

# Climate Change in Minnesota



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# Minnesotans are concerned & want to see action

60%

of all  
Minnesotans

would like to see an **increase in the use of wind, solar, and other renewable energy** to power homes and businesses.

64%

of all  
Minnesotans

think we **should prepare for climate change** by preserving & conserving our state's **grasslands, forests, and wetlands**.

83%

of all  
Minnesotans

think **local, state and municipal governments are responsible** for addressing climate change in the state.

Source: UMN MCAP, CFANS, Caravan Climate Opinion Poll, Sept. 2022



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# Climate Change - State of the Science

It's us.

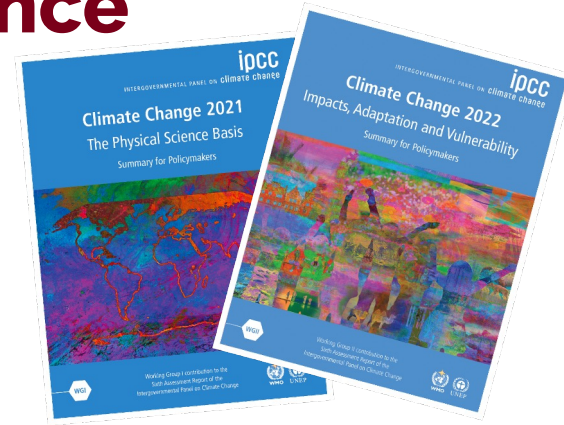
It's here.

We've committed to change.

The more we emit, the worse it gets.

We must reduce risks through adaptation.

We still choose, but there's no time to waste.



It's us.



It is unequivocal that human influence has warmed the atmosphere, ocean and land...

...and the rate of this warming is unprecedented in at least the last 2,000 years.

Data: IPCC, 2021; Photo: Mark Stone, 2019

# Source of the Problem - greenhouse gas emissions

## Global Sources of Greenhouse Gas Emissions

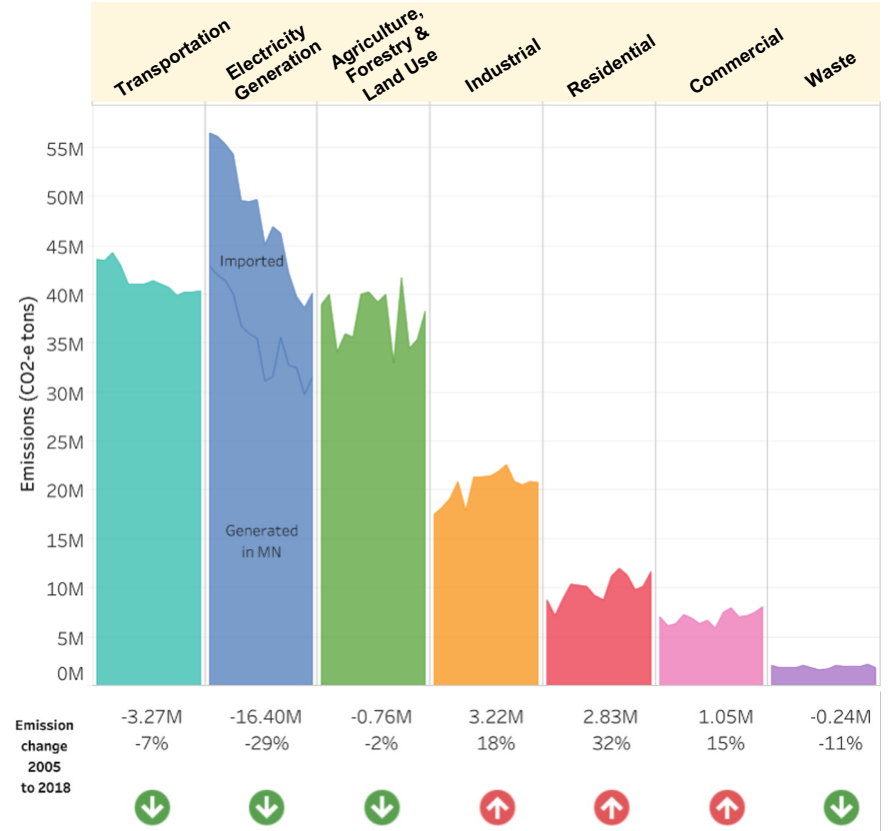
**73.2%** Energy (industry, transport, buildings)

