory illnesses.

Rising temperatures also could increase the frequency of vector- and rodent-borne diseases in the United States. For example, increasing temperatures have the potential to increase the length of the transmission season of Dengue fever in temperate regions such as Kansas. Studies have shown a positive correlation between increased rainfall and rodent populations that carry diseases such as the plague, hantavirus and leptospirosis.²²

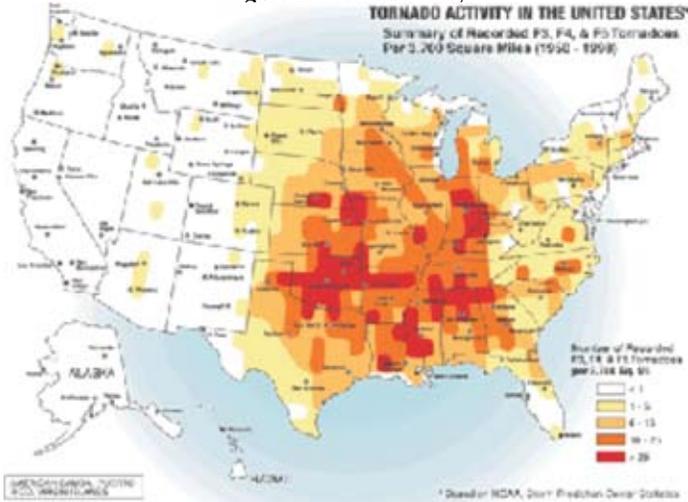
Severe Storms

Climate change models predict an increase in the intensity of storms in addition to changes in average temperatures and rainfall amounts.²³ Strong, severe thunderstorms, sometimes with hail and tornadoes, are common in Kansas during the summer months. In 2007, the Kansas Hazard Mitigation Team ranked tornadoes as the No. 1 hazard (out of 22) facing Kansas. Hailstorms were ranked ninth on the list. Hail, associated with severe thunderstorms, causes approximately \$46 million annually in property and crop damage in Kansas.²⁴

U.S. tornadoes occur most often in “tornado alley”—the area of the country that stretches north from Louisiana to Minnesota and east from Kansas to Kentucky (Figure 2). From 1950 to 2006, tornadoes caused \$6.8 billion in damage to homes and agriculture in Kansas alone, averaging \$120 million annually. In the same period, tornadoes caused 214 deaths and 2,617 injuries.²⁵ Higher summer temperatures are predicted to increase tornado intensity.²⁶ A one percent increase in the damage caused by tornadoes each year for the next 10 years could have extensive economic ramifications, including \$2 million in agricultural losses and nearly \$11 million in the building sector.²⁷



Figure 2. Tornado Alley



Source: www.nesec.org/images/haz_tornado_alley.gif

Tourism and Recreation

Diminishing or changing wildlife populations could affect some aspects of tourism and recreation, including hunting, fishing and bird watching. In 2001, the fishing and hunting industries brought in \$541 million from both out-of-state tourists and Kansas residents.²⁸ Kansas wetlands are critical to migratory waterfowl navigation. It is estimated that half of all migratory shore birds in the United States stop at Quivira National Wildlife Refuge in Stafford, Kansas.²⁹ Rising temperatures could shift the stopping point for these birds northward, taking with it revenue from birdwatchers and nature enthusiasts. Thus, deteriorating habitat due to climate change jeopardizes not only wildlife populations but also a source of tourism revenue.

CONCLUSION

Current and predicted climate trends in Kansas suggest that water supply could continue to be a major issue, especially in the arid west. Changes in precipitation, along with an increasing demand for water, may cause water shortages that will affect numerous sectors, including agriculture, power generation, food processing, and local government operations. Policies that address water management in the face of a shrinking water supply may be needed. Collaboration with industrial and municipal stakeholders could assist policymakers in evaluating water security and developing plans for water conservation and drought response.

The economic effects of changing ecosystems are not well understood, although decreasing fish and game populations could result in lower revenue from tourism and recreation. State agencies, policymakers and industrial sectors may benefit from studying the various economic effects that result from ecosystem loss or depletion and consider ways to promote adaptation.

Higher summer temperatures could strain electricity infrastructure due to increased use of air conditioning. Since coal-fired power plants rely heavily on water for cooling, increased energy production also could add further strain to water resources. Policymakers may wish to consider energy efficiency and demand-side management policies, which are proven, cost-effective ways to lower peak demand and reduce air pollution during hot summer months.



MISSING INFORMATION AND DATA GAPS

Although some studies show a positive correlation between the effects of climate change and poor health, sufficient data is not available to translate these effects into economic costs—in relation to health care or decreased work productivity, for example.

Another unaccounted indirect cost associated with climate change relates to increasing insurance costs due to variability of major weather events. More details are needed to determine how insurance companies may change their rates based on an increase in floods, tornadoes, fires or other weather-related risks.



NOTES

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