

Regional Highlight: West

The US Economic Impacts of Climate Change and the Costs of Inaction

A Review and Assessment by the Center for Integrative Environmental Research (CIER) at the University of Maryland

October 2007

Background

As science continues to bring clarity to present and future global climate change, policymakers are beginning to respond and propose policies that aim to curb greenhouse gas emissions. Although these policies are gaining momentum, their importance is not fully understood by many. All too frequently, inaction is motivated by the perceived high cost of reducing greenhouse gas emissions. The costs of not taking on the challenge posed by climate change are frequently neglected and typically not calculated. Throughout the United States, individuals and communities depend on sectors and systems that are expected to be greatly affected by the impacts of continued climate change.

- The **agricultural sector** is likely to experience uneven impacts throughout the country. Initial economic gains from altered growing conditions will likely be lost as temperatures continue to rise. Regional droughts, water shortages, as well as excess precipitation, and spread of pest and diseases will negatively impact agriculture in most regions.
- Storms and sea level rise threaten extensive **coastal infrastructure** – including transportation networks, coastal developments, and water and energy supply systems.
- Current **energy** supply and demand equilibria will be disrupted as electricity consumption climbs when demand grows in peak summer months. At the same time, delivering adequate supply of electricity may become more expensive because of extreme weather events.
- Increased incidence of asthma, heat-related diseases, and other respiratory ailments may result from climate change, affecting **human health** and well-being.
- More frequent and severe **forest fires** are expected, putting ecosystems and human settlements at peril.
- The reliability of **water supply networks** may be compromised, influencing agricultural production, as well as availability of water for household and industrial uses.

West

Similar to other regions, meeting the competing needs and uses for water resources will be a major challenge as decreased winter snowpack contributes to changes in water flow, both in quantity and timing. Although the picture is incomplete because of data limitations, a valuable glimpse of the extent to which climate change will affect these economic sectors can be gleaned from the summary below.

Water System and Agriculture

- Major climate change models predict winter snowpack will decline and snowmelt will occur earlier, which will result in greater runoff. The ability to store water in aquifers for later withdrawal may be compromised. Simultaneously, the demand for water is rising in the region. Ground-water withdrawals increased significantly in recent years in many Western states – 324% in Nevada, 147% in New Mexico, 208% in Utah, and 52% in California. Meeting increased urban demand for water in California is estimated to cost the state \$316 million to \$5 billion per year by 2085.
- Water shortages will force farmers in the area to fallow their lands. The estimated annual loss to the agricultural sector around the Central Valley will be \$278.5 to \$829 million, depending on the dryness of year. The estimated economy-wide loss for the Central Valley region is expected to reach up to \$6 billion during the driest years.
- Decreased supplies of water are expected to diminish the value of farmland by around 36%, translating into a loss of \$1,700 per farm.
- The value of wine production in California is \$3.2 billion, which may be compromised, as grape quality will likely diminish with higher temperatures.
- The decline in dairy cow productivity is correlated with higher temperatures, as well. An annual loss of \$287–902 million is expected to this \$4.1 billion industry in California.

Other impacts

- **Coastal infrastructure** will be affected by sea level rise

and flooding. For example, to protect the San Francisco Bay Area and the stretch of coast south of Santa Barbara from a 3.28 feet (1 meter) rise in sea level, an initial investment of \$1.52 billion, plus \$152 million in annual maintenance costs, will be required. The probability of a major flood event there is predicted to increase to a 2-in-5 chance of an event occurring in the next 50 years.

- **Energy** infrastructure will also be affected. Under extreme heat events, the increase in net energy expenses in California is expected to rise by \$2 to \$18.7 billion by 2100. Additionally, energy generated from hydropower sources will have to be reduced by approximately 10% because of lower water levels, costing \$3.5 billion annually for California.
- **Timber** yields are expected to decrease by 18% for mixed conifers and 30% for pine plantations in California. An expected increase of 55% in forest fires will additionally stress this and other sectors. The 1991 Oakland fire caused losses of about \$2.2 billion (in 2005 dollars), and the 2003 wildfires in San Diego and San Bernardino Counties damaged \$2 billion worth of property and infrastructure
- The **recreation industry** is also likely to suffer. Skiing, for example, is worth around \$1 billion for the entire region.

Nationwide

An assessment of the possible impacts of inaction is presented in the University of Maryland report, *The US Economic Impacts of Climate Change and the Cost of Inaction*. The range of climate changes anticipated in the United States will have real impacts on the natural environment as well as human-made infrastructure and its ability to contribute to economic activity and quality of life. The assessment suggests a need for immediate national policy to cut emissions, and a federally-funded set of region- and sector-specific studies to guide climate policy and investment.

