



# MEMORANDUM

## LEGISLATIVE REFERENCE BUREAU

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**To:** City-County Task Force on Climate and Economic Equity  
**From:** Luke Knapp, Legislative Fiscal Analyst  
**Date:** November 21, 2019  
**Subject:** Projected Climate Change Impacts on Milwaukee

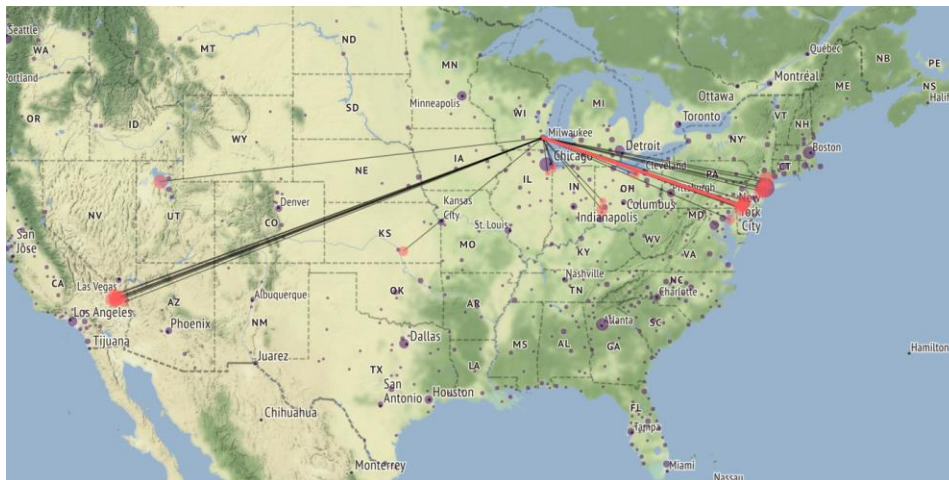
At the November 11 meeting of the City-County Task Force on Climate and Economic Equity, there was a request for information on how climate change will impact Milwaukee's environment in the decades to come. Below is information gathered from studies and forecasts on how cities, the Great Lakes region, and Milwaukee specifically will be reshaped by the climate crisis.

### City-By-City Climate Analogs

Climate change will have, and already has had, impacts spanning across various components of day-to-day life. A number of climate scientists have aimed to conceptualize the climate crisis by developing interactive mapping tools. These maps draw connections between the climate of a present-day city, to a city that has a climate most similar to what has been projected in the future. The Legislative Reference Bureau analyzed three different mapping tools to determine what the forecasted climate of Milwaukee may look like.

### Nature Communications

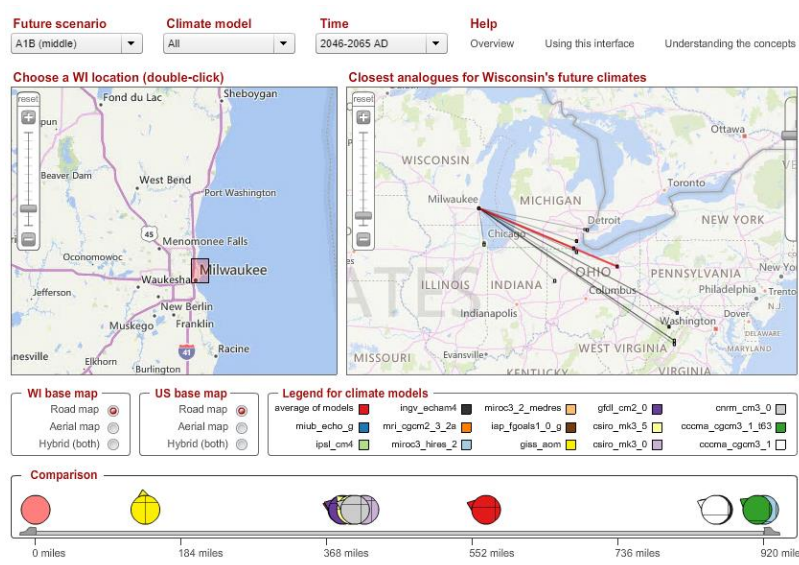
On February 12, 2019, scientists Matthew Fitzpatrick and Robert Dunn published in the journal Nature Communications an article titled "Contemporary climatic analogs for 540 North American urban areas in the late 21<sup>st</sup> century". The mapping tool they developed takes current climate trends compared to the average of 27 climate projections and identifies the city with the most comparable present-day climate to the selected city's projected climate in 2080. According to their projections, in the year 2080 Milwaukee's climate, in terms of temperature and precipitation, will most resemble Chester, Pennsylvania's present climate. The figure below shows all 27 cities Milwaukee's future climate is comparable to:



