Future Weather + Infrastructure

Requested Report to the Legislature

March 24, 2026

Dr. Jessica Hellmann, Institute on the Environment

Dr. Heidi Roop, Climate Adaptation Partnership

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Problem and Legislative Charge

In the 2023 Legislative session, a bill was passed to **conduct research examining how** projections of future weather trends may exacerbate climate conditions, including but not limited to drought, elevated temperatures, and flooding that:

(1) can be **integrated into the design and evaluation of buildings** constructed by the state of Minnesota and local units of government, in order to:

(i) reduce energy costs by deploying cost-effective energy efficiency measures, innovative construction materials and techniques, and renewable energy sources; and

(ii) prevent and minimize damage to buildings caused by extreme weather conditions, including but not limited to increased frequency of intense precipitation events and tornadoes, flooding, and elevated temperatures; and

(2) may weaken the **ability of natural systems** to mitigate the conditions to the point where human intervention in the form of building or redesigning the scale and operation of infrastructure is required to address those conditions in order to:

(i) maintain and increase the amount and quality of food and wood production;

(ii) reduce fire risk on forested land;

(iii) maintain and enhance water quality; and

(iv) maintain and enhance natural habitats.

Rapidan Dam Failure (Blue Earth River) - June 2024. Image from Wikipedia

$7,547 per capita to modernize infrastructure systems in the Midwest.

ASCE, 2021: A Comprehensive Assessment of America's Infrastructure: 2021 Report Card for America's Infrastructure. American Society of Civil Engineers. https://infrastructurereportcard.org/

Structure of the Report

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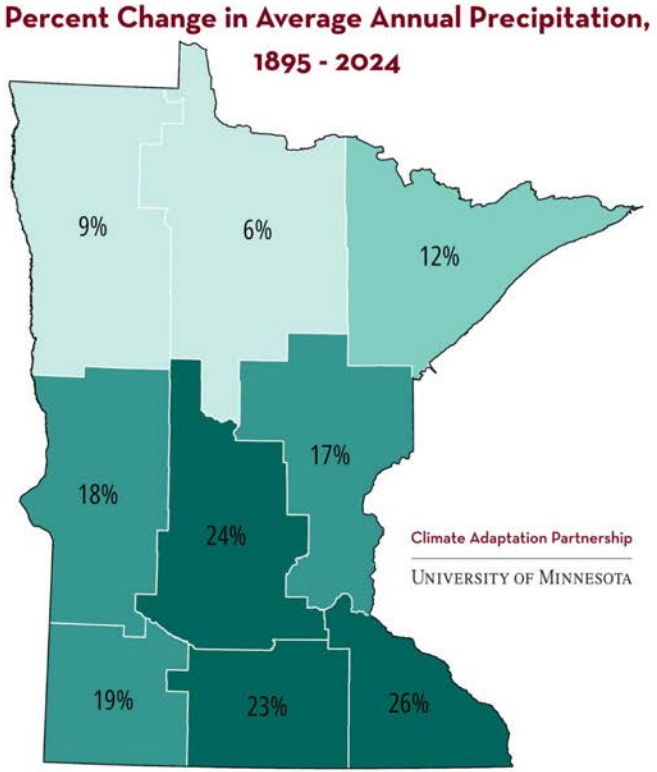
Chapter 2: Future Minnesota Climate
Chapter 3: Developing a Resilient Infrastructure Policy Framework
Chapter 4: Using SETs to Analyze Infrastructure Systems
- Minnesota's Water Infrastructure
- Minnesota's Agricultural Infrastructure
- Minnesota's Forestry Infrastructure
- Minnesota's Built Environment Infrastructure
- Minnesota's Natural Habitat Infrastructure