Five key lessons from the complete report:

1. Economic impacts of climate change will occur throughout the country.
2. Economic impacts will be unevenly distributed across regions and within the economy and society.
3. Negative climate impacts will outweigh benefits for most sectors that provide essential goods and services to society.
4. Climate change impacts will place immense strains on public sector budgets.
5. Secondary effects of climate impacts can include higher prices, reduced income and job loss.

For the complete report, *The US Economic Impacts of Climate Change and the Cost of Inaction*, see: <http://www.cier.umd.edu/climateadaptation>. We thank Environmental Defense for support of this research.

SOURCES

As documented in the full report, data sources for the Western region include:

California Climate Change Center. 2006. *Our Changing Climate: Assessing the Risks to California – 2006*. Available online at <http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF>

California Water Plan Update. 2005. *San Joaquin River Hydrologic Region*. Vol 3, Ch 7. Available online at <http://www.waterplan.water.ca.gov/docs/cwpu2005/vol3/v3ch07.pdf>.

Franco, G. 2005. *Climate Change Impacts and Adaptation in California*. California Energy Commission (CEC). Available online at <http://www.energy.ca.gov/2005publications/CEC-500-2005-103/CEC-500-2005-103-SD.PDF>

Franco, G. and A. Sanstad. 2006. *Climate Change and Electricity Demand in California*. Final white paper. CEC-500-2005-201-SF. Berkeley, CA: California Climate Change Center, February 2006. Available online at www.energy.ca.gov/2005publications/CEC-500-2005-201/CEC-500-2005-201-SF.PDF

Hanemann, M., L. Dale, S. Vicuña, D. Bickett and C. Dyckman. 2006. *The Economic Cost of Climate Change Impact on California Water: A Scenario Analysis*. California Energy Commission, PIER Energy-Related Environmental Research. Available online at <http://www.energy.ca.gov/2006publications/CEC-500-2006-003/CEC-500-2006-003.PDF>

Hidalgo, H, L. Brekke, N. Miller, N. Quinn, J. Keyantash and J. Dracup. 2006. *Assessment of the Impacts of Climate Change on the Water Allocation, Water Quality and Salmon Production in the San Joaquin River Basin*. In M. Ruth, K. Donaghy and P. Kirshen (eds) *Regional Climate Change and Variability: Impacts and Responses*. Edward Elgar. Cheltenham UK and Northampton MA, USA.

Insurance Information Institute (III). 2007. *Facts and Statistics: Catastrophes*. Available online at <http://www.iii.org/media/facts/statsbyissue/catastrophes/>

Konieczki, A. D. and J. A. Heilman. 2004. *Scientific Investigations Report: Water-Use Trends in the Desert Southwest 1950-2000*. Available online at <http://pubs.usgs.gov/sir/2004/5148/pdf/sir20045148.pdf>

Lazo, J. K. et al. 2006. *Sensitivity Assessment: Evaluation of the Sensitivity of U.S. Economic Sectors to Weather Variability*. Societal Impacts Program. Available online at http://www.wmo.ch/pages/prog/amp/pwsp/documents/JeffLazo_US_Sector_Sensitivity.pdf.

Mendelsohn, R. 2003. *The Impact of Climate Change on Energy Expenditures in California*. October 2003. Available online at http://www.energy.ca.gov/reports/2003-10-31_500-03-058CF_A11.PDF

Proceedings of the National Academy of Sciences of the United States of America (PNAS). 2007. *Emissions pathways, climate change, and impacts on California*. Available online at <http://www.pnas.org/cgi/reprint/0404500101v1>

Schlenker, W., W. M. Hanemann and A. C. Fisher. 2005. *Water Rights, Degree Days, and the Potential Impact of Climate Change on Irrigated Agriculture in California*. Available online at <http://calclimate.berkeley.edu/16%20Water%20rights,%20degree%20days%20and%20the%20potential%20impact%20of%20climate%20change%20on%20irrigated%20ag%20in%20CA.pdf>

Smith, J. B., R. Richels and B. Miller. 2001. *Potential Consequences of Climate Variability and Change for the Western United States*. Ch. 8, pp 219-245. Report for the US Global Change Research Program. Cambridge University Press, Cambridge, UK. Available online at <http://www.usgcrp.gov/usgcrp/nacc/west.htm>.

Thomas, B. E. 2006. *2006: Trends in Streamflow of the San Pedro River, Southeastern Arizona*. Fact Sheet. Available online at <http://pubs.usgs.gov/fs/2006/3004/pdf/fs20063004.pdf>.

US Census Bureau 2005a. *American FactFinder*. Available online at <http://factfinder.census.gov>

