

# CLIMATE ACTION & RESILIENCE DRAFT PLAN

A FRAMEWORK FOR OUR COMMUNITY  
TO ADDRESS THE IMPACT OF CLIMATE CHANGE



**APRIL 2019 DRAFT**

City of Saint Paul  
Mayor Melvin Carter

# LETTER FROM MAYOR CARTER



We are at a pivotal moment in the City of Saint Paul. To secure a successful future for all of our residents, we must work together to address the impact of climate change. In Saint Paul, we have been experiencing climate change for many years -- with warmer winters, more frequent heavy precipitation events leading to more frequent floods, rockslides, and downed trees, and freeze-thaw cycles that are hard on our streets and infrastructure. Around the country and the world, communities are being increasingly affected by wildfires, floods, bigger storms, droughts, famines, and extreme heat waves.

Our collective effort as a community is essential for the natural systems that we depend on and for our health and well-being. With this bold new Climate Action and Resilience Plan, the City of Saint Paul will build on a long history of environmental stewardship with our residents, businesses, governmental units, and community partners. It focuses on strategies to reduce greenhouse gas emissions which come from the energy we use in buildings, and the fuels that we use for transportation. To ensure everyone thrives as we become a more resilient city, the plan also identifies and prioritizes actions to help our most vulnerable populations, lower-income residents, and communities of color.

Taking bold and sustained action on climate change will require collaboration among our public-private sectors, neighbors, businesses, and community organizations. Our climate and resilience work will save critical resources, and most importantly, ensure we are building a prosperous city for our children and grandchildren. As we move forward together, I look forward to being your teammate in building an even more resilient and sustainable city that works for all of us.

Melvin Carter, Mayor

# TABLE OF CONTENTS



<b>Letter from Mayor Carter.....</b>	<b>2</b>
<b>Table of Contents.....</b>	<b>3</b>
<b>Acknowledgements.....</b>	<b>4</b>
<b>Executive summary.....</b>	<b>5</b>
<b>Introduction.....</b>	<b>9</b>
<b>What Causes Climate Change?.....</b>	<b>12</b>
<b>Local Impacts of a Changing Climate.....</b>	<b>13</b>
<b>Climate Resilience.....</b>	<b>14</b>
<b>Climate Vulnerabilities.....</b>	<b>15</b>
<b>Resilience Strategies.....</b>	<b>25</b>
<b>Climate Change Mitigation.....</b>	<b>27</b>
<b>Community Emissions Profile.....</b>	<b>30</b>
<b>Building Sector.....</b>	<b>31</b>
<b>Transportation &amp; Mobility.....</b>	<b>40</b>
<b>Waste Management.....</b>	<b>43</b>
<b>Water Conservation and Water Quality.....</b>	<b>44</b>
<b>Emissions Reduction Goal: Equity, Efficiency, &amp; Electricity... Targets and Initiatives 2019-2025.....</b>	<b>45 46</b>
<b>Looking Forward.....</b>	<b>60</b>



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Saint Paul is taking ambitious action to eliminate our contribution to global climate change by adopting a goal of carbon neutrality by 2050 and reducing emissions 50% by 2030 from business as usual. The city understands that the impact of climate change is already here, and it is necessary to prepare for anticipated disruptions. This plan includes both initiatives to mitigate greenhouse gas emissions and strategies to reduce vulnerabilities for a more equitable and resilient Saint Paul.

Despite increasing awareness around the impact of climate change from human activity, greenhouse gas emissions (GHG) continue to rise globally. [A recent climate report](#) shows trends toward more extreme climate scenarios than previously predicted. In Saint Paul, impacts are felt and observed most noticeably as extreme heat events, poor air quality, increases in frequency and severity of precipitation (both rain and snow), ecological changes, and psychological impacts. These changes also have a disproportionately negative impact on vulnerable populations and historically marginalized communities of color. Through the development of this plan, Saint Paul is demonstrating that through climate action that focuses on efficiency, equity, and access to clean energy and mobility, it can cultivate a healthier, stronger, and more resilient city than before.

## Resilience and Vulnerability

Saint Paul has already developed a framework for community resilience, and this plan builds on that work. For a community to improve its resilience, it must know what its vulnerabilities are. Climate change has the potential to have major impacts on people, the economy, and infrastructure — both built and natural. Certain populations, infrastructure, and natural assets can be more vulnerable to shocks and stresses depending on various factors including social characteristics, condition, and environment. For individuals, both situational and inherent characteristics such as age and preexisting conditions determine vulnerability. Geography, including proximity to highways and roads, vegetation, and water also vary the local and individual experience of climate change.

Natural infrastructure like trees, native plants, surface and groundwater, and beneficial species can be both susceptible to climate change and help improve the resilience of the city. The health of Saint Paul's urban forest impacts how climate change is experienced by location. Built infrastructure includes roads, bridges, water mains, sewer lines, energy distribution, streetlight networks, buildings, and critical infrastructure. Such infrastructure is vulnerable to damage during extreme weather events as well as sustained stress from freeze/thaw cycles, erosion, and extended heatwaves. Yet with the proactive approach that Saint Paul is adopting, there are numerous opportunities to grow and foster a resilient, sustainable city in which residents can continue to thrive.

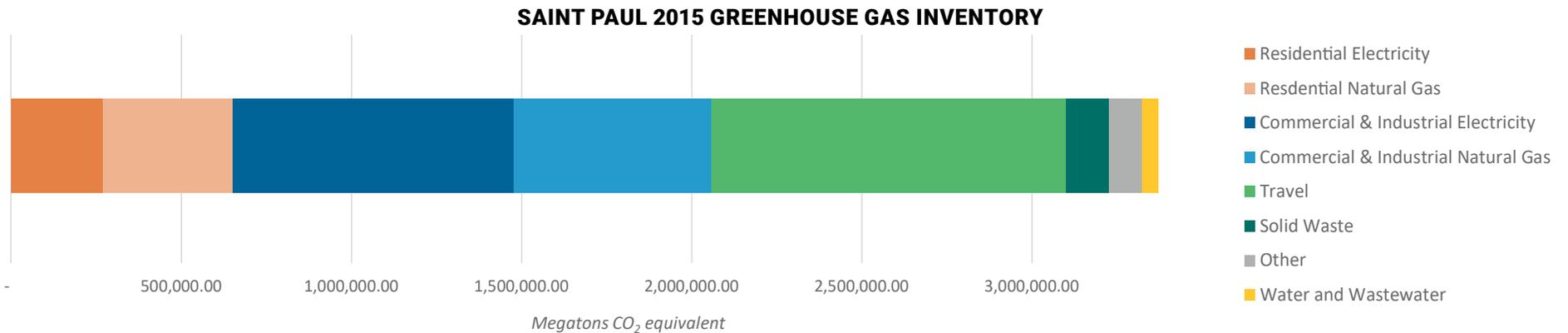
There is a call to support community resilience by helping residents prepare for, withstand, and adapt to climate-related impacts. For infrastructure, Saint Paul aims to protect natural resources and enhance it to maximize our ability to mitigate weather and climate impacts. Implementation of the plan ensures the long-term integrity and reliability of built infrastructure systems by considering future climate impacts in planning. Through the Ready and Resilient Guide, Saint Paul has also created a guide to prepare our community members for a variety of climate change-related events expected to occur more often and more intensely.

## Mitigation

Mitigating the causes of climate change is just as important as preparing for its effects. To do so requires a change in energy resources and how energy is used; inviting both systemic and individual transformation. It is crucial to replace reliance on GHG-emitting fossil fuels with carbon-free energy sources to generate electricity, deliver heat, and power our vehicles and transportation systems. It is also critical to consume less energy through efficiency and conservation, alternative modes of transportation, and modified diets. Many of these behavior shifts provide natural co-benefits to people's lives. For example, walking or biking to work, especially if the commute is full of trees and greenery, has been proven to bolster creativity and decrease stress. Individuals can contribute to collective impact by living car-free, reducing air travel, deep home efficiency improvements, purchasing or installing green energy, and shifting to a more plant-based diet.

## Emissions Profile

The current community emissions profile for Saint Paul includes greenhouse gas emissions across different sectors and energy sources including: residential, commercial, and industrial sources for buildings; emissions from vehicle travel; and other emissions from solid waste, water, and wastewater.



Most Saint Paul emissions in 2015 came from building energy use (61%), followed by travel (31%). Residential premises accounted for 19% of total emissions in the city, using 25% of the electricity and 46% of the community-wide natural gas. When considering residential emissions, particularly when examining the breakdown between electricity and natural gas use, it's important to consider disparities in ability to pay for energy. For example, there are an estimated 42,124 households in Saint Paul experiencing an energy burden (the percent of income spent on energy costs) of 4% or above. By building more affordable and accessible options into the city's energy system, Saint Paul can begin to address this gap.

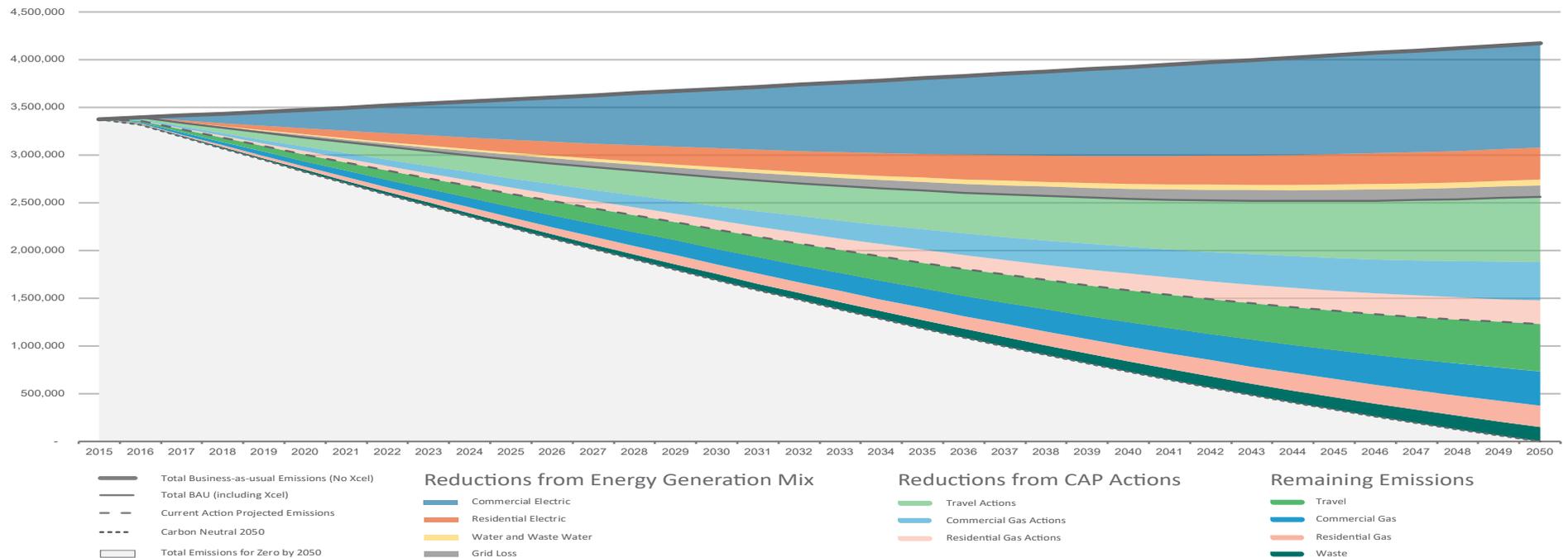
Commercial and industrial premises represented 75% of the electricity and 54% of the natural gas consumption in the city, or 42% of community-wide emissions from buildings. Solid waste makes up about 4% of total emissions and does not account for emissions that occur prior to a consumer's purchase of goods. Water and waste water account for about 1% of citywide emissions. The remaining emissions come from the losses in the delivery of energy and include natural gas leaks and grid loss along transmission and distribution lines.



## Carbon Neutral by 2050

The City of Saint Paul has a goal to achieve carbon neutrality by 2050. Under a “business as usual” scenario of 1.1% annual energy growth, carbon emissions would increase 50% by the year 2050 if nothing else changed. However, Xcel Energy has committed to delivering carbon-free electricity by 2050, which will decrease community-wide emissions 28% relative to the business as usual scenario. This reduction alone would get Saint Paul buildings 40% of the way toward carbon neutrality, allowing the city to focus our efforts more directly on reducing emissions from travel and natural gas. To achieve our goal of being carbon neutral by 2050, the city will need to realize an average annual emission savings of 3% across natural gas and travel emissions.

**SAINT PAUL 2050 REDUCTION SCENARIO**



## Targets and Initiatives

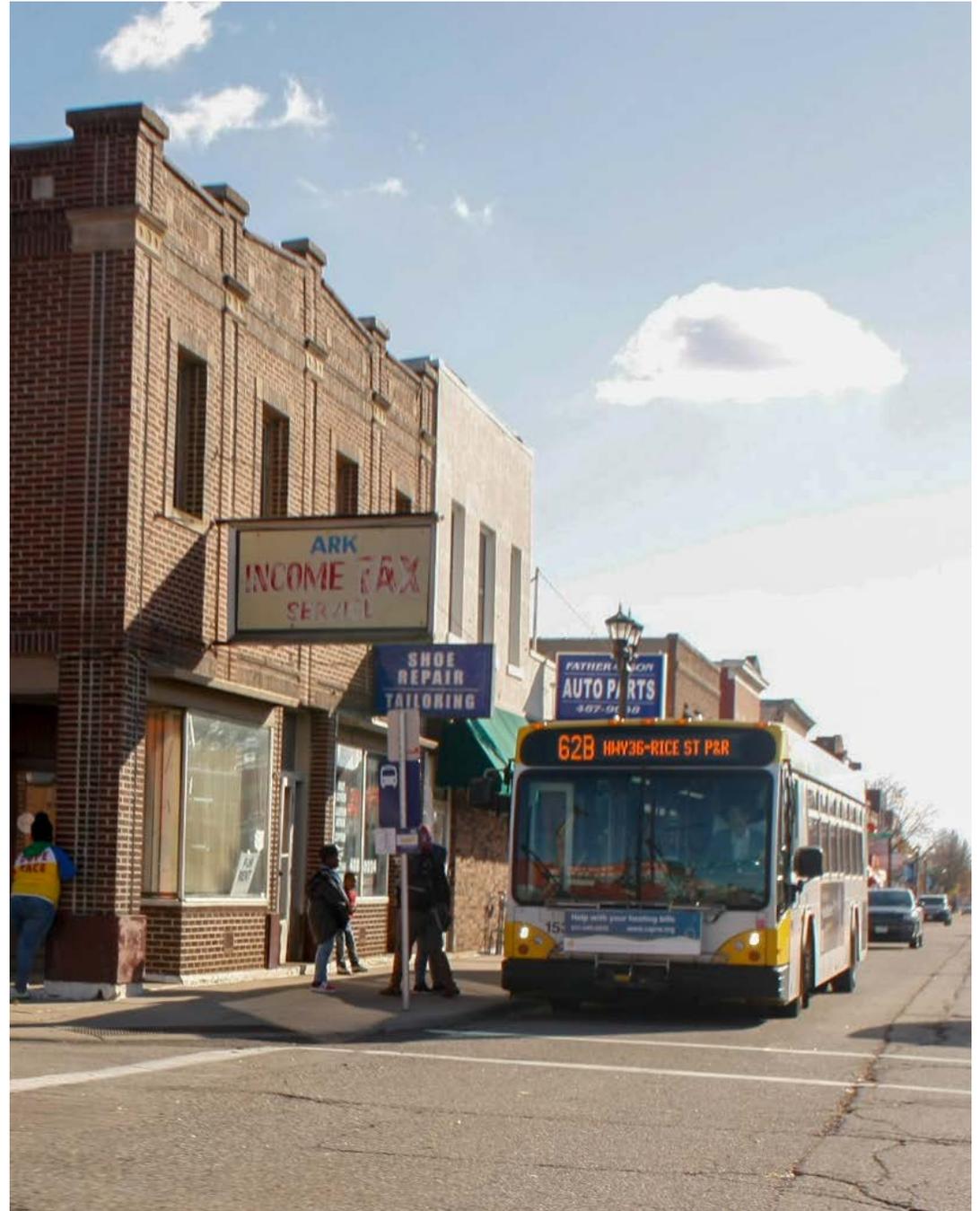
Saint Paul's near-term priorities, highlighted in the Partners in Energy (PiE) Plan, reflect sectors or activities that will have high impact and where the city can begin implementation to address building energy the next one to three years. Priorities were selected because they offered the highest likelihood of early success, laid the necessary foundational groundwork for later stage strategies, and addressed issues that needed significant lead times. Community-wide targets and initiatives identified in this plan would result in approximately 52% (70% including electricity emissions reductions) savings from a business as usual scenario, or a 63% emissions reduction from 2015.

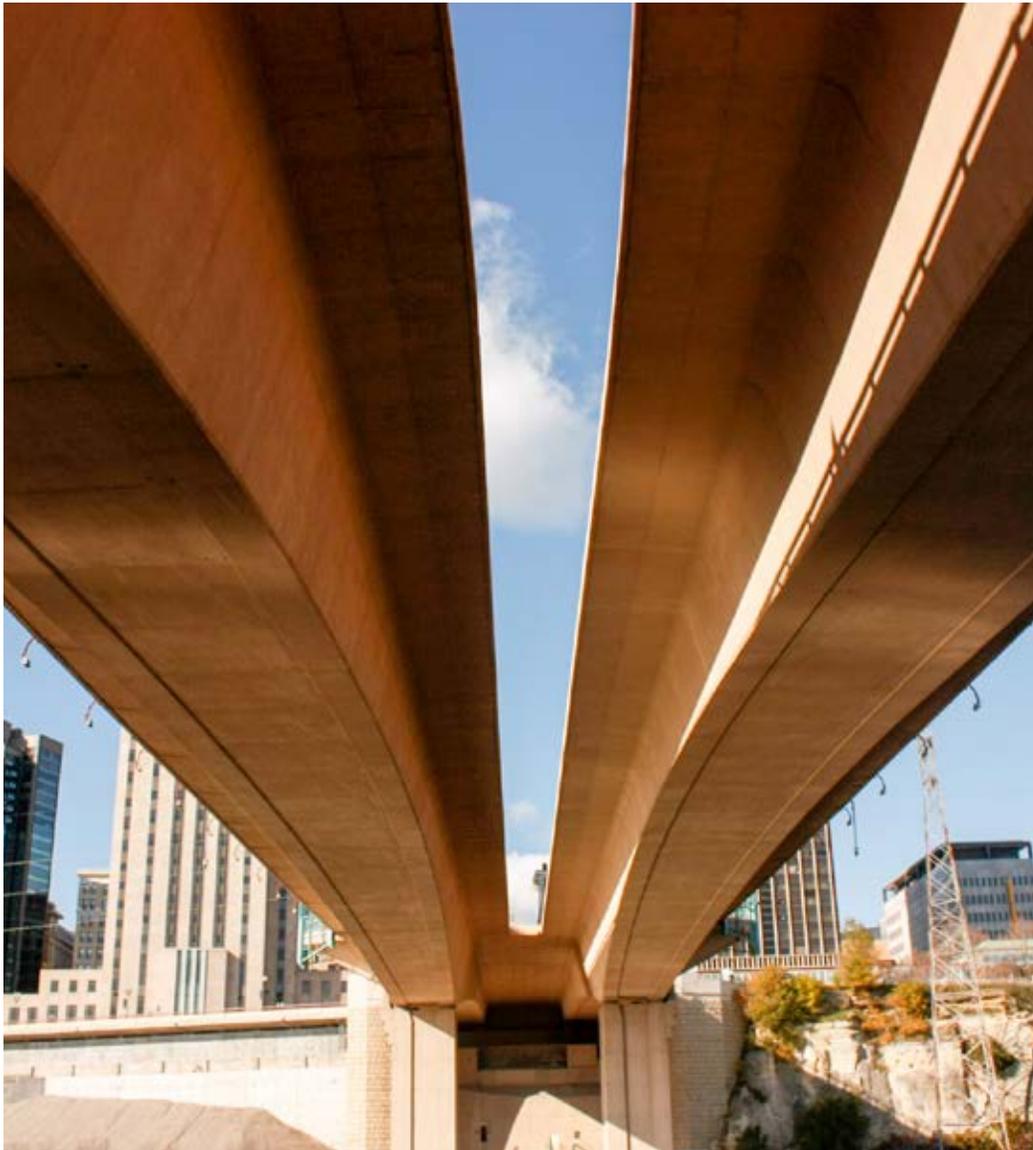
**Residential:** The highest impact actions will be 1) prevent emissions with the adoption of stricter building energy codes for new development, 2) deep energy retrofits that include building envelope improvement, and 3) electrification of natural gas appliances.