**18.4%** Agriculture, Forestry & Land Use

**5.2%** Industry (cement & chemicals)

**3.2%** Waste (landfills & wastewater)

Change in Minnesota's Emissions by Sector from 2005-2018



Sources: values from 2018; OurWorldInData.org & the World Resources Institute; MN plot modified from MPCA, 2022

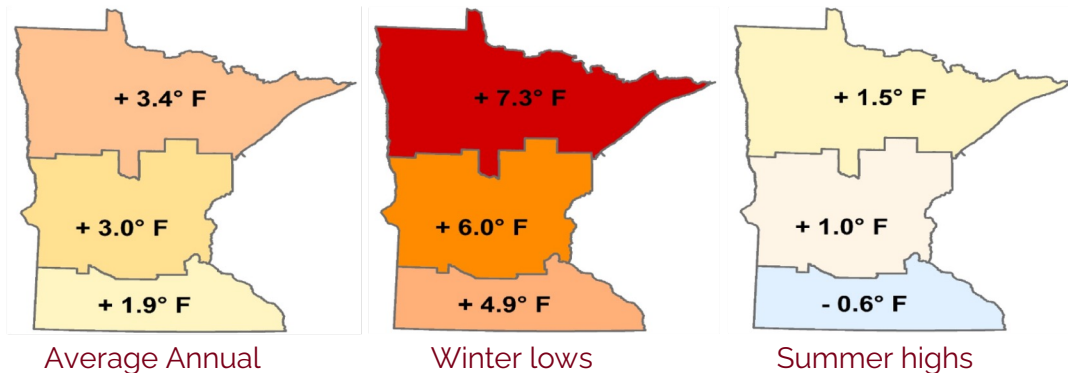
# It's here.



Average global temperature has increased over 2.0°F since the late 1800's

# Here means Minnesota.

## Total Observed Temperature Change (1895-2021)



Minnesota's average annual temperature has increased by nearly 3°F since 1895

Images: NASA; Data: NASA, 2021 & MN DNR, 2022



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# Minnesota is getting warmer & wetter



**10 wettest & warmest years on record all occurred after 1997**



**Observed 13% increase in the heaviest rainfall of the year**



**Growing season has lengthened by ~2 weeks since 1950**



**Average winter temperature in Minnesota is projected to be more than 10°F warmer by 2100.**

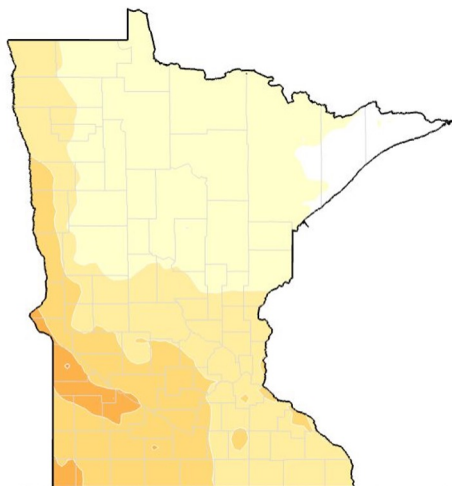




# Minnesota is projected to experience 5 to 25 more days per summer with maximum temperatures above 90°F by mid-century

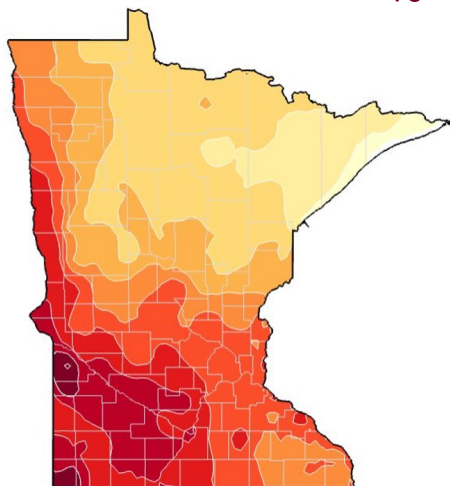
Days per year warmer than 90°F

Historical (1981-2010)

