



# FACTS MISSOURI

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: Missouri

Increased winter precipitation caused by climate change could make Missouri susceptible to more frequent spring flooding like the 2008 floods that caused \$900 million in damage.<sup>1</sup>

Less summer rainfall, in turn, could increase the number of seasonal droughts in Missouri, similar to the 2002 drought that cost the state \$460 million.<sup>2</sup>

If Missouri adopts a renewable energy standard of 20% by 2020, it could see up to 2,700 new jobs, gas and electricity savings of \$264 million by 2030 (\$120 per household), \$327 million in new investment in renewable energy, and \$298 million for landowners who produce biofuel or lease their property to wind developers.<sup>3</sup>

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 Missouri \$3.8 billion in GDP and nearly 23,000 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](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 Missouri faces significant losses in industries crucial to its economy if no action is taken.

Moreover, data shows Missouri is poised to benefit from the research, development, and distribution of renewable energy technologies. Research into the potential for wind, biomass, and solar power shows promise. Laudably, in 2008, Missouri passed legislation requiring investor-owned utilities (those publically owned by shareholders) to generate 15% of their electricity using renewable sources by 2021; this will create jobs and reduce emissions equivalent to

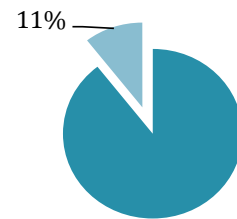
taking two million cars off the road.<sup>4</sup> One state initiative, net metering, provides individuals and business owners the opportunity to generate their own energy from renewable sources and to sell their surplus power back to the grid.<sup>5</sup> Building on such programs at the state and national level has the potential to reap even greater rewards. Should we fail to take action against climate change, Missourians have much to lose.

## Pay Later: The Cost of Inaction

In Missouri, temperatures are projected to at least rise 3-7°F by the end of the century,<sup>6</sup> and the consequences are likely to be profound.

Between 1961 and 1990, St. Louis averaged less than 40 days above 90°F each year. If current patterns continue, by 2050 nearly the entire summer could reach temperatures over 90°F, with several weeks' worth of days over 100°F.<sup>7</sup>

## Missourian Labor Force Projected to be Directly Affected



Sources: Environmental Defense Fund; U.S. Department of Agriculture; Missouri Economic Research and Information Center; Bureau of Labor Statistics, May 2006 State Occupational Employment and Wage Estimate<sup>8</sup>

Precipitation patterns will also change. Rainfall will increase in the fall, winter, and spring, likely resulting in flooding. A drop in summer rainfall will cause droughts. An increase in flooding activity over the next few decades would almost certainly have a pronounced impact on a number of significant industries throughout the state, specifically, agriculture, manufacturing, and transportation.

## An Agrarian History under Stress

These shifts in weather patterns will adversely affect agriculture production throughout the state. The increase in temperatures will put crops under almost constant heat stress, resulting in reduced yields, lower earnings by those employed in the sector, and decreased income for the state. Additionally, warmer winters without freezing temperatures will allow plant diseases and pest infestations to thrive.<sup>9</sup>

Throughout the country, climate change will alter the regional mix of sustainable crops; Missouri has already begun to see shifts in what its climate can support. Plants that grew only in southern Missouri just 20 years ago, such as the pecan and the Leyland cypress, now grow throughout the state.<sup>10</sup> Eventually, the temperatures may rise enough to curtail the growth of traditional cash crops.<sup>11</sup> Even if those crops adapt, flooding and warmer temperatures can produce optimal conditions for a variety of plant diseases—like bacterial blight and Septoria brown spot—which flourish at 77°F.<sup>12</sup>

Agriculture brought nearly \$7.7 billion to the state in 2009.<sup>13</sup> **Missouri ranks 2<sup>nd</sup> among the 50 states in farmland, with approximately 30 million acres devoted to agriculture.**<sup>14</sup> The forestry and related industries alone employ over 67,700 Missourians.<sup>15</sup> Soybeans, the largest crop, account for nearly 26% of the state's crop production. Corn comes in a close second at 18%.<sup>16</sup> Corn crops begin failing at 95°F, while soybean crops begin failing at 102°F.<sup>17</sup> By the end of the century, average summer temperatures in the state are estimated to rise by as much as 14°F. Between 1961 and 1990, St. Louis experienced 90°F for a third of its summer days; this number could double—even triple—by the end of

the century. If predictions are correct, corn and soybean crops may be unable to survive Missouri's new climate.<sup>18</sup>

Climate change will alter the regional mix of sustainable crops; Missouri has already begun to see shifts in what its climate can support. Plants that grew only in southern Missouri just 20 years ago, such as the pecan and the Leyland cypress, now grow throughout the state. Eventually, the temperatures may rise enough to curtail the growth of traditional cash crops.