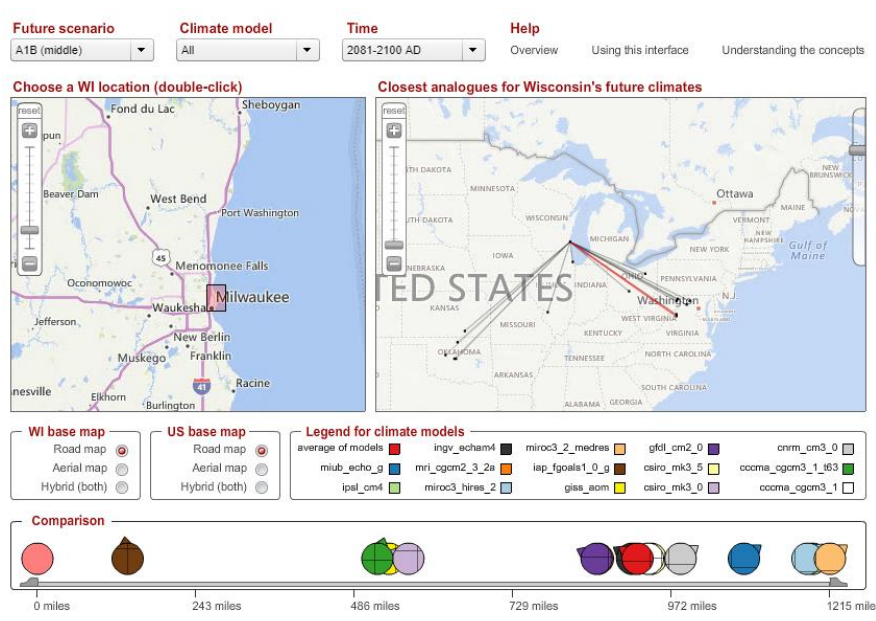
Chester, Pennsylvania, the city with the most comparable present-day climate to the forecasted climate of Milwaukee in 60 years, has a typical summer that is 5.6°F warmer and 7.8% wetter than summer in Milwaukee.

### Wisconsin Initiative on Climate Change Impacts

The Wisconsin Initiative on Climate Change Impacts has developed a similar mapping tool to determine specifically how Milwaukee’s future climate will compare to present-day climates. Their climate simulations are from the “Fourth Assessment Report of the Intergovernmental Panel on Climate Change” and incorporate a dozen different global climate models. Below is a screenshot of their map connecting the Milwaukee region’s climate to comparable cities in the years 2046-2065:



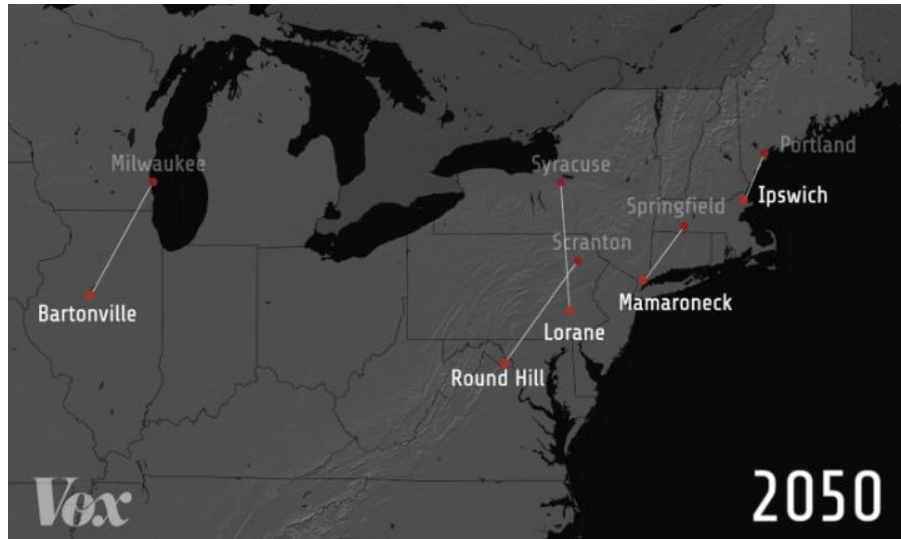
Below, using the same mapping tool, are the projections for the years 2081-2100:



Forecasts captured by the Wisconsin Initiative on Climate Change Impacts indicate that in the coming decades Milwaukee's climate will be comparable to the present day climate of more southern cities in the Ohio to West Virginia regions.

### Vox

The website vox.com recently (May 24, 2019) unveiled a similar project to those listed above, using mapping tools and forecasting of temperature and precipitation to predict major cities' present-day comparable cities for the year 2050. Milwaukee is shown on the map below as comparable in 2050 to Bartonville, Illinois' present climate:



Climate analogs are a helpful tool in conceptualizing the direct impact of climate change for the lives of residents. Below is more information expanding on the temperature and precipitation forecasted changes and various other implications of climate change, and how those will specifically impact Milwaukee.

### **Climate Changes and Infrastructure Impact**

Milwaukee will feel the effects of climate change differently than many other regions in the country and state. The Wisconsin Initiative on Climate Change Impacts – Milwaukee Working Group writes that “Dense urban populations and the complexity of the infrastructure systems magnify negative consequences of climate change.” Furthermore, for Milwaukee, the effects of climate change are exacerbated by being a part of the Lake Michigan basin.

