



MICHIGAN

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: Michigan

Water levels in the Great Lakes are projected to significantly fall—by about a meter in Lakes Michigan-Huron—over the next several decades, placing system connectivity throughout the Great Lakes at risk; by 2030, connectivity could fall by approximately 25%. This would be highly damaging to regional economies; the transport of cargo over the system is responsible for over \$3 billion in regional business and personal revenue.¹

Warmer temperatures, lost soil moisture, and drought will likely have a significant effect on the state's \$63.7 billion agriculture industry. The predicted 20-40% increase in precipitation in the region and related effects are likely to further hinder the sector, rather than offset such occurrences.²

Approximately 1.6 times of the Michigan's current electricity demand could be generated by renewable energy sources in the state, should these sources be fully exploited.³

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 Michigan \$18.3 billion in GDP and nearly 108,000 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 Michigan faces significant losses in industries crucial to its economy if no action is taken to combat the effects of global warming.

Moreover, data shows Michigan is poised to benefit from the research, development, and distribution of renewable energy technologies. In 2008, Michigan ranked second in the nation in new wind energy installations⁴ and is currently home to nearly 150 megawatts of installed wind capacity.⁵ Michigan also possesses more natural gas reserves than any other state in the Great Lakes region.⁶ Should we fail to take action

against climate change, the people of Michigan have much to lose.

Pay Later: The Cost of Inaction

Over the next few decades, global warming is predicted to cause **water levels in the Great Lakes to decline significantly. Flooding from more frequent severe rainstorms is likely to intensify. During this same time period summers will include a far greater number of days over 90°F, as many as 987 days between 2080-2099 in Detroit—compared to 1970-1989, a sevenfold increase.**⁷ These climate changes will be detrimental to Michigan's economic security, especially harming some

of its highest-grossing industries—manufacturing, wholesale and retail trade, and tourism.⁸ In total, nearly 40% of Michigan's labor force will be directly affected by unmitigated global warming.⁹

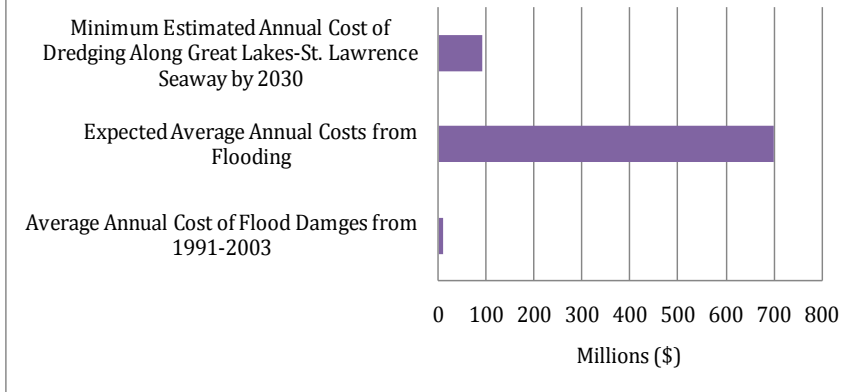
Manufacturing will be hurt as a result of declining water levels in the Great Lakes, which will hinder the state's shipping capabilities. The agriculture industry will see longer, but drier and hotter, growing seasons and will have to adapt to rapidly changing climate conditions. Michigan's winters will be warmer, wildlife will migrate northward, and its waterscape will be disrupted, bringing fewer tourists and recreational revenue into the state.

