



EFFECTS MINNESOTA

A M E R I C A N S E C U R I T Y P R O J E C T

Pay Now, Pay Later: Minnesota

Every year, nearly 3 million people contribute over \$4 billion to Minnesota's economy through hunting, fishing, and wildlife viewing. Climate change poses a serious threat to Minnesota's numerous fish, wildlife, and other natural ecosystems.¹

Severe weather events, pests, and warmer temperatures could likely reduce crop yields,² negatively impacting Minnesota's \$13.3 billion agriculture industry.³

A renewable electricity standard of 20% by 2020 in Minnesota would create 3,100 jobs, attract new capital investment totaling \$1.8 billion, and generate \$332 million in aggregate income for farmers and rural landowners.⁴

According to a new study, a failure to mitigate the effects of climate change could begin to cause serious gross domestic product and job losses within the next several decades. Between 2010 and 2050, it could cost Minnesotans \$8.3 billion in GDP and nearly 37,000 jobs.*

**GDP numbers are based on a 0% discount rate. Job losses are measured in labor years, or entire years of fulltime employment. Backus, George et al., "Assessing the Near-Term Risk of Climate Uncertainty: Interdependencies among the U.S. States," Sandia Report (Sandia National Laboratories, May 2010), 141. https://cfwebprod.sandia.gov/cfdocs/CCIM/docs/Climate_Risk_Assessment.pdf (accessed March 23, 2011).*

Admittedly, the effects of climate change, a complex and intricate phenomenon, are difficult to predict with precision. Informed scientific and economic projections, as we have used in our research, however, allow us to see that Minnesota faces significant losses in industries crucial to its economy if no action is taken.

Moreover, data shows Minnesota is poised to benefit from research, development, and distribution of renewable energy technologies. In February 2007, Minnesota adopted a renewable energy standard, requiring electric utilities to obtain 25% of their energy from renewable resources by 2025.⁵ Minnesota ranks 4th in wind power production⁶ and has vast potential to expand.⁷ Should we fail to take action against climate change, Minnesotans have much to lose.

Pay Later: The Cost of Inaction

Effects of climate change on Minnesota include warmer and shorter winters, less snowfall, diminishing ice cover on lakes, and falling water levels.⁸ Temperatures and precipitation are likely to increase by 6-10°F and 15-40%, respectively, in the colder months, and rise by 7-16°F and up to 15% during the summer months. Minnesota's agricultural production could experience higher yields from a lengthier growing season, but decreased soil moisture and more acidic soils could negate such benefits.⁹ Additionally, temperature increases are likely to decimate the state's northern and western hardwood forests.¹⁰ Minnesota's forested areas could decline by 50-70% by century's end,¹¹ dealing a severe economic blow to the

forestry industry, the fourth largest manufacturing employer, responsible for over \$6.5 billion in forest product shipments and \$4.3 billion in value added to the Minnesotan economy.¹²

Land of 10,000 Lakes—and 81,000 Farms—in Jeopardy

Outdoor enthusiasts add nearly \$10 billion to the state's economy¹³ and support over 70,000 jobs.¹⁴ The value of these activities goes well beyond the economics of recreation, however, making up a significant piece of Minnesota's cultural identity.

Minnesotan Labor Force Projected to be Directly Affected



Source: Bureau of Economic Analysis¹⁵

Minnesota's well-known waters draw millions of visitors each year.¹⁶ For example, through the first six months of 2010 the state sold over 565,000 fishing licenses¹⁷—more per capita than any other state.¹⁸ Warmer temperatures, changes in land use, and an increase in invasive species will alter

the state's aquatic ecosystems and the species that depend on them.¹⁹ Trout, for example, could lose 50-100% of their stream habitat due to climate change over the next 50 years.²⁰

Moose, also a Minnesota wildlife icon, have experienced a steep decline in population in recent decades, dropping from around 4,000 to approximately 100 today. Making matters worse, moose become stressed by temperatures above 57°F in summer and above 23°F in winter. Climate change could eliminate the Minnesotan moose population entirely within the next several decades.²¹