A report from March of this year, written by scientists from Midwestern universities including the University of Wisconsin-Madison, finds that the Great Lakes region has warmed more than the country as a whole. Between 1901-1960 and 1985-2016, the temperature of the Great Lakes basin increased 1.6 degrees in annual mean temperature compared to a 1.2-degree increase for the rest of the continental U.S. (<https://www.jsonline.com/story/news/local/wisconsin/2019/03/21/climate-change-great-lakes-region-warming-faster-than-rest-u-s/3229219002/>)

In addition to the hotter average summer temperature, Milwaukee will encounter more days of extreme heat, heavy rain events and droughts, and potential flooding. In other words, while the temperature of the region is increasing at a gradual rate, there will also be extreme weather events at an increased frequency. A report titled “An Assessment of the Impacts of Climate Change on the Great Lakes” predicts “areas within the Great Lakes Basin will see an increase of 17 to 40 extremely warm days as annual average temperatures continue to rise”. These major weather events may cause considerable damage to Milwaukee’s infrastructure. The Wisconsin Initiative on Climate Change Impacts indicates that the infrastructure of Wisconsin’s cities is the most vulnerable to projected climate changes. In winter, temperatures fluctuating below and above the freezing point cause road damage and potholes. Heavy rainfall has the potential to compromise the sewer system and cause flooding on Milwaukee roads or overflows into the Lake. The sewer overflows increase the quantity of water-borne pathogens flowing into Milwaukee’s streams, rivers, and Lake Michigan. Aside from the potential damage to infrastructure, public health will be threatened by extreme heat and weather events. The heat waves lead to poorer air quality and increase the risk of heat-related illness and respiratory diseases.

### **Great Lakes Impacts**

Climate change will also impact Milwaukee through its connection to Lake Michigan. Warmer weather and increased sewer overflows contribute to the growth of bacteria and invasive species. The migration patterns of fish will alter significantly as Lake Michigan warms and cools sporadically. Economically speaking, fluctuating lake levels resulting from climate change affect the ability of ships to navigate through the lakes to ports. A PBS Wisconsin report states that “the costs of Great Lakes shipping could increase as much as 30 percent, due in part to this “light-loading” of cargo when waters are low, increasing the number of trips needed”. There will, however, be a lengthening of the commercial shipping season due to declines in ice cover.

### **Other Possible Climate Change Impacts**

- Air Conditioning - As temperatures get hotter, the demand for air conditioning in the Midwest is expected to grow. “By the middle of the century, the increased demand for cooling is projected to exceed 10 gigawatts – equivalent to at least five large conventional power plants, requiring more than \$6 billion in infrastructure investments.” – Environmental Defense Fund, “How Will Climate Change Affect the Midwest?”.
- Migration - Because coastal cities will see the brunt of climate change, many believe that there will be a mass migration similar to that of the dust bowl, with Midwestern urban centers as the anticipated destination: “Limited evidence indicates that household consideration of climate amenities may contribute to reversing long-standing trends in out-migration from the Midwest and that changes in national migration patterns will contribute to population growth in the region.” – Fourth National Climate Assessment, Chapter 21: Midwest.
- Recreation - Much of Milwaukee’s recreational activities are reliant on Lake Michigan, such as recreational boating, fishing, and clean beaches for swimming. All of these are threatened by climate change: “Climate change will likely worsen

a host of existing problems in the Great Lakes, including changes in the range and distribution of important commercial and recreational fish species, increases in invasive species, declining beach health, and more frequent harmful algae blooms.” Additionally, winter-related recreation will be hampered by the shortened and sporadic winter season. – Michigan News, “Climate change to profoundly affect the Midwest, new report says”.

- Energy – The climate activist group Risky Business, founded by Michael Bloomberg, Hank Paulson, and Tom Steyer, say in their Midwest Report that “if we stay on our current path, the Madison/Milwaukee region will likely see electricity demand increases of 1% to 4% by mid-century and 4% to 13% by the end of the century” - Risky Business, “Midwest Report. Heat in the Heartland: Climate Change and Economic Risk in the Midwest”.
- Crime – Risky Business also reports that warmer temperatures in the summer will likely lead to increases in violent crime by “as much as 6.2% by the end of the century, with a 1-in-20 chance of increases more than 7.7%” - Risky Business, “Midwest Report. Heat in the Heartland: Climate Change and Economic Risk in the Midwest”.

### **Conclusion**

This report is not all-encompassing of the various impacts climate change will bring to the region. New effects of this problem are being uncovered almost daily by scientists and researchers working on the subject. In addition to this report being short of conveying every possible impact of climate change, it may also become outdated as projections will inevitably change as more governments, organizations, and industries adapt to the changes being discussed. With that said, the evidence is clear that in the Milwaukee region, temperatures will continue to rise, the severity and frequency of extreme weather events will increase, Milwaukee’s infrastructure is at risk, and the Great Lakes will greatly change. These changes will also have a negative impact on public health, particularly for the most vulnerable.

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