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Costs to Manufacturing and Shipping

Thirteenth in the nation for total tonnage shipped by water,¹⁰ Michigan houses over 40 commercial ports.¹¹ The most valuable economic sector,¹² manufacturing—which makes up 18% of the gross state product (GSP) alone¹³—and shipping in Michigan are among those industries which face the

Costs Associated With Flooding and Repairing Seaway, Past and Projected



Source: Ross et al

greatest threat from increasing temperatures. Climate change threatens system connectivity throughout the state's waterways. For example, water levels in Lake St. Clair, which lies between Lakes Huron and Erie, could fall by nearly 3 feet as early as 2050.¹⁴ **A 25% reduction in system connectivity—as is predicted to occur in the several decades—could cost over \$4 billion in import and export losses across the state.**¹⁵ Moreover, shipping costs could skyrocket, reducing the sector's profitability and placing the job security of thousands at risk.¹⁶

Moreover, communities along the coast depend on the Great Lakes as an important source of water.¹⁷ About half of Michigan depends on surface water for daily use.¹⁸ Receding water levels are problematic enough, but increased flooding will lead to higher levels of pollutants and contamination of local water supplies.¹⁹ Between 1989 and 2003, Michigan authorized \$733 million for environmental contamination projects,²⁰ and in 1999 alone, Michigan spent \$30 million to treat contaminated ground water. While it remains difficult to predict the exact cost of water treatment in a warmer, more susceptible climate, it is a real

cost and one that the state of Michigan will likely incur more normally.²¹

Costs to Agriculture and Forestry

Agriculture is Michigan's second largest industry. In 2007, more than 24% of Michigan's labor force was employed in agriculture and related industries, which brought over \$63 billion to the state.²² The state's forests alone generate 200,000 jobs and bring in \$12 billion annually to Michigan's economy.²³ While the state's agriculture industry is predicted to grow in the future, a northward migration of plant and animal species, more frequent extreme weather events, and higher temperatures are likely to obstruct this projected growth, bringing about reductions in the industry's profitability, which took in more than \$971 million from corn alone in 2009.²⁴

One recent study found that from 1961-1990, periods of intense heat were extremely rare in the Midwest. By mid-century, however, Michigan, under a high-emissions scenario, will be subjected to a three-day period of temperatures of or over 95°F every other summer, climbing to three of

every four summers by the century's close. A more debilitating seven-day period once every five years by mid-century could also be in Michigan's future under a high-emissions scenario, jeopardizing agriculture. Corn crops can fail when temperatures reach or surpass 95°F.²⁵

Dairy products are the state's top agricultural commodity, worth over \$1 billion in 2009.²⁶ **Dairy cattle are especially vulnerable to temperatures exceeding 75-80°F.** Depending on humidity, milk production can decline when temperatures exceed this range. From 1961-1990, average summer temperatures and humidity in Michigan did not surpass levels known to cause such stress. Under a higher-emissions scenario, dairy cattle and other livestock will likely experience constant heat stress during the warmer months by the end of the century; air-conditioned barns are one costly alternative.²⁷ Given the importance of dairy production, this could have a serious impact on Michigan's economy.

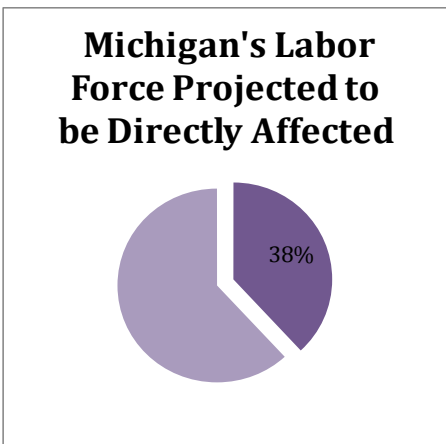
Costs to Tourism

Travelers throughout Michigan spent nearly \$17.5 billion in 2004, and supported 193,000 jobs state-wide related to various tourist activities,²⁸ including wildlife watching, fishing, cruises, and snowmobiling. Each of these attractions faces a decline in numbers of tourists due to changes in Michigan's climate. For example, trout are an important species to Michigan's wildlife industry, but they are especially susceptible to migration as temperatures continue to rise. Michigan would lose approximately \$75 million annually if trout were to leave its waters, impacting over 180,000 anglers.²⁹ In the summer of

