University of Minnesota

Twin Cities Climate Action Plan 2023

Contents

Land Acknowledgement

The University of Minnesota campuses were built on the traditional homelands of the Dakota and the Ojibwe, and scores of other Indigenous peoples who have walked on these lands from time immemorial.

It is important to acknowledge the peoples on whose land we live, learn, and work as we seek to improve and strengthen our relations with our tribal nations. We also acknowledge that words are not enough.

We must ensure that our institution provides support, resources, and programs that increase access to all aspects of higher education for our American Indian students, staff, faculty, and community members.

Executive Summary

In MPact 2025, the University committed to building a fully sustainable future, and climate change is the most significant barrier to achieving this bold vision. Climate change is considered one of the greatest challenges of the 21st century and is an existential threat that is already harming people, communities, and ecosystems in Minnesota and around the world. Those impacts will become more severe and pronounced if the causes and symptoms of climate change go unchecked.

The current warming and destabilization of the Earth's climate is attributable to human activities, primarily the use of fossil fuels, which release greenhouse gases into the atmosphere.

Climate change is a problem we all have contributed to, which means we all have a moral imperative and power to fix it.

World leaders and subject matter experts have called to limit warming to 1.5°C (2.7°F) to avoid dramatically increasing the risks related to climate change (IPCC, 2021). To remain under this temperature threshold, swift and steep carbon emission reductions must be realized. Global carbon emissions need to be reduced by 43% compared to 2019 levels by 2030 (IPCC, 2022b). With climate change impacts already occurring and expected to worsen, urgent action is needed to adapt and build resiliency in our communities, infrastructure systems, and natural environments.

The University of Minnesota Twin Cities has a long history of leadership on addressing climate change. In 2008, the University system joined other higher education institutions who pledged to act on climate change through emissions reductions and integration of climate change into research and curriculum. In 2011, the University created its first Climate Action Plan (CAP). Following this commitment and planning, the University developed critical climate science, researched solutions, and graduated students that have gone on to address the climate crisis through action at all scales.

The University of Minnesota Twin Cities also decreased greenhouse gas emissions over **50%** between 2008 and 2022.

SDG 13 - Climate Action

The United Nations' Sustainable Development Goals (SDGs) provide a shared framework to advance the well-being of all communities across the planet. The SDGs, which emphasize how interconnected we are environmentally, socially, and economically, are consistent with the University's long-term commitment and practice of bringing together partners across the University and beyond to meet the needs of the community. Accordingly, the SDGs fit seamlessly into the strategic goals and priorities of the UMN system and are specifically called out in MPact 2025.

Goal 13 of the 17 SDGs focuses on how climate change is affecting the world and the imperative of taking immediate action to mitigate and adapt to it. At the University of Minnesota, research on climate change includes everything from how we can adapt to the potential effects of climate change by developing more climate resilient plants and crops, to designing buildings that can better withstand extreme weather, to sharing with the public how climate change affects them, and training future climate champions who will advocate for needed changes well into the future. For more information, visit sdg.umn.edu/goal-13-climate-action

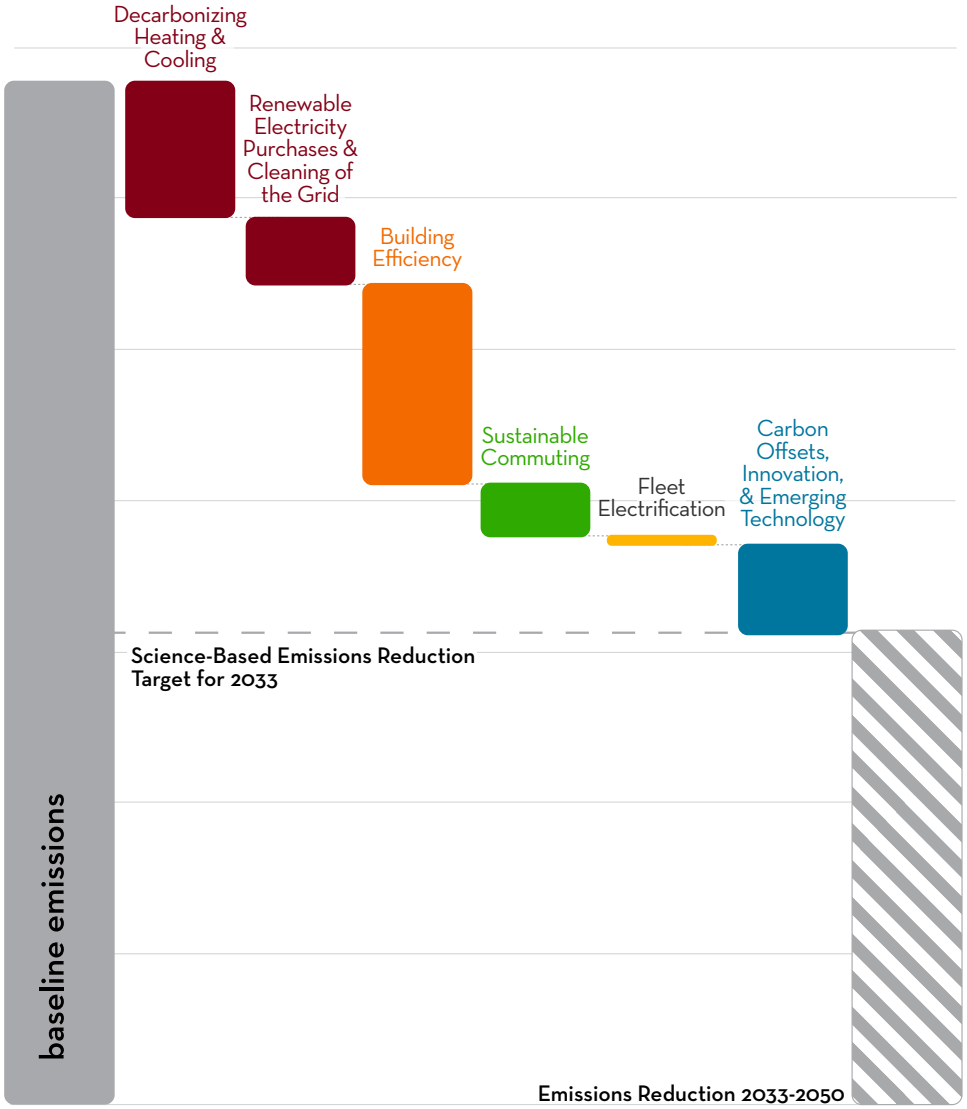
The 2023 Climate Action Plan (CAP) builds on the University's history of leadership and identifies actions to eliminate emissions from campus activities at a pace consistent with limiting warming to 1.5°C. **The University will reduce emissions by 60% over the next decade compared to 2019 levels and will become carbon neutral by 2050.** The CAP also establishes the following targets to directly eliminate carbon emissions and to become carbon neutral through offsets only when direct emissions reductions cannot be achieved:

- Directly eliminate carbon emissions from the campus energy plants and other emissions sources controlled or owned by the University (or scope 1 sources) by 2045
- Directly eliminate emissions from purchased electricity (or scope 2 sources) by 2033
- Become carbon neutral in commuting and air travel by 2050

The CAP identifies ambitious and achievable actions to meet the University's climate commitments, to include:

- Reducing energy usage on campus
- Supplying more of the campus' energy needs from renewable sources
- Aligning with space optimization and hybrid work concepts supported by other initiatives
- Rightsizing and electrifying the campus fleet vehicles
- Developing a mission-driven and value-added carbon offsets program for University sponsored travel
- Making a healthy and sustainable commute accessible for all

2033 Emission Reduction Pathway



The diagram above estimates the University's baseline carbon emissions and how different areas of emissions will be reduced over the next 10 years. The emissions reductions align with a science-based emissions reduction target or a target to stay on track with the Intergovernmental Panel on Climate Change (IPCC), an intergovernmental body of the United Nations, recommendations to limit warming to 1.5°C. About 40% of the University's remaining emissions will be eliminated between 2033-2050.

In addition to greenhouse gas mitigation, this plan also incorporates a vulnerability and strength assessment of the campus infrastructure, environment, and community in the face of local climate hazards. This assessment will provide the baseline for climate resilience planning to follow in 2023.

The CAP was developed under the auspices of the Twin Cities Sustainability Committee with support from Sustainability Staff. Through the Committee, Working Groups composed of staff, faculty, and students were established to develop a vision, goals, strategies, and key performance indicators for categories of emissions and to conduct a risk and resilience assessment for the campus. Throughout the process, over 3,200 campus and external stakeholders were engaged, providing input and direction to the process through workshops, meetings, town halls, surveys, and other activities.

Business as usual will not achieve the transformational outcomes necessary to meet the University's climate commitments. In response, the CAP identifies cross-cutting initiatives and implementation pathways to enable and facilitate the systems change required. These efforts include empowering and engaging more of the University community, enhancing the University's financial tools and processes to enable the investment required, assigning economic value to carbon pollution, and building a rigorous approach to carbon dioxide removal for hard-to-eliminate emissions.

Moving forward, the Committee, Working Groups, and staff will develop detailed blueprints that will delineate implementation steps, outline connections to curriculum and research, more closely examine intersectionalities with diversity and equity work, and more. Regular updates will reflect progress on all identified key performance indicators as well as direct emissions reductions and climate resilience performance. While the implementation structure falls to the aforementioned team, the work will require the engagement of the entire University community, from students to leadership, to ensure a sustainable future for all.

80% of the University community say climate change is extremely or very important to them personally


UNIVERSITY
OF MINNESOTA

Introduction 1

What Causes Climate Change in Minnesota and Globally

Climate change refers to a long-term shift in temperatures and weather patterns. Since the 1800s, human activities, primarily the burning of fossil fuels like coal, oil, and gas, have been the main driver of climate change (United Nations, n.d.). For example, when gasoline is used for driving a car or natural gas is burned in a boiler to heat a building, carbon pollution is released into the atmosphere. Carbon emissions cause global warming by trapping the sun's heat in the atmosphere, which raises the global temperature. This warming then leads to climate change. In summary, the global temperature will continue to rise if fossil fuels continue to be burned.

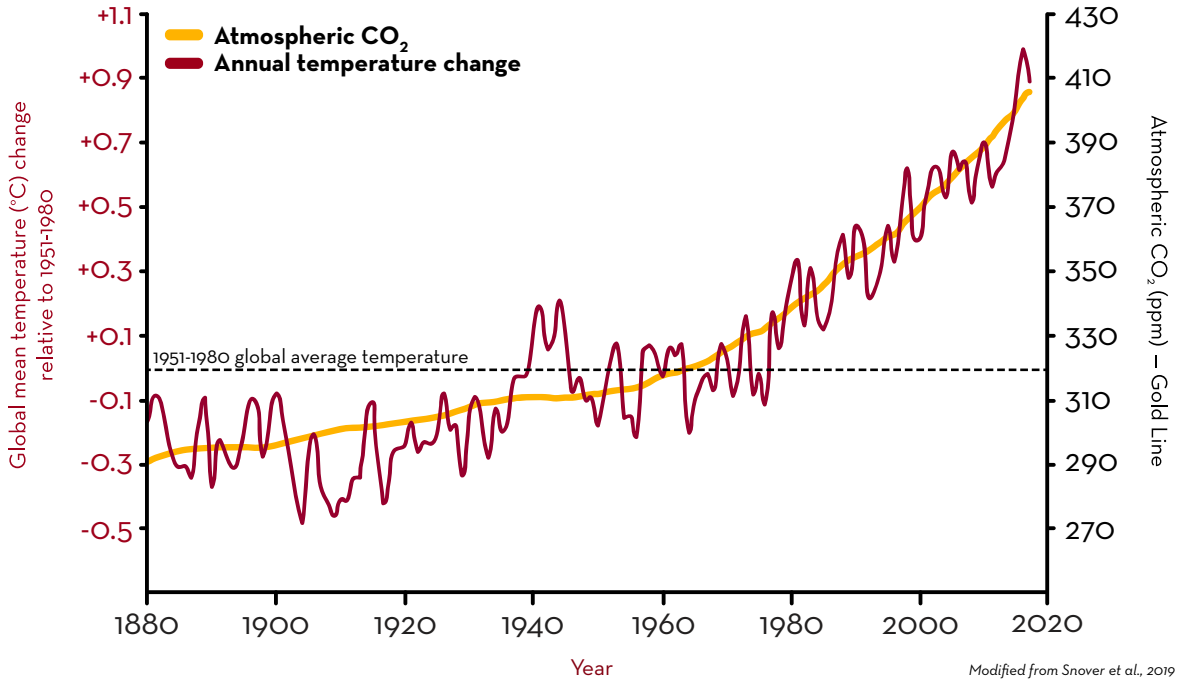
Climate Change in Minnesota

Greenhouse gas concentrations are continuing to rise (IPCC, 2022b) and the Earth is now about 2°F/1.1°C warmer than it was in the 19th century (IPCC, 2021). The last decade (2011-2020) was the warmest on record.

While a 2°F/1.1°C increase in global temperature may not seem like a lot, the Earth is a complex system and even small increases in global average temperature can have tremendous impacts. As a result of climate change, the world is already experiencing more intense droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, catastrophic storms, and declining biodiversity (Intergovernmental Panel On Climate Change, 2022). Even just a small half degree of warming can have astronomical effects, not only on humans, but on agriculture, wildlife, water supply, and the economy.

Climate change is already experienced throughout Minnesota. The 10 warmest and wettest years in Minnesota have occurred since 1998 (MN DNR, 2023).

Many climate impacts are expected to worsen. Extreme events, like flooding, drought, and heat waves, will likely become more frequent and more intense with climate change in the future.



Modified from Snover et al., 2019

	2.7°F (1.5°C)	3.6°F (2.0°C)	Impact of Difference
EXTREME HEAT			
Global population exposed to heatwaves	~4 billion	~6 billion	~2 billion more people
AGRICULTURE & FISHERIES			
Reduction in global corn harvests	10%	15%	1.5x worse
Decline in marine fisheries	4.5 million metric tons	6.0 million metric tons	1.3x worse
PLANTS & ANIMALS			
Further decline in coral reefs	70-90%	99%	up to 1.4x worse
Vertebrates, plants, & insects losing at least 1/2 of their range	7%	15%	2x worse
WATER RESOURCES			
Global population exposed to new or aggravated water scarcity	4%	8%	2x worse
People exposed to drought each month	114.3 million	190.4 million	76.1 million more people
Additional global population affected by river floods	108.4 million	146.3 million	37.9 million more people
ECONOMY			
Global costs of warming	$54 trillion	$69 trillion	$15 trillion more
U.S. Gross Domestic Product (GDP) losses	0.6%	1.2%	2x worse

Modified from Snover et al., 2019

Changes in Rainfall

"Since 1916, the amount of rain that falls during the annual largest storm in Minnesota has increased by more than an inch. Not only has the average yearly maximum rain event become more extreme, but the most damaging extreme events also have become more common."

—University of Minnesota Climate Adaptation Partnership

More Damaging Rains (MN DNR, 2019)

- **20%** increase in the number of 1" rains
- **65%** increase in the number of 3" rains
- **13%** increase in the size of the heaviest rainfall of the year
- Since 2000 widespread rains of more than 6" are **4x more** frequent than in the previous three decades

Changes in Seasonality

"Projections suggest that Minnesota winters and spring seasons will get both warmer and wetter. These changing precipitation extremes will challenge our water resources and stormwater management systems and shift both when and how we experience precipitation across the state."

—University of Minnesota Climate Adaptation Partnership

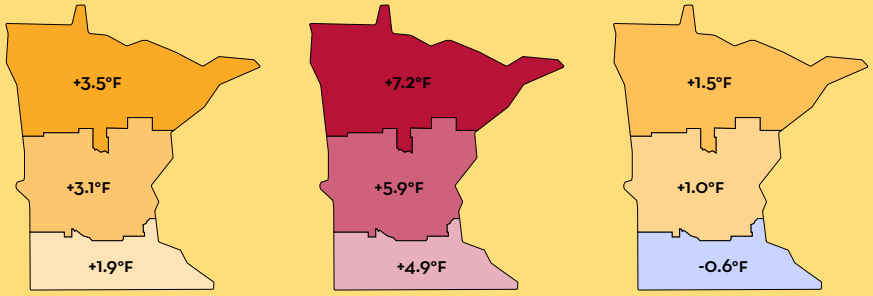
Increased Temperatures

"Although there isn't yet discernible evidence that hot days are getting hotter, we can expect days warmer than 90 degrees or even 100 degrees Fahrenheit to become more common (Pryor et al., 2014)."

—University of Minnesota Climate Adaptation Partnership

- Nights have warmed **55%** faster than days since 1970 (MN DNR, 2019)
- Average temperatures in MN have warmed by nearly **3°F** since 1895 (MN DNR, 2019)

Changing Average Temperature in Minnesota between 1895 and February 2023



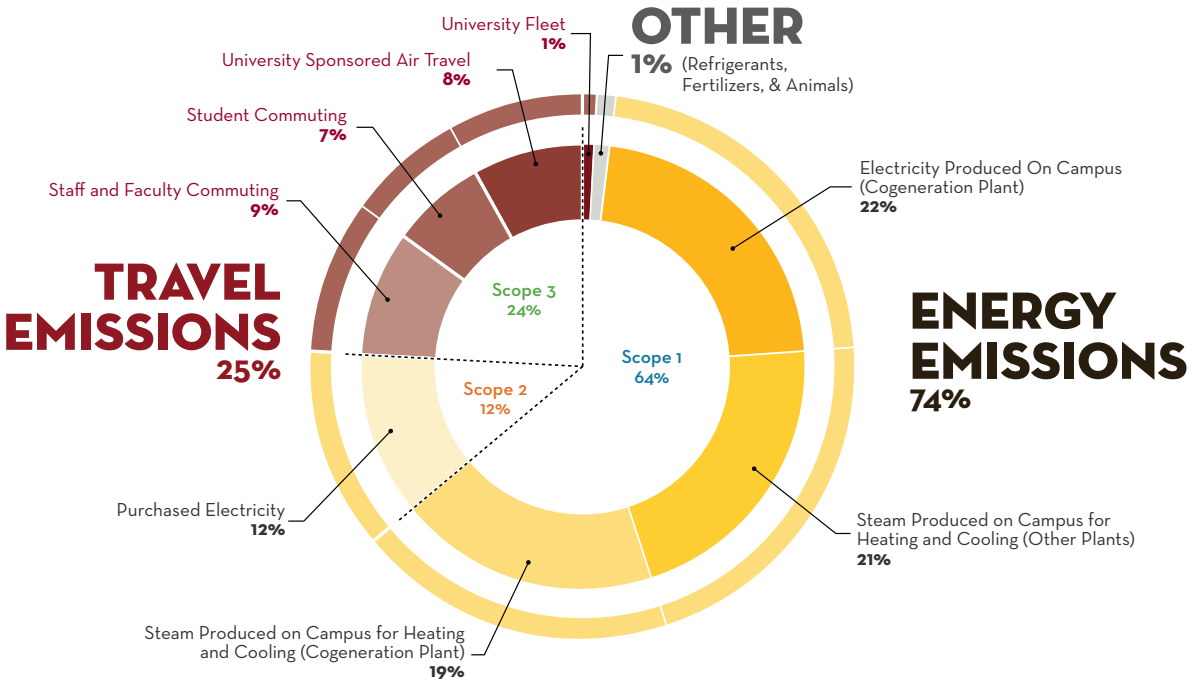
MN DNR, 2023

How the University's Emissions Contribute to Climate Change

Want to know more about emissions? See Chapter 2 for more information.