In 2009, **farms employed 90,000 members of the Minnesotan labor force;**²² **agricultural commodities brought more than \$13 billion to the state.**²³ Minnesota ranks 4th in the nation in corn production, 3rd in soybeans, 1st in sugar beets, and 10th in wheat. Minnesota also has one of the nation's most productive livestock industries, which consists of turkeys, chickens, pigs, and dairy cows.²⁴

Corn—the state's most lucrative crop—brought Minnesota over \$3.7 billion in revenues in 2009.²⁵ Corn crops can fail at 95°F; the risk increases the longer the heat lasts. Between 1960 and 1991, periods of intense heat were extremely rare in Minnesota, with three-day periods occurring about once every 10 years. Under the higher-emissions scenario, however, a three-day period with temperatures above 95°F is projected to occur every other summer in Minnesota as soon as 2040.²⁶ Rising temperatures will also increase the rate of insect proliferation, including the European corn borer²⁷—which caused more than \$285 million in losses during the 1995 outbreak.²⁸

Dairy products are the state's 4th highest grossing agricultural

commodity, valued at over \$1.5 billion each year.²⁹ Higher temperatures associated with climate change will likely stifle the appetite of livestock, decreasing weight gain. Moreover, warmer winters and less snow cover could potentially negatively impact the quality and availability of spring forage with an associated negative impact on the dairy industry.³⁰

Increasing Floods, Declining Lake Levels

Minnesota has felt the impact of severe flooding in recent history; record-breaking rains in 1997 caused an estimated \$2 billion in damage.³¹ Western Minnesota experienced its worst natural disaster in modern times when the Red River rose to record levels and wreaked havoc on many communities. More than 60,000 people were forced to evacuate the flooded areas,³² the largest displacement of an American urban area by flooding prior to Hurricane Katrina.³³ The Red River Valley has flooded three times since 1997 and, despite the characterization of the 1997 flood as a 100-year flood, the 2009 flood nearly matched it in damage.³⁴ Climate change is expected to considerably increase the risk of the kind of natural disasters Minnesota has suffered since 1997. Under either emissions scenario, the Minneapolis-St. Paul region is expected to experience an increase in heavy rain falls (more than two inches of rain in one day) by more than 66% over the next several decades.³⁵

Over \$2 billion worth of cargo is shipped through the Duluth-Superior docks annually.³⁶ The falling water level in Lake Superior and the other Great Lakes threatens the port of Duluth-Superior, which plays a crucial role in Minnesota's economy. Three-fourths of U.S. iron ore is

shipped through Duluth to steel mills in other states or abroad.³⁷ Under a higher emissions scenario, Great Lake levels could fall between one and two feet by the close of the century; low emissions would likely cause levels to fall by less than a foot during the same time period. Lower water levels will increase the distance between lake and shore, disrupting commercial shipping, ecosystems, and recreation.³⁸

Moose, a Minnesota wildlife icon, have experienced a steep decline in population in recent decades, dropping from around 4,000 to approximately 100 today. Moose become stressed by temperatures above 57°F in summer and above 23°F in winter. Climate change could eliminate the Minnesotan moose population entirely within the next several decades.

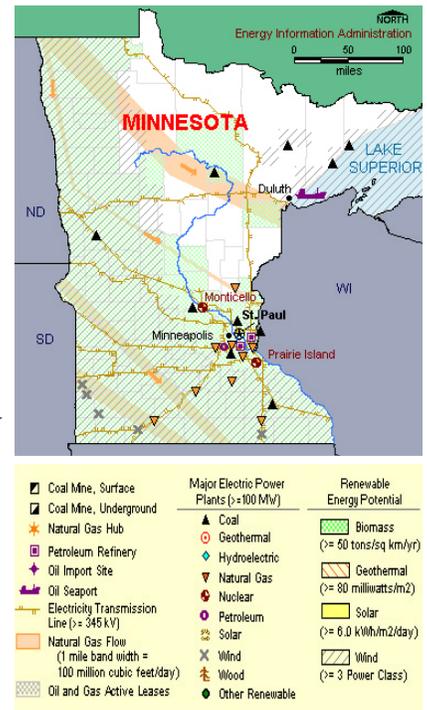
Pay Now: The Benefits of Taking Action

Minnesota's wind potential is estimated to be about 10 times the amount of electricity used in the state in 2000. Further developing Minnesota's wind resources could create significant economic benefits, especially for farmers who may profit from leasing parts of their land to wind generators. Given Minnesota's sizeable potential for wind power, the state could see a gain in the manufacturing sector that would need to supply the required machinery and other components.³⁹