Missouri's farmers are among the country's most proactive. Missouri is a leader in agroforestry, an innovative practice that combines crops and trees on the same land; among its benefits are more diversified crops and decreased soil erosion—and greater income.<sup>19</sup> Farmers would have much to lose if crop yields fall. Missouri's forest products generate nearly \$1.69 billion in revenue, nearly 2% of the state's gross state product.<sup>20</sup> Agriculture commodities account for nearly 3% of the U.S. total.<sup>21</sup> Climate change will significantly damage this industry.<sup>22</sup>

## Costs at Home

While the agriculture sector will be most vulnerable to the effects of climate change in the next few decades, warmer weather will almost certainly impact other elements of the Missourian lifestyle. Increased flooding and other weather extremes

threaten fishing, hunting, and wildlife viewing, placing roughly 57,000 jobs and \$3 billion in income at stake—not to mention a favored pastime.<sup>23</sup>

Missourians will also pay more than necessary for electricity. If business continues as usual, consumers will pass up an opportunity to directly save \$175 million on their natural gas bills, and, over the next five years, will overpay by \$457 million for electricity. Furthermore, by failing to pass statewide energy conservation policies, specifically the International Energy Conservation Code, a model energy regulation policy supported by the U.S. Government, Missourians will have wasted over \$108 million by 2020.<sup>24</sup>

Climate change will cause air quality to suffer, affecting the health of all Missourians. Heat waves, on the rise as a result of climate change, exacerbate respiratory and cardiovascular disease.<sup>25</sup>

## Pay Now: The Benefits of Taking Action

In 2008, Missouri voters passed the Clean Energy Initiative, Proposition C, **requiring utilities in the state to produce 2% of their energy from renewable sources three years later, and 15% by ten years after that.**<sup>26</sup> By this time, this Initiative will create **nearly 9,600 new jobs—including the manufacture of wind turbines and solar panels**—and generate \$856.6 million in income for workers in the state and \$2.86 billion in economic activity. If indirect impacts—support services for new energy industries, increased consumer spending by a larger workforce, and a boost in service industries such as retail—are factored in, this transition

could create 22,399 new jobs and generate \$1.76 billion in income for employees, and \$4.57 billion in economic activity.<sup>27</sup>

Missouri is also well poised to develop a renewable energy sector. The state currently generates approximately 3% of its overall energy from renewable sources, chiefly from hydroelectric power. A single-reactor nuclear power plant in Callaway also provides a significant portion of the state's power.<sup>28</sup>

**Missouri is ranked in the top 20 states in wind power potential; wind energy could generate 63% of the state's current electricity requirements.** By building 25 wind farms, the wind industry could create hundreds of construction jobs, 550 permanent jobs and bring in \$75 million in economic benefits annually.<sup>29</sup>

Furthermore, Missouri has much to gain from turning biomass into fuel. The crop residue currently available can produce up to 500 million gallons of renewable transportation fuel annually—15% of the state's current gasoline usage.<sup>30</sup>

Many within the private sector have committed to addressing the issue of climate change and renewable energy. For example, St. Louis-based Monsanto is aiding in efforts to identify crops and agriculture practices that could lower emissions of nitrous oxide (one of the most pervasive greenhouse gases released by agriculture and farming practices) and other heat-trapping emissions. **Many in the state are also participating in "net metering," a program that allows businesses and homeowners to produce their own energy with wind turbines or solar panels and sell the excess power back into the grid.**<sup>31</sup>



Major Electric Power Plants (>=100 MW)		Renewable Energy Potential
☐ Coal Mine, Surface	▲ Coal	▨ Biomass (>= 50 tons/sq km/yr)
☐ Coal Mine, Underground	○ Geothermal	▨ Geothermal (>= 80 milliwatts/m <sup>2</sup> )
★ Natural Gas Hub	◇ Hydroelectric	☐ Solar (>= 6.0 kWh/m <sup>2</sup> /day)
▨ Petroleum Refinery	▼ Natural Gas	▨ Wind (>= 3 Power Class)
◆ Oil Import Site	● Nuclear	
⚓ Oil Seaport	○ Petroleum	
— Electricity Transmission Line (>= 345 kV)	☼ Solar	
▨ Natural Gas Flow (1 mile band width = 100 million cubic feet/day)	✕ Wind	
▨ Oil and Gas Active Leases	🌳 Wood	
	● Other Renewable	