Emission Breakdown

By Scope (inner circle) and Category (outer ring)



FY2022 - Baseline Emissions Year

Importance to the Campus Community

Climate change has the potential to impact every sector of life and is important to the University community.

- **Over 83%** of faculty and staff in a sample survey cited climate change as very or extremely important to them personally
- **66%** of faculty and staff and **72%** of students experience climate anxiety or a chronic fear of environmental doom, distress, fear, and/or anger at least sometimes
- **Over 66%** of the campus community is very worried about how climate change will impact other places around the world
- **Over 78%** of the campus community are very worried about how climate change will impact future generations

University Climate Action and MPact 2025

The University of Minnesota has been systematically working on climate change for more than two decades. In 2008, the University pledged to reduce emissions from campus operations to net zero as quickly as possible and to integrate climate change into curriculum, research, and outreach. To reach these goals, the Twin Cities campus developed its first climate action plan in 2011 and set a goal to cut emissions in half by 2021. The University realized this goal in 2020. In 2021, the University created a systemwide strategic plan, MPact 2025, which established a goal to "Build a fully sustainable future." To advance this important work, University leadership called for each campus to establish a next-generation climate action plan. Many other climate action partners and programs across the University exemplify leadership and amplify the impact of the University's climate action, such as the:

- Institute on the Environment
- University of Minnesota Climate Adaptation Partnership
- Swain Climate Policy Series: Advancing Climate Solutions. Now.
- Climate Smart Municipalities
- Midwest Climate Adaptation Science Center
- The Grand Challenges Curriculum
- Department of Soil, Water, and Climate
- Center for Sustainable Building Research

The CAP also aligned with the Twin Cities Campus Plan (2021) and other related University initiatives to synchronize strategies and recommendations across the institution. Moving forward, continued coordination will be critical to realizing shared opportunities, particularly as the University completes the campus' Energy and Utility Plan.

Climate Action Vision—Carbon Neutral and Climate Resilient by 2050 or Earlier

The CAP sought to identify actions to eliminate campus greenhouse gas emissions by 2050, make the University more resilient, and address climate change through education, research, and outreach. The planning horizon for the CAP was 10 years, or put differently, what needs to be achieved by 2033. With the most recent Intergovernmental Panel on Climate Change (IPCC) report on the emissions reductions required in order to keep warming to 2.7°F/1.5°C (2021), the planning process strove to achieve emissions reductions more aggressively in the coming decade than a linear, year-over-year, reduction pathway to 2050.

The planning effort at the Twin Cities campus strives to create:

- A 10-year action plan
- An avenue for the University to lead by example
- A roadmap identifying clear implementation pathways and responsibility
- A strategy to eliminate the University's greenhouse gas emissions from the largest sources
- An assessment of risk and vulnerability in the face of climate change
- A transparent document detailing challenges and potential changing conditions

A History of Climate Action at the U

2004
The University of Minnesota Board of Regents adopt a policy on sustainability; UMN joins Chicago Climate Exchange

2008
UMN signs the American Universities and Colleges Presidents' Climate Commitment, **meaning a commitment to becoming carbon neutral by 2050**

2009
UMN releases a Systemwide Sustainability Goals, Outcomes, Measures, and Process report; Twin Cities campus completes its first annual Greenhouse Gas or Carbon Emissions Inventory

2011
Twin Cities releases UMN's first Climate Action Plan

2015
UMN signs the White House American Campuses Act on Climate pledge

2020
Twin Cities campus reaches over a 50% reduction in carbon emissions from 2008 baseline

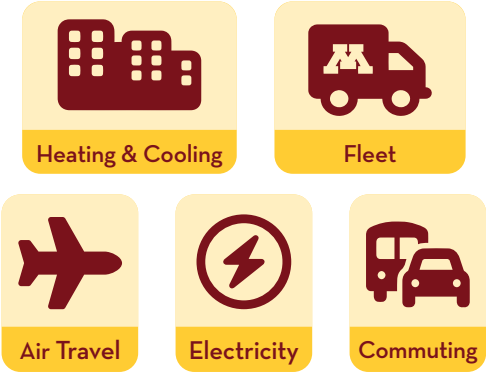
UMN commits to building a fully sustainable future in MPact 2025, the systemwide strategic plan

Process Summary

Two questions to be answered...

1. Climate Mitigation: How can the University reduce carbon emissions on campus?

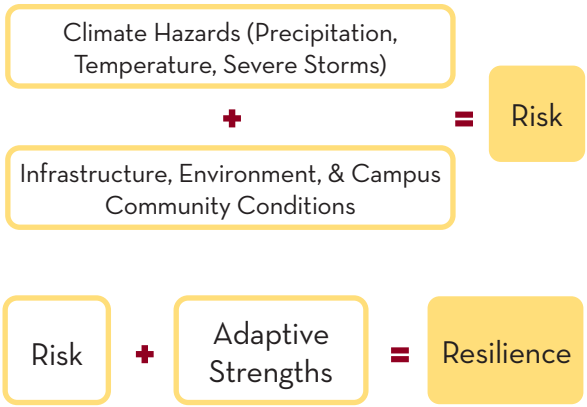
The Climate Action Plan focuses on the University's largest areas of emissions that are currently tracked, are primarily within the University's operational control, will take a long time to transition, or are highly visible. The five categories of emissions covered in this plan are:



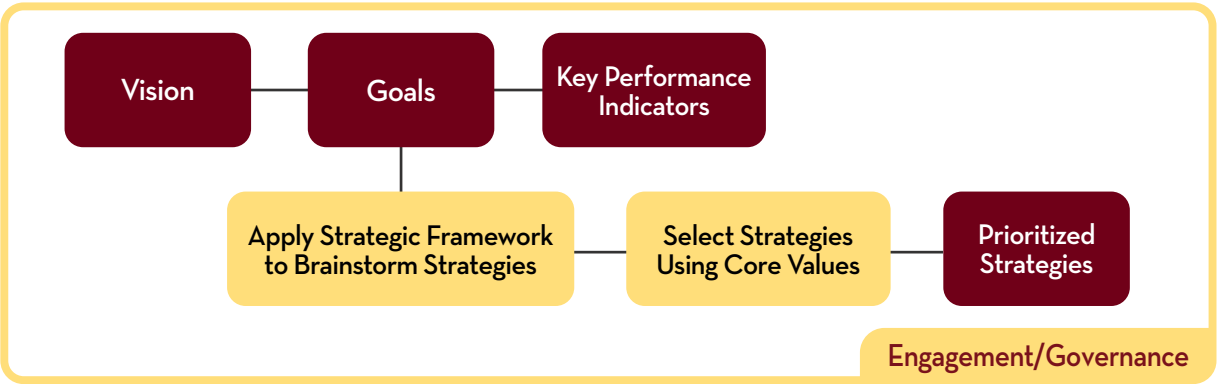
2. Climate Adaptation: How does the University adapt to climate change and build resilience on campus?

The University of Minnesota Twin Cities has never completed a vulnerability, strength, and risk assessment for climate change. The CAP completed this baseline assessment by considering the risk to infrastructure, natural resources, and the campus community in the face of changes in temperature, precipitation, and severe storms.

Adaptation and Resilience



Emission Reduction Process



Assessment Process

Strategic Framework

The Strategic Framework was developed with input from the Twin Cities Sustainability Committee. The Framework provided prompts on the following categories to encourage Working Groups to think beyond their area of expertise:

- Funding Schemes
- External Collaboration
- Curriculum & Research
- Tradeoffs & Opportunity
- Accessibility, Diversity, Equity, Inclusion, & Justice
- Campus Culture & Communication
- Interdependencies & Implementation

Core Values

Developed with stakeholder input, the Core Values guided the Working Groups to prioritize or select strategies. The Core Values were:

- Equity
- Greenhouse Gas Reduction Potential
- Leadership
- Longevity and Durability
- Cost Effectiveness

Definitions

See a new word? Definitions for common climate action terms and phrases are available in Appendix A.

Climate Change

Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming. Human-induced climate change is already affecting many weather and climate extremes in every region across the globe (IPCC, 2021).

Carbon Neutral

Carbon neutrality is achieved when an organization either produces zero carbon emissions or takes action to reduce carbon in the atmosphere equal to the amount of carbon they produce (United Nations, 2021).

Climate Mitigation

Actions that reduce carbon emissions like creating electricity with solar panels rather than burning coal or reducing deforestation.

Climate Adaptation

The process of adjustment to actual or expected climate and its effects in order to moderate harm or take advantage of beneficial opportunities (IPCC, 2022a).

What is Defined as "On Campus"?

What's not included:

- Research and Outreach Centers
- Leased buildings and property
- Minnesota Landscape Arboretum in Chaska
- University Grove
- Land Trusts
- University Golf Course

Engagement Process

Twin Cities Sustainability Committee

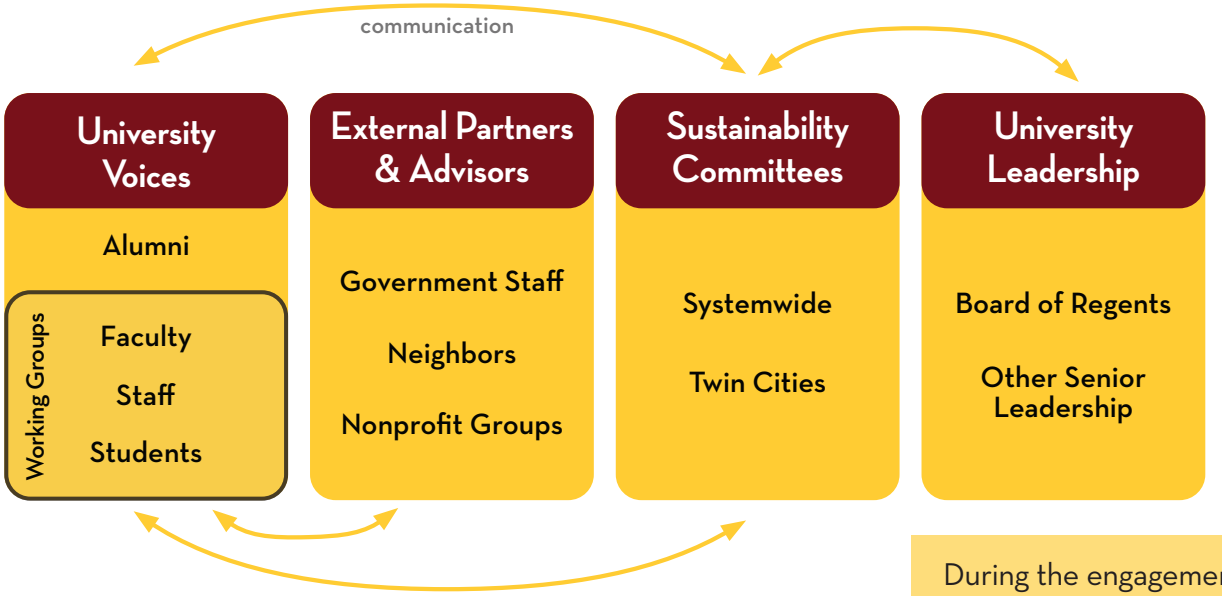
The Twin Cities Sustainability Committee was charged to guide the implementation of the climate action plan along with other priorities that contribute to realizing the commitment of MPact 2025 to build a fully sustainable future and the Board of Regents Policy - Sustainability and Energy Efficiency. Throughout the process, the Twin Cities Sustainability Committee provided direction, feedback, and input.

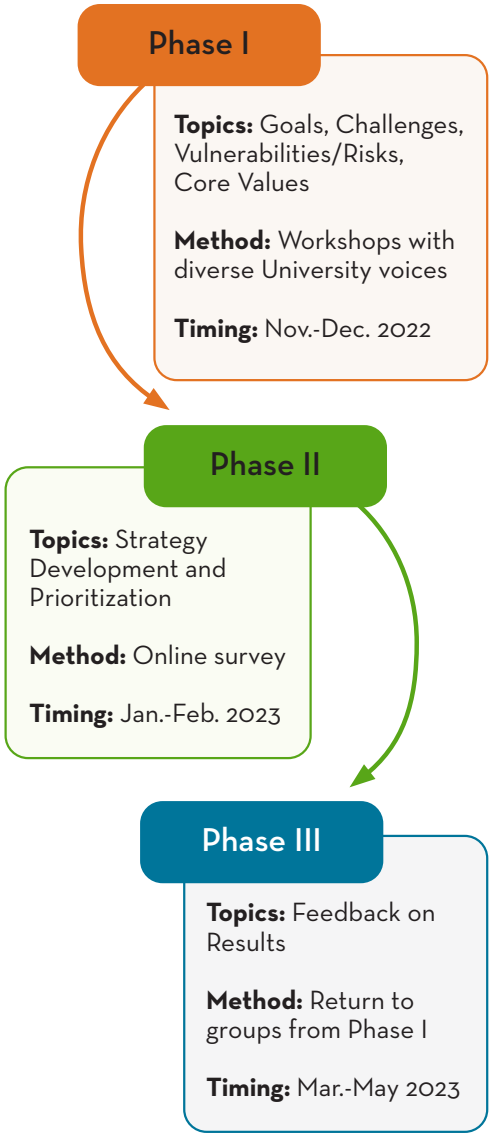
Campus Community

Members of the campus community were engaged throughout the planning process and their input was relayed between stakeholder groups to inform the outcomes of the CAP. Campus engagement was structured into three phases. As of early April 2023, the project team met with over 20 organizations or classes, connected with over 3,200 people through surveys and in-person engagement, and learned a lot about priorities and perspectives from the campus community. For a full summary of the campus community engagement, see Appendix B.

Working Groups

Recognizing the complexity and breadth of work to be done, the Twin Cities Sustainability Committee formed Working Groups to advance specific aspects of the planning process related to eliminating major sources of campus emissions and making the campus more resilient to current and future climate change impacts. The Working Groups led in-depth research and analysis to produce goals, key performance indicators, and prioritized strategies in the CAP based on the engagement process, best practices, and internal baseline assessments.

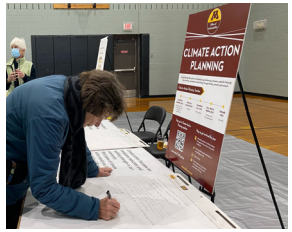




During the engagement process, questions arose about areas of study that could not be answered in the scope of this plan. These questions were collected to inform the future of sustainability work on campus. See Appendix C for some examples of those questions.

Key Engagement Takeaways

- The campus community feels a great sense of urgency and would like to see carbon neutrality before 2050
- The campus community emphasized equity as a value in which to prioritize strategies
- The campus community would like to see UMN act as a leader in climate action
- The student population feels strongly about the impacts of climate change and that aggressive action is needed



Above: Spring 2023 Climate Action Planning Open House, Left: Winter 2023 Prospect Park Neighborhood Association Event, Right: Fall 2022 Climate Action Workshop

Equity and Justice

The burdens of environmental pollution, including those associated with climate change, are disproportionately borne by Black, Indigenous, and people of color (BIPOC), people in poverty, and the disenfranchised. Throughout the climate planning process, members of the University community called attention to this injustice. While the CAP partially addresses the issue through the mechanisms described below, much more work remains to be done. Generations of environmental and climate injustice require more consideration than could be completed through the current effort. A process dedicated to equity and justice, that is led by and centers the people most impacted, is necessary. As such, environmental justice is identified as an critical issue for future University work in Appendix C.

Engaging Affected Communities

Diverse communities on and off campus were engaged in the planning process, including local neighborhood associations and campus organizations like the Diversity Community of Practice, the Circle of Indigenous Nations, and the Office for Multicultural Student Engagement.

Reducing Emissions in Environmental Justice Communities

The University campus is located in census tracts identified as environmental justice areas of concern by the Minnesota Pollution Control Agency. Many of the goals and strategies articulated in this CAP for mitigating carbon pollution (a global pollutant) also lead to reductions in local air pollutants that negatively impact human and environmental health. Through climate action, the University will help to lessen impacts of environmental injustice in the communities surrounding campus.

Accessibility, Diversity, Equity, Inclusion, and Justice in Strategy Development and Prioritization

Each Working Group was asked to develop and assess strategies with a climate justice lens, to ensure maximized community benefits and the elimination of negative externalities. Some of the questions the Working Groups considered included:

- What equity and justice impacts (positive and negative) could the proposed strategy have?
- How will these be managed and accounted for?
- Who needs to be involved in developing and implementing strategies?
- How do we prioritize accessibility in implementation?

Providing Economic Opportunity to Communities

Realizing the climate goals articulated in this CAP will involve significant economic activity, including the construction of new emissions-free energy and transportation systems, and enhancing natural and built infrastructure for resilience. Many communities have historically been excluded from these employment and business opportunities. Economic opportunities driven by our climate action plan will be accessible, and contribute to prosperity for businesses owned by women, minorities, disabled individuals, and other underserved owners, through the University's Office of Supplier Diversity and the University's partnerships with organizations like the Regional Apprenticeship Training Center in North Minneapolis.