Chapter 5: An Analysis of Future Weather Trends and the Built Environment

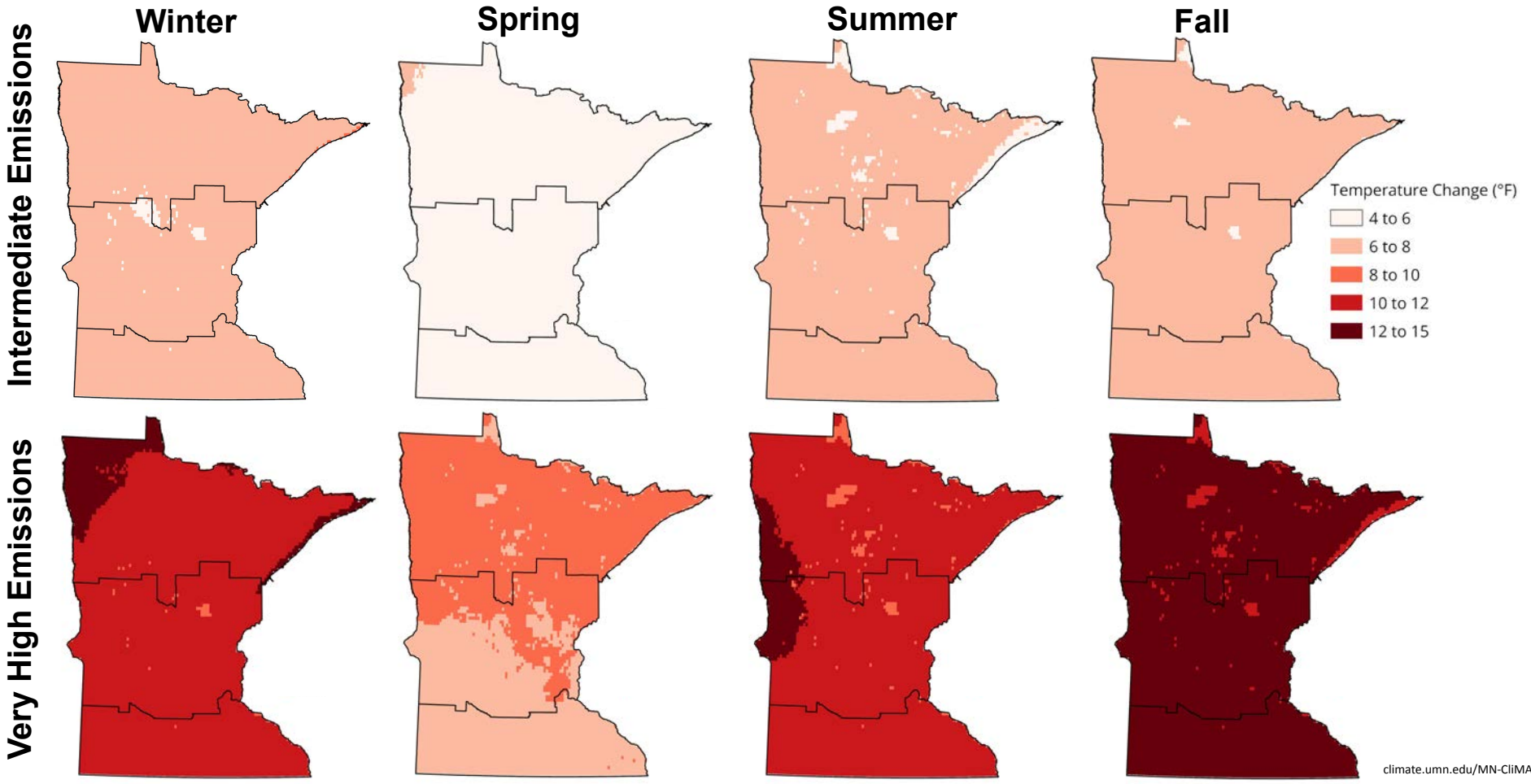
Today's Weather & Climate Context

- Heavy rains are now more intense than at any time in the state's recorded history.
- Average annual temperature has increased. Winters are warming fastest.
- Conditions are moving more quickly and more frequently between wet and dry extremes.
- Transportation networks face disruption from flooding, excessive heat and winter storms, impacting accessibility and safety.

