Climate Resilience in Minnesota

MACPZA ANNUAL CONFERENCE

October 14, 2022

Abby Finis| Principal at Local Climate Solutions

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Local Climate Solutions

Helping local governments equitably accelerate climate mitigation and adaptation action to move toward a more sustainable world.

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Presentation Overview

I. State of climate change and anticipated impacts
II. Shifting attitudes
III. Climate action in Minnesota
IV. Local climate action
V. Federal funding
VI. Discussion

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Paris Agreement and IPCC Special Report

Paris Agreement 2015

- Limit warming to below 2° C from pre-industrial levels
- Pursue efforts to limit to 1.5° C
- Ratified by 185 countries
- In 2017, the U.S. announced it would pull out of the agreement (back in as of 2021)

IPCC Special Report 2018

- Reduce global emissions by 50% by 2030 to avoid irreversible climate change
- Achieve carbon neutrality by 2050

"Human activities are estimated to have caused approximately 1.0° C of global warming above pre-industrial levels, with a likely range of 0.8° to 1.2° C. Global warming is likely to reach 1.5° C between 2030 and 2050 if it continues at the current rate."

Latest IPCC Sixth Assessment Report

Climate Change 2021: The Physical Science Basis (Released 08/09/2021):

- Indisputable that human influence has warmed the global surface temperature
- Global warming of 1.5°C and 2°C will be exceeded in the 21st century unless deep reductions in greenhouse gases occur in the coming decades
- Climate change is already happening, and many changes will be irreversible for centuries to millennia

Climate Change 2022: Impacts, Adaptation and Vulnerability (Released 02/28/2022):

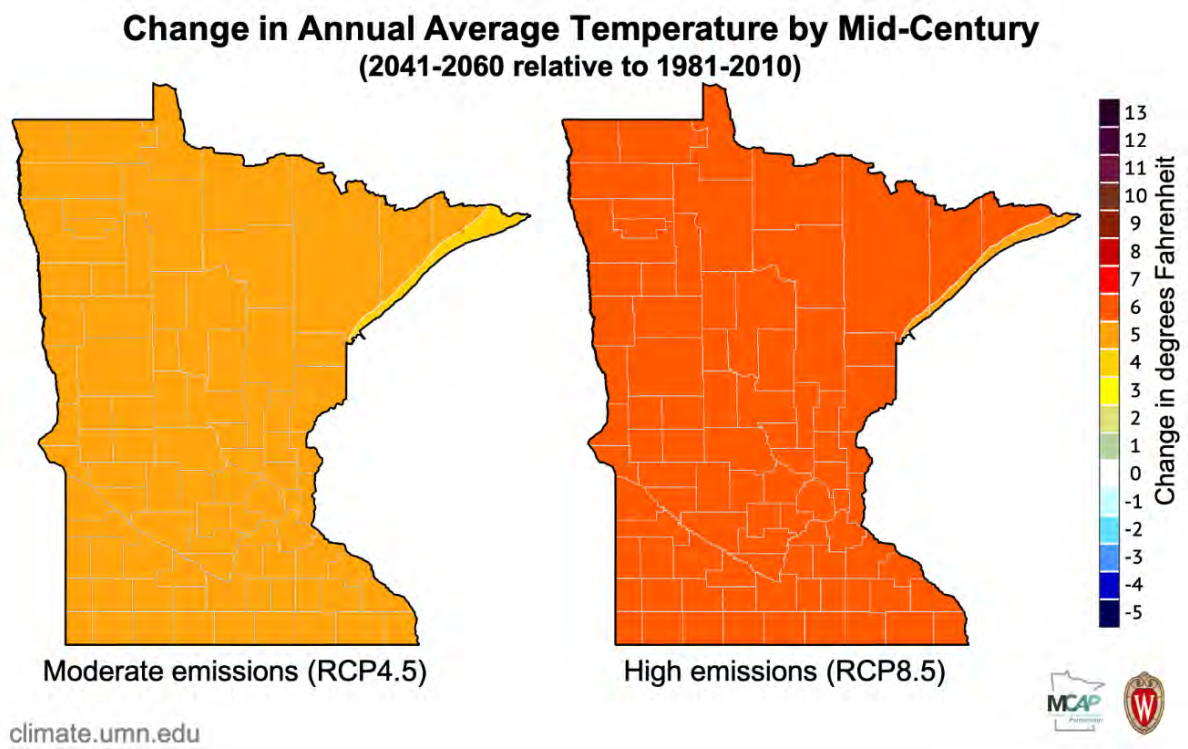
- Impacts from climate change are already happening and are more severe than anticipated
- We are locked into some amount of a changed climate, **adaptation is crucial**
- Projected adverse impacts and related losses and damages escalate with every increment of global warming – **we must mitigate and adapt**

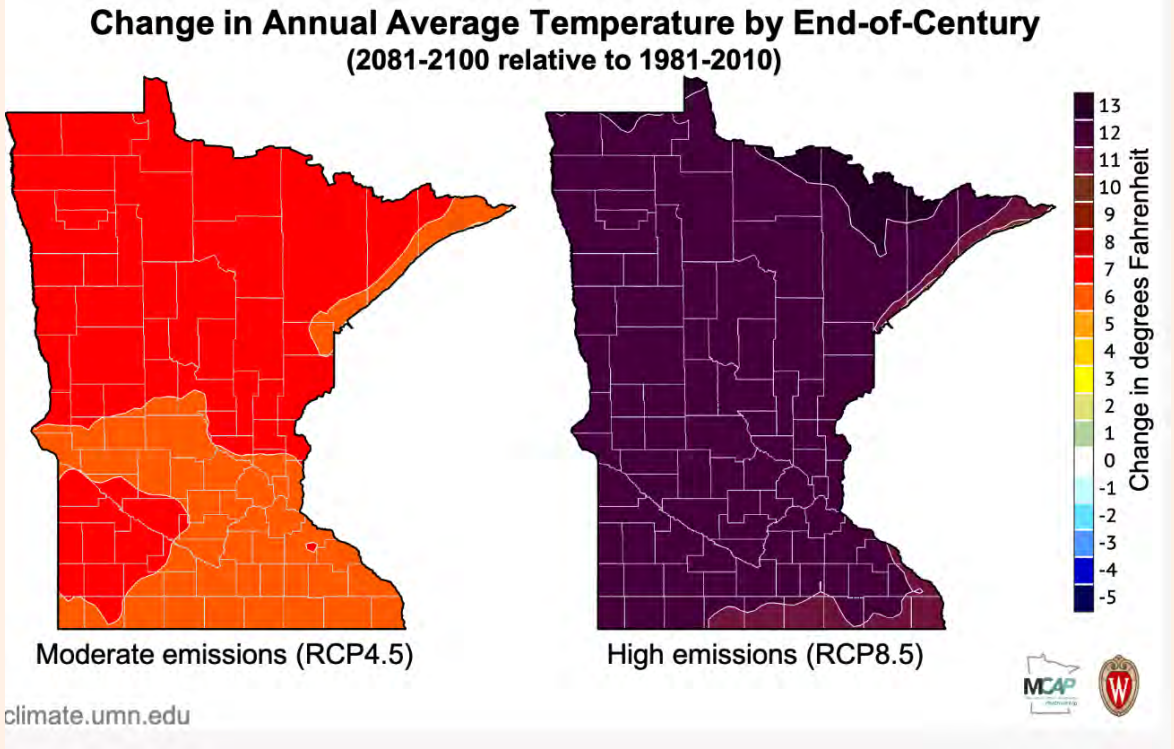
Climate Change 2022: Mitigation of Climate Change (Released 04/04/2022):

- Emissions are rising, but the rate is slowing – need to peak before 2025 and decrease 43% from 2019 by 2030
- We have the tools and technology to do it