Carbon Mitigation

2

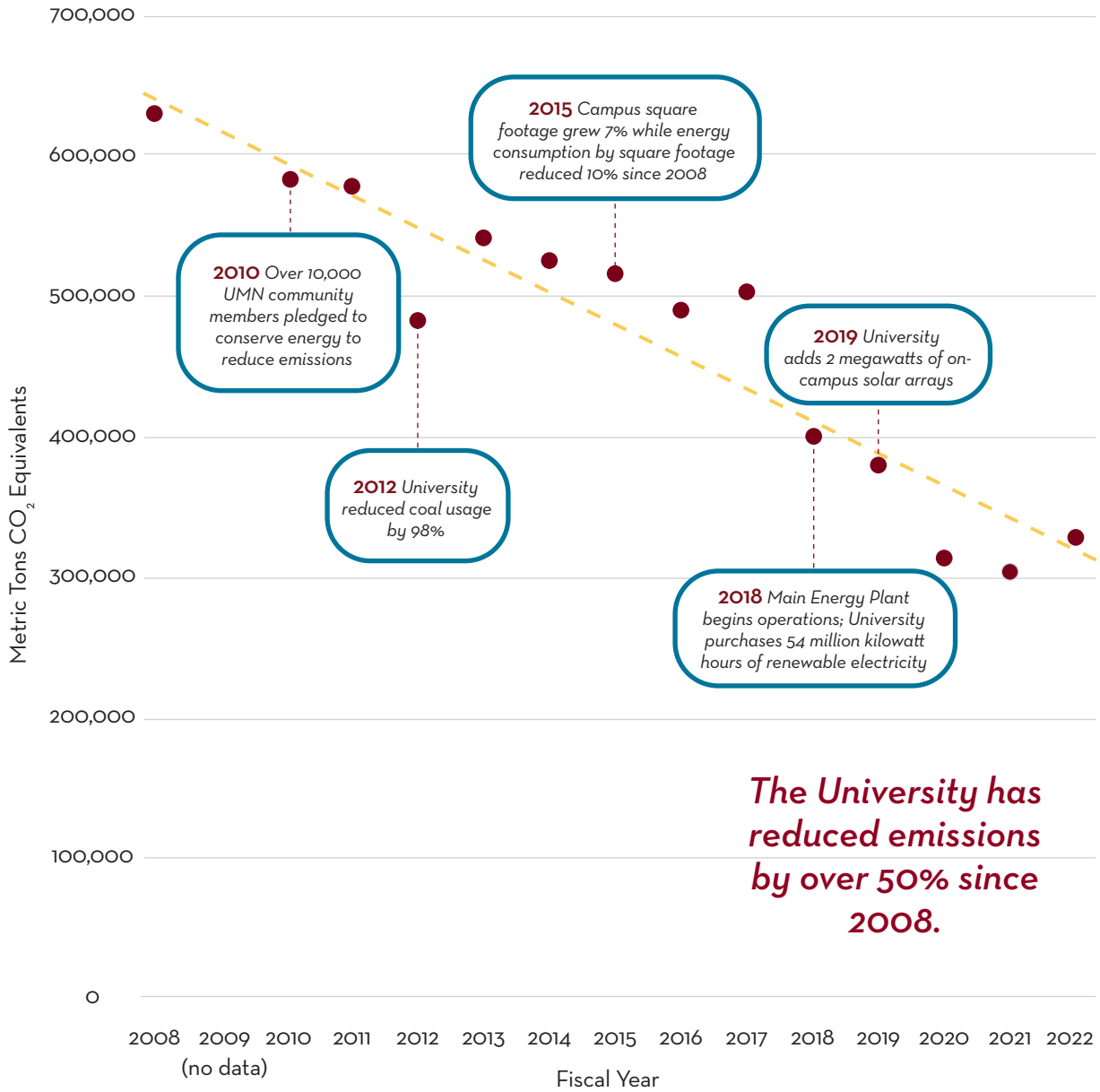
History of Climate Leadership

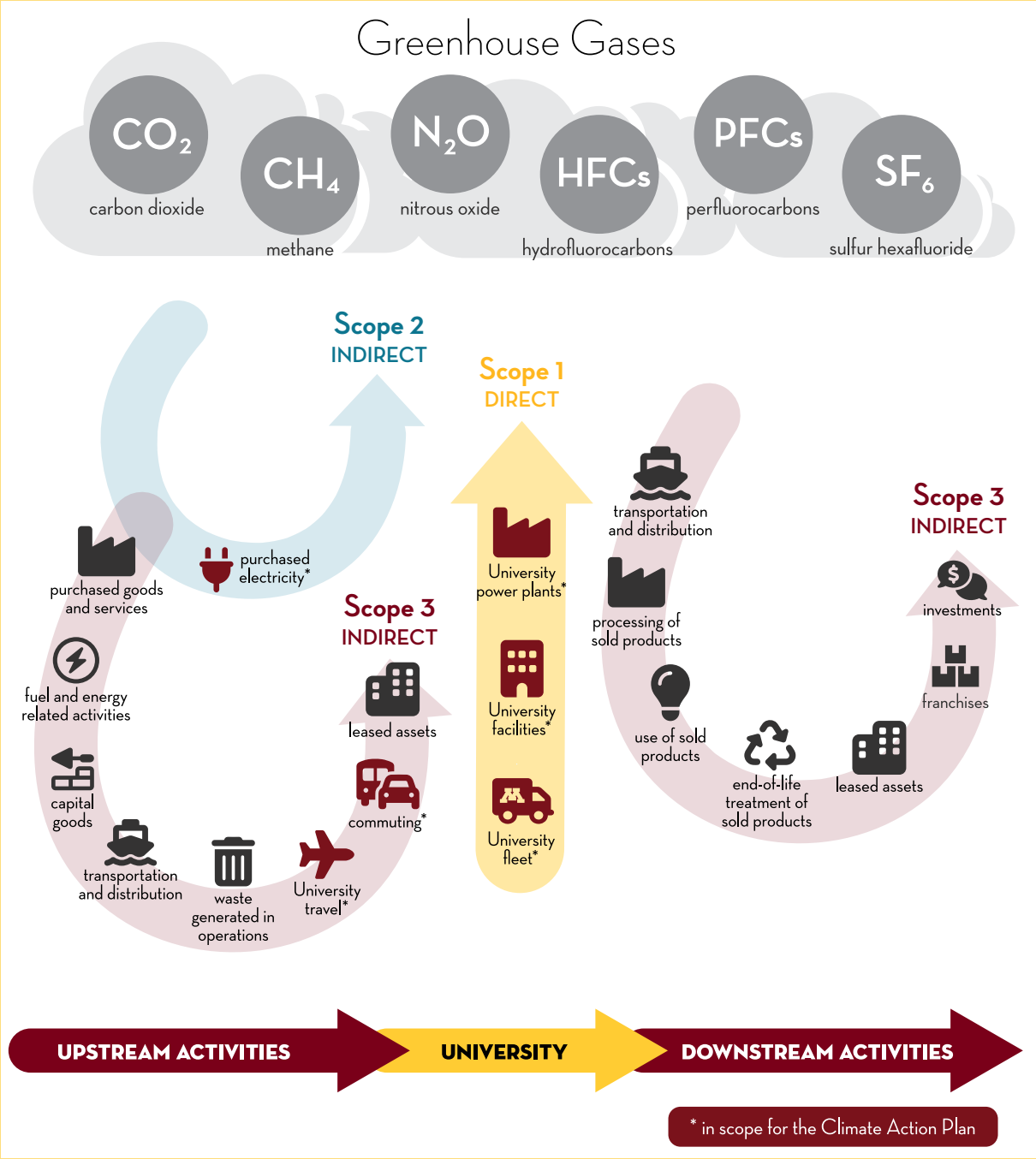
The University of Minnesota's commitment to carbon neutrality started in 2008 when the institution joined the American College and University Presidents' Climate Commitment, now known as the Second Nature Climate Leadership Commitment. Since 2010, the University has completed a greenhouse gas inventory on an annual basis. In 2020, carbon emissions had declined by approximately 50% from the 2008 baseline. Moving forward, the University will need to transform the energy, transportation, and other supporting systems to meet emission reduction goals.

MTCO2e

A metric ton of carbon dioxide equivalent (MTCO2e) is a standardized unit of measure for carbon emissions. By standardizing, emissions can be compared across sectors and greenhouse gas emissions with different impacts.

University of Minnesota Twin Cities Greenhouse Gas Emissions



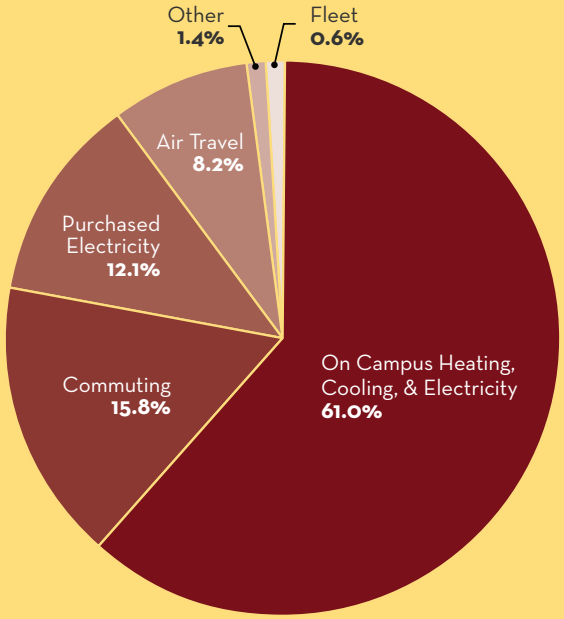


Current Emissions

Emissions are categorized into different scope categories that align with an international protocol for tracking and reporting.

- **Scope 1** emissions are from sources controlled or owned by an organization.
- **Scope 2** emissions are associated with the purchase of electricity, steam, heat, or cooling.
- **Scope 3** emissions are from assets that are not owned or controlled by the reporting organization but are part of the organization's value chain.

At the University of Minnesota, emissions are tracked across all scopes. However, data availability of several categories, particularly those in scope 3, are harder to obtain. In the future, the University aims to track all categories of emissions and to expand its climate action focus.



FY2022 - Emissions

Emissions Categories

The CAP covers five different emission categories or elements. Each emissions category has a vision and a set of goals with corresponding key performance indicators (KPIs) and prioritized strategies.

1. VISION

Aspirational statement about the future of the University's carbon reduction efforts for each Emission Category

2. GOALS

Core programmatic areas of work that will collectively advance the vision of each Emission Category

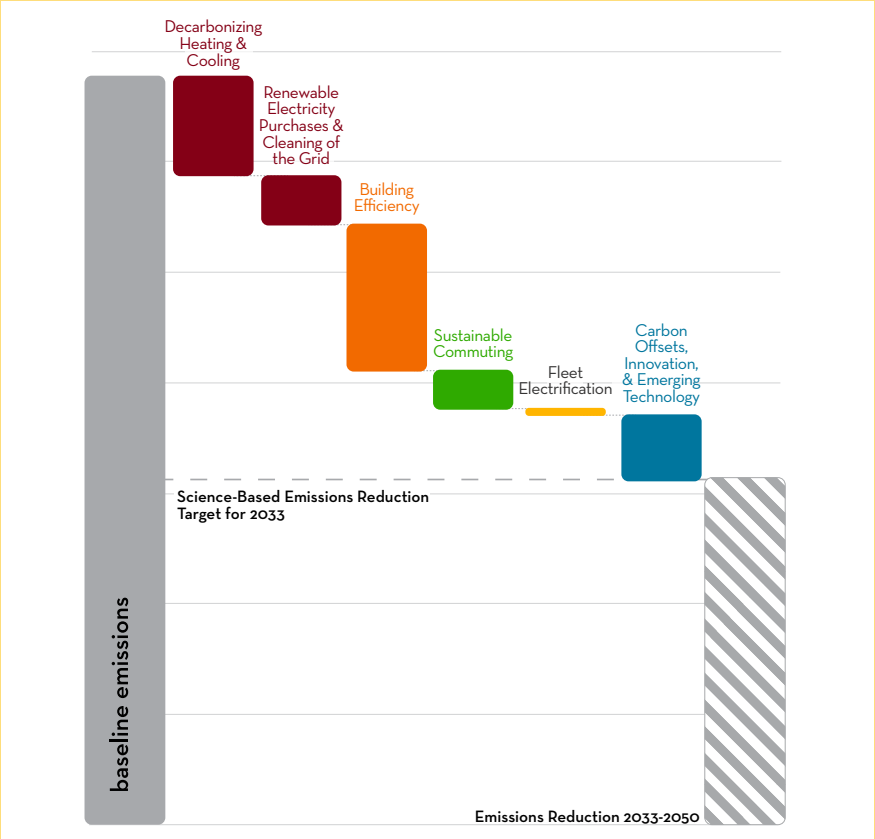
3. KEY PERFORMANCE INDICATORS (KPIS)

How progress toward the Goals will be quantitatively measured with a baseline and a final target

4. PRIORITIZED STRATEGIES

Infrastructure improvements, program development, policy, or other actions selected as a top priority to focus efforts and resources

2033 Emission Reduction Pathway



The diagram above estimates the University's baseline carbon emissions and how different actions will lead to a 60% emissions reduction over the next 10 years, in alignment with the IPCC recommendations to limit warming to 1.5°C (2021). About 40% of the University's remaining emissions will be eliminated between 2033-2050. The CAP also establishes the following targets:

- Directly eliminate carbon emissions from the campus energy plants and other emissions sources controlled or owned by the University (or scope 1 sources) by 2045
- Directly eliminate emissions from purchased electricity (or scope 2 sources) by 2033
- Become carbon neutral in commuting and air travel by 2050

2033 Goal Summary

Energy Supply

Vision: Reduce scope 1 and scope 2 emissions by 60% from the 2019 baseline by 2033

- Increase renewable energy production on campus to 6MW by 2033 and 12MW by 2050, and increase renewable energy procurement to match 100% of purchased electricity by 2033
- Reduce carbon emissions from thermal energy by 20% from the 2019 baseline by 2033, and 100% by 2045

Commuting

Vision: Reduce emissions from commuting by 40% from the 2022 baseline by 2033

- Manage travel demand through support for hybrid work and housing opportunities near campus
- Shift commuters from single occupancy vehicles to low- or zero-carbon transportation options, such as walking, biking, and transit
- Increase low- or zero-emission vehicle use among drive alone commuters without other transport options

University Sponsored Travel

Vision: Reduce emissions from University sponsored travel

- Increase procurement of carbon-free or sustainable transportation modes
- Increase utilization of carbon-reducing travel strategies
- Develop a program for purchasing high quality offsets with co-benefits linked to the type of travel

Energy Demand

Vision: Reduce scope 1 and scope 2 emissions by 60% from the 2019 baseline by 2033

- Accelerate Minnesota's B3 Sustainable Building 2030 design standards (SB 2030) and net zero operating carbon requirements for all new construction and major renovations
- Reduce site energy use intensity (kbtu/ft2-yr) from existing buildings 35% by 2033 from the 2019 baseline, and reduce carbon intensity (MTCO2e/1,000ft2-yr) to 0 by 2050
- Optimize space utilization to decommission existing square footage

University Fleet

Vision: Reduce UFleet emissions by 70% from the 2018-2022 average annual emissions by 2033

- Transition internal combustion vehicles to vehicles or modes with zero tailpipe emissions
- Reduce fuel and energy usage of the UFleet by reducing vehicle miles traveled (VMT) and improving fuel efficiency
- Integrate carbon neutral goals into contracts with third-party providers who drive vehicles on campus

Catalytic Projects Identified in Each Section

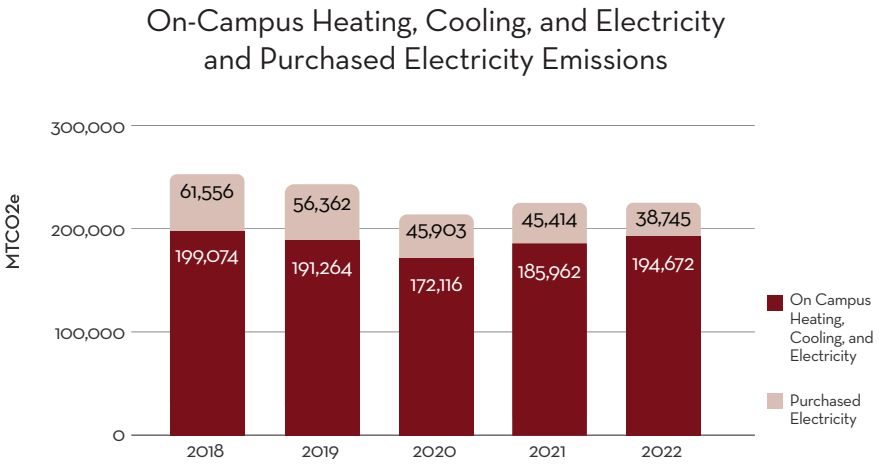
Catalytic projects tap into existing spark and need, launching implementation for each emissions category.

Energy Supply

Energy supply emissions are primarily created by burning fossil fuels for heating, cooling, and electricity. Most of the heating and cooling for the University of Minnesota Twin Cities is generated by power plants on campus and supplied through a district system. The energy needed to make steam is generated on campus through the burning of mainly natural gas (97.5%), which is supported by coal (1.9%), and fuel oil (0.6%). The University also produces some of its own electricity during this process. Chilled water for cooling is created through equipment that uses either electricity or steam to power the process. In addition, the University purchases electricity and natural gas to support buildings and operations on campus that are off the district system. Electricity not produced on campus is purchased from Xcel Energy, which uses a mix of fossil fuels, nuclear, and renewable sources to generate power. The University engages in voluntary programs to purchase additional renewable energy, beyond what is provided in the Xcel grid-mix, to further reduce emissions from the power supply.

Climate action within energy supply focuses on transitioning to a carbon neutral energy supply coupled with storage (for example, renewable energy and thermal batteries). Energy supply strategies also focus on efficiency measures such as conversion of steam distribution to hot water, energy recovery at the plants, and chiller plant upgrades.

Emissions Tracked at UMN



- **61%** of overall emissions in 2022 came from power plants on campus producing energy for heating, cooling, and electricity
- **12%** of overall emissions in 2022 came from purchased electricity

The University tracks emissions from all of its power plants and chillers on the district energy system. The University also tracks emissions from purchased electricity and natural gas for buildings that are not served by the district system. In the future, emissions tracking can be improved by solidifying the campus boundary for the greenhouse gas inventory.

Current Status and Progress

- Greatly improved efficiencies of power generation through building the Combined Heat and Power Plant (CHP)
- Significantly reduced coal usage
- Installed solar PV on campus and entered into agreements to purchase renewable energy off campus

What's the Challenge?

- Reliability and resiliency of new technology
- Increased cooling demand as temperature rises
- Balancing system needs
- Cost effectiveness and appropriate rate setting
- Quantifying thermal energy can be difficult
- Decarbonization requires a total transformation of the system

What's the Vision and How to Get There?

Vision: Reduce scope 1 and scope 2 emissions by 60% from the 2019 baseline by 2033

Catalytic Project: On-Campus Solar

In conjunction with ongoing building projects, increase on-campus solar through installing arrays on rooftops and parking lots.

Goal 1

Increase renewable energy production on campus to 6MW by 2033 and 12MW by 2050, and increase renewable energy procurement to match 100% of purchased electricity by 2033

The University purchases renewable electricity through green tariffs and other purchase agreements that accounted for approximately 30% of all purchased electricity in FY22. This does not account for on-grid renewables attributable to the University's electric provider, Xcel Energy. The percentage of renewable energy on Xcel Energy's grid is the same for all electricity customers and 34% of Xcel Energy's grid energy mix in 2021 was certified renewable (Xcel Energy, n.d.). Note that purchased electricity does not include the electricity produced on campus by the CHP, but it does include the approximately 2 MW of onsite solar electricity generation. For the purposes of the CAP, the University is assuming that the grid will decarbonize by 2040 as required by state legislation. In the interim, the University will invest in renewable electricity sources to match what is purchased from the grid to meet the University's science-based target goal and to support the massive transition of the electric grid. In addition, the University will expand on-campus renewable electricity.

KEY PERFORMANCE INDICATORS	TODAY	2033
% of carbon-free purchased electricity in annual MWh	30% (FY22)	100%
MW (DC) of solar on campus	1.97 MW (FY22)	6MW

STRATEGY
1.1 Increase on-campus solar on surface parking, parking structures, and new rooftops
1.2 Explore green tariffs, virtual power purchase agreements (vPPAs), or power purchase agreements (PPAs) to procure renewable energy that provides additional social and environmental benefit with phase-out plans as Xcel Energy becomes carbon neutral
1.3 Install electric battery storage on campus to increase resilience and address the possible intermittence of renewable energy
1.4 Upgrade the campus electric distribution grid to enable grid-interactive buildings and integrate battery storage

Goal 2

Reduce carbon emissions from thermal energy by 20% from the 2019 baseline by 2033, and 100% by 2045

(additional to reductions from demand goals)

Thermal energy systems transfer units of heat to areas that need to be warmed or away from areas that need to be cooled. Existing thermal energy systems on campus can significantly reduce emissions through efficiencies and by building storage for heat. The energy source for thermal energy production must also transition from fossil fuels to electricity produced from renewable and zero-emission sources or from zero- or low- emission fuels such as hydrogen or renewable natural gas.

"The traditional model of sourcing energy to optimize first capital cost savings and convenient access – typically focused on building power plants on the outskirts of primary campus activities and feeding buildings developed over time – is not viable given the climate commitments needed for a resilient future."