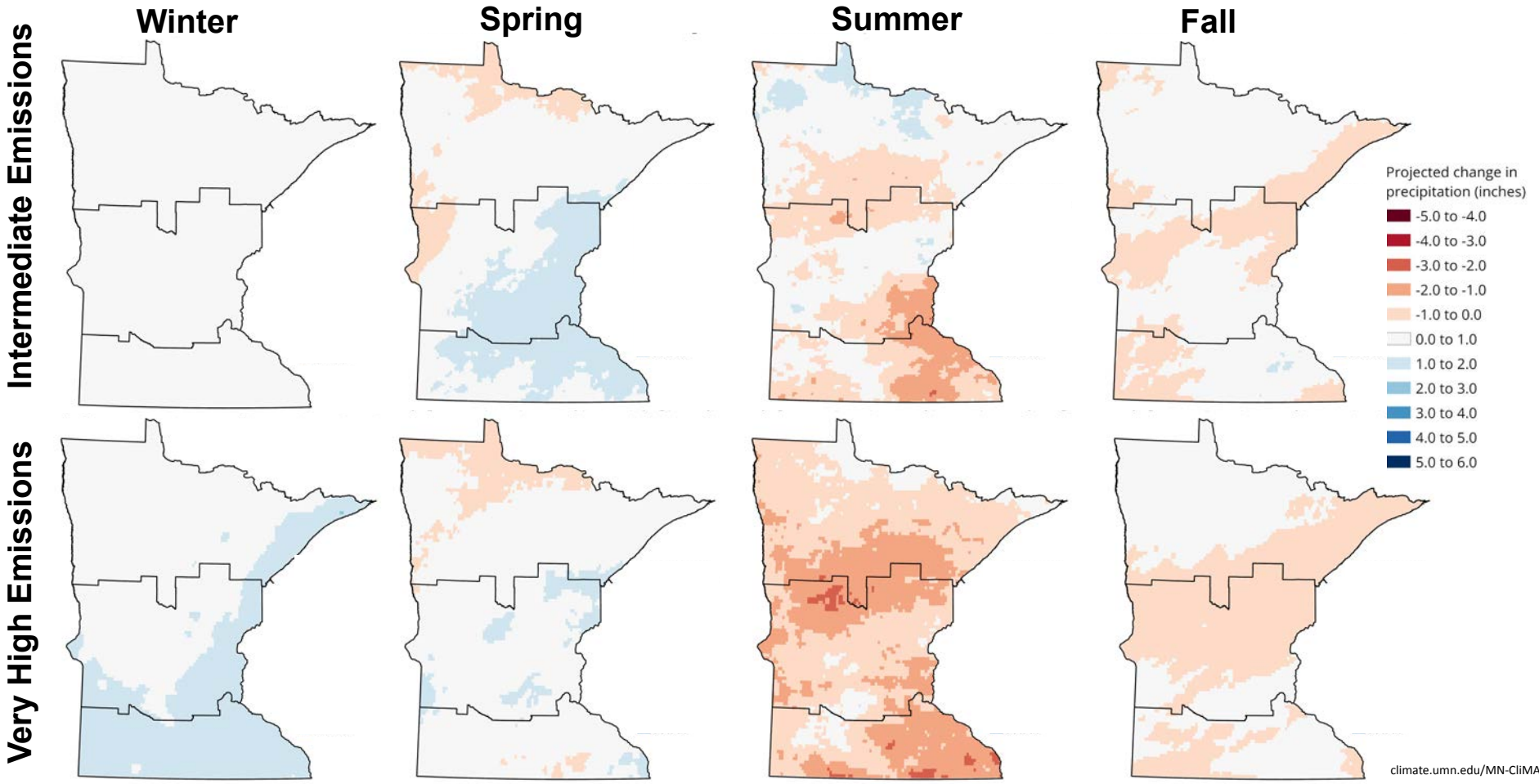


climate.umn.edu/MNclimate

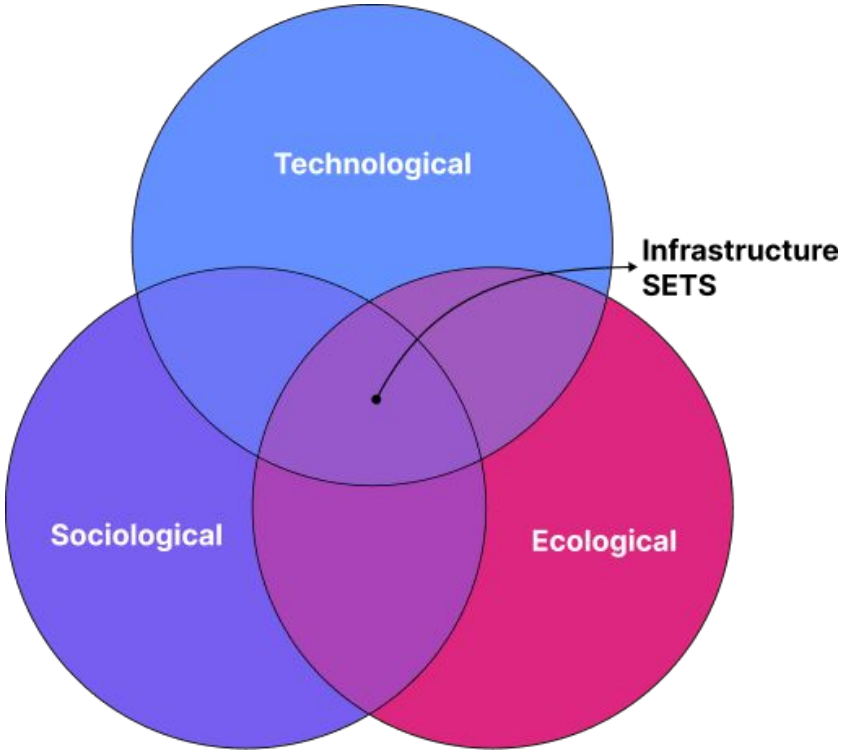
Projected seasonal change in daily max temperature by 2080-2099



Projected seasonal change precipitation by 2080-2099



Analyzing infrastructure as a complex social, ecological, and technological system can reveal overlooked actions



- Anticipates **complex and interconnected** risks to infrastructure systems and the policies that guide their design and use.
- Captures the benefits, trade offs, and opportunities of decisions through **integrated** infrastructure planning.
- Models policy responses to meet current infrastructure goals while ensuring resilient policy capacity to the range of potential futures.