2006, there was a record number of beach closings in the Great Lakes basin due to high levels of water contamination—with 1,854 beach closing and advisory days. This number will likely grow as flooding and concomitant pollutants threaten the integrity of the Great Lakes surrounding Michigan, damaging the economy that they help to support.³⁰

The Great Lakes support a burgeoning cruise industry, valued at nearly \$40 million in 2004. Michigan's presence on four of the Great Lakes places it in a prime location for this business. If policy initiatives are not put into place to curb the damaging effects of climate change on the Great Lakes, this industry, and part of Michigan's economy, could begin to suffer.³¹

Home to over 36,000 miles of snowmobile land and track and nearly 365,000 registered snowmobiles, this winter sport alone brings in over \$1 billion.³² The increase in rainfall during the colder months will likely have a detrimental effect on the winter sport season.³³



Source: Bureau of Labor Statistics

Pay Now: The Benefits of Taking Action

There is much room to expand Michigan's renewable energy sector. In 2008, the state imported all of its coal,

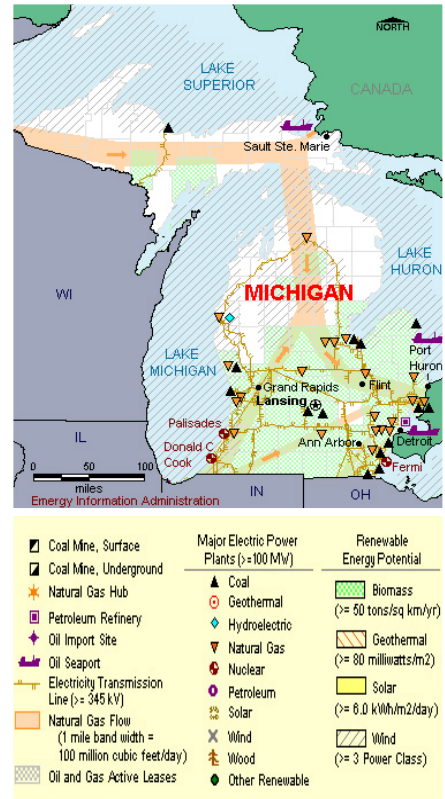
sending \$1.36 billion out of state, making it the 7th highest spender on net imports of coal in the nation.³⁴

Projections, however, show that **by 2020, a 10% renewable electricity standard would create over 2,700 jobs to ensure manufacture and maintenance of the green Michigan economy, generate \$70 million in aggregate income and add \$60 million to the GSP. The savings from reduced energy costs would amount to \$930 million by 2020,**³⁵ translating to \$93 in savings for every Michigan resident.³⁶

Moreover, Michigan possesses the capital base, technical skill, shipping infrastructure, and natural endowments to generate its energy using in-state renewable resources—and has taken some steps to do so. For instance, in September 2009, an abandoned automobile factory in Wixom, Michigan was purchased by two renewable energy manufacturers and is now set to become the nation's largest renewable energy park by 2011 through its production of solar panels and large-scale batteries.³⁷ The park is projected to employ 4,000 people directly and indirectly.³⁸ **Michigan has the 4th highest potential in the U.S. to manufacture components to supply an expanding wind energy market across the nation.**³⁹

In 2007, 22,674 Michigan residents held clean energy jobs. While overall job growth in the state fell almost 4% over the last 10 years, jobs in clean energy experienced nearly 11% growth over the same period.⁴⁰

Michigan has the third greatest number of clean technology patents in the United States and has attracted \$55 million in clean technology venture capital from 2006-2008.⁴¹ With over ten percent of the nation's capacity, Michigan ranks number one in underground natural gas storage capacity,



allowing the state to supply natural gas to its neighbors during periods of high demand.⁴²

All of these are positive signs indicating Michigan's vast potential to capture the benefits, both environmental and economic, from transitioning to a clean energy economy.

Conclusion

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

The people of Michigan 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)

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