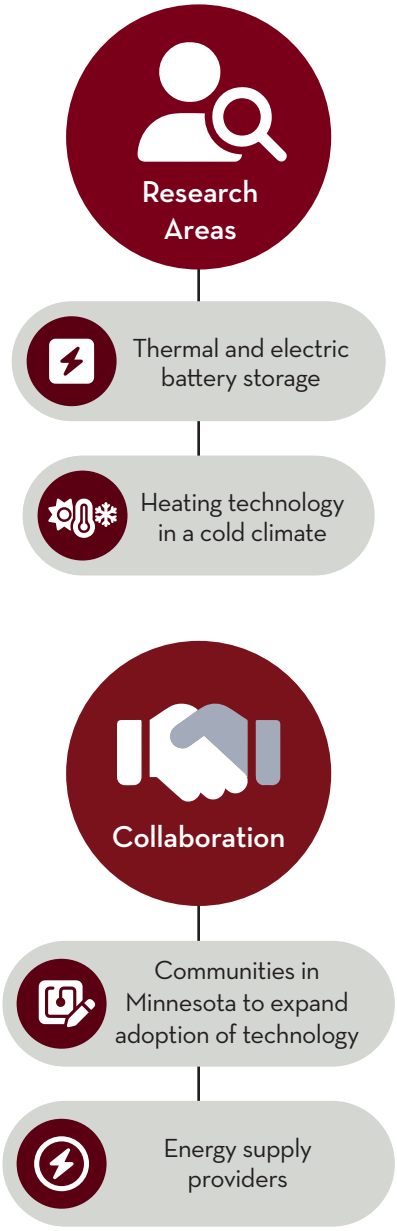
- Twin Cities Campus Plan, 2021

KEY PERFORMANCE INDICATORS	TODAY	2033
Carbon emissions from thermal energy (MTCO2e)	~140,000 (2019)	~80,000*

**The total reductions in thermal energy will be approximately 60,000 MTCO2e, but only 28,000 MTCO2e will be attributable to this energy supply goal. The remaining emissions reductions are expected to be realized through energy demand goals.*

STRATEGY
2.1 Eliminate installation of localized fossil fuel combustion equipment in buildings
2.2 Strategically convert steam heat to low- or medium-temperature water distribution systems
2.3 Decarbonize sub-districts with a suite of thermal and electric energy alternatives (ground source heat pumps, air-source heat pumps, other electric heating sources, sewage heat recovery, etc.)
2.4 Deploy thermal battery energy opportunities
2.5 Determine an energy supply alternative by 2025, in concert with the Energy and Utility Plan
2.6 Develop budgeting practices that enable decision making on life-cycle cost metrics including both capital and operating budget impacts
2.7 Support academic research on electric and thermal battery storage and carbon-free cold-climate heating
2.8 Develop a change management strategy to train and transition employees to new technology

Future Research and Collaboration



Definitions

Combined Heat and Power (CHP) Plant

Also known as a cogeneration (cogen) plant, a CHP plant concurrently produces electricity and heat from a single source of energy. Efficiencies are produced through recovering heat from the process itself.

Thermal Energy Storage

A physical structure used to store and release heating or cooling water.

Thermal Energy

Thermal energy is the creation and distribution of heating and cooling within a system.

Renewable Energy

Renewable energy is generated from sources or processes that are continuously replenished.

Renewable Energy Certificates (RECs)

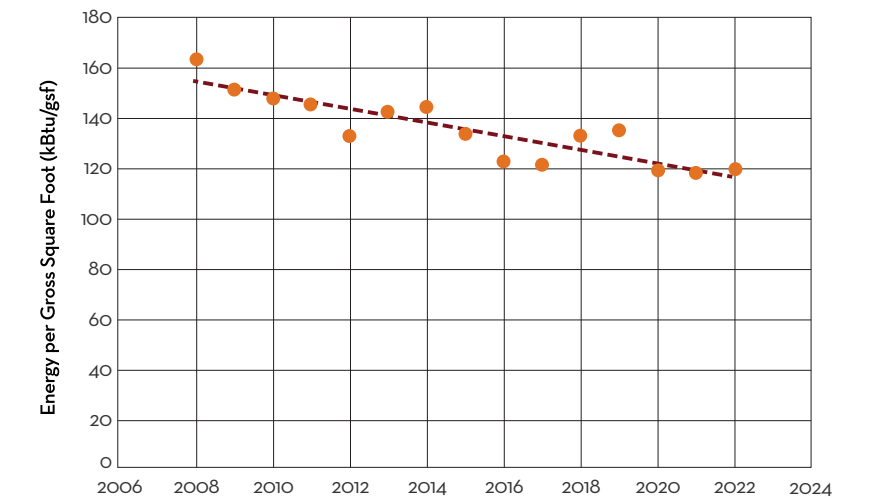
RECs act as an accounting or tracking mechanism for solar, wind, and other green energies as they flow into the power grid. They are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource.

Energy Demand

Energy demand refers to the amount of energy used on campus, primarily by buildings. To achieve the University's climate goals, buildings will need to be high-performing and regenerative, for both the University community and the environment. Energy demand strategies focus on improving energy efficiency through physical improvements and also consider the people, practices, and policy measures such as behavior changes, space utilization, and design/operation standards.

Emissions Tracked at UMN

Emissions related to energy demand are closely linked to energy supply. When less energy is used, less supply is needed. Over time, the University has been able to decrease energy use by approximately 6% while square footage or space has grown by approximately 28%.



Current Status and Progress

- Extensive building recommissioning program (adjusting fan schedules, installing room occupancy sensors, upgrading HVAC equipment)
- Laboratory energy efficiency programs
- Window, lighting, and appliance replacements
- Large-scale renovations that reduced energy demand
- Decommissioned 500,000 gross square feet of University space on campus

What's the Challenge?

- Funding for energy efficiency measures in new construction, renovations, and upgrades
- Multi-use buildings are functional but cause greater demand
- Users may not always use technology as intended
- Difficult to implement new technology in older buildings
- Older buildings present health issues (such as mold) associated with building envelope sealing
- Staff capacity

What's the Vision and How to Get There?

Vision: Reduce scope 1 and scope 2 emissions by 60% from the 2019 baseline by 2033

Catalytic Project: Digital Controls to Manage Energy in Real-time

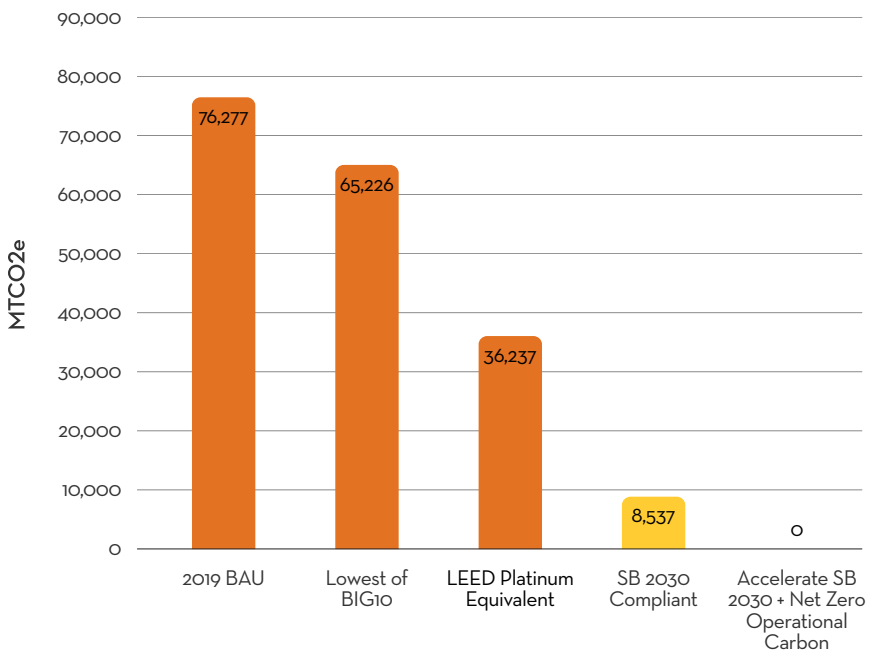
Building heating, ventilation, and air conditioning are part of a complex system that works together to keep a building at the right temperature and indoor air quality. Older controls can be updated to newer and digitally connected controls to enable more effective, real-time management of building climate to produce energy savings. This type of upgrade can be completed throughout campus, particularly in buildings already sited for renovation.

Goal 1

Accelerate Minnesota's B3 Sustainable Building 2030 design standards (SB 2030) and net zero operating carbon requirements for all new construction and major renovations

The University currently applies the energy and carbon emissions performance targets established by the Minnesota B3 Sustainable Building 2030 Energy Standards (b3mn.org/2030energystandard) for all new construction and major renovations, which was developed by the UMN Center for Sustainable Building Research. The standard is based on Architecture 2030 and sets targets for buildings to become more energy efficient and less carbon intensive in their operations. As an example, buildings constructed today under the standard must be 80% more energy efficient and less than a comparable building constructed in the baseline year of 2003. The University will accelerate the implementation of the 2030 Energy Standard, implementing a zero-carbon standard in new construction for building energy use. Emissions from major renovation projects are captured under Goal 2 in the Energy Demand section.

Estimated Potential Emissions Impact of Planned Campus Growth



The Twin Cities Campus Plan (2021) projects 9 million square feet of growth of different building uses and different carbon intensities. The graph to the left shows the projected annual emissions at buildout for different scenarios: 1) business as usual or the carbon intensity of buildings on campus today; 2) matching the lowest carbon intensity for buildings in the Big Ten; 3) designing to LEED Platinum status; 4) meeting SB2030 compliance, assuming half of the projected growth will occur before 2030 and the other half will occur between 2030 and 2050; 5) accelerating SB2030 requirements and meeting net zero operational carbon on all projected growth.

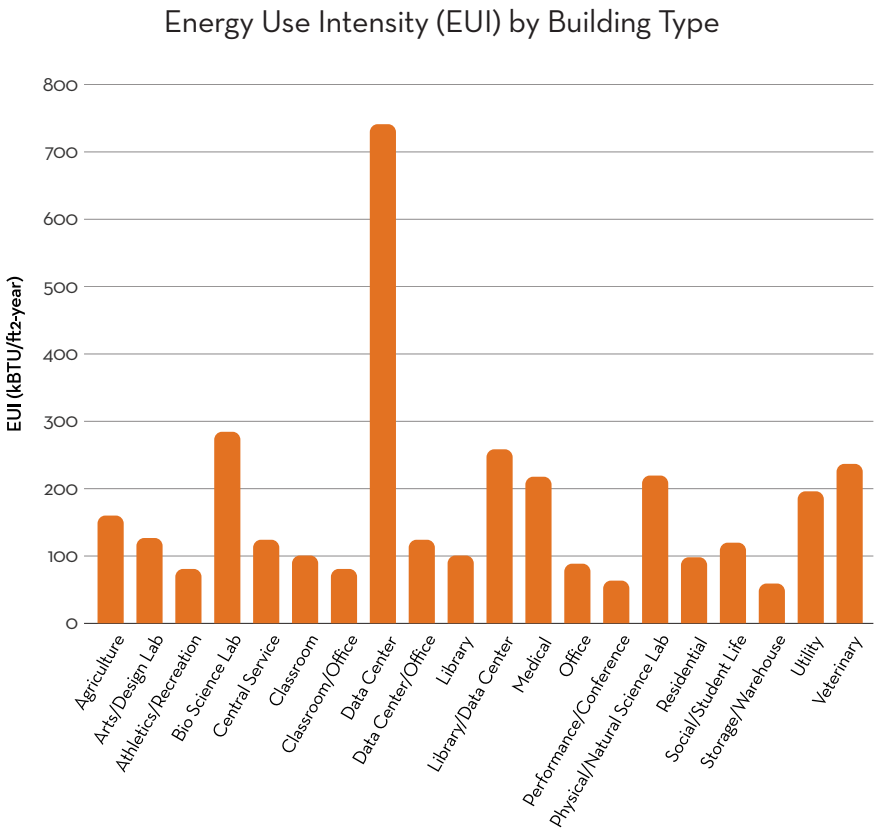
KEY PERFORMANCE INDICATORS	TODAY	2033
% of new construction projects achieving net zero operating carbon status	0%	100%

STRATEGY
1.1 Increase staffing and establish proper funding mechanisms to prioritize net zero operating carbon building design within budget dedications
1.2 Explore the option of third-party certification programs for new construction that complement the B3/SB2030 programs
1.3 Establish a University Working Group to evaluate and manage embodied carbon impacts of new construction
1.4 Update or develop new University procedures, training, and standards for capital planning, procurement, design and construction, engineering, commissioning, operations, and maintenance of net zero operating carbon buildings
1.5 Include SB 2030 and net zero operating carbon requirements in all University RFPs for new construction projects

Goal 2

Reduce site energy use intensity (kbtu/ft2-yr) from existing buildings 35% by 2033 from the 2019 baseline, and reduce carbon intensity (MTCO2e/1,000ft2-yr) to 0 by 2050

Energy use intensity (EUI) is the way the University profiles the energy efficiency of the buildings on campus. Different types of buildings on campus will use various amounts of energy and detailed energy dashboards for specific buildings can be found on the University's Energy Management website. For example, laboratories on campus use the greatest amount of energy per square foot due to storing lab equipment, refrigeration, etc.



KEY PERFORMANCE INDICATORS	TODAY	2033
Energy use intensity (kbtu/ft2-yr)	152.2 (FY19)	98.9
Carbon intensity (MTCO2e/1,000 ft2-yr)	10.1 (FY19)*	6.2

**Based on a subset of over 200+ buildings on the Twin Cities campus. Details on methodology will be provided under a separate cover.*

STRATEGY
2.1 Increase funding and personnel as required to implement additional commissioning and energy efficiency upgrades
2.2 Develop project threshold definitions and standards for major renovations to achieve SB 2030 and net zero operating carbon (new construction goals)
2.3 Deploy energy efficiency measures identified for each archetype of building to achieve the target Energy Use Intensity per building typology
2.4 Develop a robust continuous commissioning process to ensure buildings continue to operate efficiently
2.5 Increase retro-commissions on campus and target key buildings with high energy usage for building type
2.6 Expand the University-wide Demand Response and Load Management Program
2.7 Participate in third-party behavior change campaigns

"The Campus Plan envisions significant reinvestment in existing buildings in the campus cores. However, when campus needs cannot be accommodated through renovation, critical decisions about growth must consider resilience and mitigation, land use impacts, and the capacity of supporting utilities and infrastructure (energy, water, waste vegetation, etc)."

- Twin Cities Campus Plan, 2021

Goal 3

Optimize space utilization to decommission existing square footage

Since the 2011 CAP, the University has already decommissioned buildings equivalent to 500,000 gross square feet (GSF). Overall, reducing the GSF of buildings on campus reduces the campus energy footprint, especially the inefficient older buildings. With more people engaging in hybrid working/learning and buildings having less utilization, shared goals can be achieved for optimizing space usage. On average, office space has a carbon intensity of 5.7 tonnes of CO_2e per 1000 square feet ($MTCO_2e/1000ft^2$). Using these estimates, decommissioning one million square feet of office space would reduce campus emissions by 5,700 $MTCO_2e$, which is greater than the amount of emissions produced by the University Fleet.

KEY PERFORMANCE INDICATORS	TODAY	2033
GSF decommissioned	N/A	TBD

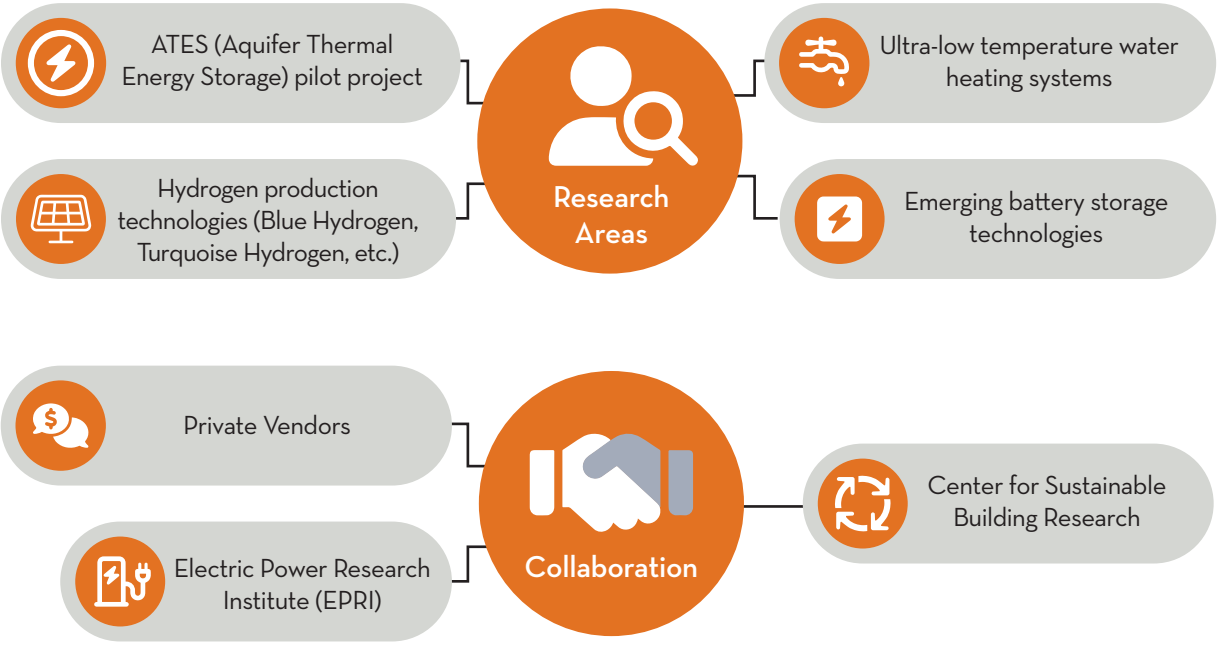
**The Twin Cities Campus Plan (2021) identifies 3 million sq. ft. of space to decommission by 2050. The emissions reduction projections for the CAP include decommissioning an additional 2 million sq. ft. Final targets should be set with the Work. With Flexibility. Executive Team. If a total of 5 million sq. ft. cannot be decommissioned, other areas of emissions will need to reduce even further to account for the change.*

STRATEGY
3.1 Complete a space optimization study and use energy use intensity as a criterion for decommissioning
3.2 Evaluate the use of flexible office space, hybrid and remote learning, multi-function flexible classrooms, and centralized scheduling to reduce square footage needs on campus
3.3 Engage with University academic stakeholders to develop space utilization plans
3.4 Decommission buildings based on space optimization study
3.5 Decommission buildings as identified in the Twin Cities Campus Plan

"As hybrid models of campus use take root, whether for teaching and learning, research, or service, it may be possible to slow the rate of new development by shifting how and where such activities occur, and focus capital investment on demolition and redevelopment of existing land and infrastructure in the campus cores."

- Twin Cities Campus Plan , 2021

Future Research and Collaboration



Definitions

Retrocommissioning

A systematic process to identify and improve building efficiency and performance.

Commissioning

A systematic process of ensuring that a building performs in accordance with the design intent, contact documents, and the owner's operational needs.