Analyzing infrastructure as a complex social, ecological, and technological system can reveal overlooked actions

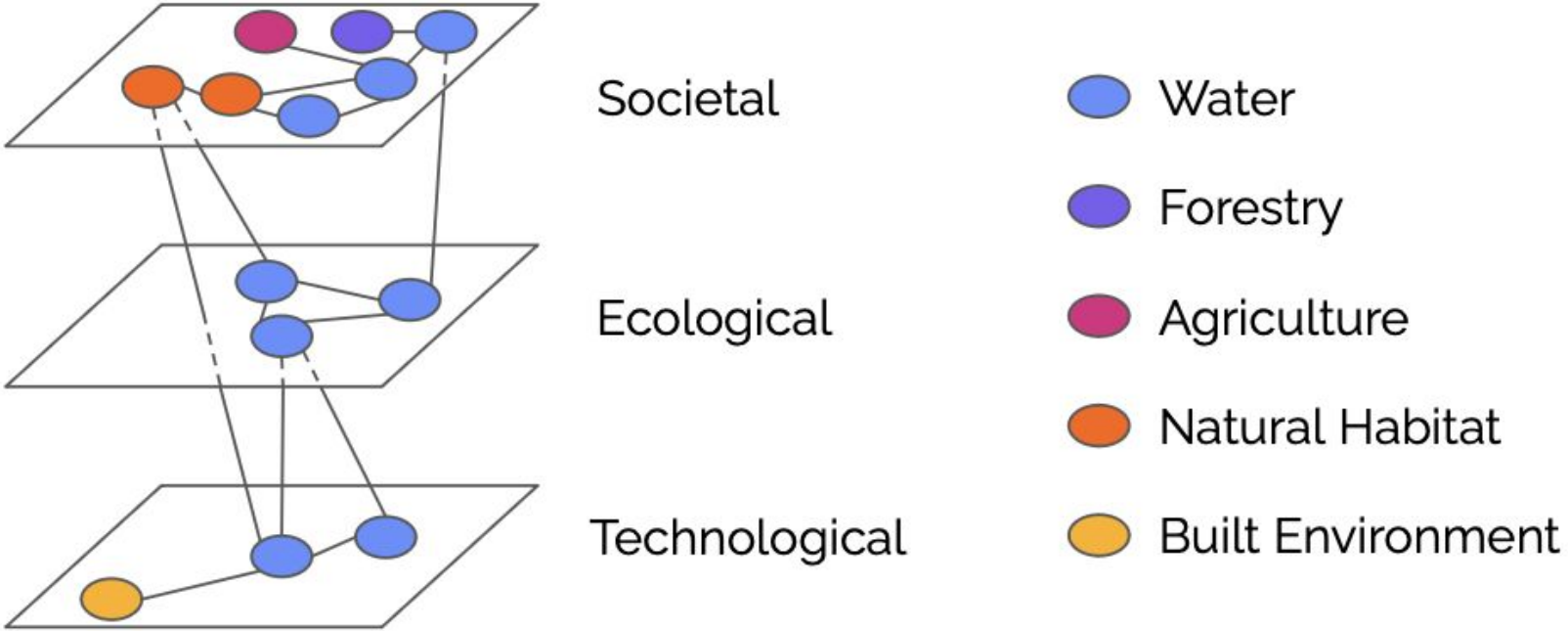


Figure 3.9: Conceptual diagram of the interconnections for agriculture infrastructure SETS map to other infrastructure systems.

Analyzing infrastructure as a complex social, ecological, and technological system can reveal overlooked actions