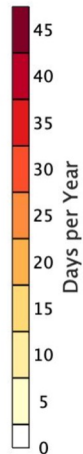
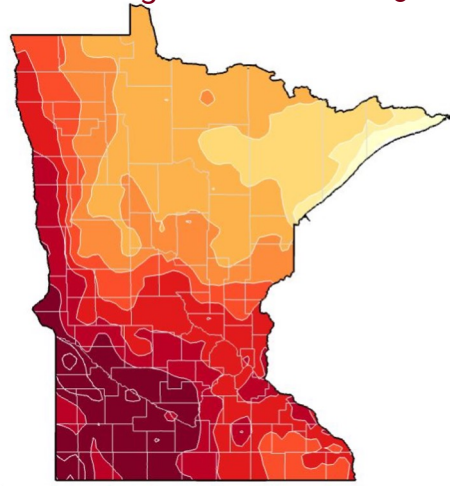


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[climate.umn.edu/climate-data](http://climate.umn.edu/climate-data)

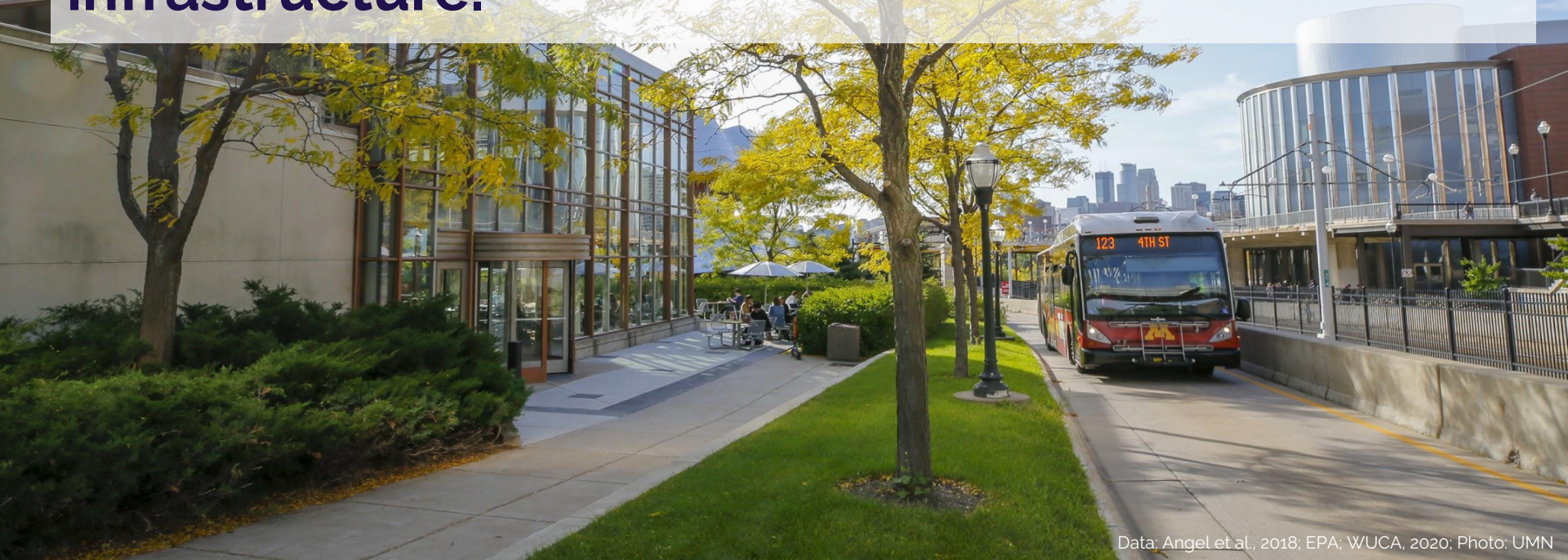
Mid-century (2041-2060)  
Intermediate emissions (RCP4.5)




Mid-century (2041-2060)  
High emissions (RCP8.5)



**Extreme heat impacts human health, the economy, and creates material stress on roads and buildings, water systems, and other critical infrastructure.**



A photograph of a flooded field. The water is a pale, milky grey color, reflecting the sky. Scattered throughout the field are numerous clumps of dry, brown grass, some standing upright and others partially submerged. The overall scene depicts a flooded agricultural or natural area.