**Commercial and Industrial:** The high impact actions will be 1) Green building standards for new buildings, 2) efficient operation of existing buildings, and 3) building energy retrofits.

**Transportation:** Transportation today has surpassed the electricity generation sector as the largest source of carbon emissions and is growing. Eliminating transportation emissions is critical to achieving the goal of carbon neutrality by 2050. Transportation emissions are influenced by three main factors: 1) Land use and urban form, 2) Mode of transportation, and 3) the types of fuels that are used.

**Waste and Water:** The City of Saint Paul, through Resolution 14-519, established goals of diverting 40% of waste from landfills by 2020 and 80% by 2030. Water priorities emphasize preservation of safe, quality drinking water and promotion of a culture of water conservation and stewardship.





While climate change poses many challenges, it also presents great opportunity to create a more livable and equitable city. In Saint Paul, 36% of households spend more than 4% of their income on home energy costs. Low-income residents and residents of color are more likely to live in neighborhoods without sufficient natural amenities like an adequate tree canopy. Often, streets in these neighborhoods have poor walkability and bike infrastructure, and lack access to quality transit. Many climate solutions are also equity solutions. As the city looks to reduce our greenhouse gas emissions, we will need to reduce energy consumption in homes and commercial spaces, create a workforce to respond to the challenge, provide multiple options for mobility, and strengthen our urban forest. Where and how these solutions are implemented matters. Creating a more equitable Saint Paul is key to the success of this plan.

The effects of climate change are apparent in Saint Paul and have a disproportionate impact on low-income communities, especially low-income communities of color. This plan identifies not only strategies to decrease emissions, but also strategies to mitigate negative impacts of climate change so that all community members, present and future, can experience a high quality of life. Leveraging city leadership, experts, community members, and advocates, this plan lays out a path toward resilience. To achieve carbon neutrality by 2050, Saint Paul needs to assess how it can have the biggest impact on our contribution to climate change. Vulnerabilities to a changing climate vary across built and natural infrastructure and populations. This plan provides strategies for Saint Paul to address these vulnerabilities.

## Vision for 2050

As a capital city with a thriving economy, Saint Paul is a leader in cross-sector approaches to emissions reduction, adaptation, and resilience and a model for both urban and rural communities in Minnesota. Our air, water, and urban landscape are clean and safe. Uncertainty is viewed as an opportunity, challenging us to innovate with changing technology to adapt to continued advances in shared-mobility, energy efficiency, and renewable energy. All residents have a manageable energy burden.

As a carbon neutral and zero waste city, electric vehicles are commonplace now that the infrastructure to support them is standard. Walkable, bike friendly neighborhoods with easy access to transit that accommodates all work schedules means fewer trips by car.

Slowed growth in the movement of goods by truck, train, barge, and people by plane help reduce overall emissions. These choices and our robust social connections make all of Saint Paul's neighborhoods strong and resilient.

By preserving, growing, and diversifying our urban canopy and ground cover on both public and private land and cultivating urban agriculture we continue to prepare for, and adapt to, the effects of climate change. Neighborhood parks and trails help make Saint Paul a healthy and safe place for all.

Politically engaged residents empowered to make decisions help sustain long term involvement. Our youth benefit from a strong network of educational resources, learning opportunities, and are engaged in every aspect of decision-making. A clear focus on innovation, workforce participation, and opportunities for all students in the green jobs of the present and future ensure access to green workforce training at the post-secondary level. Environmental stewardship is a hallmark of Saint Paul's climate action and adaptation efforts.

To track our progress and keep up on the latest innovations, technologies, and best practices it will be essential for Saint Paul to update this Plan every five years.





## Saint Paul as a Leader and Model

While Saint Paul's government buildings and operations account for a small percentage of the city's total greenhouse gas emissions, about two percent, the city has taken and will continue to take steps to reduce our own emissions. In this way, Saint Paul leads by example in encouraging our business, industrial, institutional, educational, and residential communities to implement aggressive strategies to reduce energy use and waste to achieve success.

City government cannot do it all. More needs to be done by more people and more organizations. This Plan identifies strategies for the buildings, transportation, and waste sectors that are designed to enhance and maximize emissions reduction efforts citywide. Not only will these efforts result in improved environmental quality and health of Saint Paul residents and visitors, many of them have the added benefit of saving money on energy costs for residents, businesses, and institutions.

Saint Paul has already made great strides toward greater environmental sustainability and increased climate resilience. In 2015, the City signed on with the Compact of Mayors, which requires the City to complete a GHG inventory, set GHG targets, and develop a climate action and resilience plan. The City has been actively working to meet these commitments. Between 2009 and 2016, the City implemented 476 energy efficiency projects, which have saved \$1.3 million. Other initiatives launched by the city include:

- **Energy Smart Homes and Inspiring Communities**
- **Sustainable Building Policy**
- **Deployment of Electric Vehicle Charging Infrastructure**
- **Step 5 achievement in the GreenStep Cities program**

The City was recently awarded funding under the American Cities Climate Challenge to accelerate actions to meet our climate goals. With the support of this program, the City will more aggressively tackle emissions from City operations, develop a network of mobility hubs throughout the city, and implement building energy benchmarking program, among other ambitious projects. Saint Paul is well on our way to curbing GHG emissions through innovative practices. The development of this plan will solidify and guide further action toward carbon neutrality and a more resilient city by 2050.

# WHAT CAUSES CLIMATE CHANGE?

Since the Industrial Revolution, humans have used fossil fuels (coal, oil, and natural gas) as the energy inputs for travel, space heating, electricity, and industrial processes. The acts of extracting and burning these fuels result in the release of greenhouse gases (GHGs), predominantly carbon dioxide (CO<sub>2</sub>). These gases rise into the atmosphere where they can stay for thousands of years, trapping heat as it bounces off the earth's surface. As more GHGs accumulate in the atmosphere, more heat is trapped. Over the past 260 years, enough GHGs have been released into the atmosphere that they have led to an increasing global average temperature. Increasing temperatures have been changing the climate worldwide and, if left unchecked, threaten to dramatically disrupt our current way of life, locally and worldwide.

## Greenhouse gases are released through human activity

These are the most common sources of emissions that are generated within or due to activity in cities:



**Generation of electricity** (coal or gas-fired power plants), which is used in homes, businesses, industry, outdoor lighting, and increasingly for transportation.



**Space and water heating** that uses natural gas, propane, heating fuel, or electricity generated from the combustion of fossil fuels.



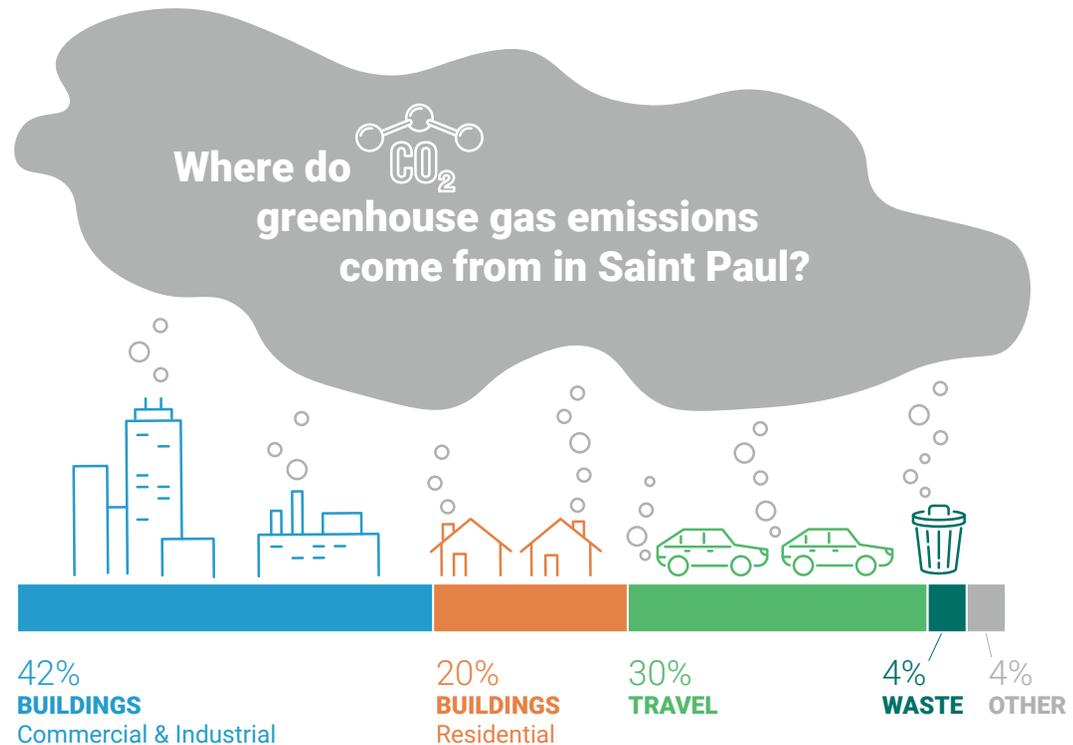
**Industrial and manufacturing processes** that use natural gas or generate CO<sub>2</sub> during production.



**Modes of transportation that combust fuel** (e.g., gasoline, diesel) to run. This includes most cars, trucks, freight, planes, boats, off-road vehicles, and more.



**Generation and disposal of waste.** GHGs are released during production of materials, methane released at landfills, and combustion at energy facilities.



Take a closer look at Saint Paul's Community Emissions Profile on page 31

# LOCAL IMPACTS OF A CHANGING CLIMATE



The Report of the Interagency Climate Adaptation Team prepared by the Minnesota Pollution Control Agency identifies warmer summers and winters and more frequent and intense weather events as the hallmarks of climate change in Saint Paul, which can result in changes to health, livability, landscape, and the environment. The report points out that the frequency and severity of extreme cold conditions are declining rapidly, adding that the heaviest snow storms have also become larger even as winter has warmed. Heavy downpours in Minnesota are now twice as frequent as they were a hundred years ago, and scientists expect events like these to become an increasingly common part of our daily lives.

Saint Paul will become warmer and wetter as a consequence of climate change. We know that warmer temperatures are often accompanied by increased humidity, increasing the heat index and making the air feel hotter. Extreme heat events are increasing in Minnesota and can cause a variety of heat-related illnesses like heat stress and heat stroke.

In April of 2016, Saint Paul Ramsey County Public Health developed a [climate change vulnerability assessment](#), which identified populations and geographic areas that may be particularly vulnerable to climate hazards. The climate hazards included in the assessment and likely to impact Saint Paul are:



**Extreme Heat Events:** Heatwaves are expected to become more common by the middle of the 21st century. Extreme heat will be exacerbated in urban areas where impervious pavement and limited vegetation result in the urban heat island effect.



**Poor Air Quality:** Air pollutants, such as ozone, particulate matter, and allergens pose acute and chronic respiratory and cardiovascular threats. Rising temperatures and changes in precipitation patterns may lead to increased air pollution. Increased frequency of wildfires in the western United States and Canada have also impacted local air quality.



**Changes in Precipitation:** Increased precipitation has already been observed in Minnesota and is likely to increase into the future. This increase occurs in all seasons, but spring and summer are becoming wetter at a faster rate than fall and winter. Changes in precipitation patterns will likely lead to more flash flooding.



**Ecological Changes:** Vector-borne disease transmission is expected to increase due to changes in the distributions of ticks, mosquitoes, and other insect vectors as a result of warming temperatures and changing precipitation patterns. Diseases may include West Nile Virus, Lyme disease, and human anaplasmosis. The urban forest may be directly impacted by invasive species like Emerald Ash Borer, that can lead to changes in the canopy and reduce the benefits that a healthy forest provides.



**Psychological Impacts:** Climate change can lead to negative mental health outcomes caused by the acute trauma of an extreme weather event or the gradual onset of climate change. Mental health issues may include anxiety, stress, depression, and PTSD.

The City of Saint Paul developed a [Strategic Framework for Community Resilience](#), which includes strategies to incorporate climate change adaptation into relevant local and regional plans and projects. The purpose of this framework is to ensure that climate resilience strategies are integrated into emergency management and community planning documents and increase the community’s adaptive capacity while promoting a healthy and prosperous community. The framework identified the acute shocks and chronic stressors that were most likely to have an impact on life in Saint Paul.

Acute shocks include sudden, sharp events that threaten a sector and examples include floods, heat waves, infrastructure failures, and disease outbreaks. Chronic stressors are ongoing conditions that weaken the fabric of a city on a day-to-day or cyclical basis. This can include unemployment, aging infrastructure, or an overtaxed public transportation system. The graphic to the right summarizes the top shocks and stressors identified by volunteer stakeholders who participated in the development of the framework.

For a community to improve its resilience, it must know what its vulnerabilities are. Certain populations, infrastructure, and natural assets can be more vulnerable to shocks and stressors depending on different factors including social determinants, condition, and environment. The following pages identify the climate vulnerabilities that occur in Saint Paul.

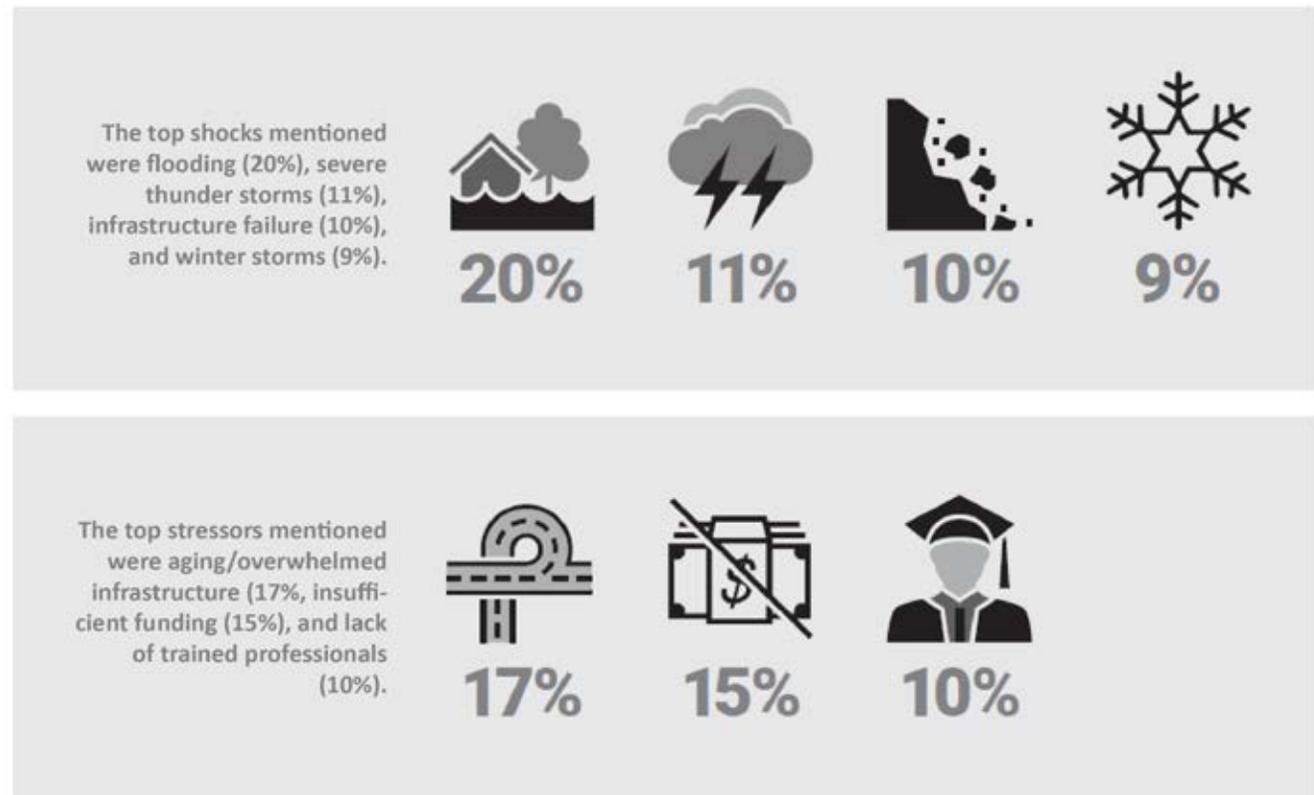


Figure 1: Strategic Framework and Community Resilience



Climate change has the potential to have major impacts on people, the economy, and infrastructure — both built and natural. Climate hazards can lead to disruption in people’s lives and threaten health and quality of life. Assets like buildings, bridges, and roads are directly threatened by increased frequency and intensity of rain events, freeze/thaw cycles, and extreme weather events. Power outages due to storms or sustained heat waves may increase in frequency and duration impacting local economies and health.

According to Ramsey County Public Health, vulnerability refers to the characteristics and situation of a person or group that negatively affects their ability to anticipate, adapt to, and recover from the effects of a climate hazard. Examples of population vulnerabilities are low socioeconomic status, limited education, pre-existing physical or mental health illnesses, barriers in communication especially for non-English speakers, and very old or very young. Built infrastructure like roads, bridges, and sewers can also be vulnerable to climate change depending on their condition and if they were not constructed to be resilient to anticipated changes. Similarly, natural infrastructure, such as trees and bodies of water, can also be susceptible to climate hazards, potentially increasing the risk to populations and property.

Climate hazards that are likely to have a local impact over time were highlighted above. This section identifies vulnerabilities across populations, natural infrastructure, and built infrastructure – a complete vulnerability assessment prepared by Saint Paul Ramsey County Health [can be found here](#).

## Vulnerable Populations

Population vulnerability can be situational, meaning an individual may only be vulnerable in the wake of a climate hazard, not necessarily inherently vulnerable. It can be temporary and dynamic, such as with the case of pregnancy, illness or homelessness. Indicators of vulnerability may include health, age, adaptive capacity, ability to upgrade/retrofit homes, unemployment, asthma, education, race, poverty, limited mobility, electricity dependency, medical needs, language isolation, transit dependency, or participation in social service programs.

The growing disparities among various populations in Saint Paul demands greater attention on minimizing climate-related impacts on at-risk groups. For instance, as the City of Saint Paul continues to experience increasing numbers of days with high temperatures, air conditioning in the summer is going to become as essential to the livability of a house or an apartment as is heat in the winter. More affluent residents likely will have the resources and access to climate change resilient solutions. Low-income residents may not have access to or be able to afford air conditioning (both units and electricity to run an air conditioner) during times of extended extreme heat and will need assistance.