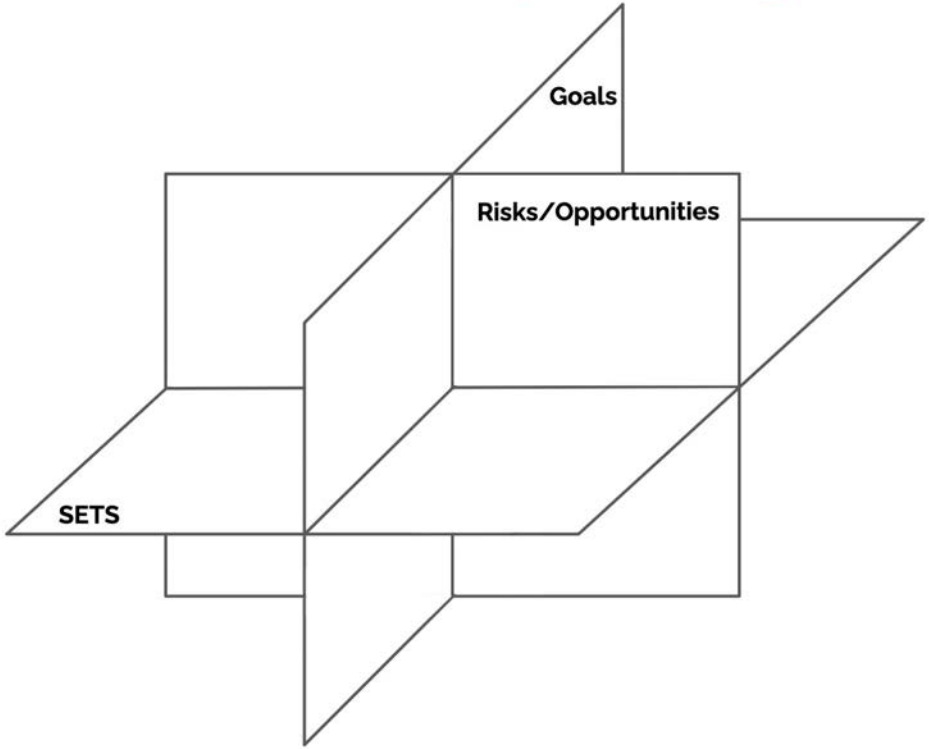


Figure 3.5: Mapping current goals for and risk to infrastructure in the current infrastructure SETS.