**Increasing precipitation has elevated overall flood risk, causing disruption to transportation and damage to property and infrastructure.**



In the Midwest, **transitions from wet to dry extremes** are happening **more quickly** and **more frequently**.



Photo: UMN Extension; for more information visit [www.drought.gov](http://www.drought.gov)



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# Climate Change Needs No Passport



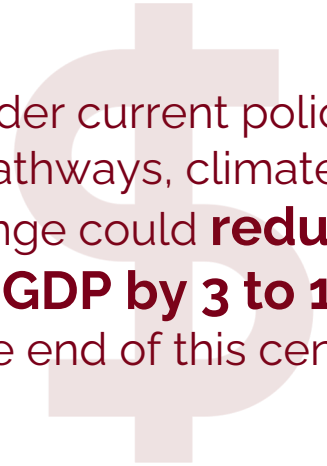
“Nearly all of the Mississippi River basin has seen below-normal rainfall since late August...**The timing is bad because barges are busy carrying recently harvested corn and soybeans up and down the river.**”

- Associated Press, October 6th, 2022

Weather and climate extremes are causing economic and societal impacts across national [and state] boundaries through **supply-chains, markets, and natural resource flows**...across the **water, energy and food sectors.**

IPCC, 2022, Photo: AP, Thomas Berner

# Climate Change is Costly. Even more so with inaction.



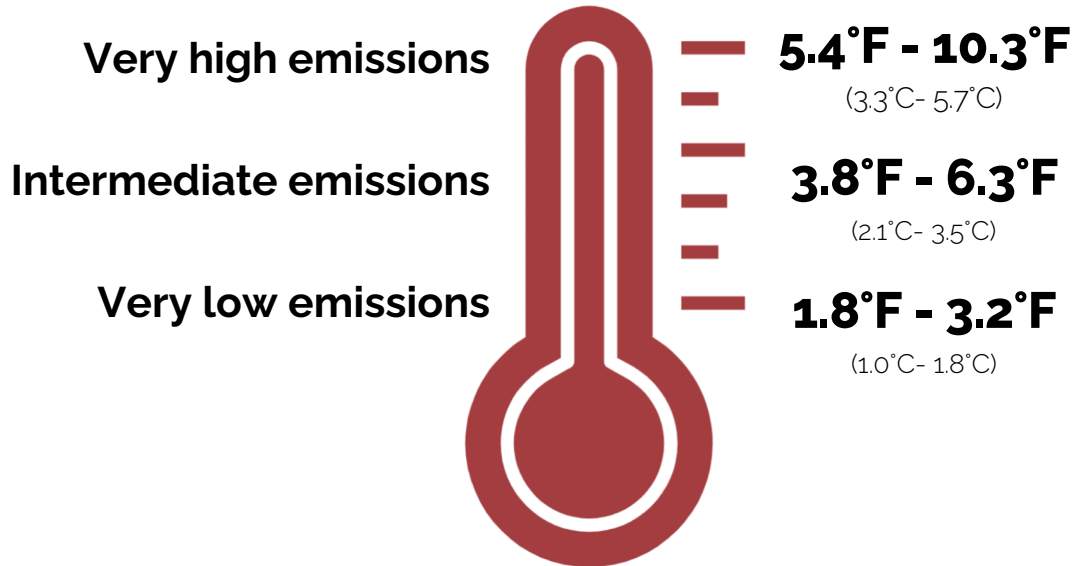
Under current policy pathways, climate change could **reduce U.S. GDP by 3 to 10%** by the end of this century