Minnesota Climate Projections

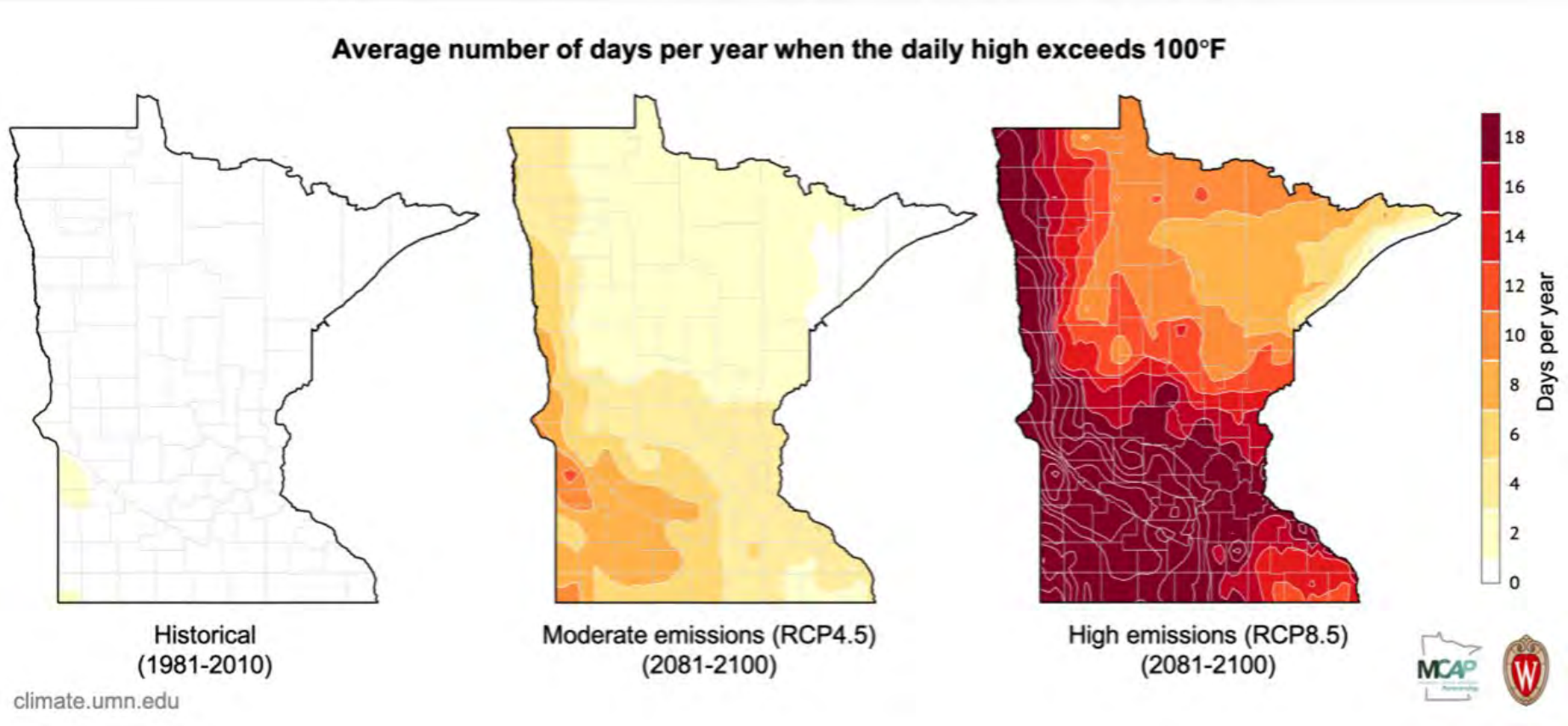
Temperatures are rising and will continue to rise.





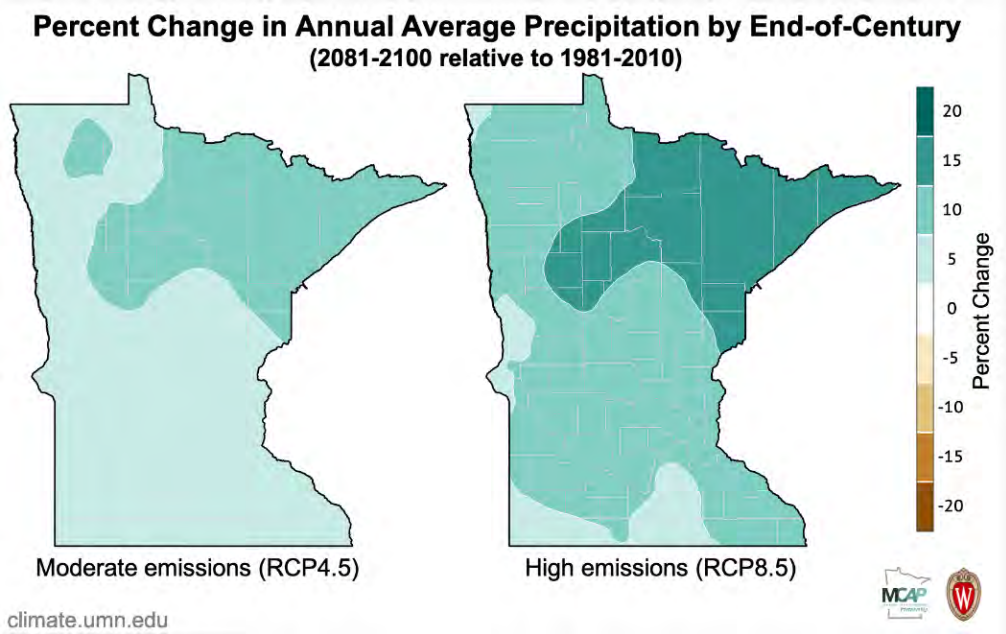
Minnesota Climate Projections

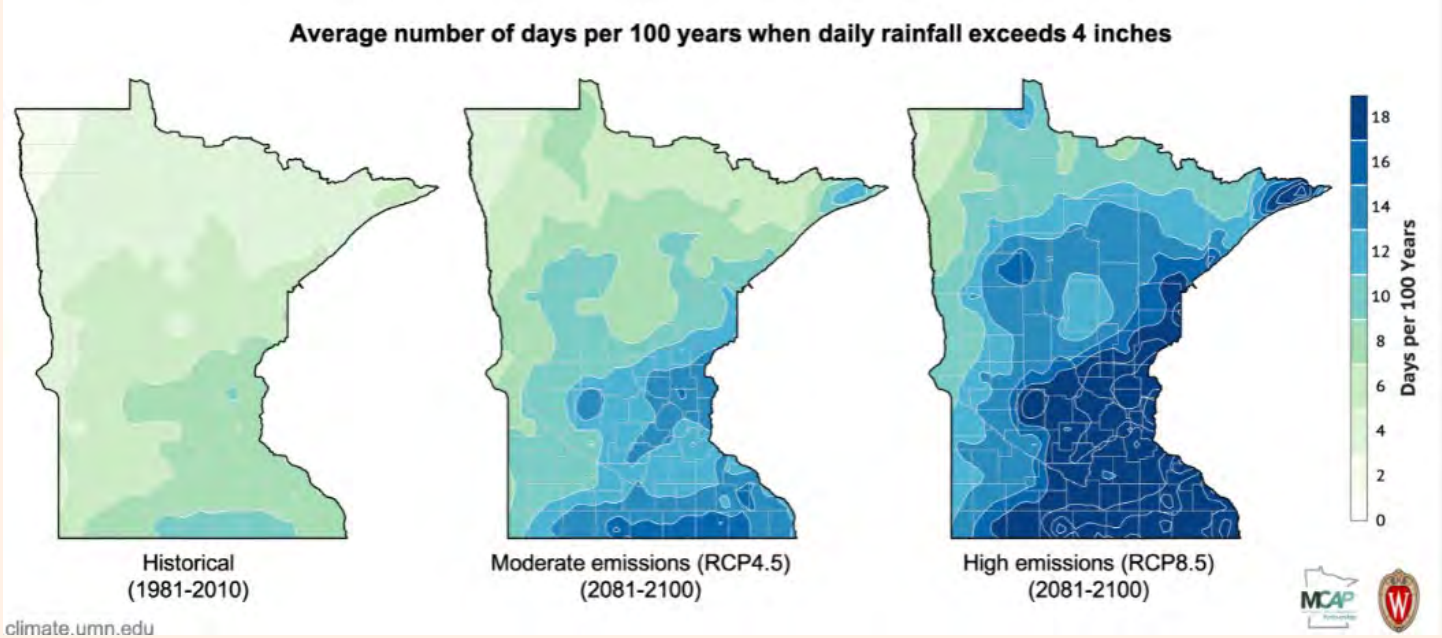
We will see more extreme heat events.