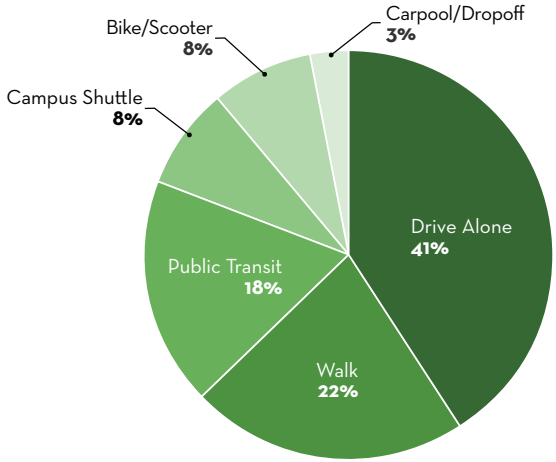
Decommissioning

The process of shutting down a building and/or removing it from operation or use.

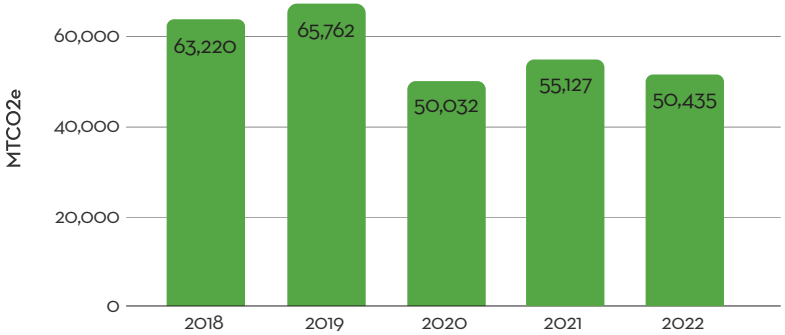
Commuting

Commuting is considered travel to and from the University for school or work as a part of regular activities. This does not include students moving to the Twin Cities area for the school year to a campus address or traveling back and forth from a home address and a campus address during academic breaks. This also does not include attendees traveling to events on campus. Commuting results in emissions as cars, buses, trains, and other forms of transportation burn fossil fuels like gas and diesel. Emissions from commuting can be reduced by traveling less and switching to sustainable modes of transportation, such as walking, biking, transit, and EVs.

Transportation Mode Share of UMN Commuters (Fall 2022)



Emissions Tracked at UMN



Commuting Emissions

Carbon emissions are calculated and influenced by the following variables, which relate to the amount of gallons of fossil fuels burned.

- Number of commuters
- Average miles traveled by mode
- Percentage of mode share
- Commuting trips per week
- Number of weeks commuting
- Percentage of hybrid workers and learners

Current Status and Progress

- Developed a Twin Cities Campus Bicycle Plan (2019) to set goals and strategies toward developing and implementing bicycle-friendly infrastructure. Recognized as a Platinum Level Bike Friendly University, and Business by the League of American Bicyclists
- Provided on-campus electric vehicle (EV) charging infrastructure
- Established the Universal Transit Pass providing full-time students unlimited rides on transit services within the Twin Cities metro area
- Supported hybrid workers through resources and guidance such as *Work. With Flexibility.* to support a flexible work environment
- Encouraged commuters to carpool through the Gopher RideShare app
- Reduced the number of cars on campus and increased access to EVs via car-sharing services

What's the Challenge?

- Transit Program Awareness
- Housing On/ Near Campus
- Vehicle Availability
- EV Adoption Hesitancy
- Real and Perceived Sense of Personal Safety

What's the Vision and How to Get There?

While there are many variables to consider when developing a sustainable transport system, the CAP organizes commuting emissions reduction into two different elements: lowering the total amount of miles that commuters travel to campus and switching commuters from higher carbon intensive transportation modes such as single occupancy vehicles with internal combustion engines (SOV-ICE) to more sustainable modes of transportation such as walking, biking, carpooling, public transportation, and single occupancy electric vehicles (SOV-EV).

Vision: Reduce emissions from commuting by 40% from the 2022 baseline by 2033

Catalytic Project: Education and Communication

Transportation Demand Management (TDM) Survey by Parking and Transportation (PTS) demonstrated a lack of awareness of multimodal incentives and programs available to the University community. Developing new educational content and distributing the information through new communication channels and tactics may provide information and encourage commuters to switch to a low- or zero-carbon alternative.

"To decrease reliance on single-occupancy auto use, the recommendations of the Campus Plan recommends continued investment to expand the network of accessible pathways, safe year-round bicycle facilities, and appealing transit options."

- Twin Cities Campus Plan , 2021

Goal 1

Manage travel demand through support for hybrid work and housing opportunities near campus

Commuting mode choice is strongly linked to housing location, economics, and available infrastructure/systems. For example, commuters closer to campus tend to walk, bike, and take transit. Supporting housing close to campus could lead to a reduction of emissions in both mode shift and vehicle miles traveled.

Hybrid work also reduces vehicle miles traveled by eliminating commutes altogether. The 2022 TDM Survey by PTS found that 5% of the campus population never travel to campus and 19% of the campus population does not travel to campus on any typical weekday.

KEY PERFORMANCE INDICATORS	TODAY	2033
Percent of hybrid workers	18%	20%
Percent of individuals living within 5 miles of campus	41.0%	41.8%
Vehicle miles traveled (VMT)	TBD (2024)	TBD

STRATEGY
1.1 Ensure hybrid working and learning accessibility and support by strengthening hybrid work/instruction policies and resources
1.2 Increase the desirability of living in on-campus/near-campus neighborhoods by increasing safety and building community cohesion
1.3 Improve education and awareness of housing options and related transportation choices
1.4 Increase and improve access to affordable housing options on or near campus for students and staff

Goal 2

Shift commuters from single occupancy vehicles to low- or zero-carbon transportation options, such as walking, biking, shared mobility, and transit

The 2022 TDM Survey demonstrated that there is potential to shift commuters from SOVs to other modes. For example, the survey found that many commuters were unaware of certain programs supported by the University and local and regional partners and that many SOV commuters had other options available to them.

The survey also asked respondents what would incentivize them to switch to a different transportation mode. The top five most influential incentives correspond with public transit:

- More direct transit services
- More frequent transit services
- Greater discount for Metropass for staff and faculty
- More comfortable bus stops
- Personalized information about transit options

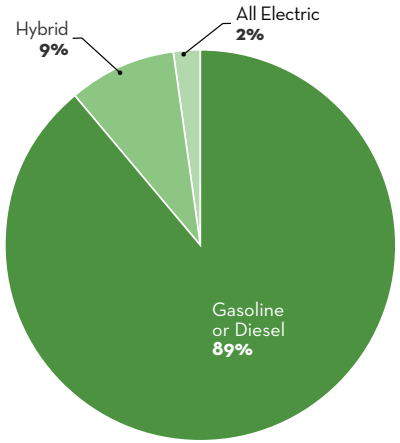
KEY PERFORMANCE INDICATORS	TODAY	2033
Percent of commutes in a SOV-ICE	Faculty: 58% Staff: 43% Student: 23%	Faculty: 44% Staff: 22% Student: 16%

STRATEGY
2.1 Improve safety and infrastructure for walking, biking, and transit
2.2 Advocate for optimal transit services to and around campus
2.3 Develop incentives for low- to zero-carbon transportation options
2.4 Improve education and awareness of different transportation programs

Goal 3

Increase low- or zero-emission vehicle use among drive alone commuters without other transport options

The University will likely always have commuters that travel by car and can support low- or zero-emissions vehicle use. Right now plug-in hybrid (PHEV) and EV adoption is the most available technology to reduce the car commuter footprint. In 2022, approximately 11% of drivers commuted with a hybrid or EV.

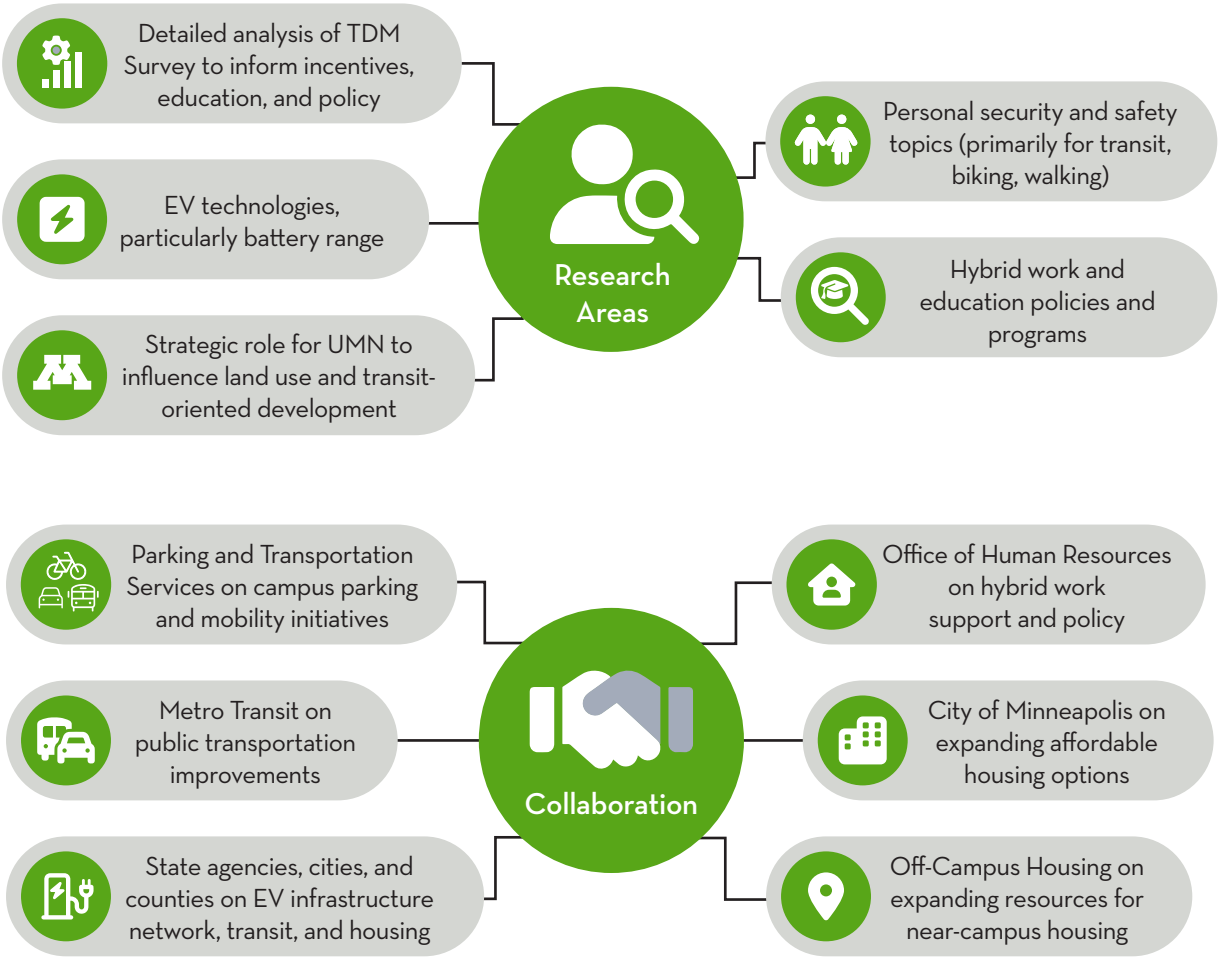


Average Commuter Vehicle Engine Type (Fall 2022)

KEY PERFORMANCE INDICATORS	TODAY	2033
Percent of commuter vehicles with ICE engines	Faculty: 75% Staff: 89% Student: 96%	Faculty: 60% Staff: 71% Student: 91%

STRATEGY
3.1 Develop parking permit and charging policies or fee structures that are equitable and promote EV adoption
3.2 Increase electrical vehicle charging infrastructure on campus for commuters and on-campus residents
3.3 Support academic research on low- to zero-emission vehicle related policies and technologies that will facilitate greater adoption
3.4 Provide leadership, through advocacy and partnerships, in increasing off-campus EV infrastructure

Future Research and Collaboration



Definitions

Sustainable Transportation Modes

Low-carbon travel options such as biking, walking, public transit, carpooling, and low- to zero-carbon vehicles.

Hybrid Work

Hybrid work refers to working or attending classes from a location other than an employer's office or an in-person classroom.

Single Occupancy Vehicles (SOV) Trip

A trip by an individual alone in a car, truck, or van.

Transportation Demand Management (TDM)

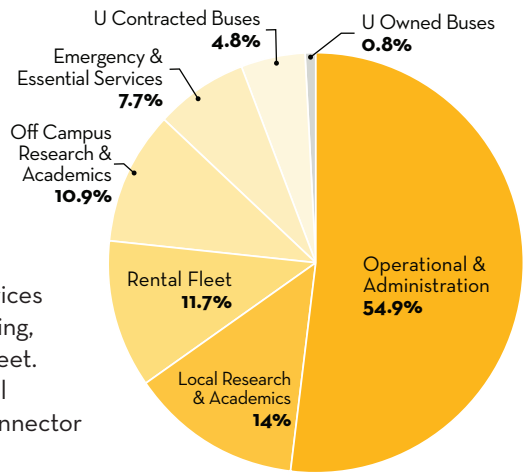
Policies and programs that influence modal shifts in transportation (Bond and Steiner, 2006).

University Fleet

The University fleet (UFleet) refers primarily to emissions from travel using University-owned vehicles and secondarily travel contracts to supplement fleet travel. The roughly 519 University vehicles (including University contracted buses) have different uses, including:

- Research
- Operations
- Rental
- Emergency Response
- Transit

Fleet Composition



Parking and Transportation Services (PTS) is responsible for purchasing, leasing, and maintaining the UFleet. PTS also administers contractual agreements for the Campus Connector and other operations.

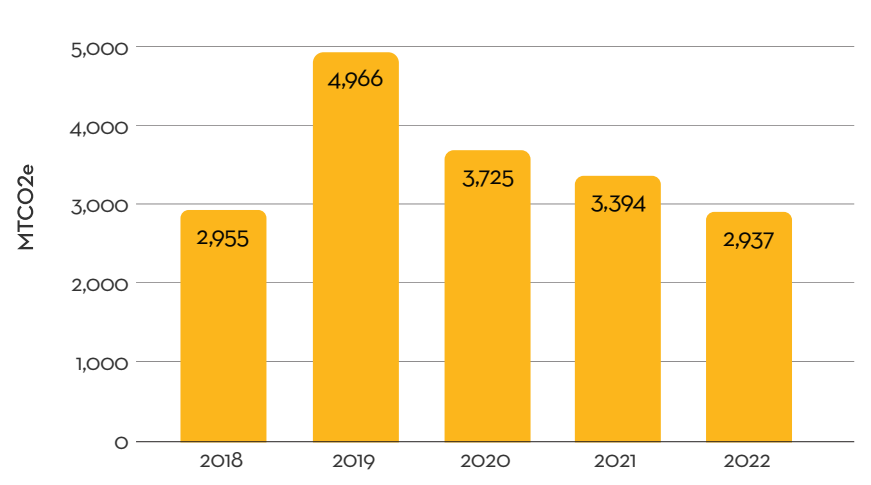
Current Status and Progress

- Increased use of flex fuel vehicles or vehicles with a certain percentage of biofuel
- Purchased electric vehicles and hybrids across a variety of vehicle types
- Installed 47 charging plugs in 27 locations across the Twin Cities campus for public and fleet charging
- Reviewed UMarket logistics to centralize package distribution and increase deliveries made on foot

Emissions Tracked at UMN

UFleet emissions are calculated based on the gallons of fossil fuels burned (diesel and gasoline) of vehicles owned by the University and by Campus Connectors. Emissions are not currently tracked for other contract agreements supporting UFleet operations or off-road vehicles. The vehicle fleet primarily runs on gasoline and the Campus Connectors or bus fleet primarily runs on diesel.

UFleet Emissions (2018-2022)



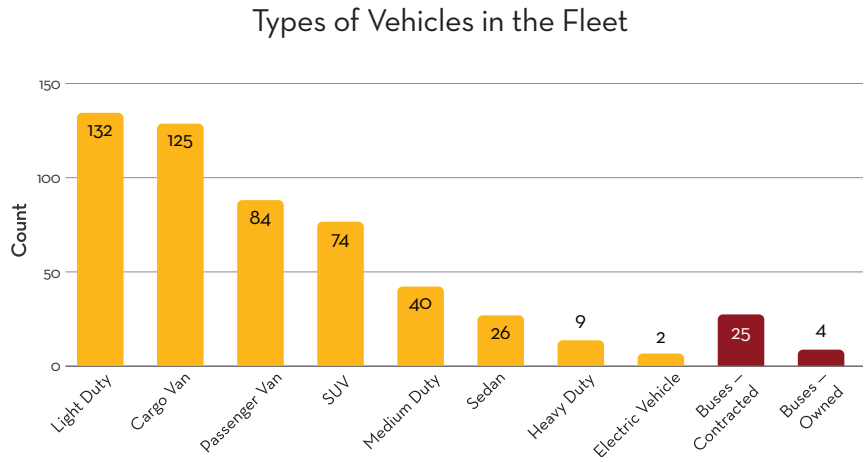
The average emissions over the last five years (2018-2022) is 3,595 MTCO2e.

What's the Challenge?

- Range Anxiety
- Electrical Grid Demand
- Vehicle Availability
- Charging Infrastructure Deployment
- Cold Weather Performance

What's the Vision and How to Get There?

Vision: Reduce UFleet emissions by 70% from the 2018-2022 average annual emissions by 2033



Catalytic Project: Install Electric Charging Hubs

The University will establish a Working Group to define charging needs and identify a pathway to implementing charging hubs across campus. The Working Group will also identify rate structures and coordinate with others to discuss commuter charging needs. The electrical needs will be closely coordinated with Energy Management.

Goal 1

Transition internal combustion vehicles to vehicles or modes with zero tailpipe emissions

In 2022, electric vehicles (EVs) are the most widely available and trusted technology to reduce emissions, but several other known technologies are in development. The University will continue to review emerging technology and its application to the UFleet.

KEY PERFORMANCE INDICATORS	TODAY	2033
% vehicles in the vehicle fleet and campus connector fleet that are EVs, PHEVs, or non-emitting	1% (2022)	70%

STRATEGY
1.1 Develop policy and guidelines for purchasing EVs as a first choice followed by PHEVs with allowances and exemptions for purchasing hybrids and internal combustion engine (ICE) vehicles sequentially
1.2 Plan and install EV charging powered by renewable energy in hubs on campus
1.3 Develop financial structures for departments to adopt EVs and install charging infrastructure at off-campus locations, such as research facilities in remote locations
1.4 Develop education about non-ICE vehicles including driving instructions and the benefits of EVs, such as air quality

Goal 2

Reduce fuel and energy usage of the UFleet by reducing vehicle miles traveled (VMT) and improving fuel efficiency

In addition to eliminating fossil fuel usage, reducing the amount of travel, improving vehicle fuel efficiency, and using smaller duty vehicles can all reduce emissions in the short term. Vehicle efficiency will continue to be important as the fleet electrifies to reduce demand on the electric grid.

KEY PERFORMANCE INDICATORS	TODAY	2033
Miles per gallon of ICE vehicles	Bus: 7.511 Vehicle: 20.98 (Avg. 2020-2022)	TBD
Miles per kWh of EVs	TBD (2024)*	TBD*
Miles traveled	Bus: 477,122 Vehicles: 2,855,482 (Avg. 2020- 2022)	TBD*

**will be determined upon completion of the fleet decarbonization and efficiency study (Strategy 2.1)*

STRATEGY
2.1 Complete a fleet decarbonization and efficiency study to be updated periodically to account for emerging technology and eco-routing
2.2 Rightsize the number of vehicles within the fleet inventory and promote vehicle sharing and other modes of transportation
2.3 Optimize vehicle duty and class for primary operations to maximize fuel or energy efficiency

Case Study: Data-driven Vehicle Electrification

Facilities Management uses a large share of the UFleet. Between 2022 and 2023, close to 200 vehicles assigned to Facilities Management were geolocated and tracked to determine fit for transitioning to an EV. The majority of the vehicles studied were found to have an electric vehicle fit when accounting for the total cost of ownership and miles traveled. This type of pilot study will be critical to not only transitioning these vehicles but also serving as an example of how this can be replicated for the rest of the fleet.