Understanding the needs of residents and meeting people where they are will help the city better know where to direct resources both to help prepare vulnerable residents for climate hazards and to provide support in the aftermath of a major event.

The following looks at the social and financial determinants of Saint Paul’s population vulnerability. These include age, race, language, income, housing, ability, access to a vehicle, and respiratory illness. Residents who live at the intersection of two or more of these determinants are among the city’s most vulnerable and it is critical for the city to prioritize improving the resilience of our most vulnerable. Demographic data comes from the 2013-2017 American Community Survey 5-year estimates.

### **AGE OF RESIDENTS**

In terms of age, residents under the age of 5 (7.6% of population) and over the age of 65 (9.8% of population) tend to be most vulnerable to many climate hazards. For instance, these groups may be more susceptible to poor air quality, hot summer days, and any event that might require mobility, such as severe weather, like damaging winds or flash flooding.

### **RACE AND LANGUAGE**

Between 2000 and 2015, the percentage of people of color living in Saint Paul grew from 35% to 46%. The city — and the Twin Cities metro region — has seen growing racial disparities in terms of employment, income, housing cost burden, education, and homeownership. As a result, low-income, people of color tend to live in neighborhoods where they may be more vulnerable to climate hazards. There are 126 languages and dialects spoken in Saint Paul Public Schools; the most frequently spoken languages after English are Hmong, Somali, and Spanish. For many of these community members, informational materials in English may not be helpful. Health and safety warnings, or outreach efforts may not reach these communities, creating additional risk in climate change-related events.

### **INCOME AND HOUSING**

As of 2017, the median household income for Saint Paul was \$52,841, with 9.9% of residents living below the poverty threshold. According to the 2018 Minnesota Homeless study by Wilder Research, 1,927 people experience homelessness in Ramsey County including those who live in emergency shelters or transitional housing; this is up from 1,787 in 2015. Low-income residents and those with unstable housing may be less likely to recover from extreme weather events that cause property damage.

### **ABILITY**

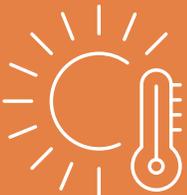
Like age and other social indicators, for some community members, ability level or experiencing a form of disability may impact how well an individual is able to adapt to a changing climate. As of 2017, 11.6% of Saint Paul community members identified as living with or experiencing some type of disability, which might include ambulatory limitations, hearing or vision loss, or cognitive difficulty.

### **ACCESS TO VEHICLE**

As of 2017, 13.9% of Saint Paul community members did not have access to a vehicle. 88% of residents without access to a vehicle were renters. In a city that supports equity and car-free lifestyles, there will need to be consideration for how to move people without access to personal vehicles in times of emergency.

### **RESPIRATORY ILLNESS**

In Ramsey County, there were 9,339 asthma-related emergency room visits, and 1,202 asthma-related hospitalizations between 2013 and 2015. 12.5% of these hospitalizations were experienced by individuals over the age of 65, while 23.7% were experienced by individuals under the age of 18. 16.5% of hospitalizations were experienced by individuals living in poverty (Source: MDH asthma query data, 2013 – 2015). There are disproportionately higher rates of asthma-related hospitalizations along the I-94 corridor, in downtown Saint Paul, and in eastern Saint Paul (Saint Paul-Ramsey County CCVA, 2016).

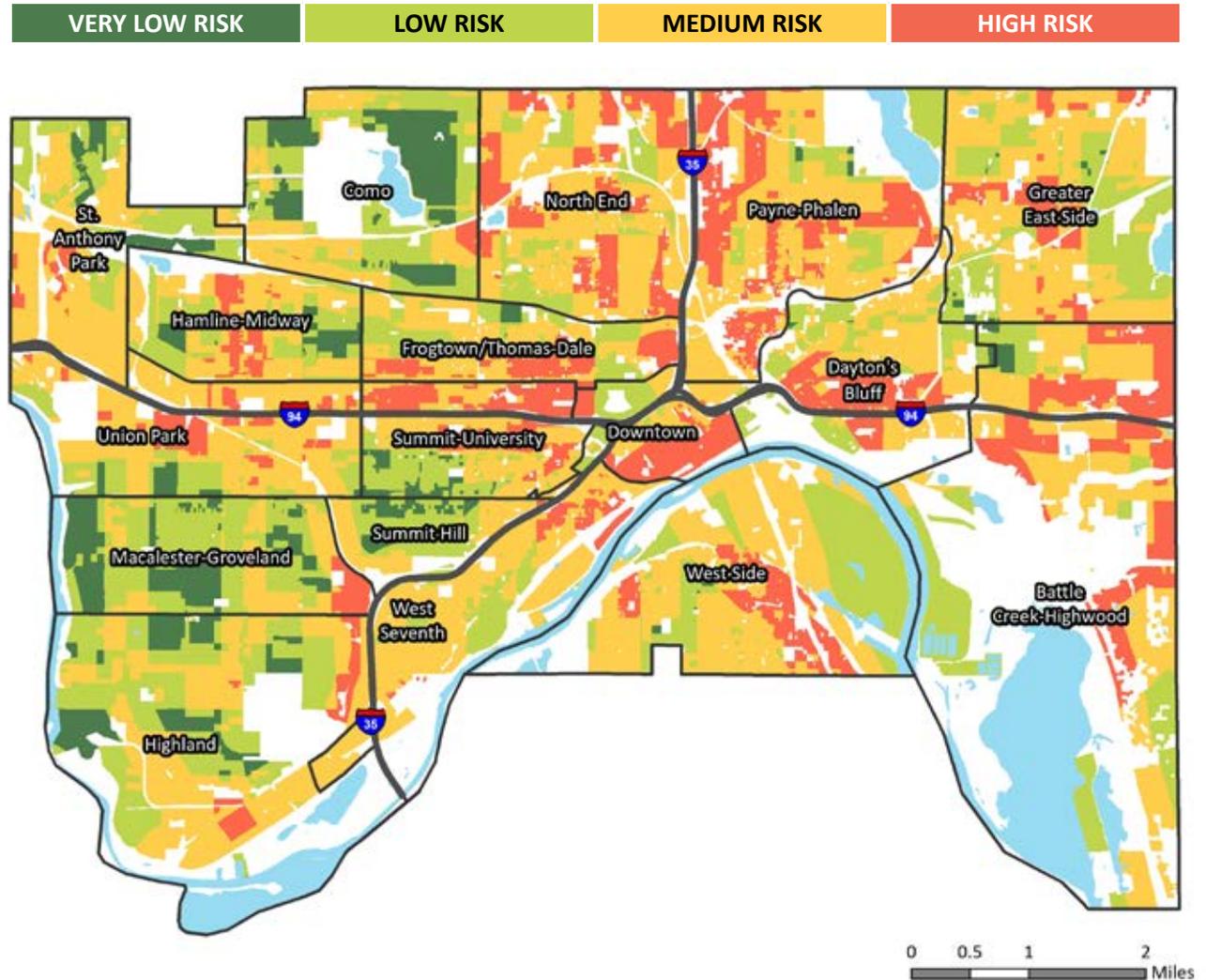
HAZARD	VULNERABLE POPULATIONS	IMPACTS
	<p><b>Heavy Rain Events</b></p> <ul style="list-style-type: none"> <li>• Older adults, especially those living alone and/or low-income</li> <li>• Residents with limited English proficiency</li> <li>• Residents with mobility limitations (access to transportation, ambulatory difficulties)</li> <li>• Residents who lack property, rental, or homeowner insurance (typically low-income)</li> </ul>	<ul style="list-style-type: none"> <li>• Drowning or injury</li> <li>• Mold or waterborne disease</li> <li>• Economic loss</li> <li>• Property damage</li> <li>• Travel limitations</li> </ul>
	<p><b>Extreme Weather Events</b></p> <ul style="list-style-type: none"> <li>• Older</li> <li>• Residents with limited English proficiency</li> <li>• Residents with mobility limitations (access to transportation, ambulatory difficulties)</li> <li>• Residents who lack property, rental, or homeowner insurance (typically low-income)</li> <li>• Homeless and those in unstable housing</li> </ul>	<ul style="list-style-type: none"> <li>• Property damage</li> <li>• Injury or death</li> <li>• Travel limitations</li> </ul>
	<p><b>Poor Air Quality Days</b></p> <ul style="list-style-type: none"> <li>• Older adults</li> <li>• Younger children</li> <li>• Residents with respiratory illnesses</li> <li>• Those who work outside</li> <li>• Residents living near high-volume traffic corridors (interstates, arterial roads)</li> </ul>	<ul style="list-style-type: none"> <li>• Asthma attacks</li> <li>• Severe allergies</li> <li>• Cardiovascular health</li> </ul>
	<p><b>Extreme Heat</b></p> <ul style="list-style-type: none"> <li>• Older adults, especially those living alone</li> <li>• Younger children</li> <li>• Residents with respiratory illnesses</li> <li>• Those who work outside</li> <li>• Low-income residents with no or limited access to air conditioning</li> <li>• Homeless and those in unstable housing</li> </ul>	<ul style="list-style-type: none"> <li>• Heat stress</li> <li>• Heat stroke</li> <li>• Cardiovascular health</li> <li>• Dehydration</li> </ul>

## Vulnerability by Location

Exposure to different types of climate risks varies depending on where someone lives within the city. Air quality, extreme heat, risk of flooding, and composite vulnerability are not experienced the same way across the city. Using the Saint Paul-Ramsey County Health Climate Vulnerability Assessment, the following section uses maps to demonstrate how vulnerability to these events vary by location. A full list of the factors are included in this assessment, and how Ramsey County evaluated risk, can be found in Appendix C.

### AIR QUALITY

Air quality refers to the concentration of particulate matter in the air, which impacts individuals' health. Exposure to poor air quality can lead to increased risk or severity of asthma, other respiratory illnesses, and can result in elevated risk of heart disease and stroke. Children and older community members, as well as those with pre-existing conditions, are more sensitive to poor air quality. Other factors, like proximity to highways or industrial uses can increase health risks. Areas with dense vegetation can help improve local air quality as vegetation, like trees, naturally filter air. In a changing climate, we can expect to see more days on average with higher concentrations of air pollutants. Per the map at right, the greatest risk of exposure to poor air quality in Saint Paul is along roads and highways where there are high volumes of vehicles. This includes the I-94 corridor through the city, as well as along highway 35E.

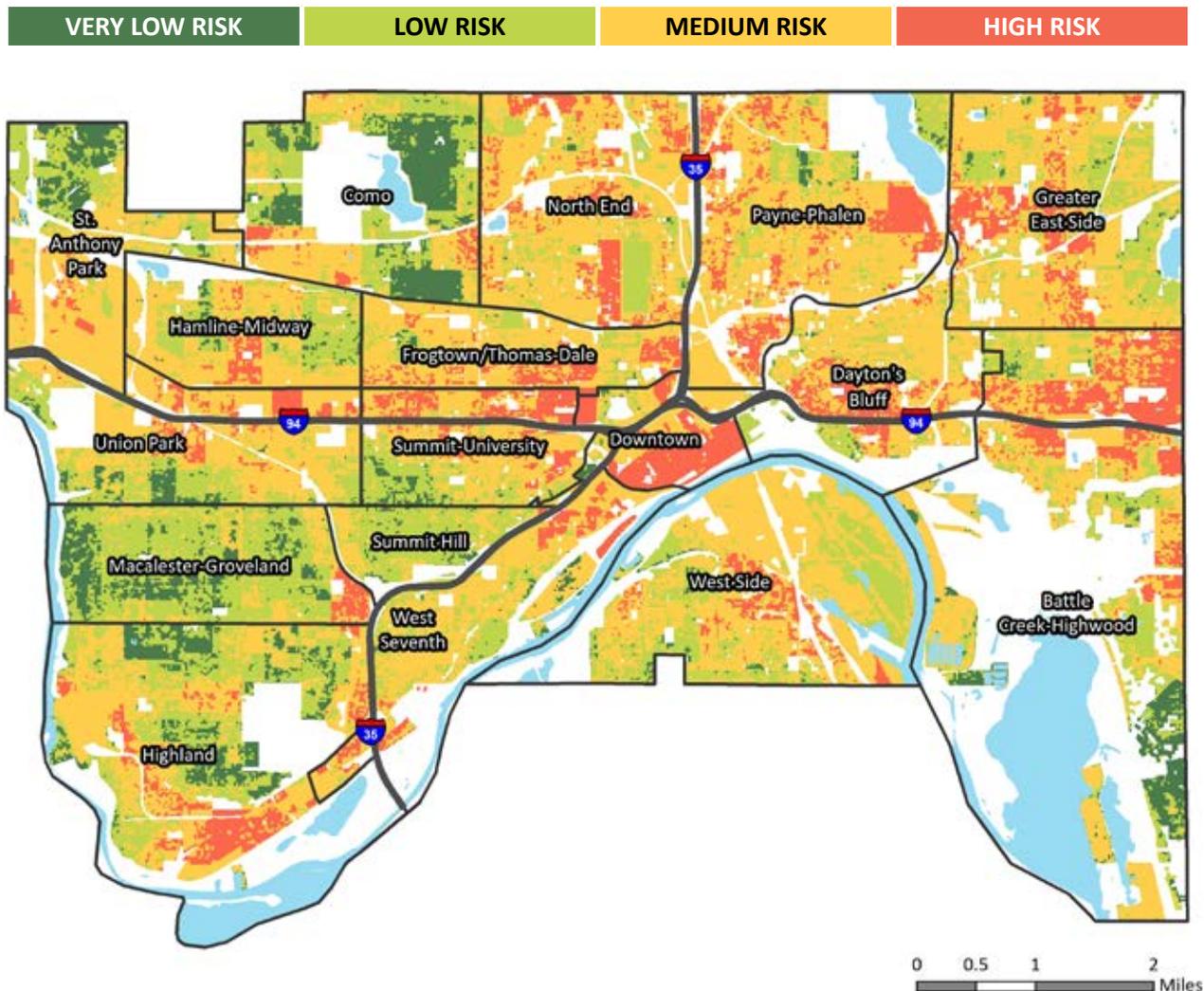


Map 1. Identifies the relative risk exposure to poor air quality (very low, low, medium, and high risk) across the city of Saint Paul. This analysis was originally conducted by Saint-Paul Ramsey County through its Climate Change Vulnerability Assessment in 2016.

## EXTREME HEAT

Urban heat island effect is caused by dark surfaces (e.g., rooftops and asphalt) absorbing the sun's heat and slowly releasing it through the night. This results in higher overnight temperatures in low-vegetation urban areas relative to surrounding communities. Many people face an increased risk of heat stroke and heat exhaustion and can be particularly vulnerable during extended heatwaves. The map at right shows how the risk of experiencing extreme heat varies relatively across Saint Paul.

The greatest risk of exposure to extreme heat is prevalent in areas across the city with less dense vegetation and tree canopy cover – namely, downtown Saint Paul, Frogtown, Greater East Side, and Dayton's Bluff neighborhoods, where prevalent "very high" risk exposure exists. There is also very high risk on the southern edge of Highland Park neighborhood.



Map 2. Identifies the relative risk of exposure to extreme heat (very low, low, medium, and high risk) across the city of Saint Paul. This analysis was originally conducted by Saint-Paul Ramsey County through its Climate Change Vulnerability Assessment in 2016.

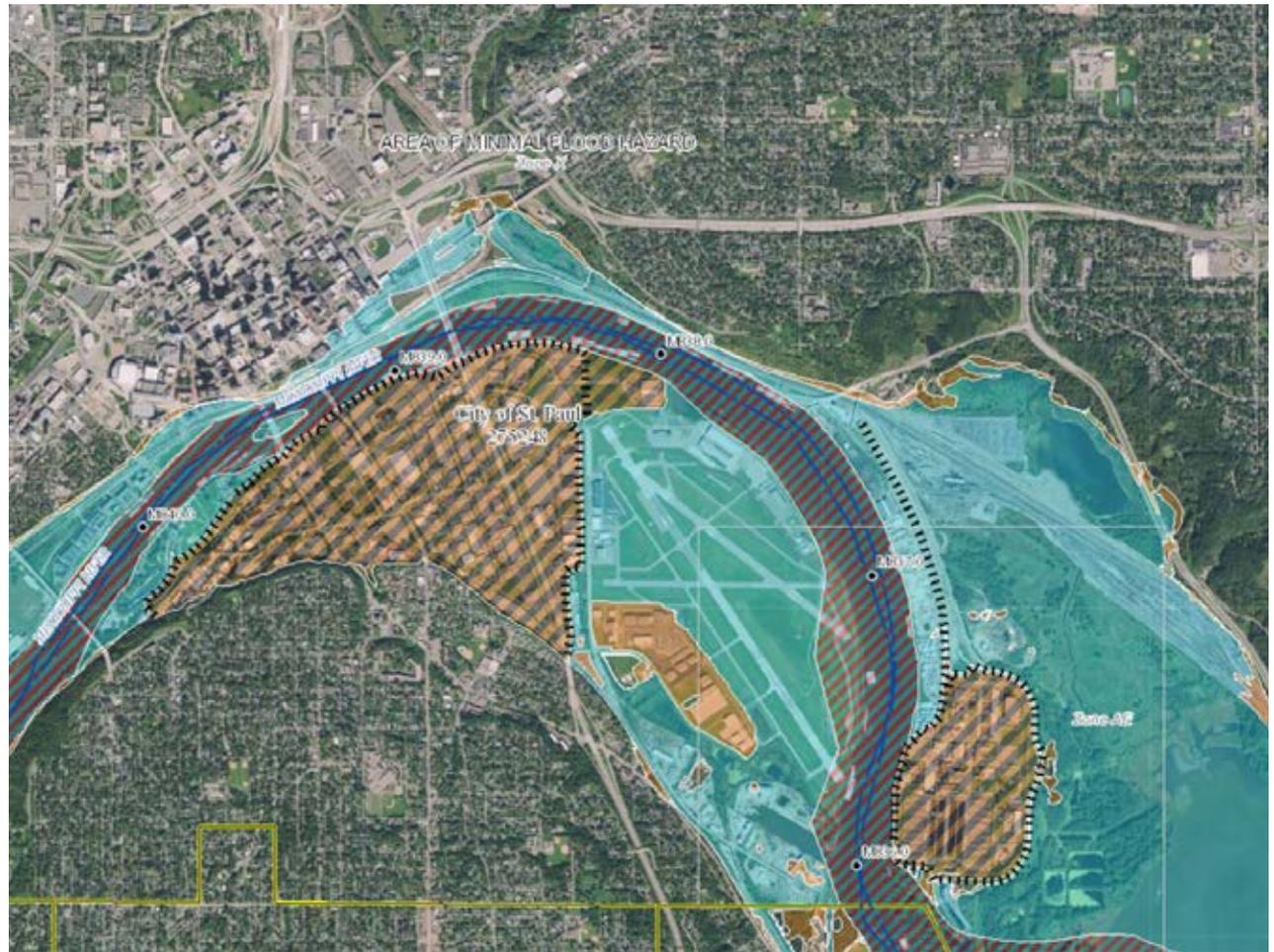
## FLOODING

Risk of flash flooding also varies across Saint Paul and is influenced by topography, watershed, and land use (i.e. impervious surface). Areas that are more susceptible to flash flooding tend to be low-lying with high levels of impervious surfaces, like roads and parking lots. Areas with greater biomass and vegetation coverage, as well as higher elevation, are at a relatively lower risk.