Minnesota Climate Projections

Increased rainfall





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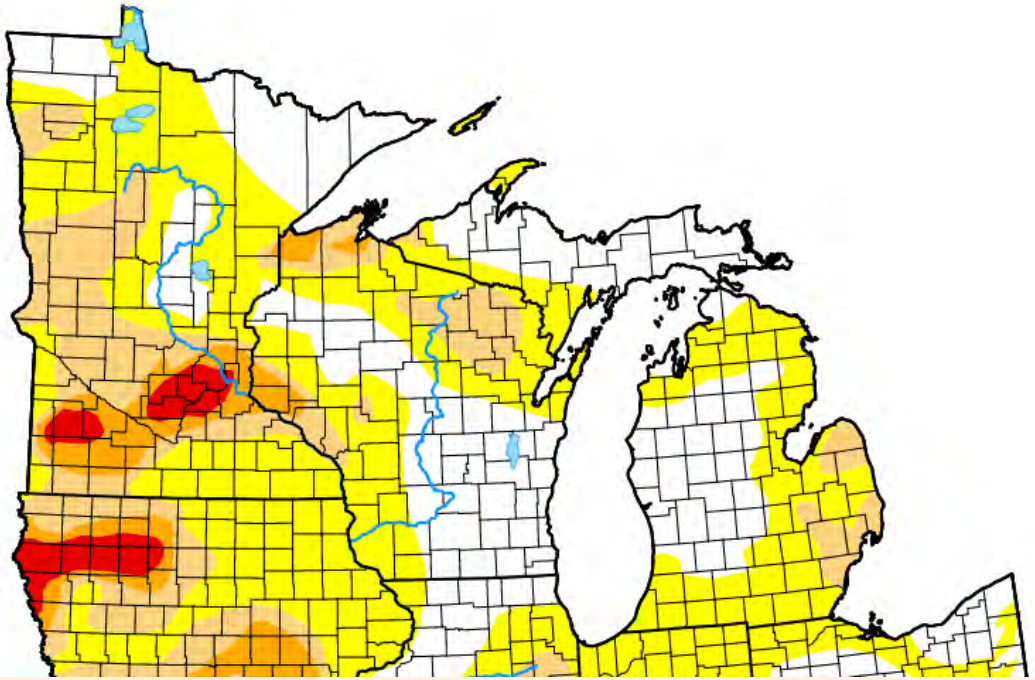
2022 Drought



Map released: Thurs. October 13, 2022

Data valid: October 11, 2022 at 8 a.m. EDT

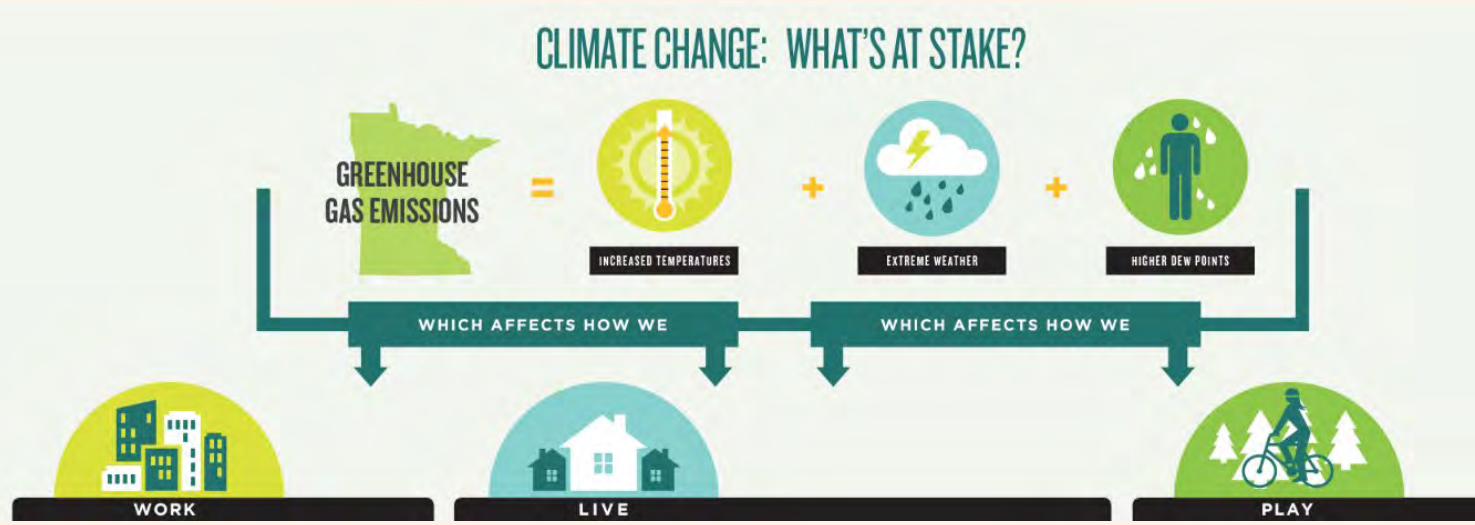
Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

The U.S. Drought Monitor is produced through a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration.

Minnesota Impacts

- Nights are warming faster than days
- Winter is warming faster than summer with less frequency of extreme cold
- Increased drought cycles
- More intense flooding
- Extreme storms
- Increased freeze/thaw cycles, stressing infrastructure
- Impact on ecosystems:
  - Loss of fish habitat, including trout and walleye
  - Increased algae blooms impacting oxygen levels
  - Changes to biodiversity of forests
  - Disrupted migratory patterns for birds and pollinators



Graphic Source: Minnesota and Climate Change: Our Tomorrow Starts Today. Environmental Quality Board.

MINNESOTA POLLUTION CONTROL AGENCY

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Northshore's Changing Climate

By the end of the 21st century:

Air Temperature: expected to increase 3°C to 4.5°C

Precipitation: Expected to increase 5-15%

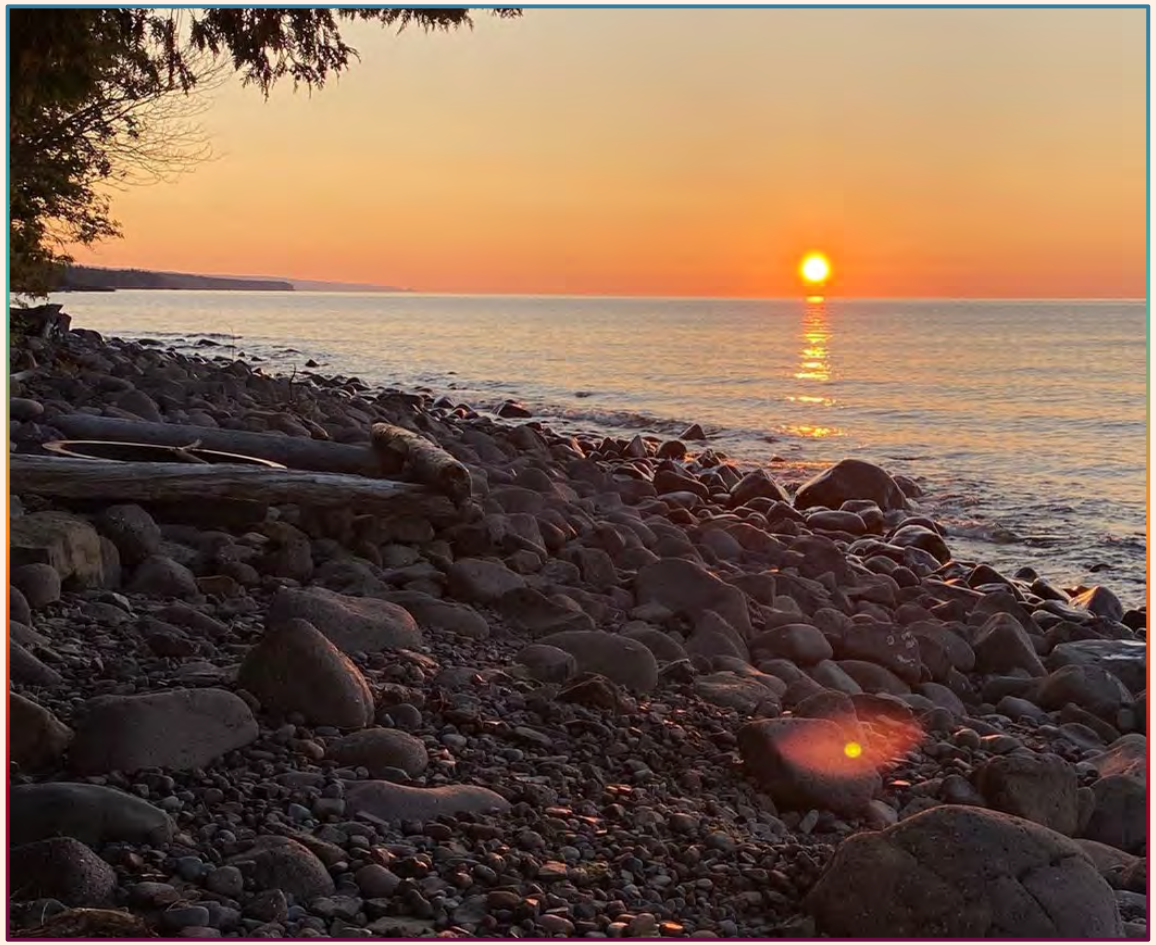
Water Temperature: Increase 5°C to 7°C, Lake Superior is the fastest warming large lake in the world

Ice Cover: continue to decrease in coverage and duration

Wind speeds: likely to increase

Lake Water Levels: Uncertainty, likely to decrease with periodic increases possible

Seasonal Variation: Spring and summer expected to be longer



Source: Huff, A. and A. Thomas. 2014. Lake Superior Climate Change Impacts and Adaptation. Prepared for the Lake Superior Lakewide Action and Management Plan – Superior Work Group. Available at https://conservancy.umn.edu/handle/11299/189267.