Ranked 4th in wind power production,⁴⁰ Minnesota has, laudably, realized some of its clean energy potential. Nevertheless, the state has much growth potential; installed are 1,366 megawatts (MW) of electricity generation, but its potential is closer to 75,000 MW. Even if only 50,000 MW of new wind energy was produced nationally, Minnesota's wind industry could create over 3,000 jobs manufacturing wind turbines and receive \$1.02 billion in investment.⁴¹

In 2007, almost 20,000 Minnesotans held clean energy jobs, capping off a 10-year period of nearly 12% job growth in the sector, while overall job growth in the state was less than 2%. From 2006-2008, Minnesota also attracted \$49.9 million in venture capital for clean energy investments.⁴²

A renewable electricity standard of 20% by 2020 would lower residents' electricity and natural gas bills a total of \$118 million by 2020, growing to \$259 million by 2030—or roughly \$97 in savings for each Minnesota household.⁴³ Moreover, deriving energy from in-state resources is likely to create jobs and will provide Minnesotans with a more secure energy supply.⁴⁴



Conclusion

Minnesota must consider action on climate change not just in terms of cost, but also in terms of opportunities. If we give Minnesota's population, businesses, and investors clear and consistent signals by properly offering initiatives and cultivating demand, investment and innovation in renewable technologies will follow.

Minnesotans will have to pay for the effects of climate change. The only remaining question is whether they will pay now, or pay later and run the risk of paying significantly more.

(Endnotes)

- 1 National Wildlife Federation Action Fund, *Sportsman's Pocket Guide to Climate Change in Minnesota*, 2009. http://targetglobalwarming.org/files/Brochure2_MN_LowRes.pdf (accessed July 28, 2010).
- 2 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region: Impacts on Minnesota's Communities and Ecosystems*, April 2003, 3. <http://www.ucsusa.org/greatlakes/pdf/minnesota.pdf> (accessed July 28, 2010).
- 3 U.S. Department of Agriculture, *State Fact Sheets: Minnesota*, September 2010. <http://www.ers.usda.gov/StateFacts/MN.htm> (accessed October 13, 2010).
- 4 Union of Concerned Scientists, *A National Renewable Electricity Standard Will Benefit Minnesota's Economy and the Environment*, July 2007, 1. http://www.ucsusa.org/assets/documents/clean_energy/cashing-in-minnesota.pdf (accessed July 29, 2010).
- 5 National Wildlife Federation, *Target Global Warming in Minnesota*, 2009, 2. <http://www.targetglobalwarming.org/files/MNfact-sheet.pdf> (accessed July 28, 2010).
- 6 National Wildlife Federation, *Charting a New Path for Minnesota's Electricity Generation and Use*, 2. http://cf.nwf.org/globalwarming/energypdfs/minnesota_10-22-4.pdf (accessed July 28, 2010).
- 7 *Ibid.*, 2.
- 8 National Wildlife Federation, *Target Global Warming in Minnesota*, 1.
- 9 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region*, 1.
- 10 Environmental Entrepreneurs and Redefining Progress, *Effects of Global Warming on the State of Minnesota*, April 2005, 1. http://www.e2.org/ext/doc/e2_minnesota.pdf;jsessionid=03922776A43347D6E37801334191866A (accessed October 18, 2010).