Saint Paul faces risks and vulnerabilities associated with the increases in frequency and duration of precipitation events that a changing climate will bring. The city has conducted modeling on historic flooding events and continues to monitor risk of flooding by evaluating and understanding infrastructure.

Based on this analysis, Saint Paul's highest risk areas for flooding are in riverine areas, particularly in the FEMA designated floodplain which include areas like Lowertown, Childs Road, Barge Channel Road, and Harriet Island. Outside of these areas, risk of flooding in Saint Paul is largely dependent on circumstances.

Flooding can happen quickly or gradually, due to heavy precipitation in a short period of time, frequent precipitation during a period of high soil saturation, or disruption to freeze and thaw cycles that accelerate snow melt.

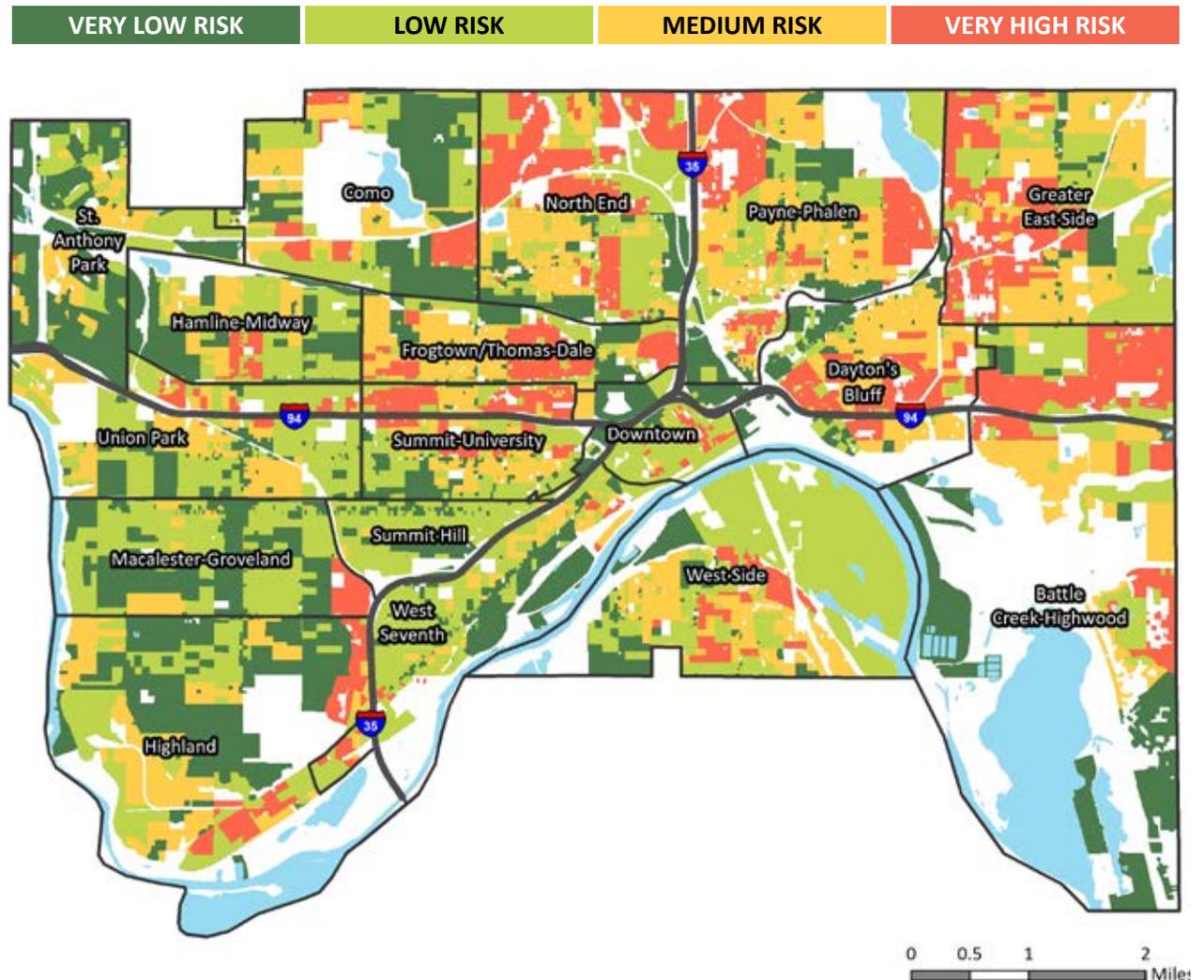


Map 3. The Federal Emergency Management Agency (FEMA) official maps show Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to a community. The majority of Saint Paul is designated as at minimal risk of flooding hazard by FEMA. Riverine areas are at the highest risk of flooding. Data from FEMA, 2018

## COMPOSITE VULNERABILITY

The composite vulnerability map at right displays areas of Saint Paul where residents are most at risk to climate-related hazards.

Areas in the Thomas-Dale, as well as North End, northern Payne-Phalen, and Greater East Side neighborhoods - are identified as having the highest combined risk to negative impacts of climate change. These areas are largely concentrated in the northeastern and north central portions of the city. In contrast, the western portion of the city is comparatively low risk.



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

## Natural Infrastructure

Natural infrastructure includes ecological systems that perform environmental services like stormwater management and reduce air pollution, as well as enhance livability and aesthetics of a place. Environmental assets like trees, native plants, surface and groundwater, and beneficial species are both susceptible to climate change and can help improve the resilience of the city. Urban forests provide a multitude of benefits including reducing the urban heat island effect, supporting stormwater management, and acting as a carbon sink (absorbing carbon dioxide from the atmosphere), among other benefits.

### URBAN FOREST

Saint Paul has a rich landscape of trees and green space that benefit our residents, businesses, and visitors. Preserving and growing this asset is important to the health and vitality of Saint Paul. Trees are the lungs of the city; they purify the air locking up carbon, contributing to reduction in the greenhouse effect. Trees protect the soil from erosion, reduce urban heat island effect, provide wildlife habitat, and help manage stormwater, which can prevent or reduce flooding.

In 2011, the citywide canopy cover was found to be 32.5% percent; though this figure was calculated prior to Emerald Ash Borer. Residential areas with high private tree canopy cover, as well as parks and green space, have the highest proportion of canopy cover. Downtown Saint Paul, with its dense development and high percentage of impervious surface, has the lowest canopy cover. The canopy cover of most Saint Paul neighborhoods is close to the city average. However, neighborhoods with a lower canopy cover are located along University Avenue, West Seventh Street, and Saint Paul's West Side. Areas with low canopy cover often correspond to areas in the city with increased transportation infrastructure (including freight rail) or land uses that have historically been industrial or commercial. See the extent of Saint Paul's urban canopy in the map (City of Saint Paul Urban Canopy Assessment 2011).



Map 5. Overview of total canopy cover in city of Saint Paul by ward. Last updated 1/9/2019 by City of Saint Paul Urban Forestry Department.

The urban forest is vulnerable to invasive species, like emerald ash borer, as well as extreme weather events with heavy rain and strong winds that, in combination with factors like root cutting for construction and saturated soils, can result in uprooting established trees. A healthy, well maintained tree planted in a space with suitable capacity for the root system is much more likely to withstand heavy rains and strong winds. Drought may also impact the health of the urban forest. For example, trees that require more water in the hotter months will need additional water and maintenance. Drought stress can also lead to negative impacts by both native and non-native insect damage, exacerbating all stress factors (Saint Paul Urban Forestry Plan, 2011; Plants for the Future, 2018).

As of January 2019, nearly 129,000 total trees have been inventoried in the City of Saint Paul, representing approximately 59 different genera. In addition to the physical factors associated with a changing climate, Emerald Ash Borer (EAB) is currently a biological threat to the city's ash trees. Many cities from the East to the Midwest have lost large portions of its ash trees due to EAB. Saint Paul has four different species of ash, which comprise 13.7% of the total tree count on city property. Map 6 provides a visualization of the location of ash trees in public rights of way, which may give some insight into the impact that Emerald Ash Borer could have on the city's overall tree canopy. While ash trees are distributed throughout the city, there are areas of higher ash tree density in the Summit-University neighborhood, Payne-Phalen, and the Greater Eastside. As ash trees are removed, the tree canopy in these communities will be noticeably altered for decades as replacement trees take time to mature.

## WATER QUALITY AND AVAILABILITY

The Mississippi River is the main source for Saint Paul's drinking water. While the river is a stable source of freshwater, its greatest risk comes from contamination. Rainwater travelling across pavement during heavy rainfalls can pick up trash, leaves, animal waste, salt, and chemicals. If these items reach the river through storm drains, they can pollute the water. Keeping rainwater where it falls or slowing its path to lakes and rivers helps reduce the load on storm sewer capacity and gives nature a chance to filter out harmful chemicals and other pollutants.



Map 6. Locations of individual ash trees across Saint Paul. Last updated 1/9/2019 by City of Saint Paul Urban Forestry Department



## Built Infrastructure

Built infrastructure includes roads, bridges, water mains, sewer lines, energy distribution, streetlight networks, buildings, and critical infrastructure. Impacts of a changing climate can be seen in damage to buildings during extreme weather events as well as impacts to infrastructure including erosion, landslides, buckling of roads, and damage to bridges.

### ROADS AND BRIDGES

Flash floods and extreme precipitation can have damaging impacts to road and bridge infrastructure, compromising the integrity of the engineering and making it unsafe for community members. Scour may leave bridges vulnerable to damage and failure during flooding by undermining bridge foundations or removing the protection from the abutment slopes. Additionally, extreme heat can cause roads to buckle and damage other transportation infrastructure such as rail lines. This may increase expenditures for repairs and maintenance, as well as create dangerous conditions for drivers, potentially disrupting travel. (MPCA Adapting to Climate Change in MN 2017)

### WATER DISTRIBUTION, STORMWATER, AND WASTEWATER

Increased frequency and intensity of precipitation and flood events will have consequences and put additional pressure on the city's water distribution and drainage infrastructure. Changes in amount, frequency, and intensity of precipitation impact stormwater management, potentially exceeding the design capacity of stormwater treatment structures or impacting future structure design. For example, changing freeze and thaw cycles puts pressures on potable water mains, as shifting soils can cause pipes to break. The city's sewer collection system may be vulnerable as well due to age - 72% of the system is older than 50 years (Infrastructure Stress Transparency Tool).

### ENERGY DISTRIBUTION INFRASTRUCTURE

Energy reliability is a major concern for utilities. Any event impacting the distribution system that leads to power failures would need to be restored as quickly as possible. Heavy rain events and ice storms pose threats to distribution infrastructure and could lead to power outages. This is especially critical in times of extreme temperatures when people have heating and cooling needs; it also impacts those who depend on medical devices that rely on electricity. Building a resilient grid – burying power lines where feasible, incorporating microgrids, and having back-up power – can help to minimize risk.

### CRITICAL INFRASTRUCTURE

Critical infrastructure can include hospitals, schools, emergency services, and community centers. Critical infrastructure is highly vulnerable to electric outages, which can increase in frequency with heavy precipitation or extreme heat. Damage to critical infrastructure can disrupt emergency response and impact the health of those in need of emergency services.



## Population

*Support community resilience by residents to prepare for, withstand, and adapt to climate-related impacts.*

### ECONOMIC AND SOCIAL WELL-BEING

- Strengthen social connectedness through relationship-building among community members across age, ethnicity, income, and other demographic differences
- Build relationships with neighborhood groups and community organizations to strengthen resilience of vulnerable residents

### EMERGENCY PREPAREDNESS AND RESPONSE

- Designate appropriate facilities as emergency shelters that are equipped with back-up electric generation Maintain public health and safety during extreme weather events
- Ensure all residents are prepared to respond to emergency situations
- Ensure mobility options and transportation plans are available to those most vulnerable during times of emergency
- Develop and promote educational materials on the health impacts of air pollution, extreme heat, longer allergy seasons, and vector-borne disease
- Communicate which facilities are open to the public during times of extreme weather events
- Ensure emergency communications are available in multiple languages and interpreters are available
- Coordinate with the County to plan for emergency debris management





## Natural Infrastructure

*Protect natural infrastructure and enhance it to maximize its ability to mitigate weather and climate impacts*

### URBAN FOREST & WATER QUALITY

- Update the citywide urban tree canopy assessment every ten years and maintain a current street tree inventory to develop targets and goals for tree canopy cover and identify strategies to achieve them
- Accelerate tree replacement programming in neighborhoods that will be most impacted by urban heat island effect and Emerald Ash Borer
- Build relationships and trust with community members; support early maintenance and care of trees
- Promote the proactive replacement of declining ash trees with a diverse mix of species to build urban forest resiliency and maintain canopy cover
- Use vegetative cover to help stabilize slopes, reduce slope failure, and address waterbody sedimentation
- Expand and connect green spaces so they are welcoming and within walking distance of all residents, especially in underserved communities where there is a high level of impervious surfaces
- Improve the ecological functionality of and resiliency of parks and open space through green infrastructure, best practices for stormwater management, and increased plant diversity and pollinator-friendly habitat
- Encourage the use of low-impact landscaping, to reduce consumption of water in yard maintenance and improve permeability and reduce stormwater runoff
- Ensure water treatment and distribution infrastructure is resilient to potential hazards

## Built Infrastructure

*Ensure the long-term integrity and reliability of built infrastructure systems by considering future climate impacts in long-term planning*

- Include life-cycle costs when preparing asset management plans and selecting construction materials and equipment
- Incorporate resilience into the capital improvement planning process
- Pilot opportunities to test and demonstrate the value of a smart grid or microgrid, including tie-ins with electric vehicles
- Invest in cost-effective materials for road surfaces that are robust enough to withstand extreme weather events, including heavy precipitation and freeze/thaw cycles
- Reduce impervious surfaces where possible, and use lighter colored pavements and building materials to lessen the impact of urban heat island effect

# CLIMATE CHANGE MITIGATION



To mitigate our impact on climate change, we need to change where our energy comes from and how we use it. Fossil fuels have long been the driver of economic growth throughout the world. We know that we can expect to maintain a high quality of life with alternative forms of energy and through changes in our habits. Reducing emissions requires displacing fossil fuels with carbon-free energy sources to generate electricity, deliver heating fuel, and power our vehicles. It also means using less through efficiency and conservation, cleaner modes of transportation, and modifying our diets. Many of these shifts can provide other co-benefits to our lives, such as improving physical and mental health, saving money, and creating jobs.

Some of these changes will have to occur at the system level. For instance, Xcel Energy provides electricity to businesses and residents of Saint Paul and is largely responsible for how electricity is generated. Over the past several years, Xcel has taken steps to remove carbon from its generation mix by adding wind and solar while reducing coal generation. The company is committed to continuing to reduce the carbon intensity of its generation mix such that it intends to be entirely carbon-free by the year 2050. Because of this shift in generation, Saint Paul will have more flexibility to focus on other areas of carbon reduction, particularly transportation, heating, and efficiency.



## What you can do to reduce emissions

To achieve the GHG emissions reductions necessary to avoid the worst impacts of climate change it will take a massive effort at all levels of government throughout the world and a major shift from individual actors. Collectively, big actions from many individuals around the world will both add up to measured reductions and put more pressure on markets to shift toward low carbon technologies and motivate governments to act. [A recent study from researchers in Sweden and Canada](#) found the most impactful actions individuals can take how they stack up to one another. The following is a summary of what you can do to maximize your impact on climate change.

Most actions don't require big life changes, just simple shifts in how you go about your day. There is flexibility in each action that allows individuals to tailor them to the demands of their lives. The graphic illustrates nine actions with the greatest potential to shift emissions toward a downward trajectory that can be taken by individuals.

**1. LIVE CAR-FREE**

**2. AVOID ONE FLIGHT PER YEAR**

**3. PURCHASE OR INSTALL GREEN ENERGY**

**4. REDUCE EFFECTS OF DRIVING**

**5. EAT A PLANT-BASED DIET**

**6. HOME ENERGY EFFICIENCY**

**7. REDUCE FOOD WASTE**

**8. REDUCE WASTE**

**9. EAT LOCAL & IN SEASON**

**What actions can you take to reduce greenhouse gas emissions in your life? It all adds up!**



**1. Live car-free.** The action with the greatest impact is to live a car-free life. While it's possible to live car free, this can be challenging for many folks as current transit and mobility options don't always fit commutes or daily transportation needs. However, the way we move people is rapidly changing as technologies and preferences evolve. Saint Paul is actively seeking opportunities and projects to enable individuals and families to reduce car trips. From supporting shared micro-mobility options to improving bike and pedestrian facilities, there are more choices than ever to get around the city.



**2. Avoid one flight per year.** Airplane travel is the greatest source of per mile transportation emissions for those who fly. Often, business travel is unavoidable, but companies and organizations are increasingly open to other communication platforms. Video conferencing through Zoom, Skype, Google, and other programs have become increasingly common alternatives to in-person meetings.



**3. Purchase or install green energy.** While Xcel Energy is cleaning up its generation mix, there is still a role for individuals to play in accelerating the green energy economy. For those with a good solar resource, consider adding solar to your rooftop. Non-rooftop installations include subscribing to a community solar garden or purchasing renewable energy credits through Xcel Energy's WindSource® or Renewable\*Connect programs. Accessing clean energy locally can have benefits to residents and businesses by decreasing electricity bills and creating jobs in the community while also reducing emissions from power plants.



**4. Reduce effects of driving.** An alternative to living car-free is to drive less. Consider telecommuting one day a week if your job allows. Mobility options include taking transit, biking, and carpooling. The transportation system is rapidly shifting to allow for a multitude of non-personal vehicle options. Electric bikes and scooters are increasingly popular and allow users to go farther in a shorter time than they would have on foot or a pedal-powered bike. Getting out of your car offers physical and mental health benefits as well. Another option is to replace at least one with an electric or high-efficiency vehicle.



**5. Eat a plant-based diet.** Shifting to a low-meat or plant-based diet is one of the biggest impact actions individuals can take. This could mean reducing the amount of meat you eat each month.



**6. Home energy efficiency.** Home energy efficiency will help reduce monthly bills while making your home more comfortable and reducing emissions. Get a home energy audit to understand how your home is using energy and where you can make improvements. Adding insulation to walls and sealing air leaks will improve the performance of both heating and cooling equipment. Replacing windows and doors will improve comfort and help reduce energy use but are often not the most cost-effective methods. As electricity generation becomes cleaner, consider switching appliances that run on natural gas, like your oven range, water heater, or dryer to an electric alternative.



**7. Reduce food waste.** Food waste is responsible for about 8% of global emissions. Food that is discarded and put into a landfill decomposes and releases methane, a powerful greenhouse gas. In Ramsey County, 26% of waste is from food. Food waste prevention strategies include planned shopping, right-sizing proportions, planning for leftovers, freezing food, composting, donating food, and checking food for freshness rather than use-by date.



**8. Reduce waste.** Using less is the best way to decrease the resources, landfill space, and energy associated with any product. Eliminate single-use products – like plastic bags, plastic utensils, and plastic water bottles – instead, invest in a sturdy tote bag, reusable utensils, and a reusable water bottle. Other single-use items, like tools, can be borrowed or rented.