Map, Evaluate, Test and Act

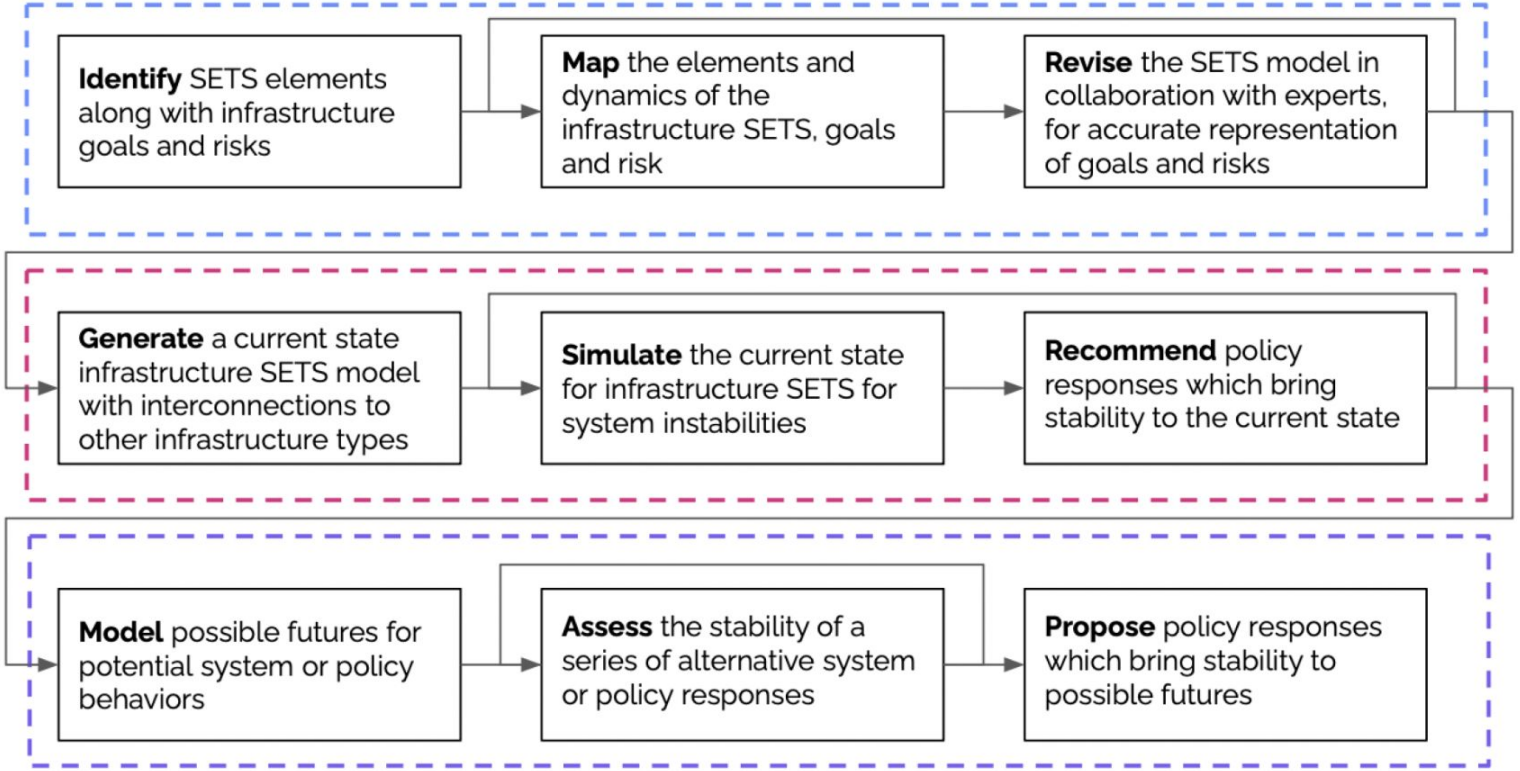


Figure 3.3: Workflow for applying the resilient infrastructure policy framework.

Sector Summary: Built Environment

Heating demand falls. **Cooling demand and electricity use rise.** Many existing buildings will face unsafe indoor conditions without envelope and mechanical upgrades.

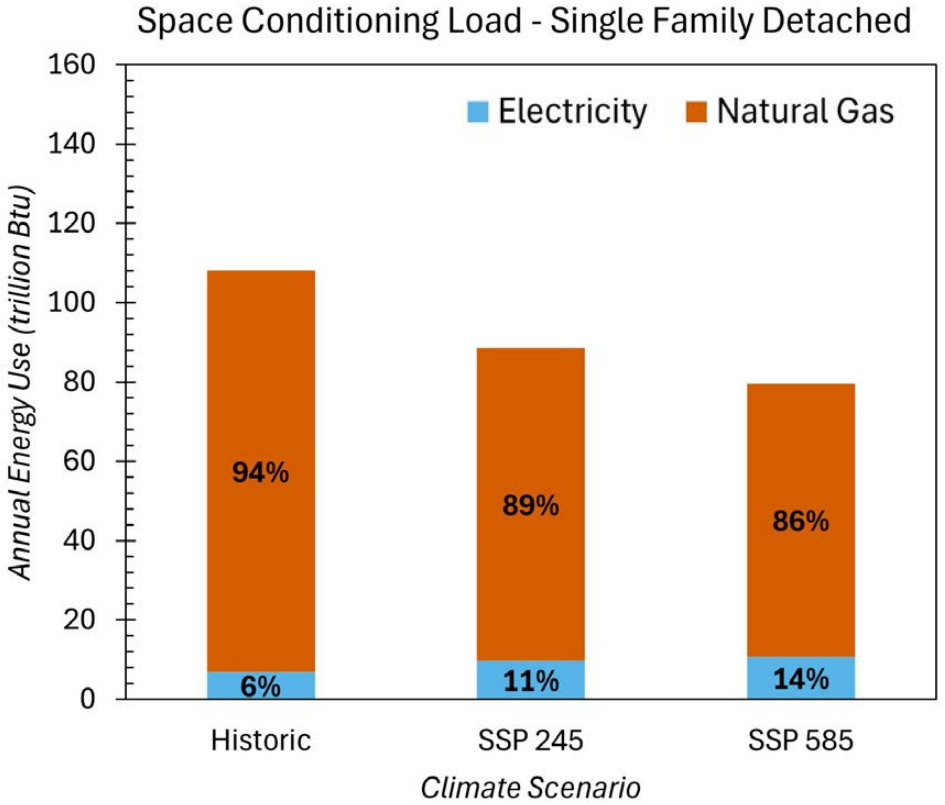


Figure 5.1: Modeled annual space conditioning loads by energy source for single family attached and single family detached homes in the Metro Area.