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Northshore Impacts

Coastal Wetlands: If water levels decline, could impact breeding areas and habitat for fish and wildlife, resulting in population decline

Forest Habitat: Northward shift and increased mortality among species with warmer temperatures

Shoreline Effects: Increased vulnerability to shoreline erosion and damage

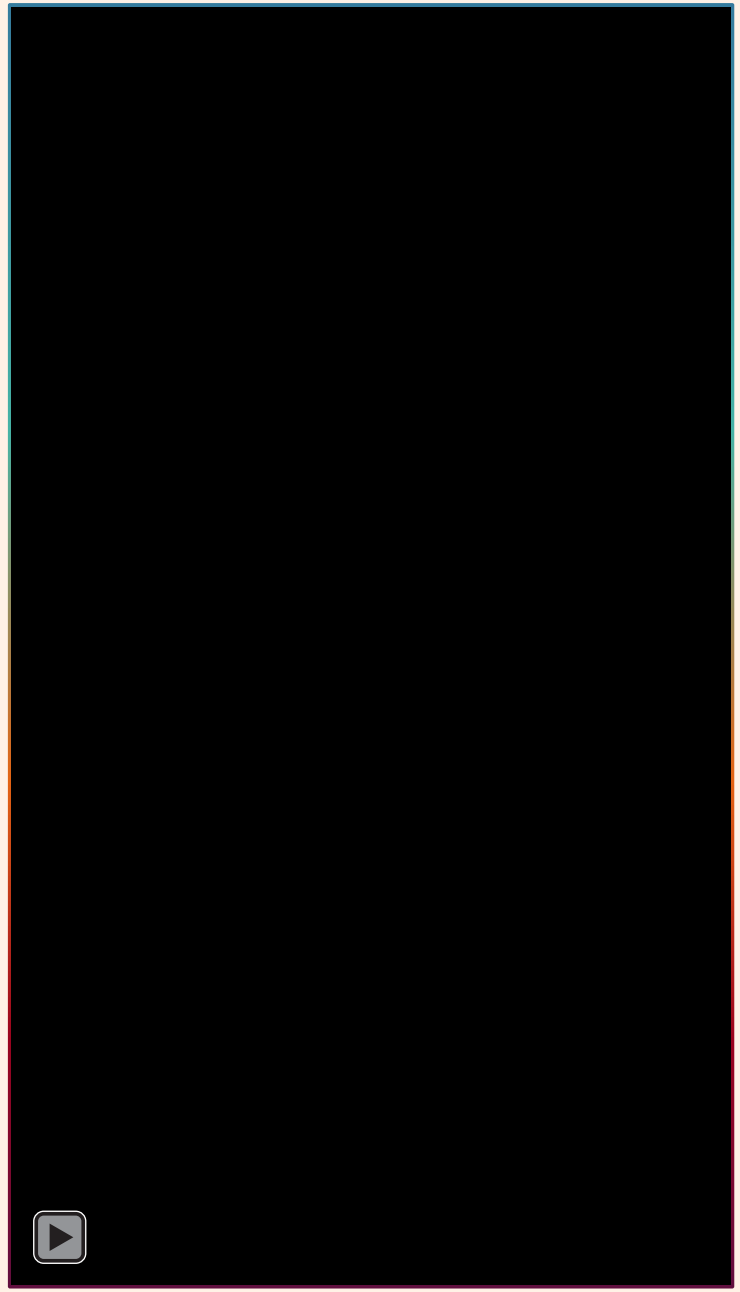
Toxic Chemicals and Pollutants: Increased concentrations of toxic pollutants from stormwater runoff can have adverse impact on wildlife

Lake Superior Water Quality: Warmer temperatures and algal blooms can degrade water quality, adversely impacting aquatic life

Mammals and birds: Increasing air temperatures and changes in snow depth are causing declines in northern mammal species, many birds are experiencing habitat loss and shifts

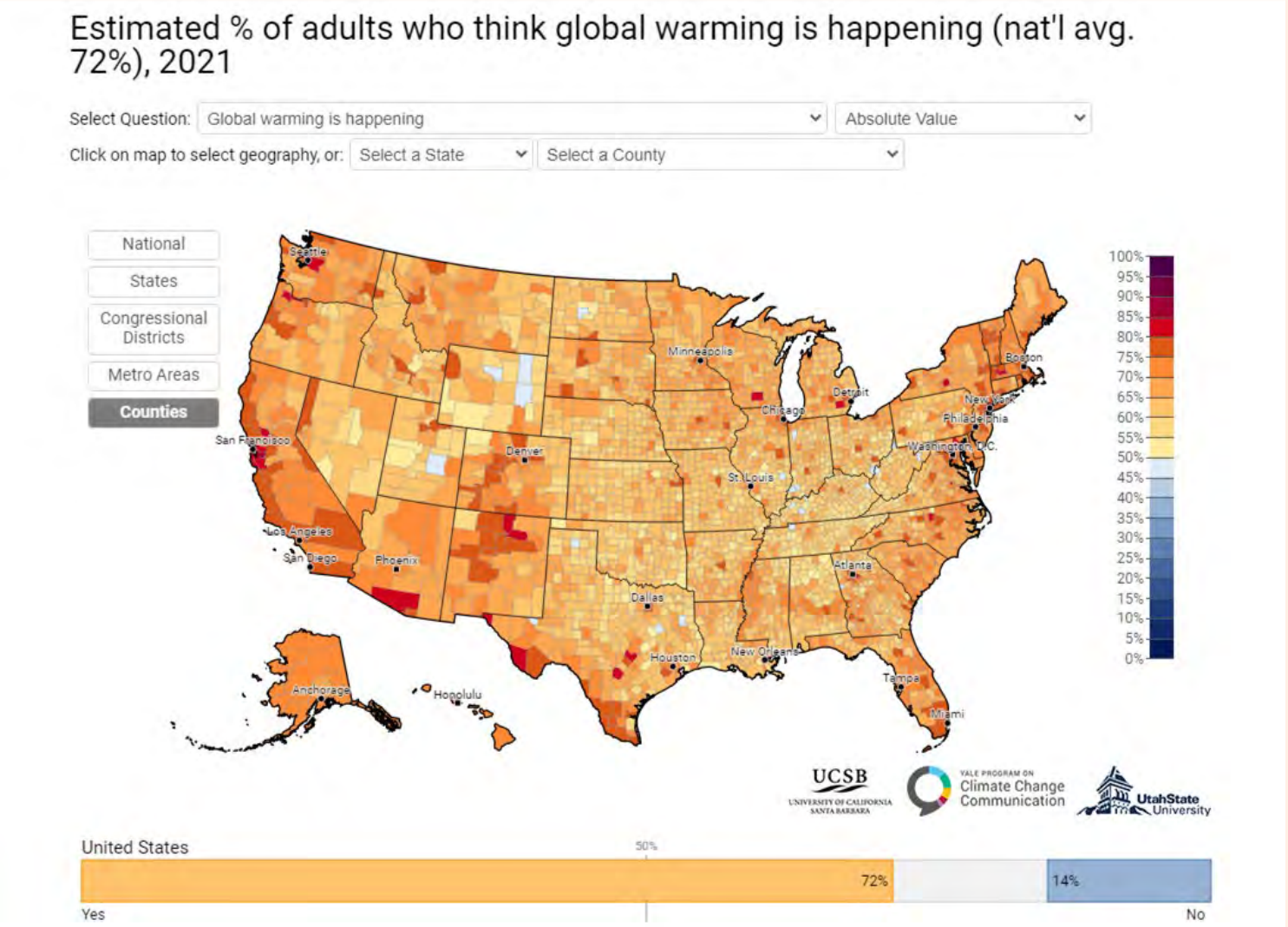
Trees and Plants: Climate change will continue to exacerbate existing stresses on trees, including drought, wind, fires, and insects

Invasive Species: Warmer air and water temperatures may enhance the spread of invasive pests



Source: Huff, A. and A. Thomas. 2014. Lake Superior Climate Change Impacts and Adaptation. Prepared for the Lake Superior Lakewide Action and Management Plan – Superior Work Group. Available at https://conservancy.umn.edu/handle/11299/189267.