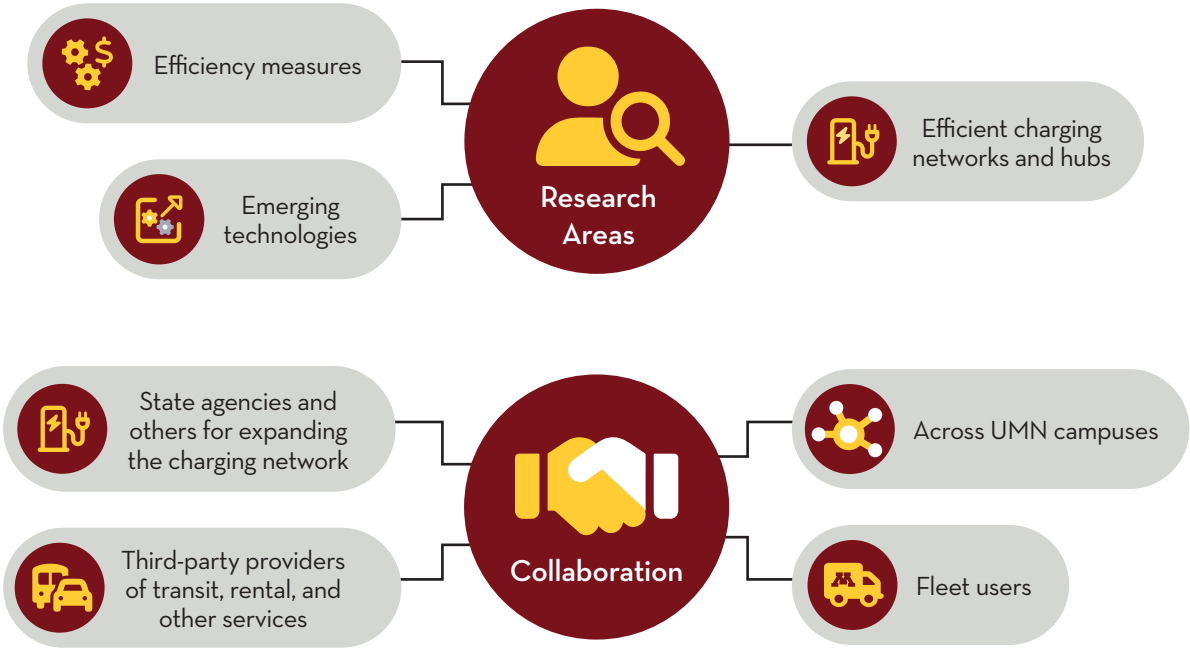
Goal 3

Integrate carbon neutral goals into contracts with third-party providers who drive vehicles on campus

KEY PERFORMANCE INDICATORS	TODAY	2033
Existence of a program to integrate decarbonization into contracts	No (2023)	Yes

STRATEGY
3.1 Work with current contract vendors to review existing operations and opportunities to transition to zero- or low-carbon emission options
3.2 Develop mechanisms to include requirements for non-ICE options and emissions reduction goals in RFPs and contracts with third-party vendors
3.3 Request carbon emission data from partners and third-party providers

Future Research and Collaboration



Definitions

Electric Vehicles (EV)

Vehicles with battery packs to power an electric motor.

Plug-in Hybrid Electric Vehicle (PHEV)

Vehicles with battery packs to power an electric motor, as well as another fuel, such as gasoline or diesel, to power an internal combustion engine or other propulsion source.

Internal Combustion Vehicles (ICE)

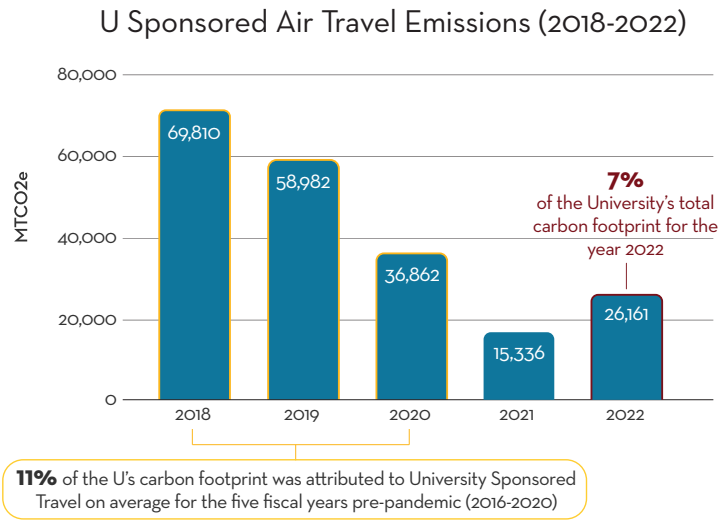
A vehicle that burns a fuel, such as gasoline or diesel, in an internal combustion engine to provide the energy that moves the vehicle.

University Sponsored Travel

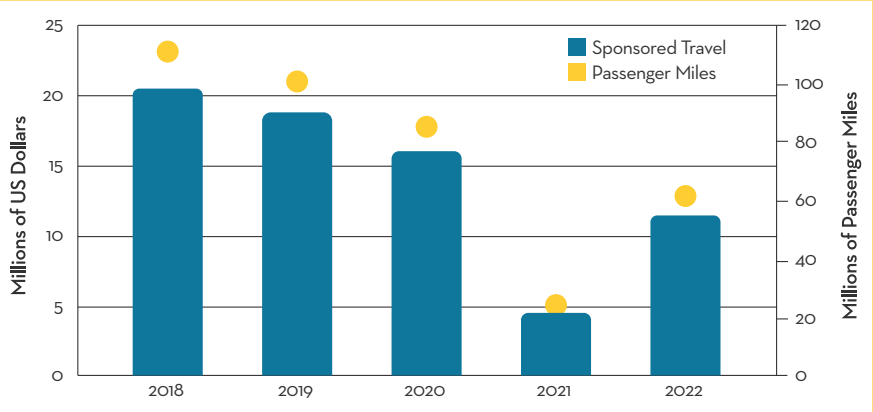
Travel is essential to the University's mission. Emissions from University sponsored travel covers emissions from third-party vendors associated with air and ground transportation. Emissions can be reduced by choosing a different travel mode, the uptake of more sustainable sources of fuel, reducing the amount of travel where equal hybrid options are possible, and lastly, buying offsets.

The use of sustainable jet fuel, hydrogen, and electrification options are emerging. However, technology is still lacking to be used at scale. Because of the University's reliance on industry travel, a large portion of the emissions in this sector will need to be offset (instead of reduced or transitioned to alternatives) within the next 10 years and then be reevaluated.

Emissions Tracked at UMN



Only air travel emissions are partially reported at this time. For example, study abroad has not historically been tracked because students purchase air travel independently. Other types of air travel are only moderately tracked through University purchasing systems. In the absence of robust, detailed data, the dollar amounts for travel are instead converted into passenger miles and emissions. In the future, passenger miles, reasons for travel, and other data can be collected to improve the understanding of University sponsored travel emissions and better inform climate action going forward. Data gathering, including emissions related to ground transportation, is another area of improvement.



Study Abroad Travel

The majority of study abroad travel is purchased independently by the student traveling and is not tracked within the University's purchasing systems. Based on the number of students that traveled and the continent they traveled to, study abroad travel may add approximately 12,350 MTCO2e to the 2019 emissions.

Current Status and Progress

The University started tracking emissions from air travel in 2008. The previous CAP did not address University sponsored travel. Offsets have been explored, but no action has historically been taken to reduce emissions from this sector.

What's the Challenge?

- Sustainable aviation fuel is in the early stages of development
- Carbon offset price projections are unknown and can be challenging to navigate
- Much of the University's Sponsored Travel is fixed, serving the University mission, and cannot be reduced
- Other alternatives for more sustainable travel (such as rail) are an option but are less likely between the Twin Cities and other destinations around the US
- Booking through a central hub or portal is not mandatory, which limits the ability to collect comprehensive data and drive narrowly-focused purchasing requirements

What's the Vision and How to Get There?

The University has not set a numeric emission reduction vision for University sponsored travel. The emissions reduction vision will be revisited after establishing a more robust data collection system over the next couple of years. During this time, the effects of the pandemic and other variables (increase in student recruitment travel, increasing size of the athletics network) will also be better understood. Lastly, carbon offset cost projections varied widely and without a better understanding of the financial implications, a reasonable carbon offset commitment could not be estimated at this time

Vision: Reduce emissions from University sponsored travel

Catalytic Project: Pilot Offsetting Program for Study Abroad

The University will establish a pilot air travel offset program for study abroad participation following the lead of other universities around the world.

Goal 1

Increase procurement of carbon-free or sustainable transportation modes

The University has several existing transportation contracts related to travel and may explore adding contracts to procure sustainable transportation options. In addition, procurement policies could be updated to include requirements or guidance for selecting travel options from vendors progressing toward their own climate goals. Lastly, annual reporting of emissions from third-party vendors would provide additional information about where there are opportunities for improvement.

KEY PERFORMANCE INDICATORS	TODAY	2033
Existence of a system to decarbonize contracts	No (2023)	Yes
Existence of travel policies with decarbonization considerations	No (2023)	Yes

STRATEGY
1.1 Require selecting air travel with a provider(s) that offsets emissions and/or has implemented sustainability/climate plans, unless deemed infeasible through a formal process (establish agreements to ensure emissions reductions are attributable to UMN's travel if necessary)
1.2 Establish ground transportation procurement policies that favor low-carbon transportation modes (EVs, trains)
1.3 Work with current contract vendors to implement options that direct employees to select low-emission choices at time of booking
1.4 Establish guidelines for staff and faculty to rent EVs and utilize public transport (including choosing accommodation based on access to transit and/or charging network) at final destinations
1.5 Incorporate incentives for procuring biofuels/renewable fuels for transportation modes into policies and contracts to increase/create new markets (biobased economy, biojet fuel, supporting emerging markets)

Goal 2

Increase utilization of carbon-reducing travel strategies

Emissions can be reduced from travel by selecting modes or itineraries with lower emissions or by reducing travel altogether. For example, swapping a train ride for a flight or renting an EV or walking at your destination over a vehicle that burns fossil fuels.

KEY PERFORMANCE INDICATORS	TODAY	2033
MTCO2 - documented miles prior to the application of offsets	58,982 (2019)	10% reduction
MTCO2 - undocumented miles* prior to the application of offsets	TBD (2025)*	10% reduction

**Undocumented travel miles refers to all ground transportation, individual study abroad, and other air travel that is not properly coded*

STRATEGY
2.1 Require sustainable modes of travel (trains and coaches) where available for University-organized programming for distances that take five hours of driving or less
2.2 Incentivize hybrid formats for UMN conferences held on campus and incentivize online professional development
2.3 Incentivize purchase of direct flights by subsidizing increased cost compared to layover journeys for units where budget is the overriding consideration
2.4 Provide support and education for booking zero to low-carbon travel tailored to travel type
2.5 Fund and support research on biofuels and other renewable fuels for transportation modes

Goal 3

Develop a program for purchasing high quality offsets with co-benefits linked to the type of travel

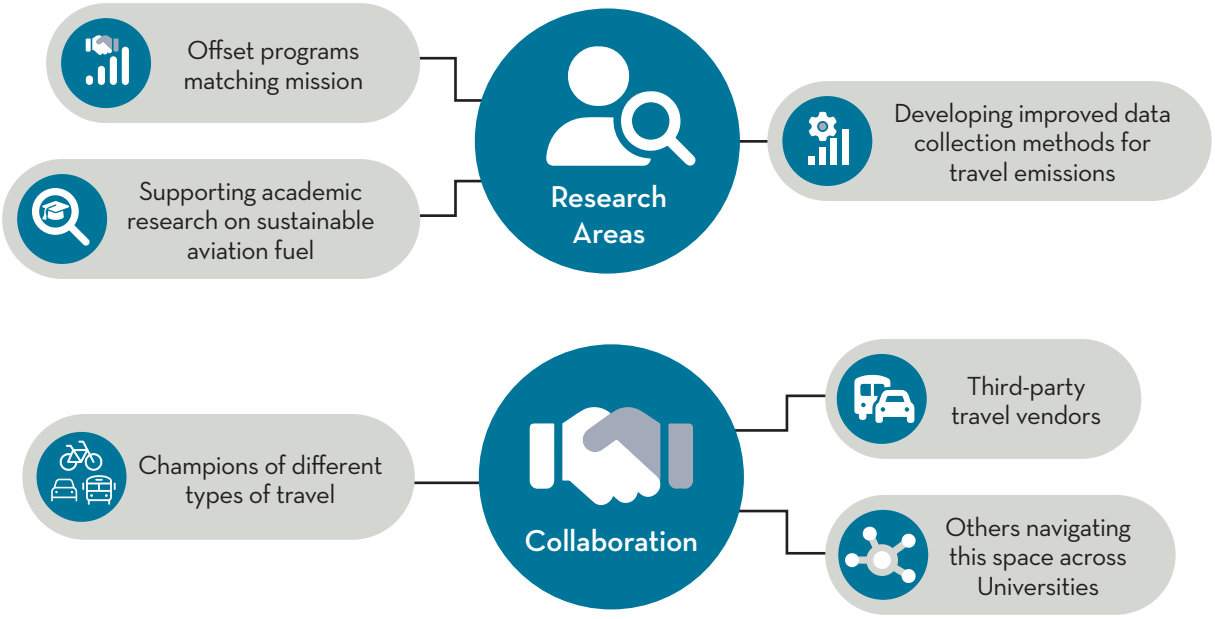
Offset programs are offered at a variety of price points and quality. Offset programs that are permanent, transparent, and verified tend to be of higher quality. Offset programs can also have local and programmatic co-benefits. For the purposes of this goal, the types of travel at the University are:

- Athletics
- Study abroad
- Research and research presentations
- Conference attendance, professional development, and training
- Administrative (recruitment/donor relations/official visits)
- Other

KEY PERFORMANCE INDICATORS	TODAY	2033
# of programmatic travel areas with an offset program with directly related benefits and targets	0 out of 6 (2023)	6 out of 6

STRATEGY
3.1 Establish a central pool of funds to offset the increased cost of sustainable travel
3.2 Update policies to allow carbon offsets as an allowable expense at the University and advocate for change in federal policy to make carbon tax/offsets an allowable expense on grants
3.3 Establish offset programs, policies, and targets by travel type

Future Research and Collaboration



Definitions

Carbon Offset

A reduction or elimination of greenhouse gas emissions in one location used to offset or make up for emissions produced elsewhere.

Sustainable Aviation Fuel

A fuel made from renewable biomass and waste resources that has the potential to deliver the performance of petroleum-based jet fuel but with a fraction of its carbon footprint (Department of Energy).

"An experience abroad is often the single most important and rewarding activity a student engages in during their academic career."

-Learning Abroad Center

Climate Adaptation

3

Overarching Approach

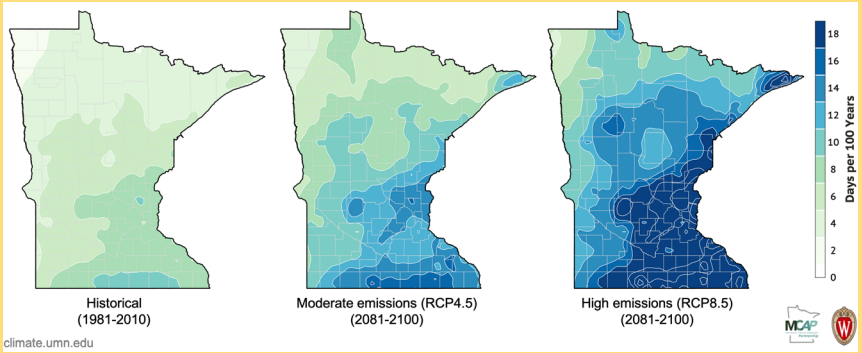
Climate adaptation planning at the University is at the very beginning stages. As a part of the Climate Action Plan, the University completed an initial assessment of the risks, vulnerabilities, and strengths across different types of infrastructure, environmental, and campus community assets. The next step will be to further understand how the University assets will be impacted under specific climate scenarios and how action can be taken to shore up and build the resilience of these assets.

Climate Hazards (Precipitation, Temperature, Severe Storms) + Infrastructure, Environment, & Campus Community Conditions = **Risk**

Risk + Adaptive Strengths = **Resilience**

Climate Hazards

Average Number of Days per 100 Years When Daily Rainfall Exceeds 4 Inches



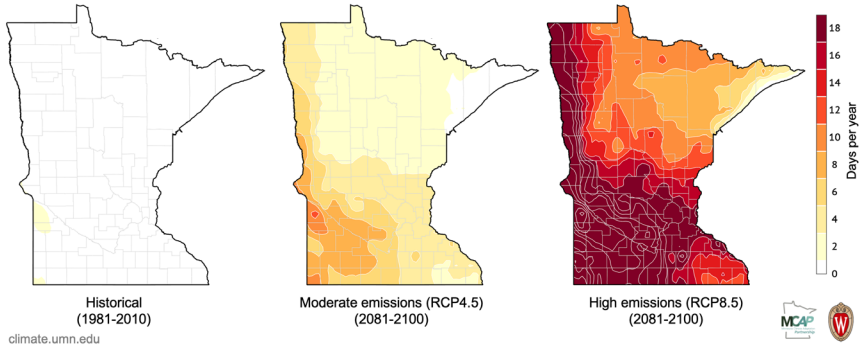
UMN Climate Adaptation Partnership, 2023a

Precipitation *(Drought, Flooding, Snowpack)*

Minnesota has already experienced increased precipitation, with the greatest increases occurring during spring and fall and with many annual precipitation records set during the 2010s (Easterling et al., 2017; DNR, 2010). Winter and spring precipitation (snow and rain) are projected to increase by up to 30% by the end of the century across the Midwest (Easterling et al., 2017). Heavy precipitation events have already become more frequent and occasionally more extreme, and climate projections indicate continued increases in the frequency and intensity of heavy precipitation in the future. Climate scientists project that Minnesota will face an increase in the length of some dry spells, which when paired with the likely heat extremes in the decades ahead, may increase drought severity beyond levels recently experienced in Minnesota. Minnesota's future climate is projected to include historic extremes of both precipitation and drought.

Temperature *(Seasonal Changes, Heat Exposure)*

Temperatures across Minnesota have already increased by an average of 3.0°F since the late 1800s, with the largest changes in temperature being recorded during winter and at night. Climate projections indicate the state will continue to warm in all seasons (Liess et al., 2022), with shorter winters, fewer cold waves, longer growing seasons, and increased summer heat extremes (Vose et al., 2017). Depending on the intensity of global greenhouse gas emissions, the Twin Cities could experience anywhere from four to fourteen days over 100°F annually (UMN Climate Adaptation Partnership, 2023b). Furthermore, an increase in winter temperatures elongates the frost-free season and causes greater problems in pest control, ice thickness, and infrastructure with increased freeze-thaw days (UMN Climate Adaptation Partnership, 2023c). Heat stress is projected to increase as a result of increased summer temperatures, increased humidity, and increased dew points. Generally, relief from extreme heat events comes at night, but overnight temperatures have also been warming in the state.