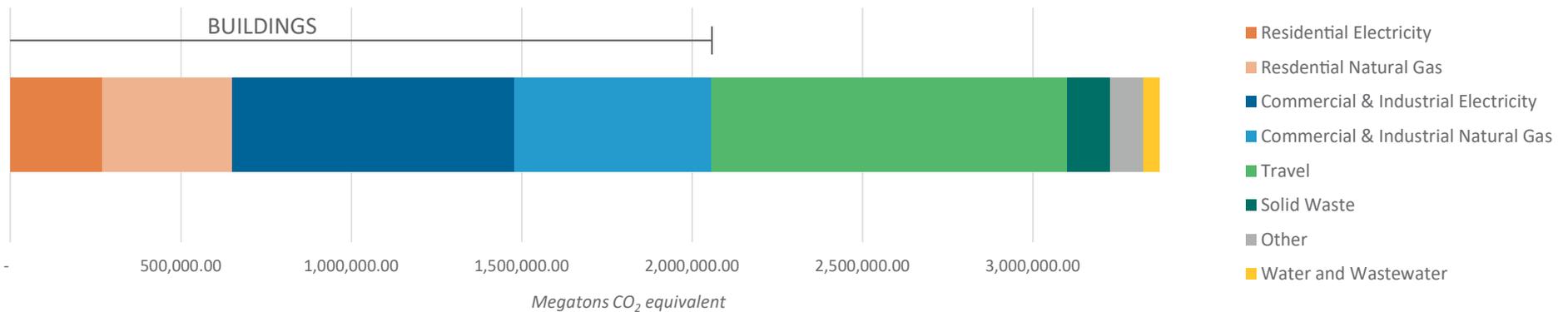
**9. Eat local and in season.** In the Midwest, most fresh fruits and vegetables have already traveled 1,500 miles before arriving at your local grocery store. By purchasing locally grown food, you can reduce the impact of that transportation. Saint Paul has a strong Hmong farming community that has been a major force in the expansion of local food markets and small farms. Buying from farmers' markets and participating in community-supported agriculture can help reduce the amount of produce purchased from the grocery store.

# COMMUNITY EMISSIONS PROFILE



A community's emissions profile is made up of greenhouse gas emissions across different sectors and energy sources. The Saint Paul greenhouse gas (GHG) inventory includes energy use from residential, commercial, and industrial sources for buildings; emissions from vehicle travel; and other emissions from solid waste, water, and wastewater. This is not an exhaustive list of emissions that businesses and residents are responsible for but is a good assessment of the emissions where there is some level of local control. For instance, emissions that result from producing consumable goods are not included in the community inventory but would show a significant increase of per person emissions. Other major sources of emissions that are not included in this inventory are Xcel Energy's High Bridge Generating Plant, District Energy, and the portion of the Minneapolis-Saint Paul International Airport that can be attributed to Saint Paul residents. These were excluded from the inventory as the city has limited authority to influence those emissions. The following summarizes the GHG emissions inventory for the City of Saint Paul.

**SAINT PAUL 2015 GREENHOUSE GAS INVENTORY**



In Saint Paul, the majority of emissions in 2015 came from building energy use (61%), followed by travel (31%). Solid waste makes up about 4% of total emissions, while water and waste water account for 1%. The remaining emissions come from the losses in the delivery of energy and include natural gas leaks and grid loss along transmission and distribution lines.

The following sections provide detailed background information for each sector, and priorities for addressing GHG emissions to maximize benefits to residents and businesses.



In June of 2017, Saint Paul completed a [climate action plan for its building stock](#) through the Partners in Energy (PiE) program offered by Xcel Energy. The PiE plan guides the city’s buildings to carbon neutrality by 2050. Sections of that plan are incorporated herein to support the climate action plan by reducing emissions from the building sector including residential, commercial, and industrial properties.

For the development of PiE plan, a Technical Advisory Group was convened. The group consisted of local energy and building sector experts whose goal was to assess the technical feasibility of the strategies and advise city staff and officials on impact and prioritization. Through this process, the group shared its inspirations for Saint Paul’s energy future and imagined a city that has achieved our energy goals as a guide to creating a unified vision statement:

.....

**By expanding energy efficiency, conservation, and energy recovery, as well as energy storage, renewable energy, and distributed energy, Saint Paul has achieved carbon neutrality in the built environment and fortified our resilience to climate change by the year 2050. Saint Paul has achieved this remarkable goal by intentionally and consistently engaging the public toward locally relevant solutions. All views — especially those of the traditionally underrepresented — have been heard and respected, and all residents, regardless of housing type or income, have benefited from the clean energy economy transition and are safeguarded from adversity.**

.....

## Guiding Themes

***The near-term strategies in this plan are also linked to important guiding themes for the city:***

- Prioritize conservation, energy efficiency, and energy recovery
- Prioritize renewable-based distributed generation and energy storage
- Ensure solutions and opportunities are equitable, particularly in communities and households of color
- Commit to reducing the energy burden on low- to moderate-income residents
- Focus on efforts that result in co-benefits (e.g. employment, economic development, other environmental benefits such as water conservation and improved air quality)
- Showcase best practices and innovative solutions

## The Path to Carbon Neutrality

Attaining carbon neutrality in just over 30 years will require aggressive efforts to reduce overall building energy use through efficiency and conservation and convert current energy sources to renewable or carbon-free. The scale of this effort will also depend on how Saint Paul’s underlying energy needs are growing and on projections for the carbon intensity of the regional electricity supply. As mentioned, Xcel Energy delivers electricity to Saint Paul and is expected to make significant steps to decarbonize its generation mix between now and 2030; and then to fully decarbonize by 2050. The 2030 changes alone would bring Saint Paul 40% of the way toward carbon neutrality in its building sector by 2050.



## PROJECTED CARBON EMISSIONS UNDER A 1% BUSINESS AS USUAL GROWTH SCENARIO

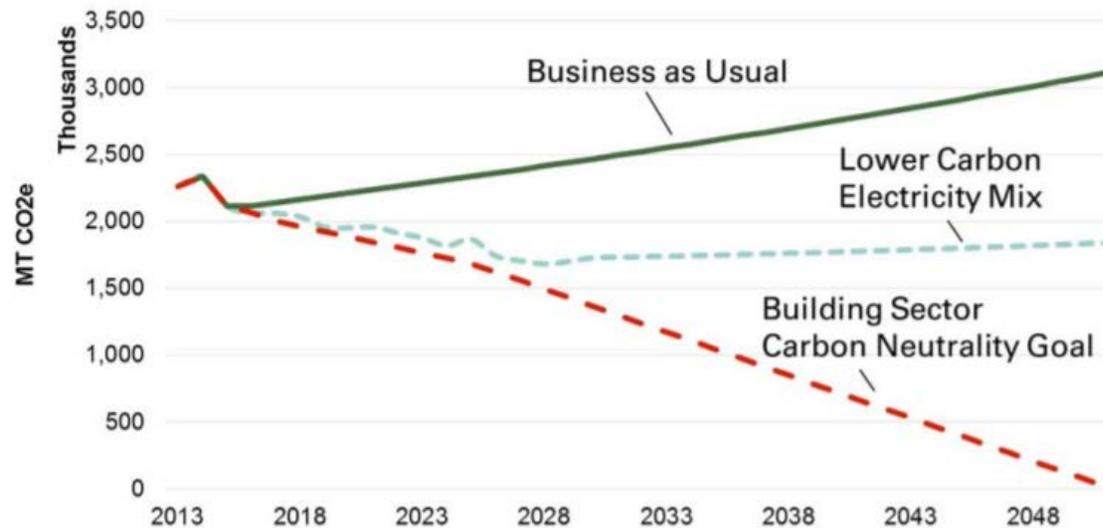


Figure 2: Saint Paul's Path to Carbon Neutrality: Buildings Sector

### Building Priorities

- **Inspire a culture of energy stewardship.** Inspire a culture shift that transforms the community's relationship to energy use, tripling the incremental annual savings from residential conservation and renewable energy adoption within 10 years
- **Reduce resident energy burden.** Within 10 years, lower the energy burden so that no Saint Paul household spends more than 4% of household income on energy costs
- **Engage major public and private institutions on climate leadership.** (1) Within three years, win commitments of major institutions to achieve carbon neutrality by 2050 and ensure 80% of institutional buildings are actively benchmarked, and (2) within 10 years, help institutions realize a 35% total GHG reduction, with energy efficiency as a leading strategy
- **Engage on multifamily and large commercial sector.** Adopt multifamily and large commercial sector conservation and renewable energy initiatives that result in an additional 4% annual reduction in GHG emissions for those sectors
- **Inspire through municipal leadership.** Achieve carbon neutrality in municipal building operations by 2030

Combined, the sectors targeted in these five priority areas accounted for 58% of the building electricity use and 74% of building natural gas use in 2015. Within 10 years, the associated strategies will reduce GHG emissions by 435,000 metric tons of carbon dioxide equivalent (CO<sub>2</sub>e), or 21% below 2015 levels.

# RESIDENTIAL ENERGY USE



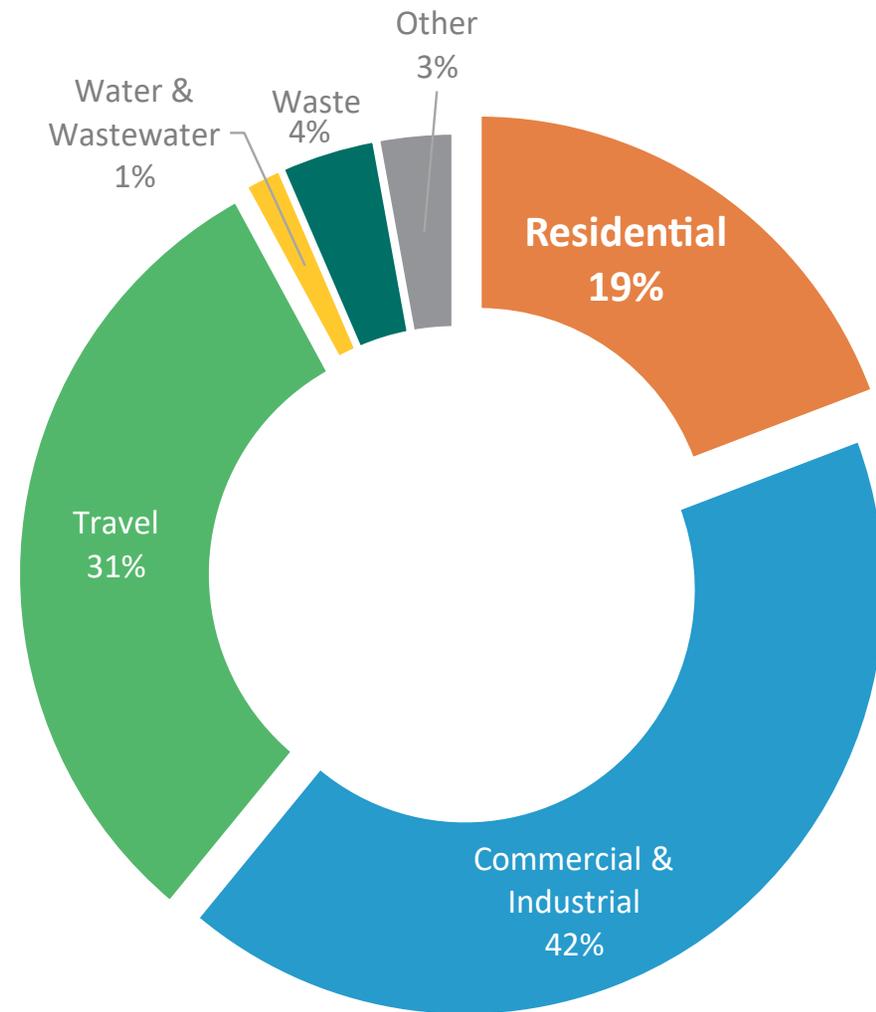
In 2015, Saint Paul residents and businesses consumed a total of 2.7 billion kWh of electricity and 155 million therms of natural gas in 2015. Residential premises used 25% of the electricity and 46% of the community-wide natural gas, which accounted for 19% of total emissions in the city. The portion of residential gas use is significantly higher than electricity use. This may be due in part because space heating is a large load for single-family homes in Minnesota.

The maps on the next page show the average electricity and natural gas use of residential premises across the city at the census tract level. This variation is due to several factors, including the mix of housing stock (i.e. age and size of homes), previous energy efficiency investments, household size, and the types of energy use activities within a home.

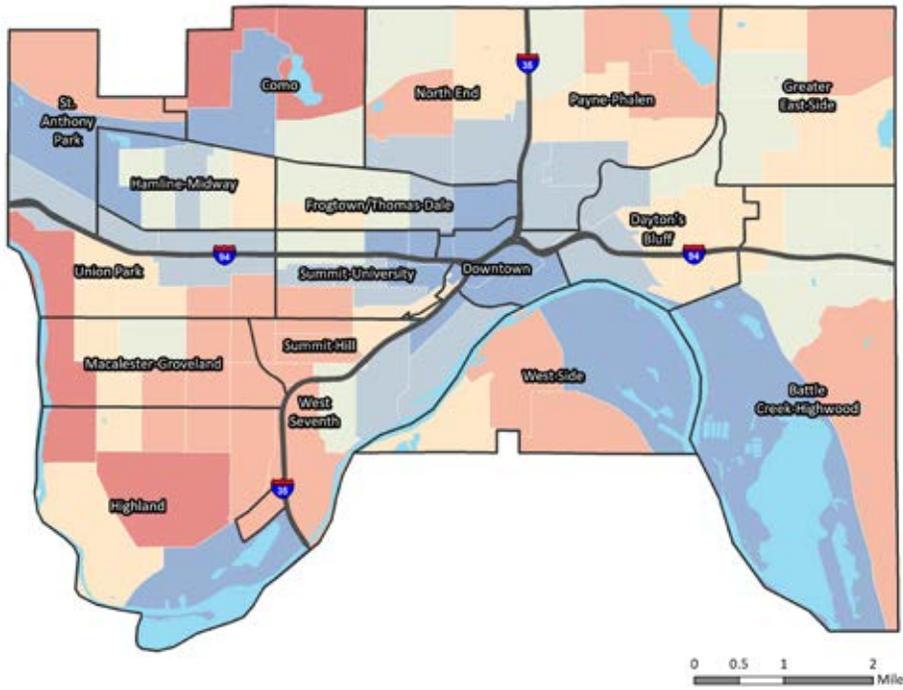
Saint Paul residents spent a total of \$128 million on energy in 2015. On average, households spend a total of \$1,424 per year on electricity and natural gas.

## SAINT PAUL AVERAGE ENERGY COSTS (BASED ON THREE-YEAR AVERAGES)

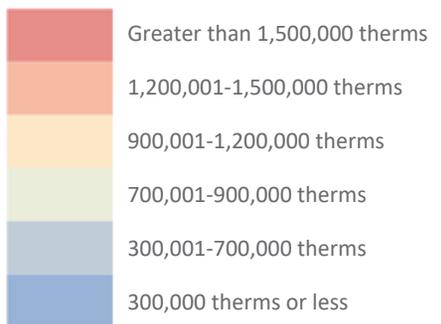
Customer Type	Average Electricity Cost (\$/premise/year)	Average Gas Cost (\$/premise/year)
Residential	\$717	\$707



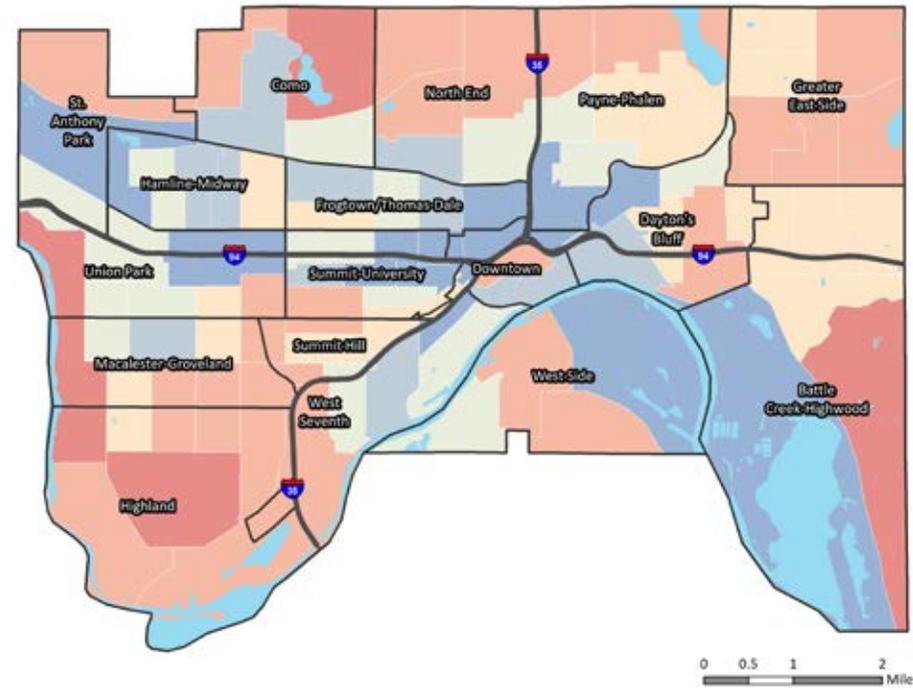
**AVERAGE ANNUAL RESIDENTIAL NATURAL GAS USE**



Map 7. Average annual residential natural gas use in therms by census tract (Xcel Energy, 2015)



**AVERAGE ANNUAL RESIDENTIAL ELECTRICITY USE**



Map 8. Average annual residential electricity use in kWh by census tract (Xcel Energy, 2015)

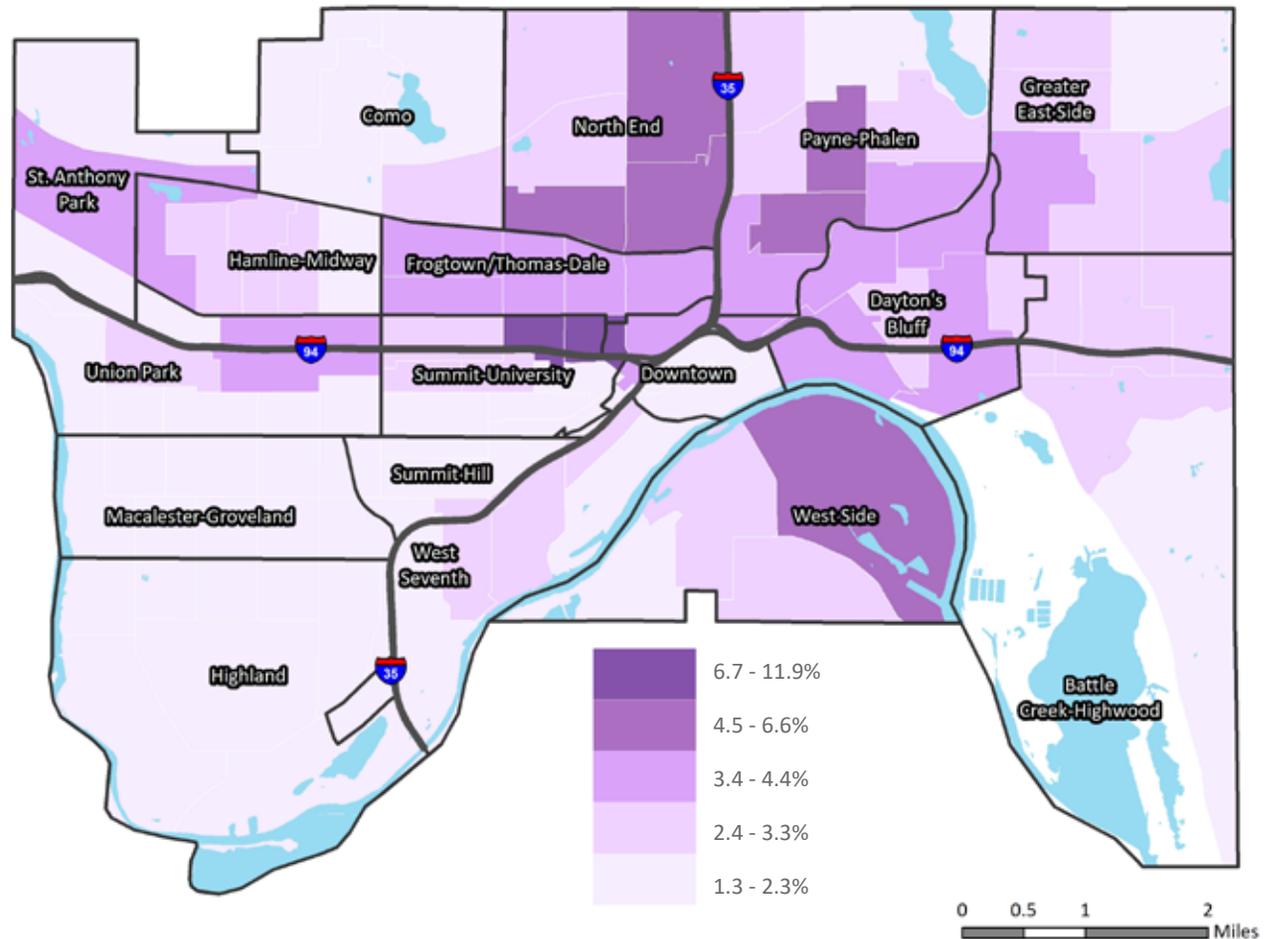


## Residential Energy Burden

Energy Burden is defined as the percent of household income spent annually on energy. Understanding energy burden and how it is distributed across neighborhoods, racial and ethnic groups, and household types can help to better target low-income energy efficiency programs in Saint Paul. According to a 2016 report from the American Council for an Energy-Efficient Economy that looked at the Twin Cities metro region as a whole, the median energy burden for a household in the Twin Cities is 2.32%. For low-income households, the median energy burden is 5.11% and is as high as 8.20% for some households, according to the report.