Shifting Attitudes



Up from 59% in 2010.

YALE PROGRAM ON Climate Change Communication

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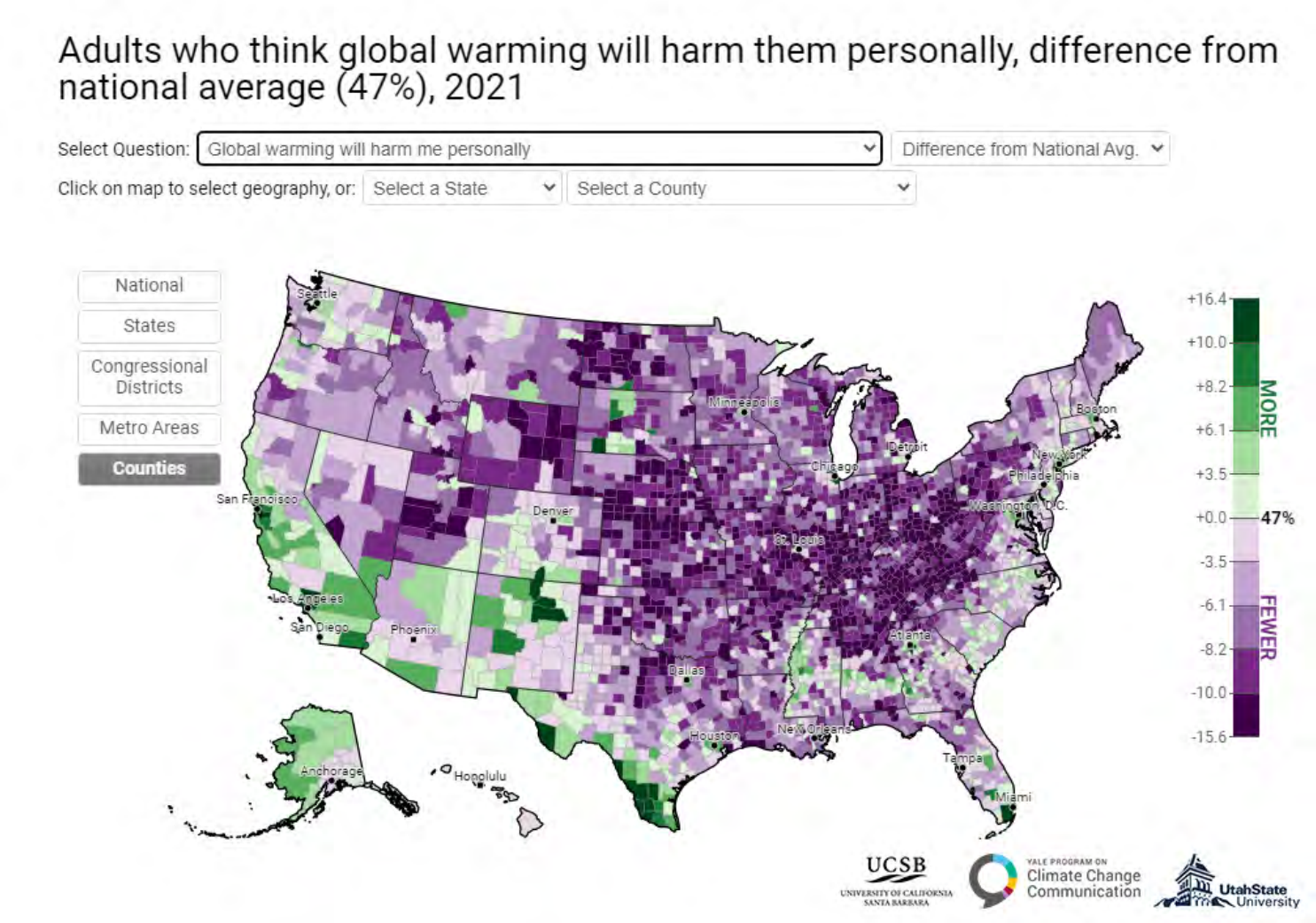
Shifting Attitudes



YALE PROGRAM ON
Climate Change Communication

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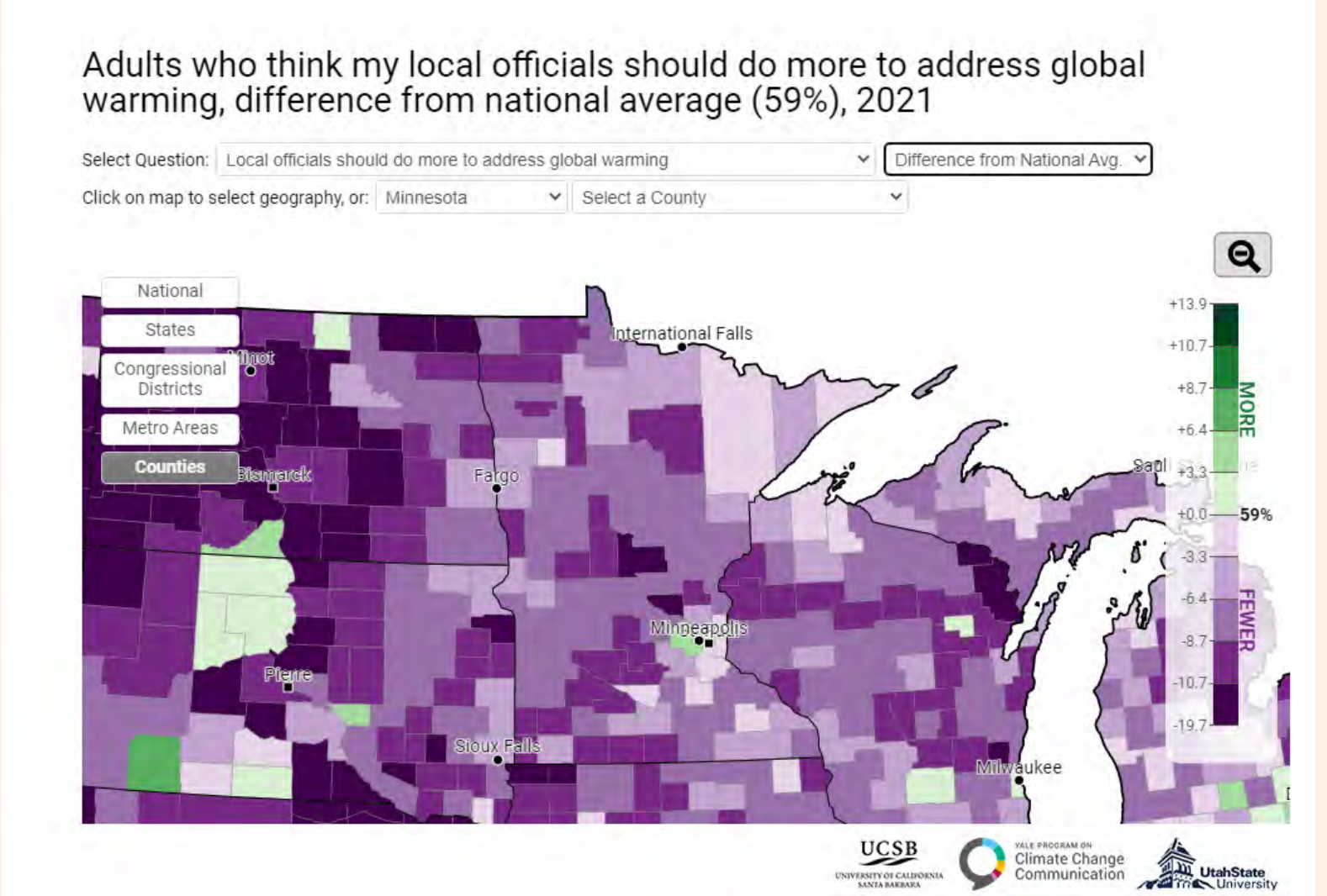
Shifting Attitudes