Sector Summary: Built Environment

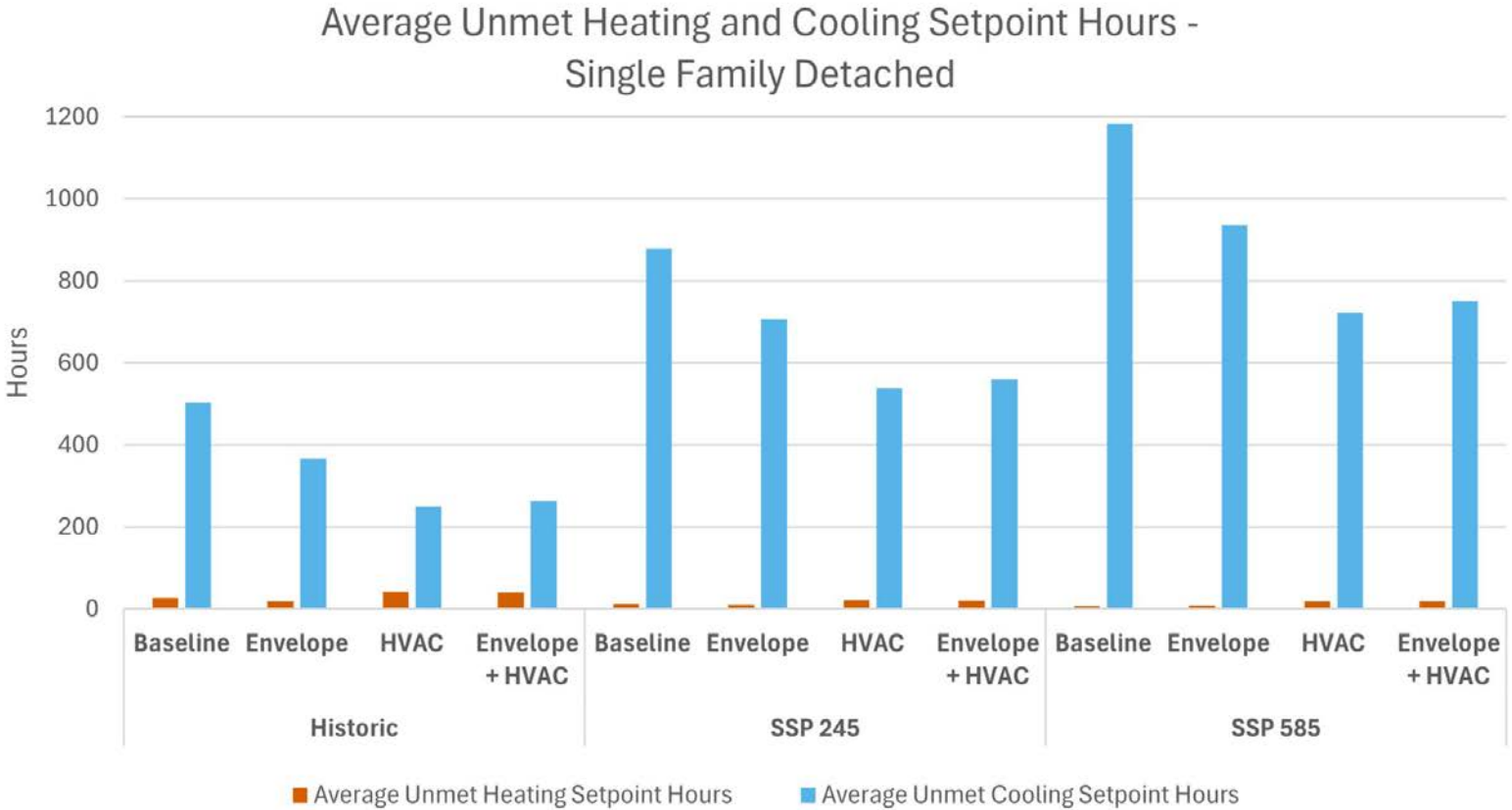


Figure 5.11: Modeled annual average hours in which desired temperature can't be maintained, in historic and possible future climate scenarios, and with various upgrade scenarios for single family detached homes.

Report Recommendations

- **Future Weather Scenarios**
  - The **Legislature** should provide funding to support the additional research on the use of Future Weather Data for Infrastructure Planning by local governments and the state. **Department of Administration** to incorporate recommendations resulting from further research into infrastructure-related best practices for state agencies, local units of government and other stakeholders.

These actions reduce long-term costs, avoid maladaptation and protect public health and services.

Report Recommendations

- **Governance and Resilient Infrastructure Policy**
  - The **Legislature** should consider reviewing bond funded projects for their impacts and potential benefits on infrastructure with a consideration for future weather trends and integration across units of government.
  - The Department of Administration to work with the Minnesota Pollution Control Agency to develop goals for resilient infrastructure with support from the University of Minnesota.

These actions reduce long-term costs, avoid maladaptation and protect public health and services.

Report Recommendations

- **Resilient Infrastructure Planning**
  - The **Legislature** to work with the **Department of Administration** on integrating resilience into the infrastructure bonding process.
  - The **Legislature** should fund additional research on the Resilient Infrastructure Planning framework as a tool for local units of government to coordinate projects with state agencies and legislative goals.
  - **Department of Administration** to work with the **Minnesota Pollution Control Agency** to develop a resilient infrastructure planning process with support from the **University of Minnesota.**

These actions reduce long-term costs, avoid maladaptation and protect public health and services.

Report Recommendations

- **Built Environment**
  - The **Legislature** should fund and respond to risk assessments including extreme heat resistance for existing buildings and infrastructure, and upgrade as needed.
  - The **Department of Administration** to work with the **University of Minnesota** to continue to integrate resilience into the B3 standards and look for guidelines that should apply to all state owned facilities.