Analysis performed through Partners in Energy shows that the 10 census tracts with the highest median energy burden range from 4.2% to 12%. Note that this number may be conservative, as it only includes dollars spent directly on energy purchases (not taxes and fees) and may exclude indirect residential expenditures on natural gas (as in the case of multifamily buildings that purchase gas on commercial tariffs).

Based on further calculation, there are approximately 42,124 households in Saint Paul experiencing an energy burden of 4% or above. Lowering energy burden to below 4% for all Saint Paul households would save an estimated 13.5 million kWh of electricity and 1.3 million therms of natural gas each year, resulting in an average annual cost savings of \$2.4 million.



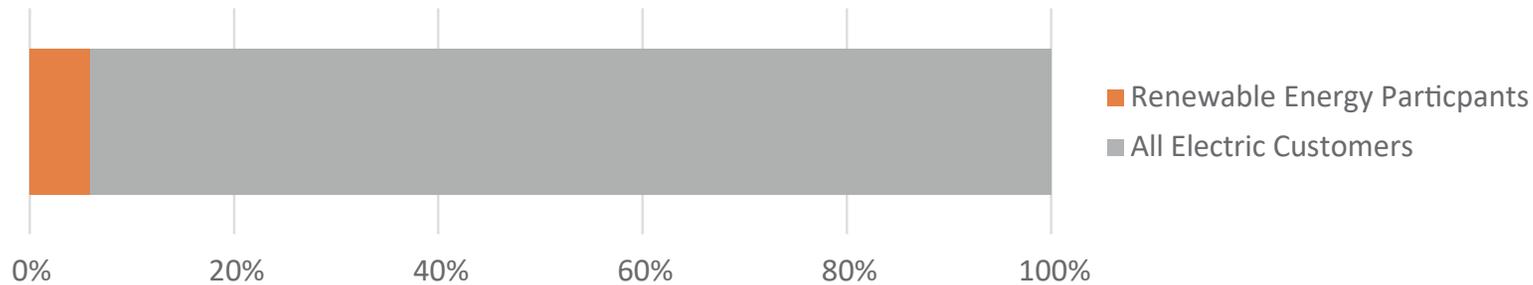
Map 9 Median energy burden by census tract. All energy consumption data are from 2015 and have not been weather normalized, per the Partners in Energy report.

## Participation in Conservation and Renewable Energy Programs

In addition to energy use, historical participation in Xcel Energy Conservation Improvement Programs (CIP) provides useful data on current trends and future opportunities. Between June 2013 and May 2016, Saint Paul residents took almost 17,000 efficiency program actions. These efforts add up to approximately 7.3 million kWh of electricity and 1.2 million therms of natural gas saved annually, equal to a reduction in energy bills by \$1.68 million per year. Averaged over the 3-year period, this is equivalent to 0.5% of annual 2015 residential energy use.

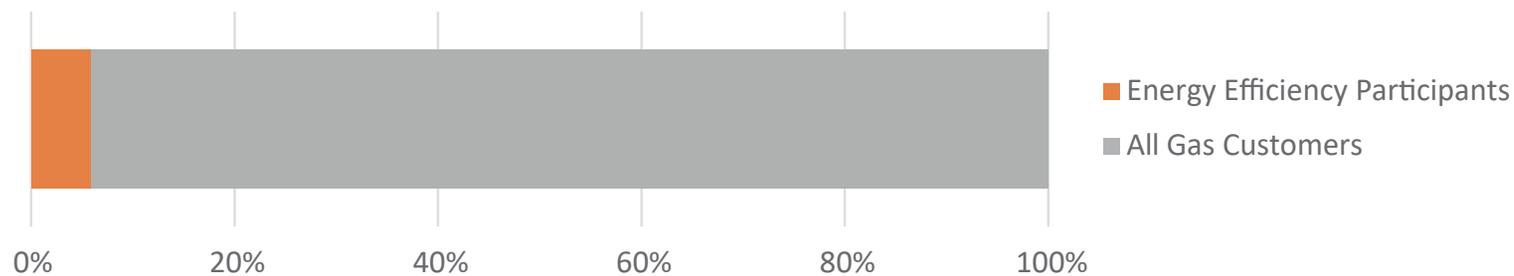
The most popular programs by number of participants were Saver's Switch, residential heating, and the Low-income Home Energy Squad. The top programs by energy savings were residential heating, Home Energy Squad, and Low-Income Home Energy Squad. Xcel Energy also provides information related to participation in renewable energy programs including on-site solar installation, and green power purchase programs, like WindSource® and Renewable\*Connect. Participation and associated renewable generation are included in the graph below. The graph represents the number of customers participating in renewable energy programs; about 6.32% of all residential electric customers are represented.

### RESIDENTIAL PARTICIPATION IN RENEWABLE ENERGY PROGRAMS



Similarly, approximately 6.34% of residential customers participate in energy efficiency programs. This is not a full representation of the number of customers who take actions to reduce energy use as not all customers utilize the utility incentives that are available.

### RESIDENTIAL PARTICIPATION IN ENERGY EFFICIENCY PROGRAMS

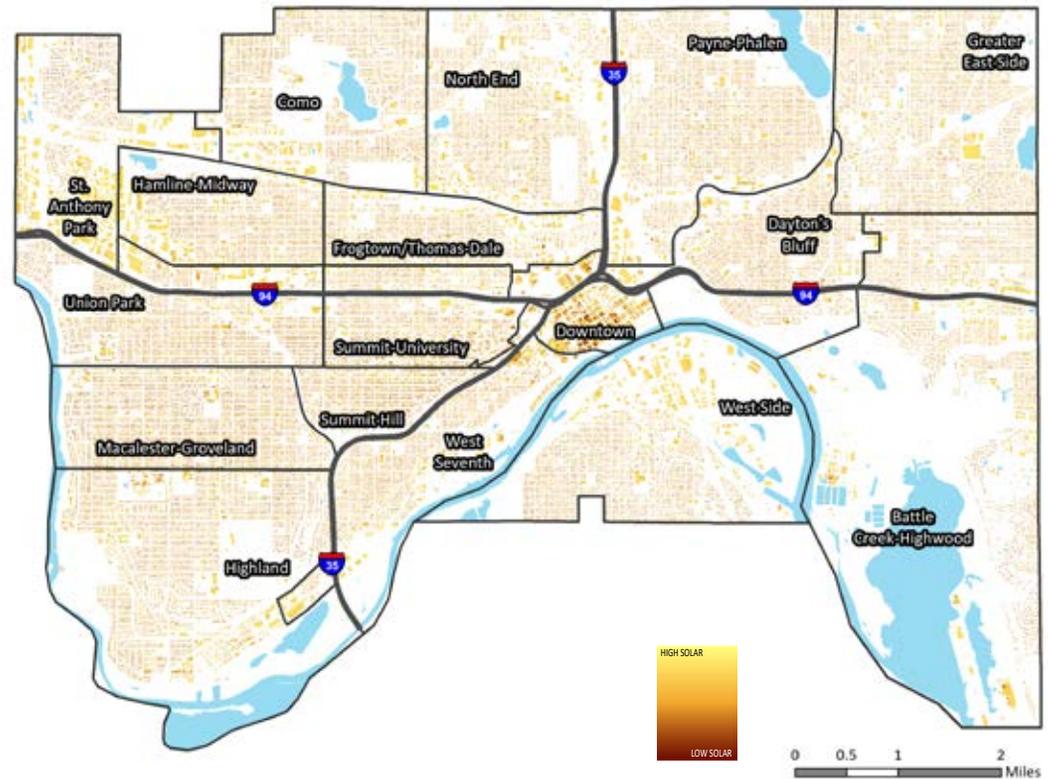
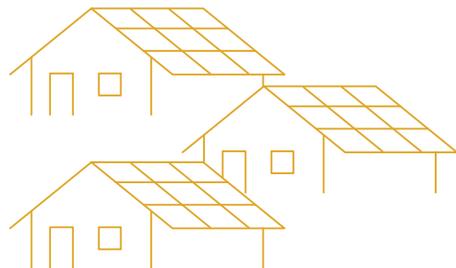


## Local Solar Energy

Increasingly, solar energy is becoming a more accessible and affordable technology to generate local electricity. Beyond generating clean electricity, solar energy systems can also have local economic impacts. Residents and businesses who install solar panels on their rooftops receive the economic benefit of free electricity generation. Local installations also increase local job opportunities. Xcel Energy offers income-qualified incentive programs for both rooftop solar installations and participation in community solar gardens, increasing access to affordable electricity generation for more people. Solar offers additional resilience benefits to the local community members. Installations can be designed so that during times of power outages, solar can be paired with a back-up battery system to continue to provide electricity to a home, business, or critical infrastructure.

Saint Paul has a good rooftop solar resource. If solar were installed on all rooftops with a decent rooftop potential, there could be a solar capacity greater than 800 MW, or about 40% of the city's total electricity consumption. The ten largest buildings alone have enough solar potential to achieve close to 1.5% of the city's electricity consumption.

Annual installations of rooftop solar have grown rapidly since 2010. The graph at the right illustrates both the annual increase in installations of rooftop solar energy systems and the cumulative capacity of solar energy within the city. The current capacity of solar in St. Paul is approximately 7.1 MW. This trend is expected to continue as the cost of installations decline and more people choose to participate in solar.



**ANNUAL SOLAR INSTALLATIONS & TOTAL CAPACITY**



# COMMERCIAL AND INDUSTRIAL ENERGY USE



Saint Paul has a large downtown area, with several high-rise commercial buildings as well as historic buildings including the Landmark Center, the State Capitol building, and the Cathedral of Saint Paul. Saint Paul’s downtown is also home to restaurants, art galleries, entertainment venues, museums, and sports arenas.

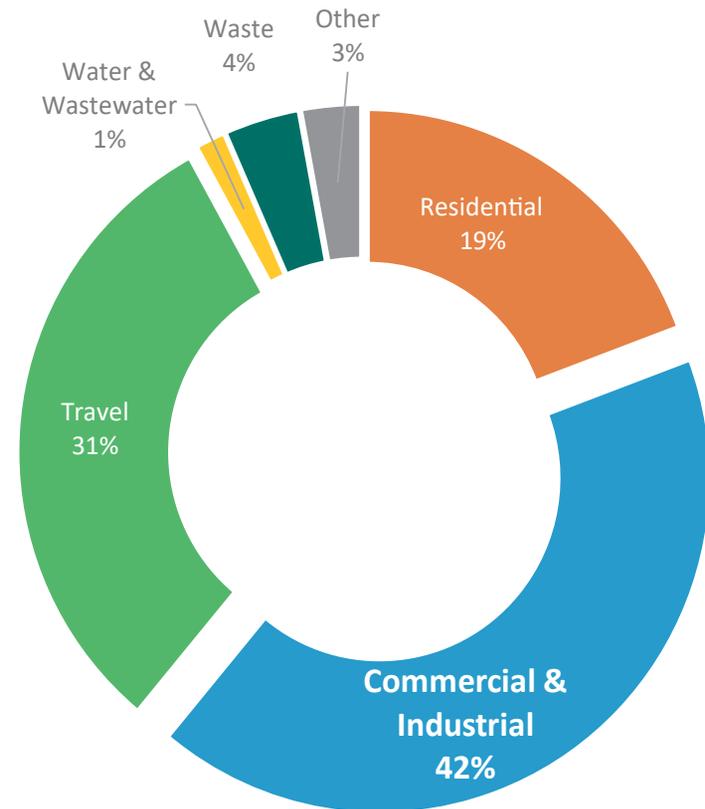
Buildings classified as commercial properties include a wide range of use types and reflect the large government and institutional presence in Saint Paul. Of the properties recorded as having over 25,000 square feet, the largest use category are properties classified as general commercial, which includes offices and retail spaces. After that, the largest special use categories by building count are public schools, churches, charitable institutions, municipal services, special tax districts, state property, and colleges and universities.

Saint Paul’s commercial buildings were constructed throughout the city’s 160-year history, though the heaviest construction period occurred between the years 1950 and 1975.

As mentioned previously, in 2015, Saint Paul had a total of 126,530 premises, 11% of which were commercial and industrial. Of the 2.7 billion kWh of electricity and 155 million therms of natural gas, the majority was consumed by the commercial and industrial premises. They represented 75% of the electricity and 54% of the natural gas consumption in the city and represent 42% of community-wide emissions.

A large part of Saint Paul’s downtown is served by District Energy Saint Paul, a thermal energy grid connected to a combined heat and power generating plant located on the banks of the Mississippi River. District Energy Saint Paul uses a mix of biomass and fossil fuels to generate both hot and chilled water, which is then piped to downtown customers.

Saint Paul businesses spent a total of \$218 million on energy in 2015. On average \$17,208 was spent per year on electricity and natural gas.



## SAINT PAUL AVERAGE ENERGY COSTS (BASED ON THREE-YEAR AVERAGES)

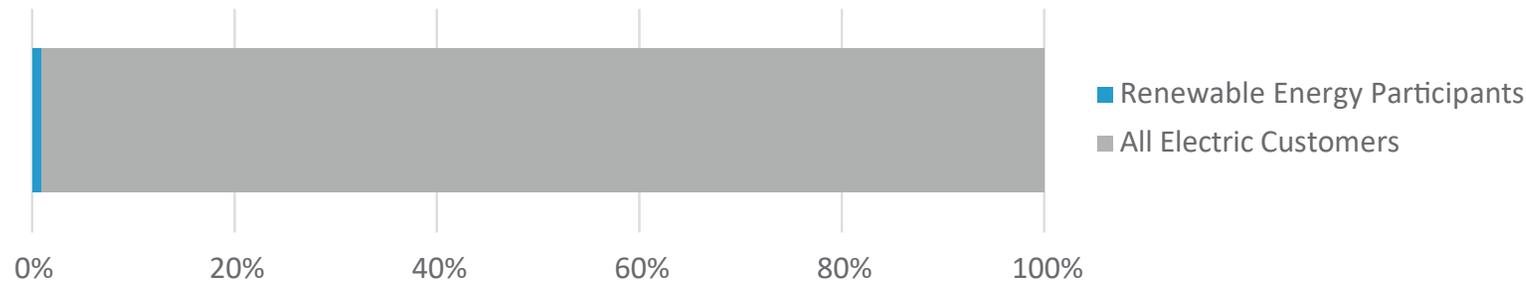
Customer Type	Average Electricity Cost (\$/premise/year)	Average Gas Cost (\$/premise/year)
Commercial & Industrial	\$13,082	\$4,126

## Participation in Conservation and Renewable Energy Programs

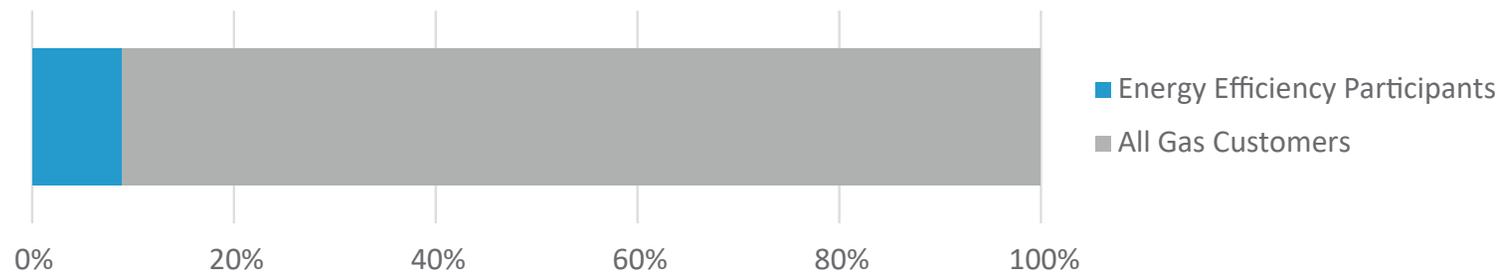
Between June 2013 and May 2016, Saint Paul businesses took almost 3,000 efficiency program actions. Combined, these investments saved approximately 91 million kWh of electricity and 2.8 million therms of natural gas per year, which amounts to an annual savings of approximately \$8.96 million. When savings are averaged over the three-year period, this is equivalent to 1.3% of annual commercial and industrial energy use.

The most popular programs by number of participants were lighting efficiency, small business lighting, and Saver's Switch. The top programs by energy savings were heating efficiency, Energy Design Assistance, and the custom efficiency program. Further detail is provided in the complete PiE plan. Participation and associated renewable generation are included in the graph below. Just under 1% (.95%) of commercial customers participated in renewable energy programs, while nearly 10% (9.80%) participated in energy efficiency programs in 2017.

### COMMERCIAL PARTICIPATION IN RENEWABLE ENERGY PROGRAMS



### COMMERCIAL PARTICIPATION IN ENERGY EFFICIENCY PROGRAMS



# TRANSPORTATION & MOBILITY



Transportation today has surpassed the electricity generation sector as the largest source of carbon emissions and is growing. Eliminating transportation emissions is critical to achieving the goal of carbon neutrality by 2050. Transportation accounts for nearly 30% percent of all Saint Paul Climate emissions today, a yearly total of 1.02 million metric tonnes of carbon dioxide equivalent (MMTCO<sub>2</sub>e). A majority of trips are carried out by car, often driving alone.