YALE PROGRAM ON Climate Change Communication

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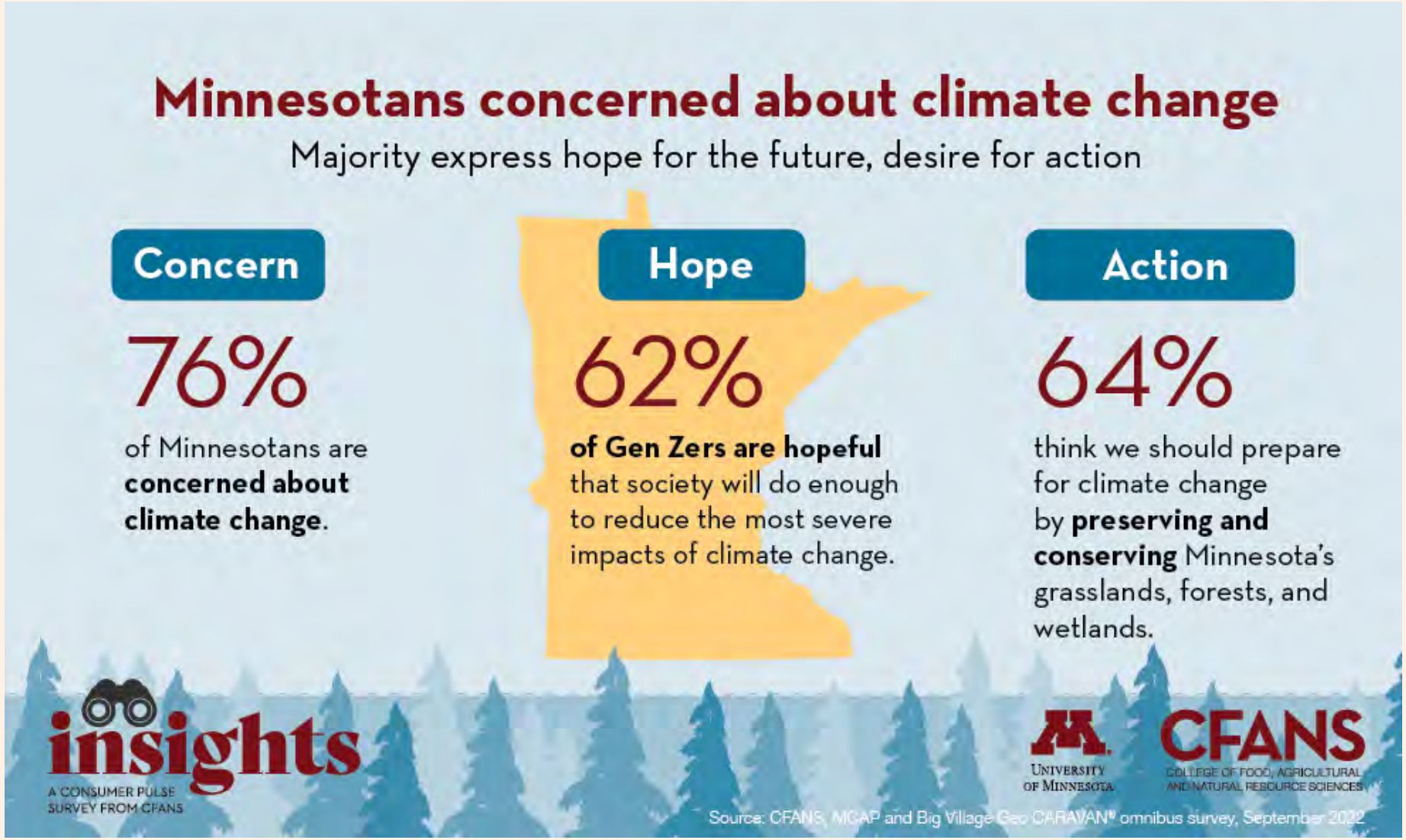
Shifting Attitudes



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Minnesota Climate Action Framework

The climate vision for our state

The vision for our state embodied in this framework is:

Carbon-neutral
By 2050, Minnesota substantially reduces greenhouse gas (GHG) emissions and balances any GHG emissions with carbon storage, especially in our landscapes.

Resilient
Minnesota communities, businesses, and the natural environment can prepare, respond to, and recover from the impacts of climate change so all Minnesotans can thrive in the face of these challenges.

Equitable
Minnesotans acknowledge and address inequitable and inaccessible systems that contribute to some communities experiencing disproportionate climate change impacts; ensure fair distribution of the costs and benefits of action now and to future generations; and ensure meaningful participation in planning.

To get there, we all have a role to play.
This Climate Action Framework outlines priorities and next steps to help Minnesota achieve this vision. The framework also invites you, your organization, and your community to join us to achieve a shared vision.

More information: mn.gov/framework

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Minnesota Climate Action Framework

Resilient communities

GOAL 3 — MN CLIMATE ACTION FRAMEWORK

Provide each Minnesota community with tools to plan for and become resilient to its unique climate impacts

SHORT FORM

The challenges Communities experience a variety of climate-change effects, including wastewater releases, stormwater flooding, shoreline erosion, drought, and more. Solutions must be tailored to each community's needs.

The vision Communities across Minnesota have the resources and support to plan for and implement projects to build a more resilient future for themselves. Physical infrastructure, natural systems, and communities are more prepared for climate impacts and can recover from extreme events.

Priority actions

Provide more resources for adaptation. Expand funding, staff capacity, technical support, and training for planning and implementation of adaptation and resiliency projects.

Increase capacity of the GreenStep Cities program. Share resilience best practices and adaptation resources and expand pilot programs that include tribal nations, schools, counties, and townships.

Plant climate-ready trees and preserve mature trees. Climate-ready tree species are well-adapted to challenges such as heat, drought, extreme weather, and pests. Along with mature trees, they decrease energy use in homes and buildings and mitigate heat islands. They should be used to replace diseased trees.

Initiative 3.1

Climate-smart communities

Build the capacity of Minnesota communities to protect against and withstand the effects of climate change.

Initiative 3.2

Healthy community green spaces and water resources

Expand and protect tree canopies; parks and other green spaces; and lakes, rivers, and wetlands that provide community resilience benefits.

Initiative 3.3

Resilient buildings, infrastructure, and business

Help the built environment and local economies become more resilient to climate change.

More information: mn.gov/framework

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Climate Resilience Forum

- First-of-its-kind forum held in February 2022
- Brought together local and tribal government leaders with climate practitioners to discuss climate mitigation and adaptation action in the western Lake Superior region
- Momentum and support to advance climate and resilience actions among coastal communities in the region

[A Climate Resilience Forum | Minnesota DNR (state.mn.us)]

Climate Resilience Forum

Climate Concerns and Priorities

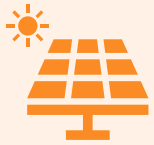
Local Government	Concerns	Priorities
Cook County, including the City of Grand Marais	• Water levels and quality • Species loss • Decreasing biodiversity • Increased cost of damages from climatic events • Public health and safety • Adaptation and mitigation	• Increased stormwater infrastructure and water treatment capacities • Extreme weather and events: • Flood, Drought, Wildfires • Creating sustainable systems • Funding for small cities and counties • Climate affecting Lake Superior, our wilderness and individual contributions
Lake County, including the City of Beaver bay and the Town of Silver Creek	• Increasing severity of weather • Changing precipitation rates • Culvert sizing • Erosion from flooding and storm events • Coastal erosion • Severe weather conditions	• Preparedness • Water quality and quantity • Increased fuel reduction to reduce wildfires • Predictable weather
St. Louis County	• Mitigation of tree species and forest ecosystems • Difficulty enacting changes needed to draw down transportation-related greenhouse gas emissions • Attitudes • Forest harvest operability • How to adapt • Facility design for sustainability, resilience, and energy efficiency	• Water quality and protection • Trees • Renewable energy • Moving homes and other structures our of flood risk areas • Diversifying ecosystems • Invasive species management • Preparedness • County operations, ensuring they are uninterrupted
City of Duluth	• Stormwater management, extreme storms • Adaptation of native plants • Infrastructure needs • Mitigation • Funding	• Resilient housing and infrastructure, especially older homes and low-income neighborhoods • Environmental justice • Thermal energy transitions • Public safety and welfare