Average Number of Days Per Year When the Daily High Exceeds 100°F

UMN Climate Adaptation Partnership, 2023b

Severe Storms *(Tornadoes, Hail, Thunderstorms, Winds)*

The Twin Cities area is in an active region for tornadoes, large hail, and damaging thunderstorm winds, and long-term analysis has shown that major, destructive, and even deadly severe storm outbreaks recur within some parts of the metropolitan area every three years on average (Blumenfeld, 2010). Severe weather databases are sensitive to changes in population, technology, and reporting procedures, making it difficult to identify changes in the frequency or intensity of severe storm events over time or to link any observed changes with increased global temperatures. In 2017, three tornadoes struck Minnesota on March 6, marking the earliest date for tornadoes on record. In 2021, over 20 tornadoes occurred on December 15, marking the latest such event on record by nearly a month. These record-early and late events match research indicating that a warmer climate has expanded severe weather seasons nationally (Kossin et al., 2017). Additionally, though rising global temperatures may be decreasing the number of days with tornadoes, they appear to be increasing the number of tornadoes on those days, leading to more and even larger "outbreaks." Climate projections indicate that hail and damaging thunderstorms may become more frequent and/or more intense through the 21st century (Kossin et al., 2017).

Assets

The Resilience and Adaptation Working Group selected and analyzed assets within the campus purview. The University has a responsibility to oversee **infrastructure systems** (including energy networks), care for the **living environment** on campus, and to support the **campus community**. The current condition of these assets is an essential indicator of adaptability and resilience. Assets in need of repair or care that face the greatest impacts of climate change will be prioritized in future analysis and action. Assets in excellent condition are a demonstration of where the University's adaptive strengths lie.

Infrastructure

Asset	Description/Condition
Building Envelope	Outer shell of buildings including the general facade. Recommended envelope replacements (windows, roofs, etc) are upwards of $750M in the next decade.
Building Research/ Laboratory Equipment	Indoor research facilities such as: laboratories, freezer storage, chemical storage, film processing, cold rooms, and more. Conditions are variable depending on the space with some HVAC, humidity, and mold concerns.
Grey Stormwater Infrastructure	Engineered system of drains and pipes collecting rain and snowmelt from impervious surfaces and conveying it to local water bodies. The condition is well tracked and managed.
Severe Storm/ Tornado Shelters	Building structure designated for use during a severe storm. Generally in good condition but may lack adequate capacity.
Hardscapes/ Impervious Surfaces	Hardscapes are parking lots, streets, sidewalks, and plazas on campus. Impervious surfaces don't allow water to pass through the material, which includes most hardscapes as well as building roofs. 77% meet the "very good to excellent" condition rating.
Archives	The Archives refers to Andersen Library's collection of historical documents, data, photographs, publications, and websites. Building is in Good condition (Facilities Condition Assessment, 2023). Fire prevention and moisture control systems are being updated.
Communications/ IT Network	Communications infrastructure includes the data center as well as communication towers and any IT systems. The mechanical support for the main data center is aging and lacking adequate backup/ redundancy.

Energy Systems

Asset	Description/Condition
Electric Distribution	System of underground electrical wires, transformers, substations, and other network components on campus. Condition is variable but campus buildings do have 13.8kV of redundancy.
Steam Distribution	Pipe located in 9-miles of underground tunnels. Conditions are deteriorating faster than the pace of repairs.
Chilled Water Distribution	System of pipes, cooling tanks, and chillers that are responsible for distributing chilled water to buildings on campus. The majority of the system was built within the last 30 years and is fairly resilient.
Emergency Generators	Back up power sources fueled with diesel located throughout campus. Inventory is aging and many generators and transfer switches are obsolete.
Chilled Water Generation	17 central cooling plants that feed into six geographically separated networks. Conditions vary from new to reaching end of life.
Steam Generation	Two power plants on the Minneapolis campus and one plant on the St. Paul campus. One newer facility exists in Minneapolis but the St. Paul plant is aging.
Power Generation	Electric on-site power generation resides at the newly built Minneapolis UMN co-generation plant.
On-site Fuels	Fuel tanks for vehicles and back-up power sources. The condition is variable but almost all tanks are at or near end of life, and there is not a sufficient enough supply of fuel to generators for long-term blackouts.

Environment

Asset	Description/Condition
Drinking Water	Surface water is the main water source, along with wells, for the Twin Cities campus, with drinking water meeting all applicable industry standards.
River Banks/Slope	Existing on both the East Bank and West Bank campuses, running along East River Parkway and West River Parkway with minimal land in the 100 year floodplain. A gorge area that is near/touching campus is prone to landslides.
Tree Canopy	7.8% of campus is shaded with trees. There are 11,359 total trees and 75% are healthy. Campus regularly experiences a slight annual net loss of trees.
Green Space	Green space comprises 64% of campus land and has a Good condition rating.
Campus Agriculture Lands/ Research Gardens	Campus farm and research gardens on campus. Conditions are variable. The campus neighborhood increasingly experiences flooding due to poor drainage.
Air Quality	Air quality as measured by the quantity of the following pollutants: fine particles (PM2.5), ozone, sulfur dioxide, nitrogen dioxide, and carbon monoxide (Minnesota Pollution Control Agency, n.d.). Listed as improving, with 75% of days having a "good" Air Quality Index rating.

Campus Community

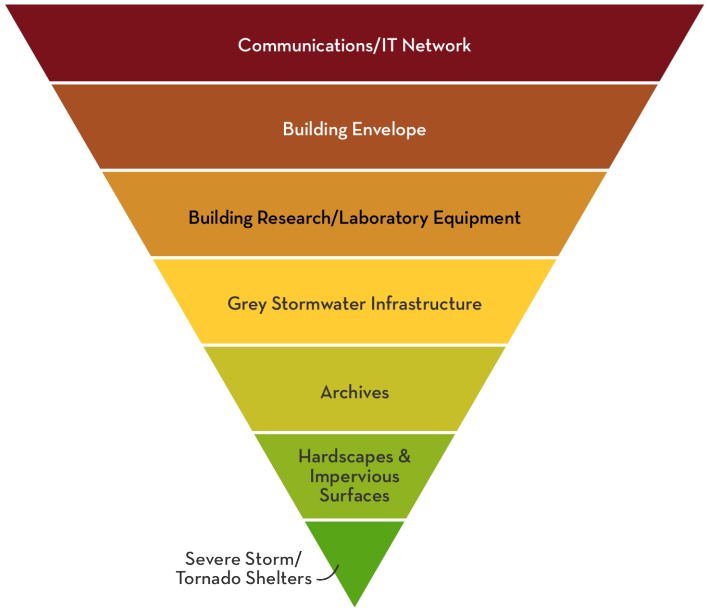
The people within the campus community are paramount to the University. In the same way that condition ratings reflect the ability of infrastructure or the natural environment to adapt to climate change, there are conditions within the campus community that can cause populations experiencing certain circumstances to be more vulnerable. The University has the responsibility to support the campus community in the same way it cares for assets. Many of the campus conditions that reduce resiliency are systemically reinforced.

Asset	Description/Condition
Populations with Financial Vulnerabilities	22% of students eligible for PELL grants, the 19% of employees that make less than the Twin Cities' living wage, and systemically marginalized communities.
Populations with Health Vulnerabilities	Hospital patients, daycare and child program participants (youth under 5), the elderly (population over 65), people with pre-existing health conditions are considered, as well as systemically marginalized communities.
Populations with Accessibility Barriers	Mobility issues, language gaps, low social connectivity (international students, first-year and first generation students, new staff/faculty) constitute those with barriers to accessibility. 25% of students are first generation students, and upwards of 4,000 students are registered with the disability resource center.
Populations Exposed to the Elements	Essential workers (on-site 100% of the time) and employees who work outside are more exposed to the elements.
Hybrid Workers and Learners	These are employees who are not deemed essential and have a greater degree of flexibility with their work. Students with access to online learning are also within this category.
All Others	These are members of the campus community that are not deemed vulnerable or in a particular work/learn group.

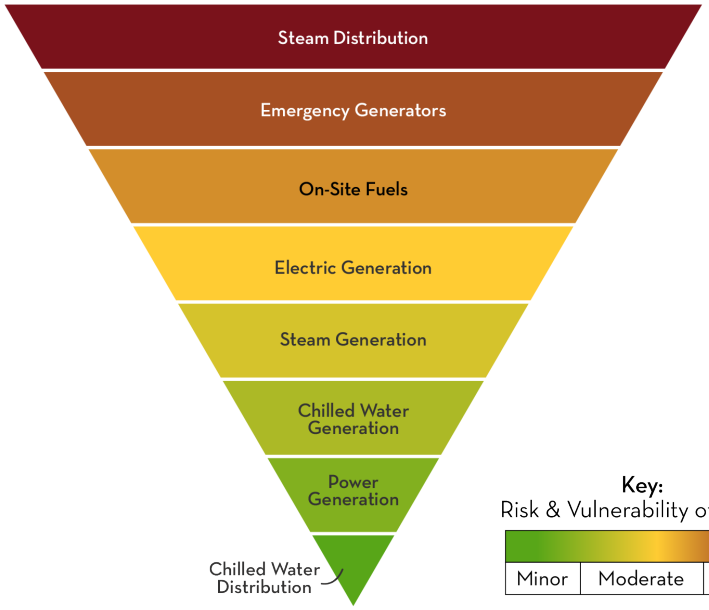
Risk and Vulnerability Assessment

Campus experts shared information on asset condition and vulnerability to three climate hazards (variable precipitation, variable temperature, and severe storms) through surveys and meetings. The risk and vulnerability assessment graphics in this section represent the cumulative consideration of the assets' condition plus the vulnerability of the asset to each climate hazard. In the risk and vulnerability assessment graphics, green does not necessarily mean no vulnerability or risk, but rather that the asset is less vulnerable in relation to the other assets analyzed.

Infrastructure



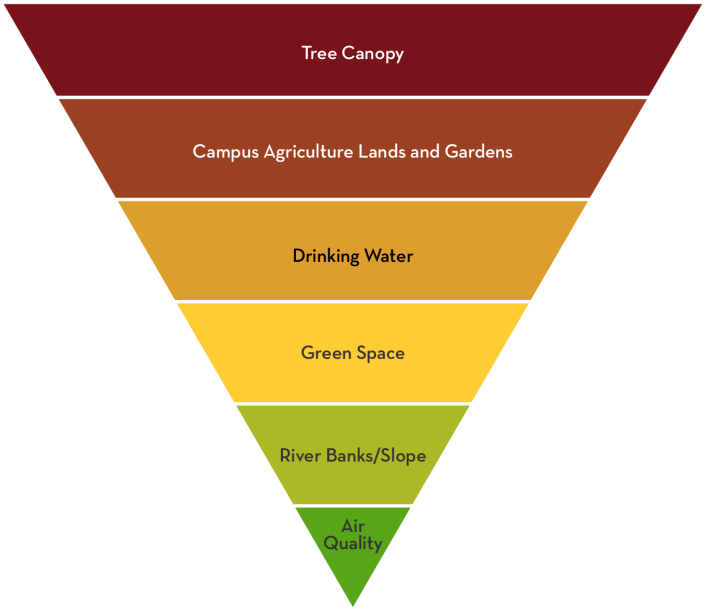
Energy



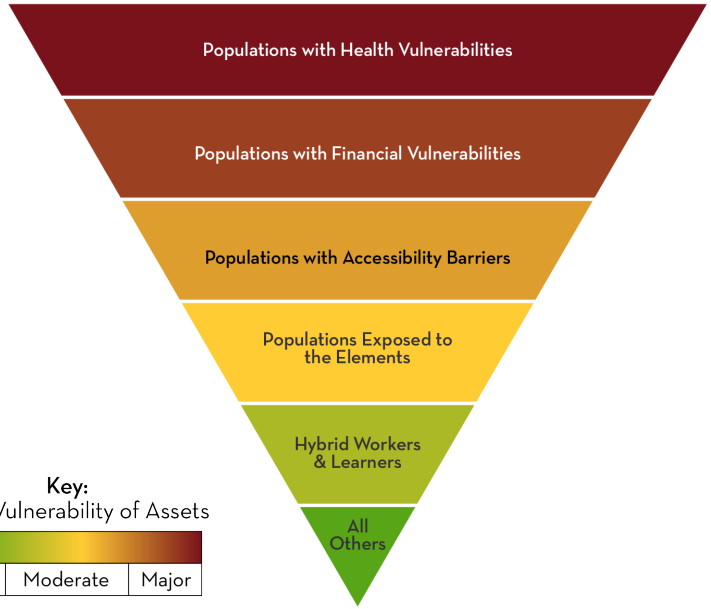
Key:
Risk & Vulnerability of Assets

Minor	Moderate	Major

Environment



Campus Community



Key:
Risk & Vulnerability of Assets

Adaptive Strengths

The assets' strengths were also assessed through multiple rounds of collecting data and input from experts and stakeholders. The initial findings highlight research and campus green spaces as strengths that will aid the University's resilience. The University's strength in research lies in the quality of the research facilities and research capacity. In particular, the University has the capacity to continue to educate ourselves and our peers on climate change while looking for advancing climate mitigation and adaptation solutions through research. Campus green spaces, particularly trees, contribute to health, air quality, and the buffering of the urban heat island effect. Additional areas of notable strength were the availability of data for decision making, the University's comprehensive understanding of its assets, the expertise of staff, the rigor of maintenance, and the redundancy of systems.

Next Steps

The risk, vulnerability, and strength assessment is the first of its kind at the University of Minnesota Twin Cities. Further work needs to be completed to fully understand the University's detailed risks and to develop strategies to reduce vulnerability and fortify strengths. Specific climate scenarios will be developed for each hazard, and primary and secondary impacts of individual assets will be analyzed. Climate adaptation planning will then continue with the Working Group, campus experts, and the campus community to develop strategies to build resilience.

Implementation Support

4

Cross-Cutting Initiatives

During the planning process, common themes and strategies, with broader impacts and considerations, emerged across Working Groups. These cross-cutting opportunities have the ability to advance one or more aspects of the CAP and are critical to achieving mitigation and adaptation goals and strategies.

Develop a Culture of Sustainability on Campus and in Communications

Climate action can't be the domain of only a few specialists across the institution. Given the urgency for action and the scale of the challenge, this undertaking needs to engage across the University community and the insights gained need to extend broadly into the larger society. While stakeholders across the institution are eager to participate in this work, they often lack an understanding of how to become involved. Strategies to address this gap between interest and action and to foster a culture of climate protection at the University include:

- Amplify the ongoing diversity, equity, and inclusion work of the University
- Increase the visibility of the importance of climate action with senior leadership
- Develop a strategic engagement plan with targeted messages for different audiences across the campus community
- Communicate opportunities for the campus community to be part of implementation
- Seek to understand shared values and opportunities with internal and external partners
- Partner with other University departments to share climate action achievements
- Share climate action progress to support recruitment, onboarding, and retention of students and employees
- Identify pilot projects to learn and share findings with others around the state
- Advocate for support at the legislature and with other key partners

Enhance Climate Action in Curriculum and Research

Climate literacy and proficiency in climate solutions are required competencies in many organizations today. As the climate crisis progresses, these skills will become increasingly relevant. By integrating climate change into students' curricular experience and building on existing strengths in climate-related

research, the University can enhance its service to stakeholders. In addition, by coupling the climate action happening on campus with research and teaching, knowledge gaps in climate solutions can be identified, explored, and addressed to advance University mitigation and adaptation goals while building a living laboratory that enriches student and faculty experience. Strategies to bring about this integration include:

- Enhance and expand research and teaching on climate mitigation and adaptation
- Pursue opportunities to make campus a living laboratory
- Advance implementation of the CAP through research and teaching
- Increase faculty tools and support integrating climate action into research and teaching
- Support internal grant opportunities to encourage research and curricular innovation

Pursue Carbon Dioxide Removal

All models prepared by the Intergovernmental Panel on Climate Change (IPCC) show the need for some carbon dioxide removal from the atmosphere in order to limit warming to 1.5°C. Some categories of emissions attributable to the University, like air travel, are expected to be difficult to directly decarbonize in the foreseeable future. In addition, the CAP does not account for many upstream and downstream emissions, referred to as scope 3 emissions, associated with University activity. The University can play an important leadership role in driving scientific understanding and practice of effective carbon dioxide removal programs. Strategies to bring about this work include:

- Charge a task force to research and make recommendations on the best use and sourcing of carbon insetting, offsetting, and carbon removal credits
- Identify sources of funding to procure carbon credits
- Engage with and learn from academic expertise related to carbon dioxide removal and sequestration or utilization

Carbon Pricing

A carbon price, sometimes referred to as the Social Cost of Carbon (SCC), is a unit cost that can be applied to the direct cost of burning fossil fuels. Carbon pricing attempts to quantify the cost of climate change to society, such as crop loss due to drought, increased health care costs from heat waves, and loss of property from flooding. Quantifying the SCC daylights impacts from climate change that are often disproportionately borne by the most vulnerable, and helps shift the burden for the damage from greenhouse gas emissions back to those who are responsible for it and who can avoid it.

While there is a growing consensus that carbon pricing has an important role in the transition to a decarbonized economy, economists and multiple levels of government have debated what the carbon price is, how to calculate it, and how to use it. The Biden Administration set a price on carbon, and some states, including Minnesota, have set a range for the cost of carbon. Several universities and businesses are also implementing a carbon price mechanism as a proxy in capital planning choices, attaching it to the cost of airfare, and several other ways.

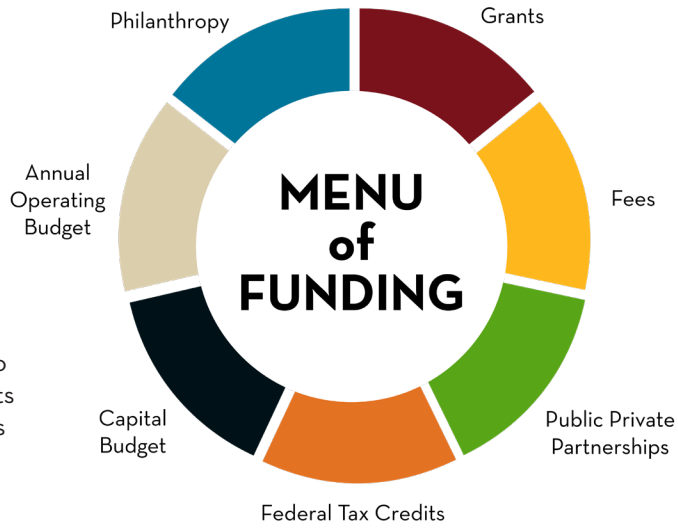
The University of Minnesota System can support climate action planning work by creating a task force to establish a price on carbon and delineate its use.