Transportation emissions are influenced by three main factors:

1. **Land use and urban form**—where people are located and where they are going affect how often trips are made and how long they are. If destinations are further away and more dispersed, a higher number of trips will have to be made over longer distances
2. **Mode of transportation**—whether people are driving, walking, biking or taking transit
3. **What fuels are used**—gasoline, diesel, biofuels, or electricity

Since the creation of the interstate system in the 1950s, cities across the country were re-designed to predominantly accommodate the automobile, leaving less room for other modes of transportation including transit, walking, and biking and Saint Paul is no exception. Eighty percent of city travel is by car, often driving alone. People drive about 2 billion miles a year in Saint Paul, or about 5.5 million miles a day. Driving alone is by far the most energy intensive mode of surface transportation. On average, a car uses 3,000 British thermal units (BTU) per passenger mile traveled, compared to 800 BTU for transit rail – in addition to the significant amounts of energy used to manufacture automobiles and the acres of pavement dedicated to their storage and movement.

Saint Paul is projected to add an additional 30,000 residents by 2030. If current transportation trends continue, this growth is likely to increase car-usage, congestion, and associated greenhouse gas emissions.

Transportation and land use decision-making has an outsized influence on how communities are shaped. Access to destinations mitigates racial segregation, income inequality, and promotes family stability. Historically, transportation projects have often resulted in disproportionate negative impacts on marginalized communities, such as segregation. For example major downtown highways in the 1950s were intentionally routed through communities of color such as the Rondo neighborhood in St. Paul, which is predominantly African American. As a result of these transportation projects, communities of color are more likely to be situated in close proximity to major highways and are more likely to breathe polluted air, and having higher rates of asthma and cardiovascular disease. People of color in the city, who are also likely to be lower income as a result of historical marginalization and segregation, are more likely to be victims of car-crashes.

An auto-centric transportation system is a financial burden, especially for lower income residents—the average cost of car-ownership in Ramsey County adds around \$9,500 a year to the household budget. Those who do not own a vehicle often pay for auto-centric infrastructure that they do not use. For example, the hidden cost of parking is often reflected in higher rents and higher costs for goods and services. This disproportionately impacts low-income residents who have limited or no access to a personal vehicle. Approximately 14% of city residents have no access to a vehicle.

Traffic crashes exact a huge emotional and financial toll on society— in 2018, 112 pedestrians and 29 bikers were hospitalized after being struck by a vehicle; there were five fatalities (2018 Pedestrian and Bike Crash Data, City of St. Paul).

Transportation investments also have the potential to attract new development that could raise housing prices and rents in low-income neighborhoods. City plans showed support for development of new affordable housing units throughout the city.

Decreasing carbon emissions in the transportation sector requires a concerted set of policies that focus on simultaneously electrifying the transportation system, while reducing driving demand and increasing mode share on public transit and active transportation infrastructure.

Saint Paul has made significant strides towards increasing public transit and active transportation usage. The opening of the eleven-mile Green Line light rail system in 2014 connected the central business districts of Saint Paul and Minneapolis. Twenty-seven miles of new biking infrastructure have also been added since 2015. Biking in the Twin Cities has gone up by 13 percent since 2000, and driving has reduced by 6%.

Saint Paul has developed far-reaching plans that will influence transportation and land-use decision making in the coming years. The city recently updated its comprehensive plan that will guide the city’s development for the next twenty years. The plan seeks to provide true transportation choice in the city by 2040 by improving the number of transportation options available to residents, substantially increasing the number of new developments that are “transit-oriented” and providing high-quality sidewalks throughout the city. The city has also released versions of transit, bicycle and pedestrian plans as addendums to the comprehensive plan that seek to increase transit frequency and reliability and make walking and biking easy, safe and comfortable throughout the city.

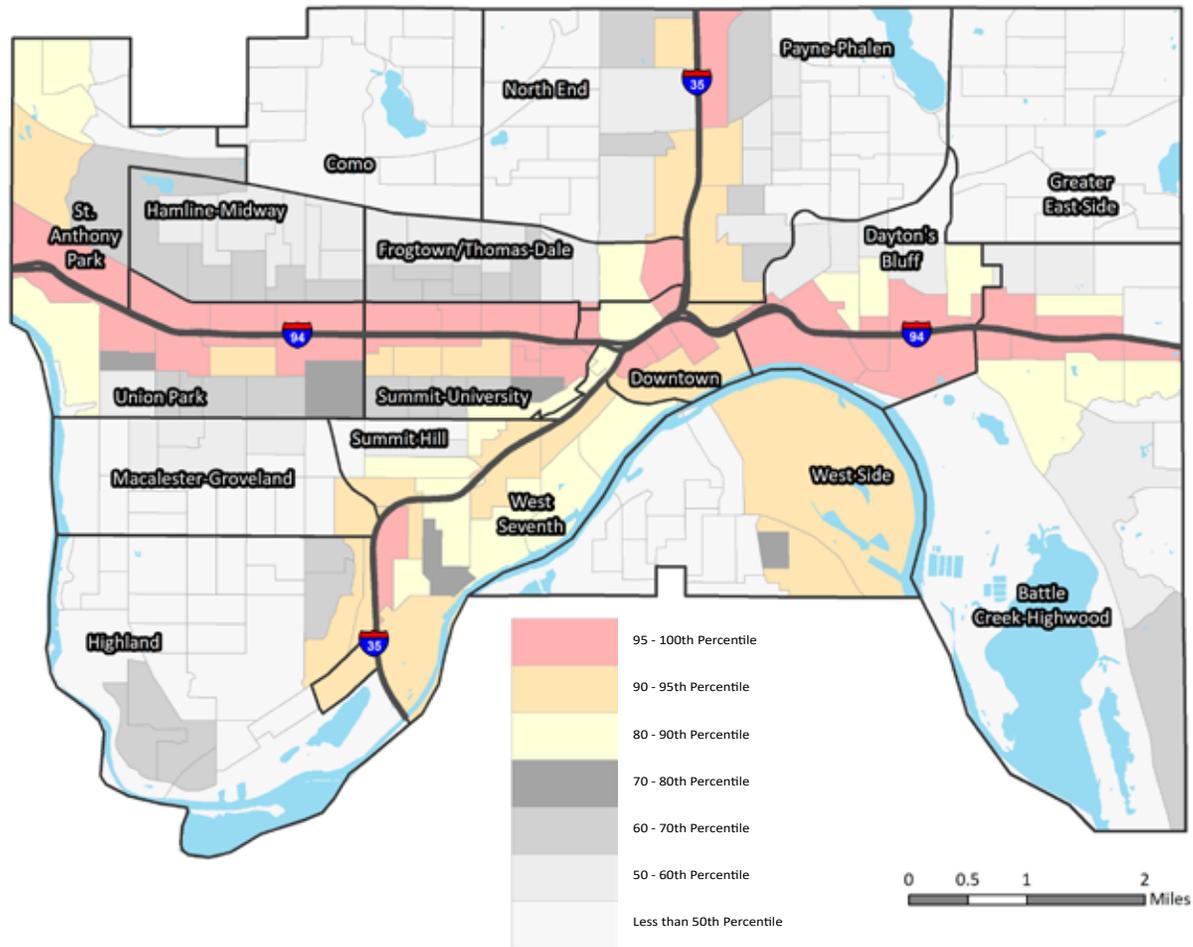


Figure 3. Percentile of exposure to poor air quality (based on national data) from traffic particulate matter emissions. Data collected from USEPA tool EJSCREEN and based on proximity to varying traffic volumes.

## Transportation and Mobility Priorities

Reducing emissions from the transportation sector will require a concerted set of actions that must be implemented simultaneously--focused primarily around electrifying the transportation system and reducing the number of vehicles miles traveled (VMT) in the city. The priorities recommended in this plan were developed around a number of guiding themes:

- Increase safe and reliable access to city destinations without the use of a private automobile
- Mitigate the historical effects of discriminatory transportation decision-making and bring transportation equity to marginalized communities
- Commit to reducing transportation costs, particularly in communities of color and low-income communities through a range of initiatives such as providing more public transportation options and investing in safe and affordable active transportation options
- Improve public health through effective transportation and land-use decisions--reduce particulate matter emissions, increase active transportation options and eliminate deaths and injuries from traffic crashes





Waste accounts for approximately 4% of total GHG emissions in Saint Paul. The emissions are largely attributed to GHG emissions from the Newport Resource Recovery facility. Emissions that occur prior to a consumers' purchases of goods are not included in the GHG inventory. The City of Saint Paul, through Resolution 14-519, established goals of diverting waste 40% by 2020 and 80% by 2030. Saint Paul contracts with haulers to provide recycling and garbage services to residential households. Recycling is collected for all residential households (single family – large apartment buildings); garbage is collected through an organized trash collection system for all residential properties up to 4 units. All other residential and commercial property trash is collected through an 'open hauling' system.

The city has already taken steps to work toward achieving these goals. Through organized trash collection the city will be better able to track waste generation and know where to target education and outreach efforts to increase waste reduction and recycling. In addition to residential collection, the city also offers a drop-off site for recyclable materials, drop off events for recycling and proper disposal of larger items that are not collected through the residential collection program such as appliances, electronics, scrap metal, mattresses and construction debris. The city also supports and promotes organics recycling opportunities at the Ramsey County Yard Waste sites and additional drop off locations. The City also promotes use of the Ramsey County Household Hazardous Waste drop off facility for proper disposal of toxic and hazardous items.

The Ramsey County Solid Waste Management Master Plan provides the blueprint for the solid waste system for communities under its jurisdiction. Ramsey County incorporates the State's waste management hierarchy, which emphasizes waste diversion through a prioritization of waste reduction/reuse and recycling/composting over energy recovery and disposal. The County is an important partner that can help Saint Paul achieve our waste goals by providing support through policy development, financial assistance, regulation, education and outreach, and direct services.

## Waste Priorities

- Follow the state's waste hierarchy with particular attention on the prevention of waste generation
- Ensure environmental justice is included in decision-making and program implementation
- Continue education and outreach in partnership with Ramsey County to increase recycling rates in historically low participation neighborhoods
- Demonstrate leadership at the city level in operations and at events
- Coordinate with the county to ensure proper management and disposal of debris that results from emergency situations.



The Mississippi River is the main source for Saint Paul's water. Rainwater travelling across pavement during heavy rainfalls can pick up trash, leaves, animal waste, and chemicals. If these items reach the river through storm drains, they can pollute the water. Efforts to prevent polluted waterways must include steps to take during heavy rain events which are occurring with greater intensity and more frequency due to climate change. Keeping rainwater where it falls or slowing its path to lakes and rivers helps reduce the load on storm sewer capacity and gives ecological systems a chance to filter out harmful chemicals.

Likewise, we also need to be smarter about the products that are used to keep roads safe in winter months to protect water and soil quality. This will improve the growing environment for trees and vegetation which help keep Saint Paul cool in the summer. Decreased use of salt and other chemicals on our roadways means less runoff to lakes and rivers as well. Finally, a significant amount of energy is used to treat, distribute, and heat water. Conservation and wise use of water help prevent waste and reduce that energy intensity of water consumption.

## Water Priorities

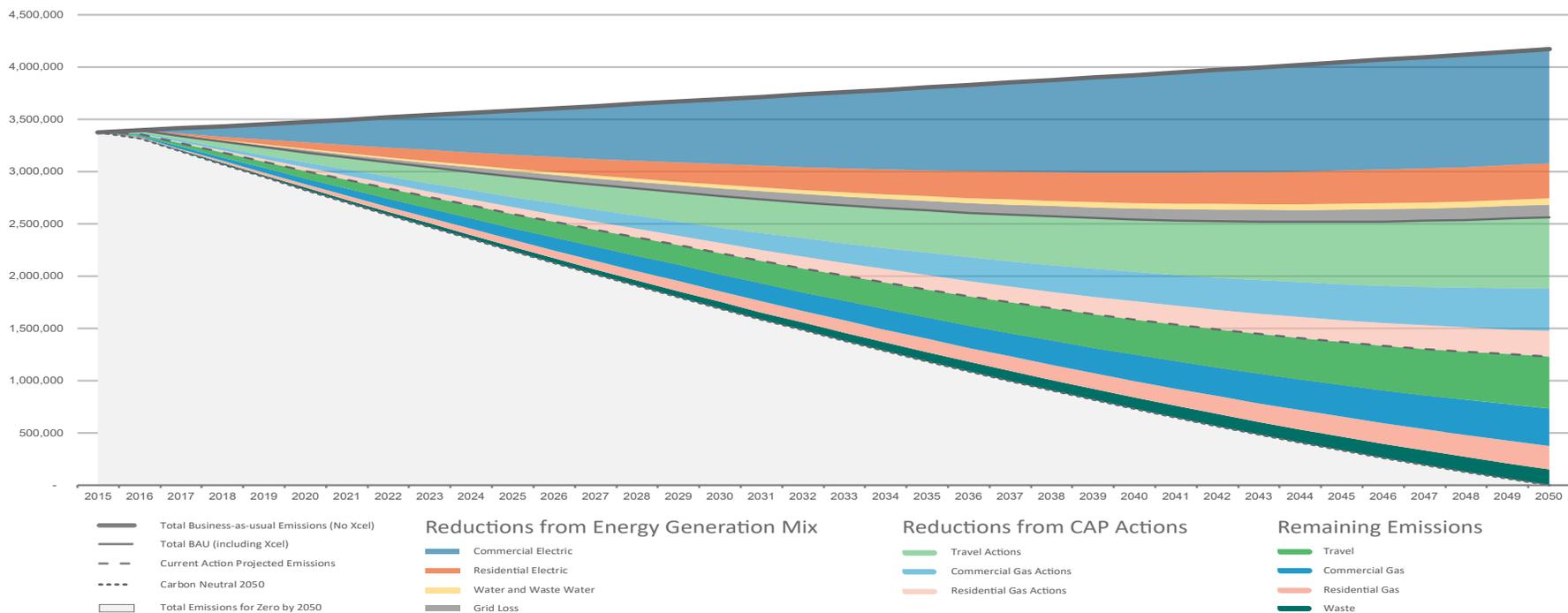
- Preserve safe, quality drinking water sources and distribution systems for the city
- Promote a culture of water conservation

# EMISSIONS REDUCTION GOAL: EQUITY, EFFICIENCY, & ELECTRICITY



The City of Saint Paul has a goal to achieve carbon neutrality by 2050 and cut our emissions in half by 2030. Xcel Energy has committed to delivering carbon-free electricity by 2050, which will decrease community-wide emissions 39% relative to the business as usual scenario. This reduction allows Saint Paul to focus our efforts more directly on reducing emissions from travel and natural gas, and on improving equitable access to clean electricity. To achieve our goals, the city will need to realize an average annual emission savings of 3% across natural gas and travel emissions.

**PROJECTED EMISSIONS REDUCTIONS BY 2050 (METRIC TONS CO2E)**



By 2050, the remaining emissions in Saint Paul will come from the use of natural gas and fossil fuels used in internal combustion engines. In order to achieve carbon neutrality, the technology for these energy sources will need to change or be displaced. The targets and initiatives identified in this plan would result in approximately a 52% savings from a business as usual scenario (70% with electric emissions savings), or a 63% emissions reduction from 2015 levels. These targets include aggressive energy efficiency savings in both residential and commercial buildings. The reduction scenario graph includes Xcel Energy’s 2050 carbon-free generation mix and 33% vehicle electrification by 2030, in line with the state’s announced goal. Strategies that are not included in the scenario but would help the city further reduce our emissions are those that displace the use of natural gas, like electrification and thermal grid applications.

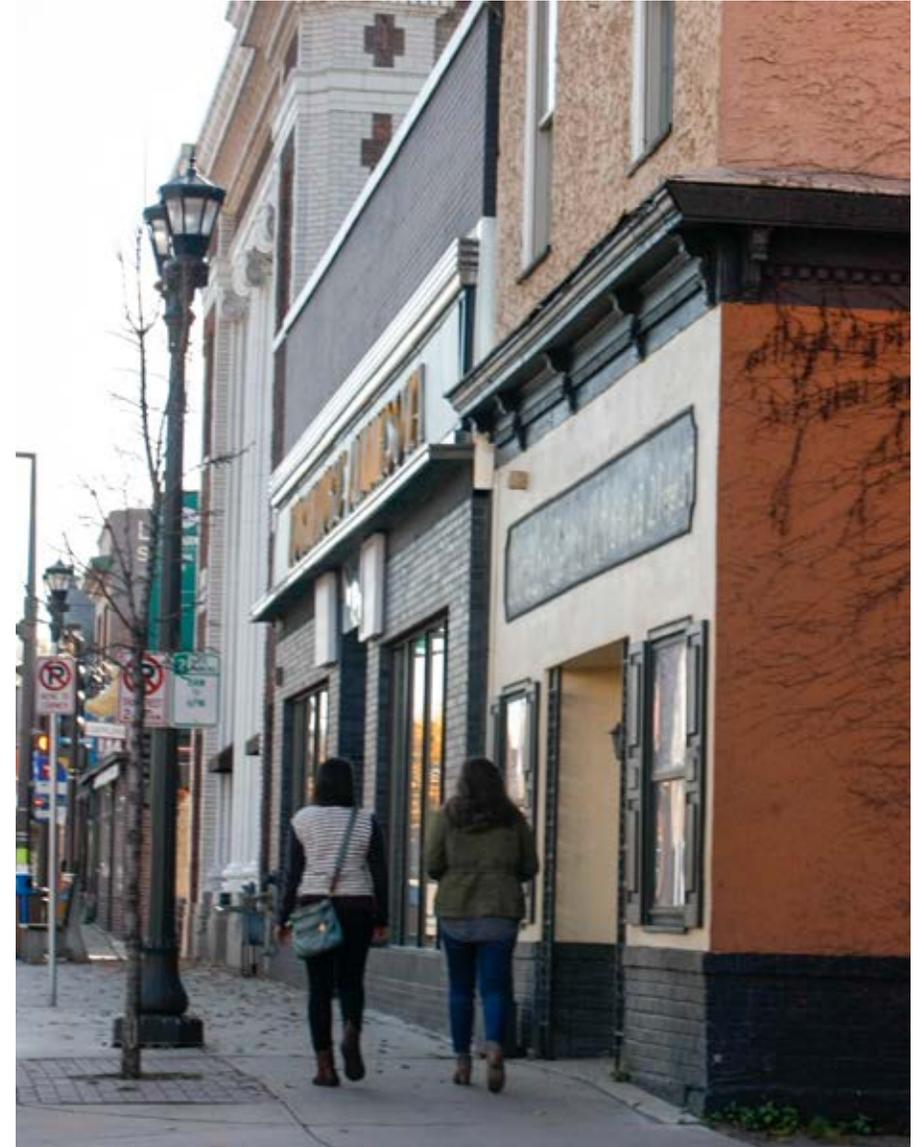


## Buildings

Attaining carbon neutrality in just over 30 years will require aggressive efforts to reduce overall building energy use through efficiency and conservation and convert energy sources to renewable or carbon free energy. The scale of the effort will also depend on how Saint Paul's underlying energy needs are growing.

Under a "business as usual" scenario of 1.1% annual energy growth, carbon emissions would increase 50% by the year 2050 if nothing else changed. However, Xcel Energy's current Upper Midwest resource plan forecasts significant electricity decarbonization between now and 2030 and has committed to carbon free electricity by 2050. The 2030 reductions alone would get Saint Paul buildings nearly 40% of the way toward carbon neutrality, significantly freeing up city resources to achieve additional emissions reductions.