These actions reduce long-term costs, avoid maladaptation and protect public health and services.

Report Recommendations

- **Natural Systems (Habitat, Water, Forests and Agriculture**
  - The **Legislature** should fund coordinated programs that strengthen the resilience of natural systems and infrastructure, ensuring they receive consistent, long-term, and place-based investments.
  - The **Legislature** should fund the development of an approach to measure resilience to future weather scenarios that would develop standardized resilience indicators, quantifiable metrics for weather risk, and robust data-gathering tools.
  - The **Department of Administration** and other agencies with relevant jurisdiction should work with the University of Minnesota to further develop resilience standards and guidelines that should apply to all the natural systems and infrastructure that reside on state owned land.

Report Recommendations

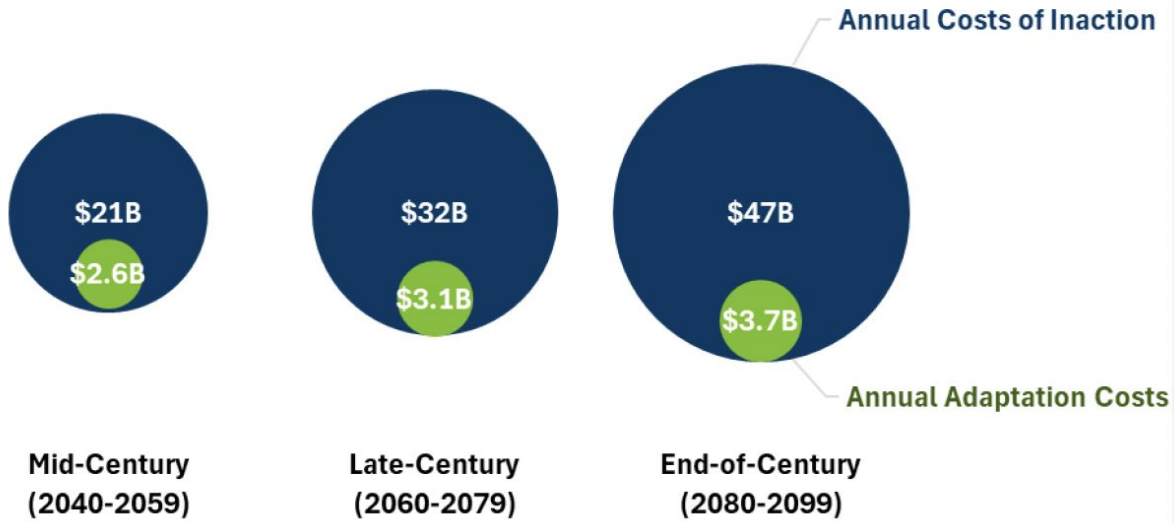
- **Additional Research (Work and Investigation) Needed**
  - The **Legislature** should fund additional research on future weather scenarios and the financial impacts and opportunities to not only infrastructure systems, but also public health, economic impacts/benefits and other societal needs that rely on the materials and process from environmental systems that will change.

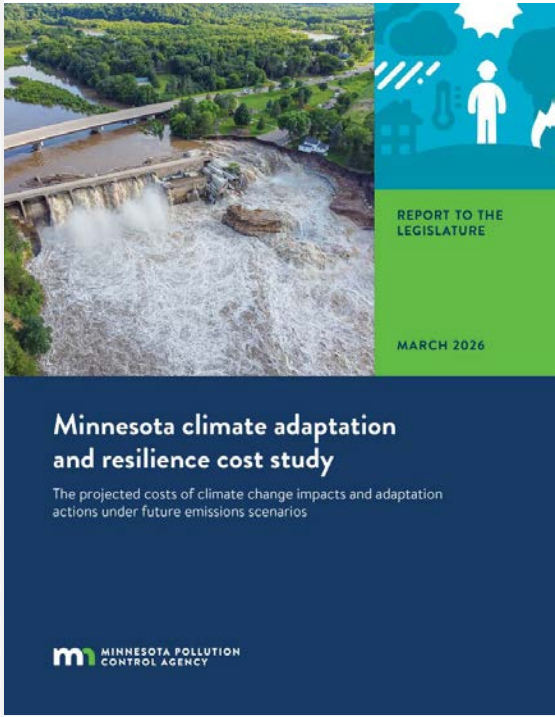
These actions reduce long-term costs, avoid maladaptation and protect public health and services.

New Legislative Report on the Costs of Adaptation in Minnesota

Annual Costs of Inaction and Adaptation Costs

The figure shows study results for three time periods and the High emissions scenario. The annual costs of inaction are eight to 15 times higher than the annual adaptation costs in this scenario.





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