- 11 Hennepin County, Minnesota, *What Does Climate Change Mean for Minnesota*. <http://hennepin.us/portal/site/HennepinUS/menuitem.b1ab75471750e40fa01dfb47ccf06498/?vgnnextoid=f48141036ae64210VgnVCM10000049114689RCRD> (accessed October 18, 2010).
- 12 Based on 2007 estimates. Minnesota Department of Natural Resources, *Minnesota's Forest Resources Annual Report*, December 2008, 7. http://files.dnr.state.mn.us/forestry/um/forestresourcesreport_08.pdf (accessed July 28, 2010).
- 13 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region*, 4.
- 14 National Wildlife Federation Action Fund, *Sportsman's Pocket Guide to Climate Change in Minnesota*, 1.
- 15 Based on the 2009 employed labor force and includes members of the farming, forestry, and related sectors as well as the hospitality sectors. Bureau of Economic Analysis, *SA25N Total full-time and part-time employment by NAICS industry 1/ -- Minnesota*, September 20, 2010. <http://bea.gov/regional/spi/default.cfm?selTable=SA25N&selSeries=NAICS> (accessed October 18, 2010).
- 16 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region*, 3.
- 17 Doug Smith, "Minnesota Fishing License Sales Soar," *Star Tribune*, June 5, 2010. <http://www.startribune.com/sports/outdoors/95664859.html> (accessed July 31, 2010).
- 18 Minnesota Department of Natural Resources, *Fish & Fishing*, 2010. <http://www.dnr.state.mn.us/faq/mnfacts/fishing.html> (accessed October 18, 2010).
- 19 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region*, 3.
- 20 National Wildlife Federation Action Fund, *Sportsman's Pocket Guide to Climate Change in Minnesota*, 1.
- 21 National Wildlife Federation, *Target Global Warming in Minnesota*, 1.
- 22 Bureau of Economic Analysis.
- 23 U.S. Department of Agriculture, *State Fact Sheets: Minnesota*.
- 24 U.S. Department of Agriculture, *2008 State Agriculture Overview*, 2009, 3. http://www.nass.usda.gov/Statistics_by_State/Ag_Overview/AgOverview_OH.pdf (accessed July 29, 2010).
- 25 U.S. Department of Agriculture, *State Fact Sheets: Minnesota*.
- 26 Melanie Fitzpatrick et al., *Confronting Climate Change in the U.S. Midwest: Minnesota*, Union of Concerned Scientists, July 2009, 8. http://www.ucsusa.org/assets/documents/global_warming/climate-change-minnesota.pdf (accessed July 29, 2010).
- 27 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region*.
- 28 K.R. Ostlie, W.D. Hutchison, & R. L. Hellmich, *Bt Corn & European Corn Borer: Long Term Success through Resistance Management*, University of Minnesota Extension, 2002. <http://www.extension.umn.edu/distribution/cropsystems/dc7055.html> (accessed October 18, 2010).
- 29 U.S. Department of Agriculture, *State Fact Sheets: Minnesota*.
- 30 Union of Concerned Scientists, *Findings from Confronting Climate Change in the Great Lakes Region*, 3.
- 31 Minnesota Department of Natural Resources, *1997 Record Spring Floods*. <http://www.dnr.state.mn.us/climate/floods/1997/index.html> (accessed October 18, 2010).
- 32 National Oceanic and Atmospheric Administration, *Northern Plains Flooding*, 2009. <http://www.ncdc.noaa.gov/oa/reports/dakota-flood/dakota-flood.html> (accessed July 29, 2010).
- 33 National Public Radio, *The great flood: Grand Forks 10 years on*, April 2007. <http://www.npr.org/templates/story/story.php?storyId=9566394> (accessed July 29, 2010).
- 34 Fitzpatrick et al., 6.
- 35 Ibid.
- 36 Duluth Seaway Port Authority, *Shipping impacts more than those working on the boats*. <http://www.duluthport.com/port-stats-economic.php> (accessed October 18, 2010).

37 Fitzpatrick et al., 7-8.

38 Ibid., 8.

39 Environmental Entrepreneurs and Redefining Progress, 2.

40 National Wildlife Federation, *Charting a New Path for Minnesota's Electricity Generation and Use*, 2.

41 Ibid., 2.

42 Susan Urahn et al., *The Clean Energy Economy: Executive Summary*, Pew Charitable Trusts, June 2009, 8. http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf (accessed July 28, 2010).

43 Union of Concerned Scientists, *A National Renewable Electricity Standard Will Benefit Minnesota's Economy and the Environment; Using the 2030 projected household data (2,652,600) to calculate savings*. Minnesota Department of Administration, *Number of Households in Minnesota Projected to Grow: Household Projects 2000-2030*, December 2003. <http://www.demography.state.mn.us/resource.html?Id=5333> (accessed October 18, 2010).

44 Union of Concerned Scientists, *A National Renewable Electricity Standard Will Benefits Minnesota's Economy and the Environment*, 3-4.