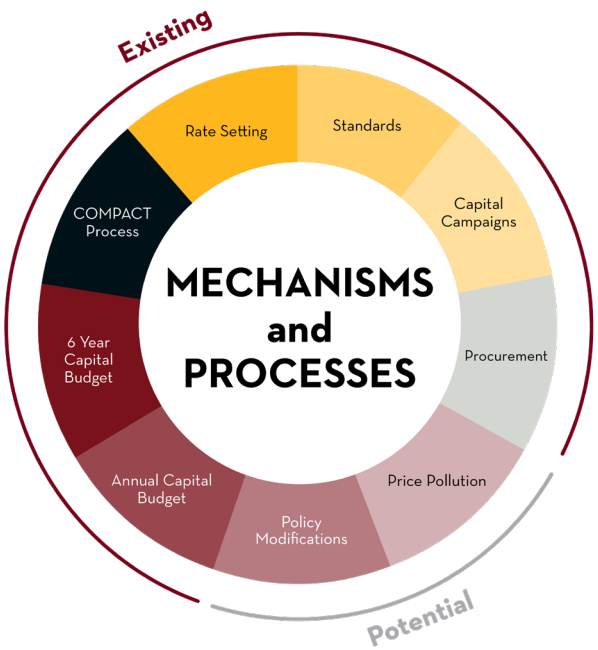
Develop a Funding and Finance Approach to Advance Goals

Funding to accomplish the goals of the CAP will take a blend of familiar resources and innovative means. Grants, Inflation Reduction Act (IRA) funds, and existing external resources will help move initiatives forward, but internal funds will also need to be appropriately allocated to achieve the necessary changes required to meet the University's carbon neutrality and resiliency commitments.

Developing a direct implementation cost of the CAP at this time would have a large margin of error and do a disservice to the long-term implementation. Markets and technology are always evolving and interventions may become more or less financially appealing over time. The total cost of ownership (TCO) should be one of several criteria for strategy evaluation going forward. An informed total cost of ownership not only recognizes the upfront price, but also ongoing costs, return on investment, and the impact choices have on future avoided costs and impacts of climate change. The TCO should also be compared to the business as usual, which has a cost too. Strategies to develop funding and finance approaches to support climate action include:

- Create and revise financial tools, resources, and processes to enable the objectives identified in the CAP
- Identify and pursue grants and incentives aligned with objectives
- Create a task force to make recommendations on the use and value of a carbon price
- Increase capacity, tools, and support to implement strategies
- Utilize a Total Cost of Ownership framework for decision making

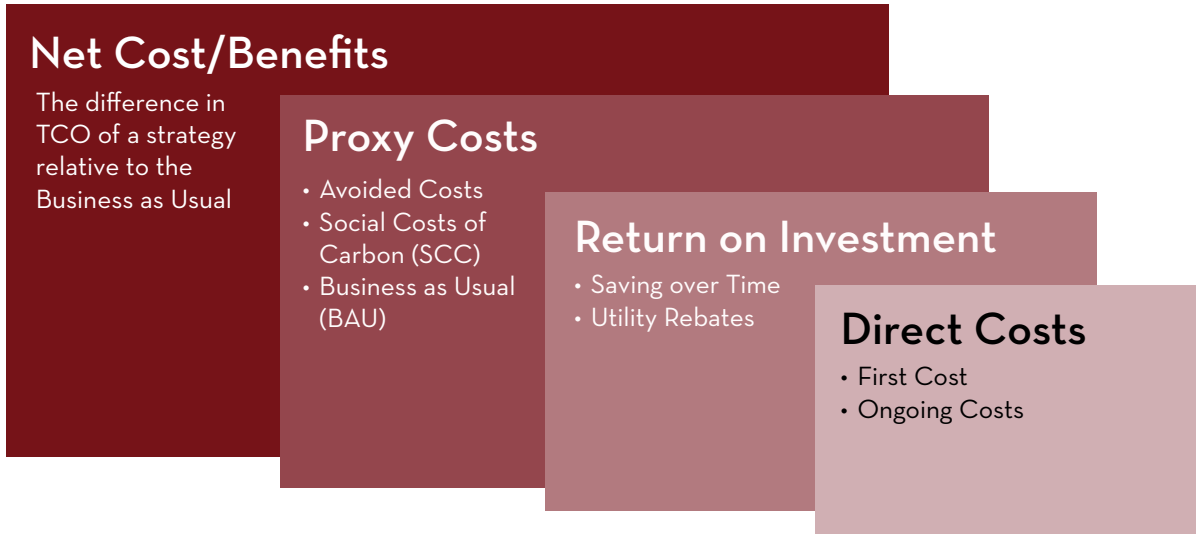




Inflation Reduction Act

The Inflation Reduction Act (IRA) passed into law in August 2022 and provides nearly $400 billion in funding over the next decade to enable climate action. Importantly, the law includes provisions for nonprofit entities, like the University, to receive direct payment from the US Treasury through tax credits for installing many of the technologies referenced in the CAP. These include solar and wind energy, energy storage, geothermal, and electric vehicles. The IRA and other federal funds can reduce costs of implementing climate mitigation and resilience actions substantially, but the University must act swiftly as many of the benefits expire after 10 years and some of the projects have long development cycles.

Total Cost of Ownership (TCO)



Plan Implementation

The Working Groups will develop implementation blueprints to support the strategies identified to reduce carbon emissions. The blueprints will identify detailed pathways to completion including implementation steps, champions, partners, a timeline for completing each step, and other pertinent information specific to the strategy.

In addition, building upon the climate hazard risk and vulnerability assessment, the Resilience and Adaptation Working Group will refine key areas to focus on through reviewing specific climate hazard scenarios and developing strategies to address specific vulnerabilities and fortify strengths.

The Twin Cities Sustainability Committee will be responsible for annually reviewing the progress of the CAP. Champions identified in the blueprints will be asked to present progress updates. Key performance indicators will be collected and reviewed on a biennial basis by the Office of Sustainability, reported to senior leadership and the Board of Regents, and posted to the website. As information on progress is shared and new information or technology emerges, the CAP will be updated to reflect strategic pivot points over time.

"A key strategy to accomplish this ambitious (net-zero carbon) goal is to ensure that early scoping on capital projects remains open to emerging technologies, and allocates budgets to include investments in sustainability measures as essential, not optional, project components."

- Twin Cities Campus Plan, 2021

Acknowledgements

The CAP was made possible by the contributions and commitment of dozens of people across the institution. We are grateful for their generosity of time and skill, and the sincerity they brought to the work.

Twin Cities Sustainability Committee

Jacob Bechtold - Undergraduate Student, College of Science and Engineering
Eesha Bharti - Undergraduate Student, College of Biological Sciences
Catherine Bruns - PhD Candidate, College of Liberal Arts
Brian Buhr (Co-Chair) - Dean, College of Food, Agricultural, and Natural Resource Sciences
Andrew Carter - PhD Candidate, College of Food, Agricultural, and Natural Resource Sciences
Ashley Dziuk - Executive Assistant, Office of Human Resources
Shannon Farrell - Interim Research Data Services Librarian and Co-Director of AgEcon Search, University Libraries
Madisen Gittlin - PhD Candidate, College of Food, Agricultural, and Natural Resource Sciences / College of Science and Engineering
Richard Graves - Associate Professor, College of Design; Research Director, Center for Sustainable Building Research
Jessica Hellmann - Director, Institute on the Environment
Dawn Hood - Associate Director, Center for Transportation Studies
Patricia Izek - Director of Diversity, Equity, Inclusion & Accessibility, University Libraries
Erik Jensen - Senior Building and Grounds Worker, Facilities Management
Cathy Jordan - Associate Director for Leadership & Education, Institute on the Environment; Professor, Department of Pediatrics
Uwe Kortshagen - Professor, College of Science and Engineering
Kate Nelson - Director of Campus Sustainability, Facilities Management
Bill Paulus (Co-Chair) - Associate Vice President, Facilities Management
Teddie Potter - Clinical Professor, School of Nursing
Pervin Shroff - Professor, Carlson School of Management
Jeff Standish - Associate Director, MnDRIVE
Shane Stennes - Chief Sustainability Officer, University Services
Avni Tripathi - Undergraduate Student, Carlson School of Management
Sarah Tummala - Instructor, School of Public Health

Working Groups

Adaptation and Resilience

Cathy Abene - Principal Civil Engineer, Facilities Management
Farrukh Bashir - Associate Director, West Bank District, Facilities Management
Andrew Caddock - Senior Planner, Planning, Space, and Real Estate
Amanda Farris - Senior Program Manager, University of Minnesota Climate Adaptation Partnership
Andy Garcia-Velez - Adaptation and Resilience Intern; Undergraduate Student, College of Liberal Arts
Madisen Gittlin - PhD Candidate, College of Food, Agricultural, and Natural Resource Sciences/ College of Science and Engineering
Cathy Jordan (Lead) - Associate Director for Leadership & Education, Institute on the Environment; Professor, Department of Pediatrics
Amanda Kohn, Sustainability Project Manager, University Services
Kate Nelson - Director of Campus Sustainability, Facilities Management
David Paulu - Assistant Radiation Safety Officer; Interim Deputy Director of Emergency Management, University Health and Safety
Tom Ritzer - Assistant Director, Landcare, Facilities Management
Heidi Roop - Assistant Professor, Department of Soil, Water, and Climate; University of Minnesota Climate Adaptation Partnership
Pervin Shroff - Professor, Carlson School of Management
Stacey Stark - Associate Director, U-Spatial

Commuting

Jason Cao - Professor, Humphrey School of Public Affairs
Andrew Carter - PhD Candidate, College of Food, Agricultural, and Natural Resource Sciences
Jacob Harris - Commuting Intern; College of Food, Agricultural, and Natural Resource Sciences
Dawn Hood (Lead) - Associate Director, Center for Transportation Studies
Amanda Kohn - Sustainability Project Manager, University Services
John Mark Lucas - Transportation Programs Manager, Parking & Transportation Services
Kate Nelson - Director of Campus Sustainability, Facilities Management
Libby Stille - Communications Specialist, Office of Human Resources
Kendre Turoni - Program Director, Off-Campus Living

Energy Supply and Distribution

Sairaj Dhople - Assistant Professor, College of Science and Engineering
Jenna Fang - Energy Intern; Undergraduate Student, Carlson School of Management
Richard Graves - Associate Professor, College of Design; Research Director, Center for Sustainable Building Research
Mike Grimstad (Lead) - Principal Engineer, Energy Management
Amanda Kohn - Sustainability Project Manager, University Services
Uwe Kortshagen - Professor, College of Science and Engineering, Department of Mechanical Engineering
Joe Krekeler - Senior Energy Engineer Supervisor, Energy Management
Arwen Larson - Financial Analyst, University Services Finance
Peter Lindstrom - Public Sector & Community Engagement Manager, Clean Energy Resource Teams - Regional Sustainable Development Partnerships (CERTS-RSDP)
Energy Management
Scott McCord - Principal Mechanical Engineering Supervisor, Energy Management
Beth Mercer-Taylor - Sustainability Education Program Director, Institute on the Environment
Dana Murdoch - Design Project Manager II, Capital Project Management
Kate Nelson - Director of Campus Sustainability, Facilities Management
Kate Saucedo - Student Representative, College of Food, Agricultural, and Natural Resource Sciences
Jeff Standish - Associate Director, MnDRIVE
Nora Tanel - Energy & General Support Intern; Undergraduate Student, College of Food, Agricultural, and Natural Resource Sciences
Avni Tripathi - Undergraduate Student, Carlson School of Management

Erik Wadman - Assistant Project Manager, Capital Project Management
Jessie Whittaker - Utility Accountant, University Services Finance and Payroll

University Sponsored Travel

Shannon Farrell - Interim Research Data Services Librarian and Co-Director of AgEcon Search, University Libraries
Brenda Fisher - Travel Advisor, Shorts Travel Management
Rebekka Gronfor White - Travel Program Administrator, Purchasing Services
Emily Hoover - Professor, College of Food, Agricultural, and Natural Resource Sciences
Tiffany Howard - Former Assistant Athletics Director, Intercollegiate Athletics
Ann Hubbard - Assistant Dean, Learning Abroad
Amanda Kohn - Sustainability Project Manager, University Services
Timothy McCleary - Associate Athletics Director, Intercollegiate Athletics
Kate Nelson - Director of Campus Sustainability, Facilities Management
Rylie Pelton - Research Scientist, Institute on the Environment
Paige Rohman (Lead) - Senior Assistant to the Vice President, University Services
Ainsley Schwerr - Travel Intern; Undergraduate Student, College of Liberal Arts
Paulina Vergara Buitrago - PhD Student, College of Food, Agricultural, and Natural Resource Sciences

University Fleet

Ross Allanson (Lead) - Parking & Transportation Services
Kate Gerber - Fleet Intern; College of Food, Agricultural, and Natural Resource Sciences
Melina Helgeson - Assistant Director of Fleet Management, Parking & Transportation Services
Dawn Hood - Associate Director, Center for Transportation Studies
Amanda Kohn - Sustainability Project Manager, University Services
Kate Nelson - Director of Campus Sustainability, Facilities Management
Will Northrop - Associate Professor, Mechanical Engineering
Clint Schoeck - Senior Finance Manager, Parking & Transportation Services
Shashi Shekhar - Professor, Department of Computer Science & Engineering
Kyle Shelton -Director, Center for Transportation Studies
Jeff Standish - Associate Director, MnDRIVE
Linda Weingarten - Director of Central Services; Facilities Management

Other Contributors

Jay Amundson - Senior Energy Engineer, Energy Management
Ian Baebenroth - Space Systems Data Analyst, Facility Information Services
Brent Belanger - Golf Course Superintendent, University Recreation and Wellness
Anthony Bittner - Fleet Manager, Parking and Transportation Services
Andrew Chan - Portfolio Management Program Manager, University Services
John J. Cook - Engineering Records Supervisor, U Services Information and Systems
Joseph Dahip - Transit Manager, Parking and Transportation Services
Abby Diekmann - Mechanical Engineer, Energy Management
Chris Dillon - Chief Operating Officer, College of Veterinary Medicine
Maram Falk - Assistant Director of Facilities Engineering and Energy Efficiency, Energy Management
Tobias Fimpel - Enterprise GIS, University Services
Lonetta Hanson - Administrative Services Assistant Director & Chief of Staff, Parking and Transportation Services
Andy Johnson - Turf Fields and Outdoor Facilities Supervisor, Intercollegiate Athletics
Jones Lang LaSalle
John Kellogg - Analyst, Institutional Data and Research
Zahra Khani - GIS Analyst, Geographic Information Systems
Kathy Krum - Finance Manager FANS/APEC, CFANS Finance and Budget
Arwen Larson - Financial Analyst, University Services Finance
Ann Lundholm - Data Analyst, Facilities Management Utilities Engineering
Office of Measurement Services
Tom Ritzer - Assistant Director, Landcare, Facilities Management
Salas O'Brien
Andrew Scobbie - Campus Operations Manager, MN Agricultural Experiment Station
Erin Suski - Graphic and Multimedia Designer, Printing Services
Systemwide Sustainability Colleagues
Vera Westrum-Ostrom - Senior Planner, Planning, Space, and Real Estate (PSRE)
Linnea Weum - Environmental Compliance Administrator, Department of Environmental Health and Safety
Linda Woock - Strategic Sourcing Program Manager, Purchasing Services

Sustainability Staff

Systemwide Office

Jenna Fang - Energy Intern; Undergraduate Student, Carlson School of Management
Andy Garcia-Velez - Adaptation and Resilience Intern; Undergraduate Student, College of Liberal Arts
Kate Gerber - Fleet Intern; Undergraduate Student, College of Food, Agricultural, and Natural Resource Sciences
Jacob Harris - Commuting Intern; Graduate Student, College of Food, Agricultural, and Natural Resource Sciences
Amanda Kohn - Sustainability Project Manager
Ainsley Schwerr - Travel Intern; Undergraduate Student, College of Liberal Arts
Shane Stennes - Chief Sustainability Officer
Nora Tanel - Energy & General Support Intern; Undergraduate Student, College of Food, Agricultural, and Natural Resource Sciences
Coby Vanderwall - GHG and Data Analysis Intern; Undergraduate Student, College of Science and Engineering

Twin Cities Office

Yumi Kashihara - Sustainability Student Assistant; Undergraduate Student, College of Liberal Arts
Hannah Lauber - Sustainability Communications Associate
Kate Nelson - Director of Campus Sustainability
Yesui Nyamchuluun - Sustainability Student Assistant; Undergraduate Student, College of Liberal Arts
Carley Rice - Sustainability Coordinator
Luisa Santos Nothaft - Sustainability Student Assistant; Undergraduate Student, College of Science and Engineering
Molly Vagle - Student Sustainability Communications Assistant; Undergraduate Student, College of Food, Agricultural, and Natural Resource Sciences

---

A special thanks to all who participated in the town hall, workshops, surveys, open house, and other meetings. Your advocacy and input has been invaluable.

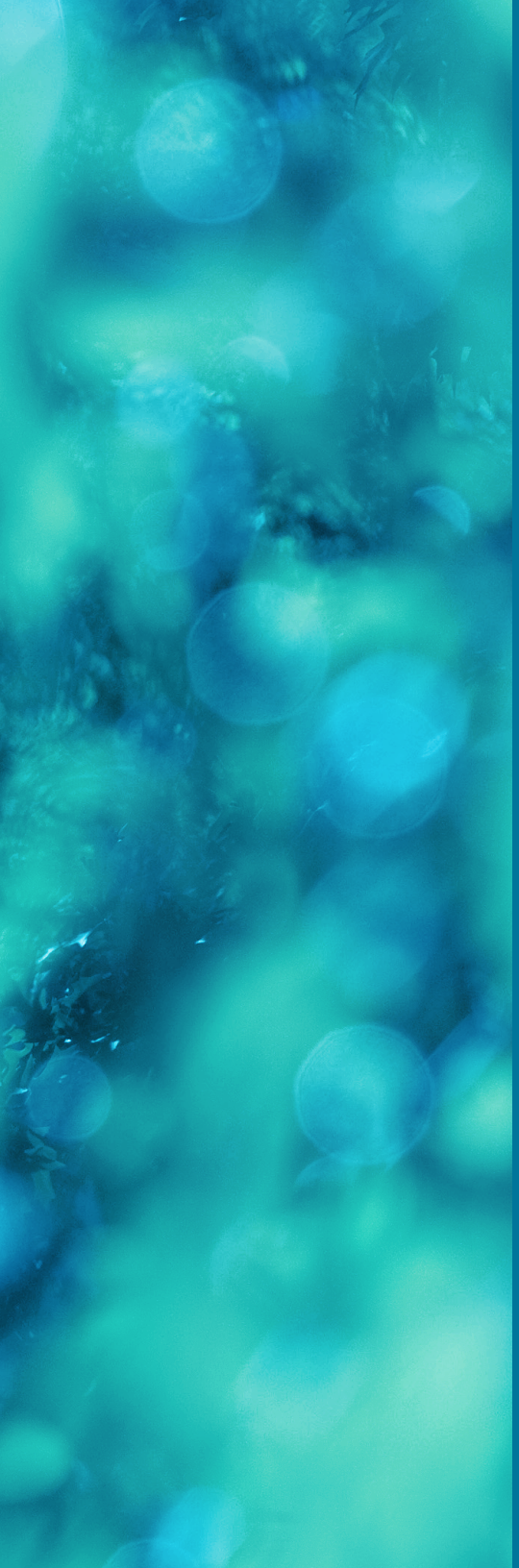

UNIVERSITY
OF MINNESOTA

Appendix A
Definitions

See the full appendices online at:
z.umn.edu/CAPappendix

Appendix B
Engagement Summaries


Driven to
Discover
UNIVERSITY
OF MINNESOTA
Driven to
Discover℠



Appendix C
Future Questions


UNIVERSITY OF MINN

Appendix D
Citations