## Conclusion

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

**Missourians 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 risks of paying significantly more.

### (Endnotes)

- 1 Rick Mattoon, *Assessing the Midwest Floods of 2008 (and 1993)*, Federal Reserve Bank of Chicago, July 10, 2008. [http://midwest.chicagofedblogs.org/archives/2008/07/mattoon\\_flood\\_b.html](http://midwest.chicagofedblogs.org/archives/2008/07/mattoon_flood_b.html) (accessed July 16, 2010).
- 2 "Drought Cost Missouri \$460 Million, State Says," *St. Louis Business Journal*, January 22, 2003. <http://www.bizjournals.com/stlouis/stories/2003/01/20/daily52.html> (accessed July 16, 2010).
- 3 Based on a 2000 household estimate of 2,194,594. U.S. Census Bureau, *State and County QuickFacts: Missouri*. <http://quickfacts.census.gov/qfd/states/29000.html> (accessed September 15, 2010); Melanie Fitzpatrick et al., *Confronting Climate Change in the U.S. Midwest: Missouri*, Union of Concerned Scientists, July 2009, 11. [http://www.ucsusa.org/assets/documents/global\\_warming/climate-change-missouri.pdf](http://www.ucsusa.org/assets/documents/global_warming/climate-change-missouri.pdf) (accessed July 15, 2010).
- 4 Fitzpatrick et al, 9; David Laslo, *Clean Jobs, New Prosperity: Economic Impact of Proposition C: The Missouri Clean Energy Initiative*, Missouri Coalition for the Environment, Public Policy Research Center, University of Missouri-St. Louis, Fall 2008, 1. <http://pprc.umsl.edu/data/PropCEconomicImpactFullReport.pdf> (accessed July 13, 2010).
- 5 Michael Amantea, "Effects of Climate Change in Missouri Take Root," *Missourian*, March 9, 2009. <http://www.columbiamissourian.com/stories/2009/03/09/changing-face-missouri/> (accessed July 15, 2010).

- 6 Ibid.
- 7 Fitzpatrick et al., 2-3.
- 8 Assumes 1.5 workers per farm.
- 9 Fitzpatrick et al., 7-8.
- 10 Amantea.
- 11 Fitzpatrick et al., 8.
- 12 Laura Sweets, *Integrated Pest and Crop Management: Soybean Foliage Diseases May Begin to Show Up*, University of Missouri, June 21, 2010, 89. <http://ppp.missouri.edu/newsletters/ipcm/archives/fullissue/v20n13.pdf> (accessed July 16, 2010).
- 13 Economics Research Center, U.S. Department of Agriculture, *Farm Income: Cash Receipts*, August 31, 2010. <http://www.ers.usda.gov/Data/FarmIncome/FIRkDMUxls.htm> (accessed October 12, 2010).
- 14 U.S. Department of Agriculture, *Missouri Farm Numbers Decline: 2005*, January 31, 2006. [http://www.nass.usda.gov/Statistics\\_by\\_State/Missouri/Publications/Press\\_Releases/20060131-Farm\\_Numbers.asp](http://www.nass.usda.gov/Statistics_by_State/Missouri/Publications/Press_Releases/20060131-Farm_Numbers.asp) (accessed July 16, 2010).
- 15 Missouri Economic Research and Information Center, *Economic Impacts of Forest Products Industry: Forest Products in Missouri*, October 2007, 2. <http://www.moforest.org/Missouri%20Forest%20Economic%20Impacts%20Study%20Oct%2007.pdf> (accessed September 15, 2010).
- 16 U.S. Department of Agriculture, *State Fact Sheets: Missouri*, September 10, 2010. <http://www.ers.usda.gov/statefacts/mo.htm> (accessed September 15, 2010).
- 17 U.S. Global Research Program, *Global Climate Change Impacts in the United States*, 72. <http://www.globalchange.gov/images/cir/pdf/agriculture.pdf> (accessed September 15, 2010).
- 18 Fitzpatrick et al., 1-3, 8.
- 19 Georgina Gustin, "Trees, Farms Do Mix," *St. Louis Post-Dispatch*, June 3, 2010. <http://www.cornucopia.org/2010/06/trees-farms-do-mix/> (accessed July 16, 2010).
- 20 Missouri Economic Research and Information Center, 2.
- 21 U.S. Department of Agriculture, *State Fact Sheets: Missouri*.
- 22 Environmental Defense Fund, *Missouri Will Benefit from Clean Energy Legislation that Limits Carbon Pollution*. [http://www.edf.org/documents/9993\\_CleanEnergyJobs-MO.pdf](http://www.edf.org/documents/9993_CleanEnergyJobs-MO.pdf) (accessed July 20, 2010).
- 23 Environmental Defense Fund.
- 24 Fitzpatrick et al., 10-11.
- 25 Ibid., 3.
- 26 Laslo, 1.
- 27 Ibid., 3.
- 28 U.S. Energy Information Administration, *State Energy Profiles: Missouri*, September 2, 2010. [http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=MO](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=MO) (accessed September 15, 2010).
- 29 Natural Resources Defense Council, *A Clean Energy Economy for Missouri: Building Rural Communities through Renewable Resources Development*, March 2010, 1, 5. [http://www.nrdc.org/energy/cleanmo/files/cleanmo\\_fs.pdf](http://www.nrdc.org/energy/cleanmo/files/cleanmo_fs.pdf) (accessed July 20, 2010).
- 30 Ibid., 2.
- 31 Amantea.