Importance of Local Climate Action

- Local and corporate entities have been critical in driving climate action while federal action has been stalled
- Local entities can provide emissions reductions that are additive to states and nations
- Emissions and hazards occur locally and impact vulnerable populations
- People are most impacted by climate hazards at the local level
- Local entities have authority over development, land use, and transportation systems*
- Local entities can also enable deployment of emerging technologies

Local Climate Action in Minnesota

Trends in 2040 Comprehensive Plans:



117 include solar requirements

36 include a resilience chapter

26 achieved SolSmart designation

31 want to complete an energy plan

55 are GreenStep Cities

32 want to complete a climate action plan

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Minnesota Cities with Climate/Energy Plans

Climate Action Plans

Minneapolis
St. Louis Park
St. Paul
Richfield
Eden Prairie
Edina
Hennepin County
Grand Marais
Red Wing
Northfield
Duluth
Albert Lea
Burnsville

Energy Plans

Shorewood x2 (PiE)
Eden Prairie (PiE)
St. Louis Park (PiE)
St. Paul (PiE)
Rosemount (PiE)
Edina (PiE)
Minnetonka (PiE)
Fridley (PiE)
Wayzata (PiE)
Golden Valley (PiE)
Bloomington (PiE)
Shoreview (PiE)
STP Schools (PiE)
La Crescent
Mahtomedi (PiE)
Maplewood (PiE)
Inver Grove Heights (PiE)
Ramsey County Parks (PiE)
Washington County (ops)

Climate Action Plans

Climate Planning

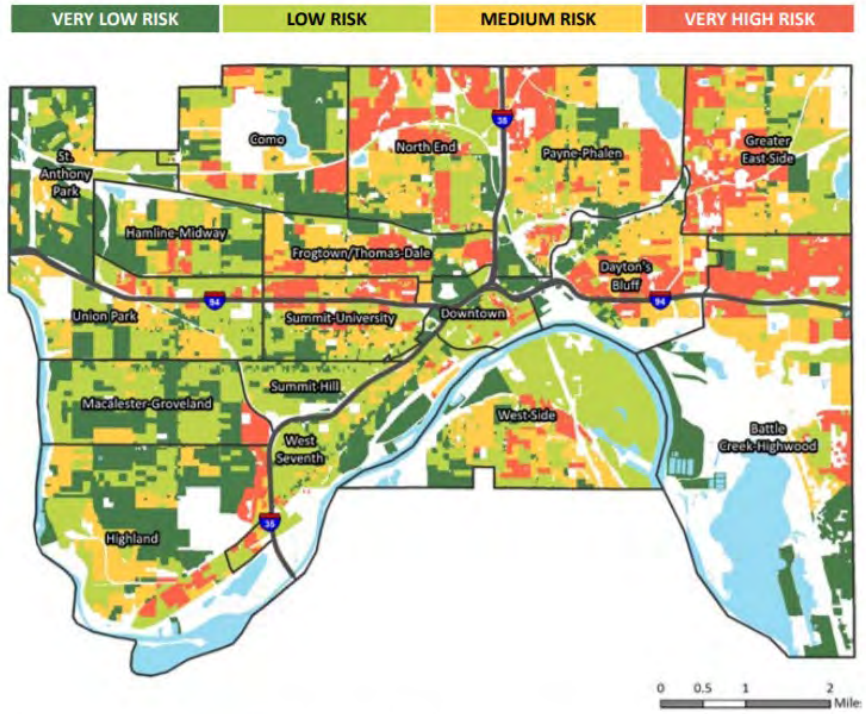
Climate action plans guide local entities on a path to achieve mitigation and resilience goas. Plans can include:

- Long-term and near-term targets
- Greenhouse gas inventory
- Anticipated climate impacts
- Vulnerability assessment
  - People
  - Natural Resources
  - Built infrastructure
  - Economic
  - Energy infrastructure
- Strategies and actions

Population Vulnerabilities

Data from the Saint Paul-Ramsey County Health Climate Vulnerability assessment was used to map vulnerabilities based on the relative exposure to poor air quality, extreme heat, flooding, and social indicators.

These kinds of assessments can be used to help visualize where cities can prioritize engagement and implementation to help reduce vulnerabilities among populations with the greatest risks.



Map 4. Characterizes the composite vulnerability based on the relative risk of exposure to poor air quality, extreme heat, and flooding (very low, low, medium, and high risk), as well as demographic inputs, across the City of Saint Paul. This analysis was originally conducted by Saint Paul-Ramsey County Public Health through its Climate Change Vulnerability Assessment in 2016.

Graphic Source: City of Saint Paul Climate Action and Resilience Plan

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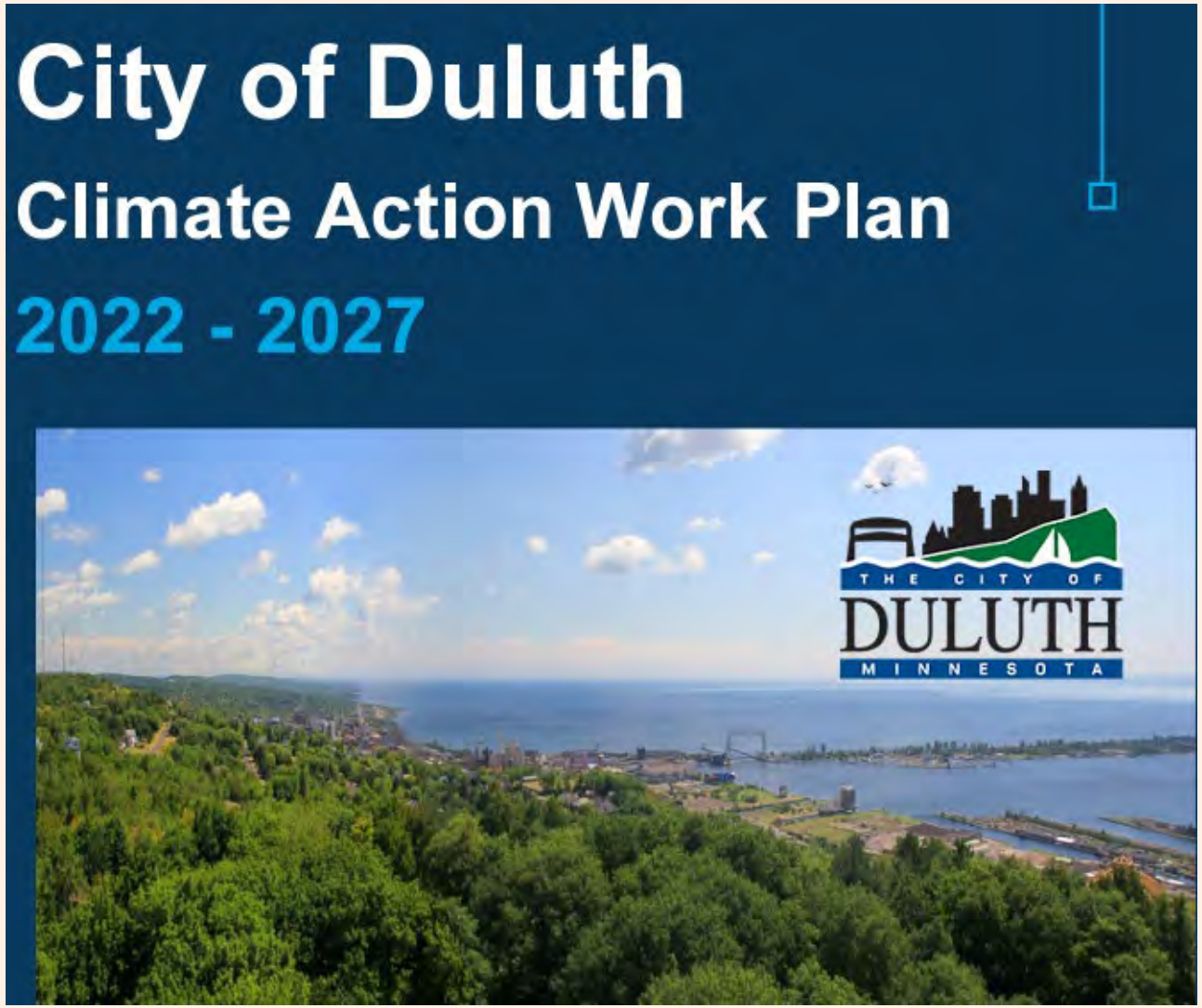
Duluth Climate Action Work Plan