**“The fiscal risk of climate change is immense.”**

Federal spending on **crop insurance** premium subsidies is projected to **increase 3.5 to 22 percent** due to climate change-induced crop losses by 2100 with an annual cost of **\$330 million to \$2.1 billion.**

# The more we emit, the worse it gets.

Compared to 1850–1900, global surface temperature averaged over 2081–2100 is very likely to be higher by:



# We've committed to change.

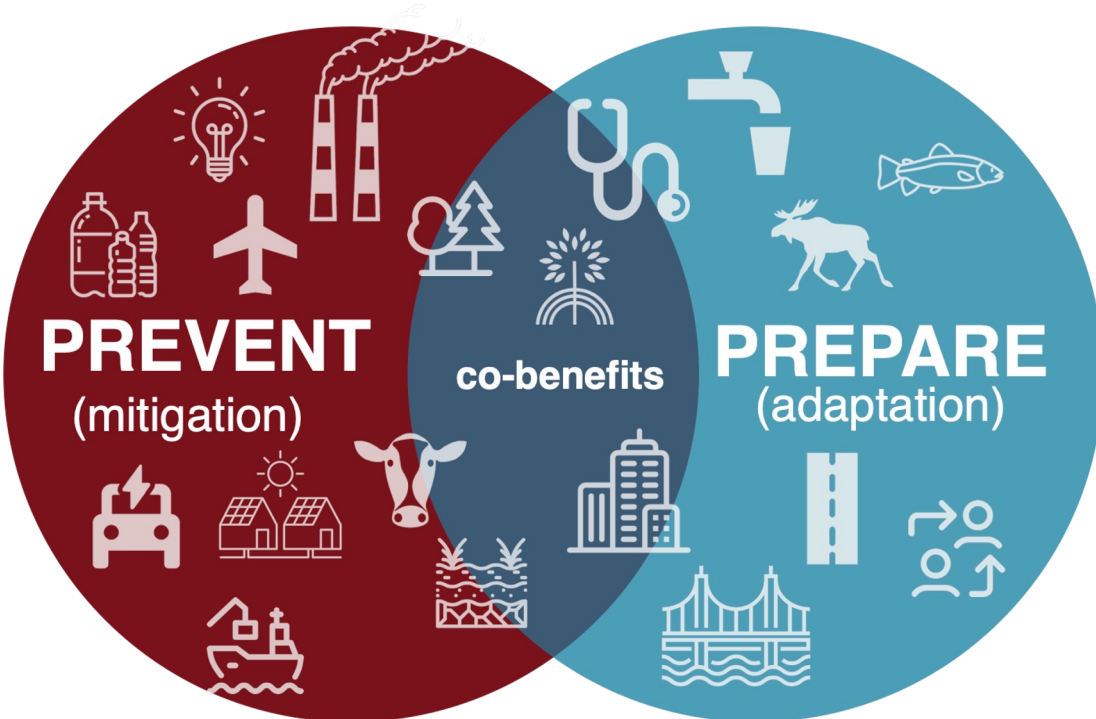


**Our exposure to climate impacts is dependent upon how well we prevent and manage them.**

Photos: UMN Extension, H. Roop, M. Stone



# Climate Risk Management - Prevention + Preparation

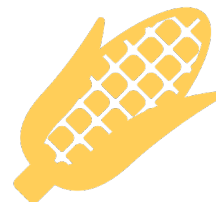


Effective climate risk reduction and management **requires investments & actions that address both mitigation *and* adaptation.**

# We must reduce risks through adaptation.

## Adaptation can bring multiple benefits:

improved agricultural productivity, innovation, health, food security, livelihood, biodiversity conservation, and reduction of risks & damages.



**Long-term planning and accelerated implementation, particularly in the next decade, is important to close adaptation gaps.**



# 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.

Source: [climate.state.mn.us/minnesotas-climate-action-framework](https://climate.state.mn.us/minnesotas-climate-action-framework)



# There's no time to waste.



“Any further delay in concerted anticipatory global **action on adaptation and mitigation** will miss a **brief and rapidly closing window** of opportunity **to secure a liveable and sustainable future for all.**”

Source: IPCC, 2022; Photo: UMN Extension



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