Climate Change in the Midwest: Challenges and Responses

Illinois Green Economy Network
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Opinions expressed are solely those of the presenter.
1. Indicators of Global Change
A five minute history of climate science

Joseph Fourier

Eunice Newton Foote

John Tyndall

Svante Arrhenius

Source: Katherine Hayhoe, Union of Concerned Scientists https://blog.ucsusa.org/katharine-hayhoe/climate-science-its-a-lot-older-than-you-think
Keeling Curve

Charles David Keeling

http://scrippsc02.ucsd.edu/data/atmospheric_co2/primary_mlo_co2_record
http://berkeleyearth.lbl.gov/auto/Global/Land_and_Ocean_complete.txt
Emissions Scenarios

Source: National Climate Assessment
The Arctic Ocean is expected to be essentially ice-free by mid-century.

Source: National Climate Assessment
Global sea levels have risen by about 8 inches since reliable records began to be kept in the 1880s.

Source: National Climate Assessment
Biodiversity

Coral Reefs
• 25% of ocean species rely on
• Feed hundreds of millions
• 1.5 degree scenario: lose 80%
• 2.0 degree scenario: lose 99%
Projected Change in African Sorghum and Millet Yields

Source: IPCC AR5 chapter 22
2. Midwest Impacts

- Emissions Scenario
- Modelled Ranges
- Noise
- Interactions
- Data Limitations
- Basic Science

UNCERTAINTY
Observed changes in mean temperature, 1901-1960 vs. 1986-2016.

90+ Days
1901-1960: 44.4/year
1987-2016: 46.1/year

Source: National Climate Assessment
Projected Changes in Annual Average Temperature

Mid 21st Century

Lower Scenario (RCP4.5)  

Higher Scenario (RCP8.5)

Late 21st Century

Lower Scenario (RCP4.5)  

Higher Scenario (RCP8.5)

Source: National Climate Assessment
Observed changes in precipitation, 1901-1960 to 1986-2016

Hannibal, May 1, over flood stage:
- 1879-1968: 11
- 1969-2018: 25

St. Louis, days per year >= 1 inch precip:
- 1939-1968: 8.0
- 1969-2018: 10.9

Source: National Climate Assessment
Projected Change (%) in Seasonal Precipitation
RCP 8.5 Scenario

Winter

Spring

Summer

Fall

Source: National Climate Assessment
The Midwest is a major producer of a wide range of food and animal feed for national consumption and international trade. Increases in warm-season absolute humidity and precipitation have eroded soils, created favorable conditions for pests and pathogens, and degraded the quality of stored grain. Projected changes in precipitation, coupled with rising extreme temperatures before mid-century, will reduce Midwest agricultural productivity to levels of the 1980s without major technological advances.
Midwest forests provide numerous economic and ecological benefits, yet threats from a changing climate are interacting with existing stressors such as invasive species and pests to increase tree mortality and reduce forest productivity. Without adaptive actions, these interactions will result in the loss of economically and culturally important tree species such as paper birch and black ash and are expected to lead to the conversion of some forests to other forest types or even to non-forested ecosystems by the end of the century. Land managers are beginning to manage risk in forests by increasing diversity and selecting for tree species adapted to a range of projected conditions.
The ecosystems of the Midwest support a diverse array of native species and provide people with essential services such as water purification, flood control, resource provision, crop pollination, and recreational opportunities. **Species and ecosystems**, including the important freshwater resources of the Great Lakes, are typically most at risk when climate stressors, like temperature increases, interact with land-use change, habitat loss, pollution, nutrient inputs, and nonnative invasive species. Restoration of natural systems, increases in the use of green infrastructure, and targeted conservation efforts, especially of wetland systems, can help protect people and nature from climate change impacts.
Biodiversity and Ecosystems

(a) Observed change in plant centroids

(b) Change in climatic conditions

(c) Difference

Source: National Climate Assessment
Climate change is expected to worsen existing health conditions and introduce new health threats by increasing the frequency and intensity of poor air quality days, extreme high temperature events, and heavy rainfalls; extending pollen seasons; and modifying the distribution of disease-carrying pests and insects. By mid-century, the region is projected to experience substantial, yet avoidable, loss of life, worsened health conditions, and economic impacts estimated in the billions of dollars as a result of these changes. Improved basic health services and increased public health measures—including surveillance and monitoring—can prevent or reduce these impacts.
Maps show county-level estimates for the change in average annual ozone-related premature deaths over the summer months in 2050 (2045–2055) and 2090 (2085–2095) compared to 2000 (1995–2005) under the lower and higher scenarios (RCP4.5 and RCP8.5) in the Midwest. The results represent the average of five global climate models. Source: adapted from EPA 2017.28
Storm water management systems, transportation networks, and other critical infrastructure are already experiencing impacts from changing precipitation patterns and elevated flood risks. Green infrastructure is reducing some of the negative impacts by using plants and open space to absorb storm water. The annual cost of adapting urban storm water systems to more frequent and severe storms is projected to exceed $500 million for the Midwest by the end of the century.
Fig. 21.11: Meramec River Flooding

This composite image shows portions of Interstate 44 near St. Louis that were closed by Meramec River flooding in both 2015 and 2017. The flooding shown here occurred in May 2017. Image credit: Surdex Corporation.

Source: National Climate Assessment
At-risk communities in the Midwest are becoming more vulnerable to climate change impacts such as flooding, drought, and increases in urban heat islands. **Tribal nations are especially vulnerable because of their reliance on threatened natural resources for their cultural, subsistence, and economic needs.** Integrating climate adaptation into planning processes offers an opportunity to better manage climate risks now. Developing knowledge for decision-making in cooperation with vulnerable communities and tribal nations will help to build adaptive capacity and increase resilience.
3. Response
Creve Coeur

- GHG Inventory
- 1st Climate Action Plan
- Gov’t Center energy use 75%
- Lighting energy 70%
Missouri Gateway Chapter, USGBC

- Education
- Technical Assistance
- Advocacy
- LEED Certification
Native Vegetation

Source: National Climate Assessment
Climate-Resilient Plant Species

Source: National Climate Assessment
Restoration

Source: National Climate Assessment
Minneapolis City Trees Program
Cermak/Blue Island Sustainable Streetscape

- Stormwater Diversion
- Heat Island
- Solar-Powered Lighting
MSD Project Clear: $100 million for rainscaping
Heartlands Conservancy

- Land Conservation
- Conservation Easements
- Land Acquisition
- Land Donation
- Land Stewardship
Stream Restoration

Kalamazoo
Arcadia Creek

Milwaukee Metropolitan Sewerage District
Kinnickinnic River
Great Rivers Habitat Alliance and Ducks Unlimited

- Conservation easements > 8,000 acres
- NAWCA restoration > 23,000 acres
Ravine Restoration
Great Lakes Alliance
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