Strategies	Actions	Action Leads	Resources Needed
S2	**2.1 Improve the resiliency of the water plant and distribution system** Seek opportunities to improve resiliency of the water plant, including transformer upgrades, burying lines, back-up power, and clean energy procurement options. **2.2 Complete a citywide assessment of vulnerable built (sidewalks, roads, pipes, etc.) and natural (trees, soil, water, etc.) infrastructure** ❑ Manage Emerald Ash Borer; implement strategic planting plan ❑ Develop a plan to minimize risk to infrastructure, prioritizing highest risk and infrastructure located in vulnerable communities **2.3 Expand current CIP offerings from Comfort Systems for residential and commercial customers**	Public Works and Utilities, Stormwater, Property Parks and Libraries, Sustainability	Funding request is pending for water plant Funds required for citywide assessment Staff resources are available for CIP expansion
S5	**2.4 Develop a stormwater management plan that integrates resilience and identifies financing opportunities and includes these elements:** • Identification of priority parcels for preservation, vegetation quality mapping and repair; inventory natural resource and flood protection opportunities • Prioritization of improvements in high-risk neighborhoods with vulnerable populations • Reduced stormwater runoff flow and volume through green infrastructure and on-site stormwater management • Demonstration of green infrastructure on City property • Recommendations to incorporate green infrastructure into the unified development chapter • Continued collaboration with the Regional Stormwater Protection Team and other key partners to advance stormwater adaptation strategies	Public Works and Utilities, Engineering, Property Parks and Libraries, Parks Maintenance, Stormwater, Sustainability	Funds needed for stormwater planning and installation of stormwater practices
S6	**2.5 Strengthen inclusive and culturally specific community relationships through neighborhood volunteer events** ❑ Seek community partnerships and volunteer opportunities for blight clean-up, green infrastructure installations, community gardens, and tree planting	Life Safety, Community Relations, Community Partners, Human Rights, Stormwater	Love Your Block funding secured to develop community input process
S7	**2.6 Reduce population vulnerabilities and ensure basic needs are met** ❑ In collaboration with key partners, engage vulnerable populations in conversations around disaster preparation, planning, and response **2.7 Reduce environmental hazards and climate risks in vulnerable communities** ❑ Prioritize tree planting and green infrastructure in neighborhoods with vulnerable populations ❑ Seek opportunities to reduce harmful air pollutants in priority zones with highest particulate pollution	Life Safety, Property, Parks and Libraries, Sustainability, Fleet, Human Rights, Community Relations, Community Partners,	Resiliency planning and implementation funds required Funding needed to bolster tree canopy enhancements
S9	**2.8 Fully establish the Natural Resource Management Program to sustain the ecological, cultural, and recreational values of our open space lands, and increase resiliency to climate change**	Property, Parks and Libraries	Funding to support program

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Hazard Mitigation Plans

Minnesota State Hazard Mitigation Plan

Including Recommended Actions for Climate Change Adaptation

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Local Authority

Educate & Engage

Lead by Example

Incentives

Policy & Regulation

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Local Authority

WHAT LOCAL ENTITIES CAN DO

Educate and Engage

- Provide climate adaptation and resilience resources on website, social media, in newsletters, and other communication materials
- Host Community Emergency Response Teams (CERTs) groups, train residents in emergency preparedness and response
- Promote FIREWISE best practices

Local Authority

WHAT LOCAL ENTITIES CAN DO

Lead by Example

- Integrate resilient design elements into city buildings, facilities, and properties
- Add sustainable, clean, and reliable back-up power to critical infrastructure
- Integrate resilience into budgets and capital improvement plans

Local Authority

WHAT LOCAL ENTITIES CAN DO

Incentives

- Financial:
  - Incentivize green infrastructure, on-site stormwater management
  - Low-interest financing
  - Stormwater credit
- Process:
  - Expedited permitting
  - Streamlined application process

Local Authority

WHAT LOCAL ENTITIES CAN DO

Policy and Regulation

- Integrate climate resilience into long-range planning documents, e.g., comprehensive plans, hazard mitigation plans
- Remove barriers and enable climate resilience in regulatory frameworks, such as zoning, permitting, and development review
- Adopt and implement policies that address climate, e.g., sustainable/resilient building ordinance, complete green streets policies
- Incorporate climate resilience into budgeting and other decision-making processes

Federal Funding – IIJA

Area	Funding
Roads, Bridges, and Major Projects	$110 billion
Passenger and Freight Rail	$66 billion
Safe Roads	$11 billion
Public Transit	$39.2 billion
Broadband	$65 billion
Ports and Waterways	$17.3 billion
Airports	$25 billion
Water Infrastructure	$55 billion
Power and Grid	$73 billion
Resiliency	**$46 billion**
EV, Low-Carbon, and Zero-Emission School Buses and Ferries	$15 billion

IIJA Defines Resiliency as:

A project with the ability to anticipate, prepare for, or adapt to conditions or withstand, respond to, or recover rapidly from disruptions, including the ability— (A)(i) to resist hazards or withstand impacts from weather events and natural disasters; or (ii) to reduce the magnitude or duration of impacts of a disruptive weather event or natural disaster on a project; and (B) to have the absorptive capacity, adaptive capacity, and recoverability to decrease project vulnerability to weather events or other natural disasters

Federal Funding – IIJA

Transportation

- Over $16 billion for transportation resiliency programs
- $500 million dedicated to cool pavements, porous pavements, and tree cover expansion through the US DOT Healthy Streets Program
- Integration of resilience into USDOT formula and emergency relief programs

Energy, Buildings, and Development

- Grant programs “to enable sustained cost-effective implementation of update building energy codes

Preparedness & Emergency Response

- $1 billion for existing FEMA Building Resilient Infrastructure and Communities Program (BRIC)
- $500 million for hazard mitigation revolving loan funds authorized by Storm Act

Source: Georgetown Climate Center

Federal Funding – IRA

$369 billion in Energy Security and Climate Change

- Combination of tax incentives, rebates, loans, and grants

Tax credits and rebates:

- Restores and extends ITC and PTC for wind and solar (MN counties collect a tax from wind production and share revenue with cities and townships where the wind project is located).
- Additional tax credits and rebates for home energy efficiency and solar
- Tax credits for new and used electric vehicles

Grants:

- Over $60 billion in environmental justice investments to reduce pollution and improve access in communities that are burdened with public health harms
- ~$30 billion Famers, Forestland Owners, and Resilient Communities

Federal Funding – NACo

What local entities need to be successful

- Technical capacity
- Time and staff capacity
- Data tracking and communications
- Funding and other supportive resources
- Internal and external support
- Inclusive engagement
- Workforce
- Volunteers

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Climate Resilience in Minnesota

MACPZA ANNUAL CONFERENCE

October 13, 2022

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Resources

- Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Reports: https://www.ipcc.ch/assessment-report/ar6/
- Minnesota Climate Projections, University of Minnesota, Minnesota Climate Adaptation Partnership: https://climate.umn.edu/minnesota-climate-projections
- Effects of Climate Change in Minnesota, Minnesota Pollution Control Agency: https://www.pca.state.mn.us/air/effects-climate-change-minnesota
- Huff, A. and A. Thomas. 2014. Lake Superior Climate Change Impacts and Adaptation. Prepared for the Lake Superior Lakewide Action and Management Plan – Superior Work Group. Available at https://conservancy.umn.edu/handle/11299/189267
- Yale Climate Opinion Maps: https://climatecommunication.yale.edu/visualizations-data/ycom-us/#downscaling-panel-faq
- Minnesota's Climate Action Framework: https://climate.state.mn.us/minnesotas-climate-action-framework
- Climate Resilience Forum: https://www.dnr.state.mn.us/waters/lakesuperior/lake-superior-climate-resilience-forum.html
- City of Duluth Climate Action Work Plan and Finance Memo: duluth-cawp_final_and_financememo.pdf (duluthmn.gov)
- National Association of Counties Funding Opportunities for Counties: https://www.naco.org/resources/implementing-infrastructure-investments-county-level