Saint Paul's near-term priorities reflect sectors or activities that will have high impact and where the city can begin strategy implementation over the next one to three years. While implementation can begin immediately, the incremental impact of these strategies is expected to be realized over at least a 10-year time horizon. However, these priority areas do not account for the full energy footprint across all city sectors, and therefore are not inclusive of all efforts that will need to be put in place to achieve carbon neutrality. These priorities were selected because they offered the highest likelihood of early success, reflected necessary foundational groundwork for later state strategies, or addressed issues that needed significant lead times to get off the ground.



## RESIDENTIAL TARGETS AND ACTIONS

Residential energy accounts for 19% of Saint Paul’s community-wide emissions. By 2050, residential building emissions will come entirely from natural gas consumption for the purposes of space and water heating, as well as cooking. The most impactful actions to reduce those remaining emissions will be:

1. Prevent emissions with the adoption of stricter building energy codes for new development
2. Do deep energy retrofits that include building envelope improvement
3. Electrification of natural gas appliances

An inventory of actions to improve efficiency and expand renewable energy is included in the PiE action plan. This page includes targets and additional initiatives the city should implement to achieve our goals.

Inspire a Culture of Energy Stewardship	Residential Targets	2030 Targets	2040 Targets	2050 Targets
Inspire a culture shift that transforms the community’s relationship to energy use, tripling the incremental savings from conservation and renewable energy adoption within 10 years.	Annual household participation in deep energy conservation programs	1,200	3,500	2,500
	Annual household participation in green power purchase program (50% participation)	3,250	3,250	2,000
	Residential solar rooftop capacity (MW) 10% solar	10	25	50
	Green new development (% of new housing)	10%	50%	100%

### Key Initiatives:

- Achieve PiE energy plan Year 1 milestones related to efficiency
- Work at the state level to support green residential building development standards; adopt the stretch code when it becomes available
- Create a comprehensive deep energy efficiency retrofit program that systematically reaches every 1-4 unit household in the city, beginning simultaneously in high energy use and low-income neighborhoods
- Educate residents about the benefits of replacing heating equipment and with air-source heat-pumps, or other efficient electric heating options
- Support opportunities for residents to replace natural gas appliances (e.g., ranges, water heaters, etc.) with electric alternatives; partner with Xcel to explore thermal storage opportunities
- Identify opportunities for thermal grid applications for new developments
- Develop and implement a point-of-sale and point-of-rent energy disclosure ordinance
- Host a citywide solar resource map on the city website
- Offer a one-year production incentive for residential solar

## RESIDENTIAL ENERGY BURDEN

An estimated 38,000 Saint Paul Households live below 50% of the area median income. A baseline analysis of household income and average energy costs show that 12 census tracts within the city have a median energy burden above 4%, with the highest at 12%. These 12 tracts contain over 10,000 households. The following initiatives are aimed at relieving energy burden among households in the 12 census tracts identified in the PiE report.

Reduce Resident Energy Burden	Residential Targets	2030 Targets	2040 Targets	2050 Targets
Lower the energy burden so that no Saint Paul household spends more than 4% of household income on energy costs.	Annual household participation in low-income deep energy conservation programs	1,600	1,600	500
	Annual household participation in low-income community renewable energy programs	1,000	1,000	1,000
	Percent of new affordable development designed to green building standards	100%	100%	100%

### Key Initiatives:

- Establish an energy burden working group to coordinate outreach actions and resource knowledge among local community entities and trusted leaders
- Develop policy options that incentivize 4D property owners to make energy efficiency improvements
- Help increase low-income access to affordable renewable energy
- Host a community-solar gardens that includes low-income participation
- Offer a one-year production incentive for with a low-income rate for residential solar installations in conjunction with existing, related programs

### Existing Residential Programs and Resources

- Home Energy Squad
- Weatherization Assistance Program
- [Energy Smart Homes](#)
- WindSource®
- Renewable\*Connect®
- Community solar gardens
- Bulk purchase programs: Solar United Neighbors, Solar Power Hour
- Energy Sage Solar [Calculator](#)
- Residential Renewable Energy Federal Investment [Tax Credit](#)
- Xcel Solar\*Rewards
- Minneapolis [4D Housing Incentive](#)
- Low-income community solar garden at Dayton’s Bluff
- Inspiring Communities
- Xcel Energy’s low-income solar rate
- [Minneapolis Green Cost-Share](#)



## MAJOR INSTITUTIONS TARGETS AND ACTIONS

The commercial and industrial sectors make up the greatest share of building emissions. Achieving significant reductions among the city’s largest buildings will be critical to work toward carbon neutrality. Many companies across the country are setting their own GHG reduction goals. By working closely with the largest users in the commercial sector both the city and the business community can realize the benefits of reducing energy use and GHG emissions. The most impactful actions in the commercial sectors are:

1. Green building standards for new buildings
2. Efficiency operation of existing buildings
3. Building energy retrofits

Engage Major Institutions on Climate Leadership	Institutional Targets	2030 Targets	2040 Targets	2050 Targets
Within 3 years, win commitments of major institutions to achieve carbon neutrality by 2050 and ensure 80% of institutional buildings are actively benchmarked, and within 10 years, help institutions realize a 35% total GHG reduction, with energy efficiency as the leading strategy.	Participation of institutional buildings in energy benchmarking	100%	100%	100%

### Key Initiatives:

- Secure institutional commitments to achieve carbon neutrality by 2050
- Explore feasibility and impact of energy benchmarking requirement
- Support institutions in assessing readiness for renewable energy and investing in renewable subscriptions and/or local renewable installations.
- Implement additional outreach with local partners to increase participation in available programmatic financing options
- Implement an energy challenge competition to motivate institutional partners



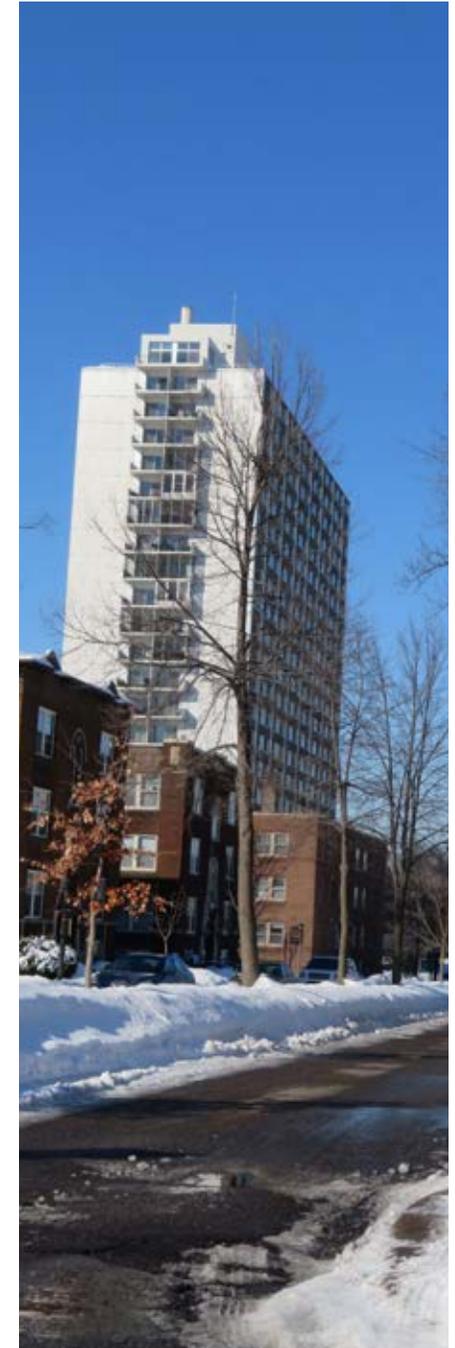
## MULTIFAMILY AND LARGE COMMERCIAL

Multifamily and large commercial are the next largest users of building energy. Of the more than 100,000 housing units in Saint Paul, approximately one-third are multifamily (5+ units). Other buildings classified as commercial properties include a wide range of use types. Of the over 25,000 square feet, the largest use category are properties classified as generic commercial, such as offices and retail. The different use types pose a range of challenges in addressing energy consumption and program delivery. Better building management and increased energy awareness can help minimize many of those challenges.

Engage the Multifamily and Large Commercial Sector	Multifamily and Large Commercial Targets	2030 Targets	2040 Targets	2050 Targets
<b>Adopt multifamily and large commercial sector conservation and renewable initiatives that result in an additional 4% annual reduction in GHG emissions.</b>	Participation in building benchmarking (50k sq. ft.)	100%	100%	100%
	Green new development (% of buildings)	10%	100%	100%
	Commercial solar rooftop capacity (MW)	50	150	300

### Key Initiatives:

- Ensure the former Ford site becomes a leader for sustainable planning with locally generated power from an integrated, renewable site-based energy system
- Explore feasibility and impact of the energy benchmarking requirement
- Provide energy tools and resources for commercial building code officials
- Update and expand Saint Paul’s Sustainable Building Policy
- Host a citywide solar resource map on the city website
- Enhance the expertise of building operators and code officials to optimize efficient building performance
- Prepare and disseminate resources for commercial sector on financial benefits of solar installation
- Offer a one-year production incentive for commercial solar installation
- Consider expanding the eco-district and ensure it can be successful
- Assess feasibility of thermal grid & natural gas decarbonization
- Pursue and consider policies to incentivize advanced heat recovery projects
- Identify where strategic electrification of certain loads would assist in decarbonization



## SMALL AND MID-SIZE COMMERCIAL

Small and mid-size businesses often operate on budgets with thin margins. Making energy improvements in these years can help decrease unnecessary costs and improve comfort.

Engage the Small & mid-size Commercial Sector	Small & mid-size Commercial Targets	2030 Targets	2040 Targets	2050 Targets
Reduce energy consumption and GHG emissions in small and mid-size businesses.	Annual participation in energy conservation programs	5%	5%	5%
	Annual participation in green power purchase program	2.5%	2.5%	2.5%
	Commercial solar rooftop capacity (MW)	10	30	50

### Key Initiatives:

- Engage small businesses in energy efficiency programs
- Target small businesses in low-income communities with energy efficiency opportunities
- Promote financing and rebate opportunities, such as commercial PACE and utility rebate programs
- Ensure educational information for small business efficiency programs are available in multiple languages
- Promote utility green power purchase programs
- Provide information and resources for participating in a community solar garden project
- Offer a one-year production incentive for commercial solar installations

### Existing Multifamily and Large Commercial Programs and Resources:

- Sustainable Growth Coalition
- [Energize Saint Paul](#)
- WindSource®
- Renewable\*Connect®
- Community solar gardens
- [Race to Reduce](#)
- Commercial PACE
- [Energy Efficiency Programs](#)



## Transportation Emissions

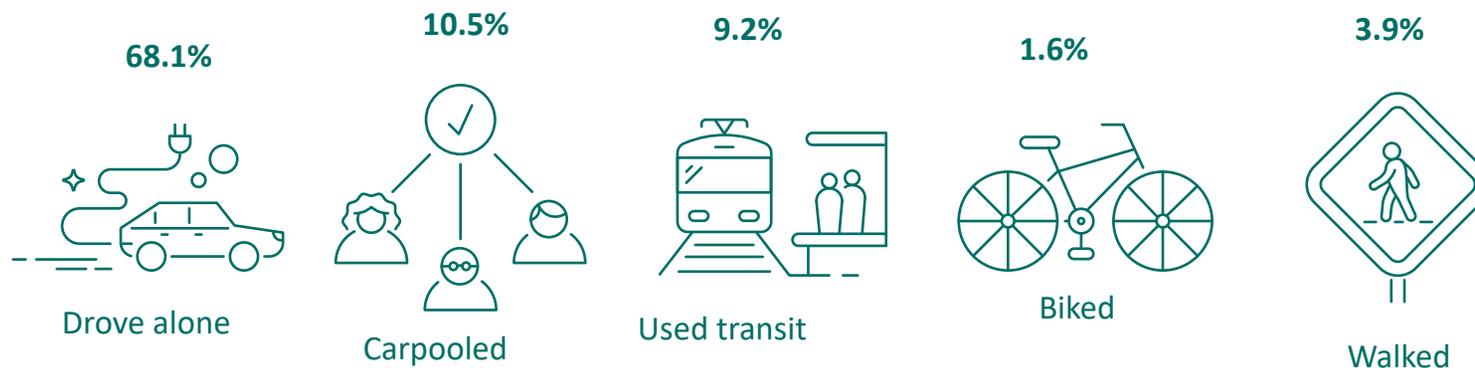
Transportation emissions make up approximately 31% of travel. The majority of emissions come from on-road vehicles including light-duty passenger vehicles and heavy-duty vehicles. Of these vehicles types, 71.5% are passenger vehicles and 27.9% are heavy-duty vehicles, which often use diesel as the primary fuel. Additional in-boundary transportation emissions come from rail and boats, though these make a small percentage of travel emissions.

In 2017, the majority of commuters traveled in single-occupancy vehicles (68.1%). Just over 10% carpooled. Together, transit, biking, and walking made up about 15% of commuters, and 5.6% of residents worked from home. There is opportunity to continue to shift people from personal vehicles to other modes of transit. As technologies and services change, there are more options than ever for people to move around the city.

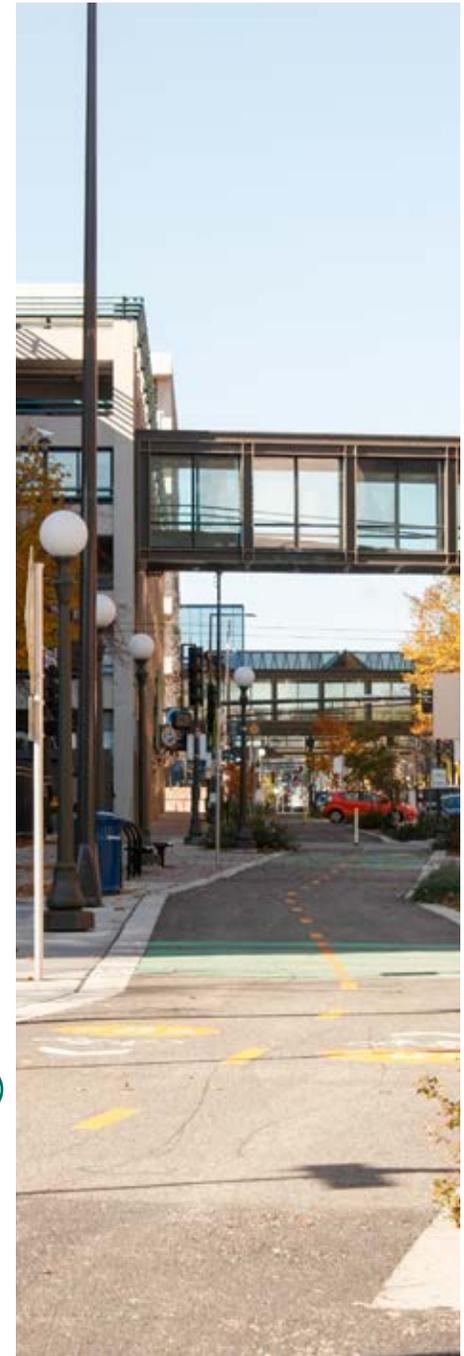
This plan focuses on reducing emissions first by making cleaner modes of transportation the easy option. Reducing the amount of vehicle miles driven is critical to achieving carbon emission reduction goals. Providing safe and easy access to walking, rolling, and biking has the added benefit of promoting better health.

In addition to reducing vehicle miles travel through mode shift, this plan also recognizes that there are times when people are going to need cars. Electric vehicles offer cleaner alternatives to internal combustion engines both in terms of GHG emissions and local air pollution. By enabling accelerated adoption of electric vehicles through charging infrastructure buildout, the city can help move toward a more sustainable transportation future. As much as possible, the city is focused on the electrification of car-sharing services to better support those who do not own a car.

### 2017 Commuting Characteristics



Source: 2017 American Community Survey 5-year Estimates



## Transportation and Mobility

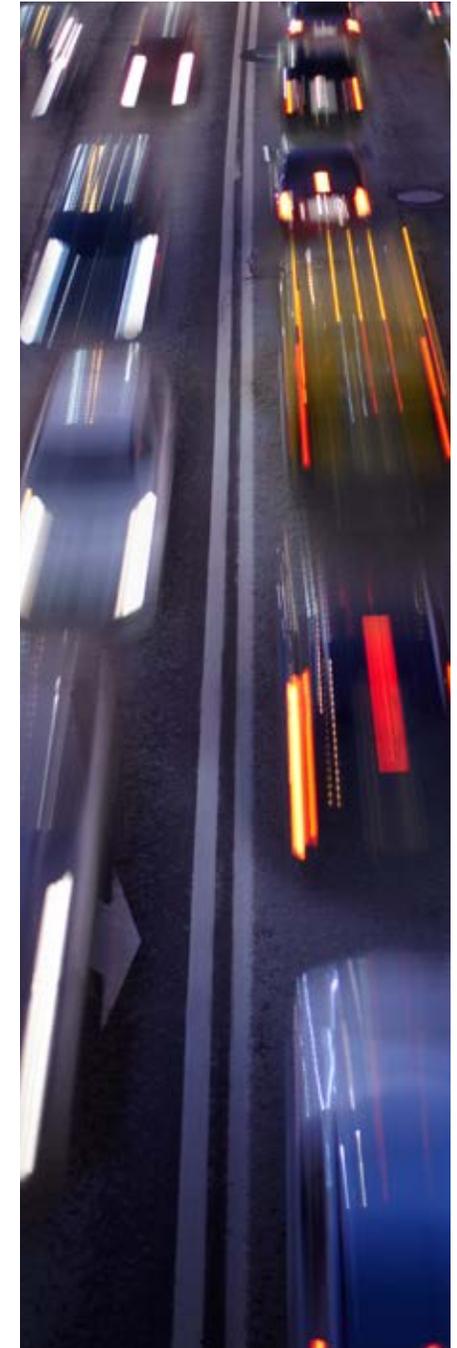
### SINGLE-OCCUPANCY VEHICLES

The majority of trips taken in Saint Paul are people driving alone in their vehicles, often for distances less than one mile. Alternative transportation modes, like biking, public transit, rideshare, and using a scooter, or walking, all minimize emissions from single passenger vehicles. These also offering co-benefits like reducing traffic congestion, improving mental health and well-being, and minimizing cost to the individual. Providing residents with easy alternatives can help reduce the number of people who drive alone and reduce the per person vehicle miles driven each year.

Reduce SOV travel demand	Land use and Travel Management Targets	2030 Targets	2040 Targets	2050 Targets
The City of Saint Paul will prioritize walking, biking, rolling and taking public transit for travel and reduce driving by 40% by 2040.	% reduction of SOV commuters (from 2015)	10%	40%	50%
	% Reduction of per person VMT annually	2.5%	2.5%	2.5%

#### Key Initiatives:

- Reduce or eliminate citywide minimum parking requirements and set parking maximums for most land-use types and require developers and landlords to “unbundle” parking from rent
- Redesign parking fees to capture the full cost of parking in downtown and other commercial districts
- Provide a stable funding source to implement the recommendations of the city’s comprehensive lan
- Bring together various stakeholders including the city, transit agencies, and community groups to create affordable housing in the transit market areas defined by Metropolitan Council
- Implement pricing strategies that accurately capture the cost of driving and auto-centric infrastructure on city roads
- Identify strategies to mitigate the impacts of inner-city highways including capping, conversion to boulevards, or complete removal
- Incentivize infill development by implementing smart growth strategies described in the city’s draft comprehensive plan
- Increase the number of communities that are mixed-use and higher-density
- Implement the “Vision Zero” program recommendation of the Comprehensive Plan to achieve zero traffic fatalities on city rights of way



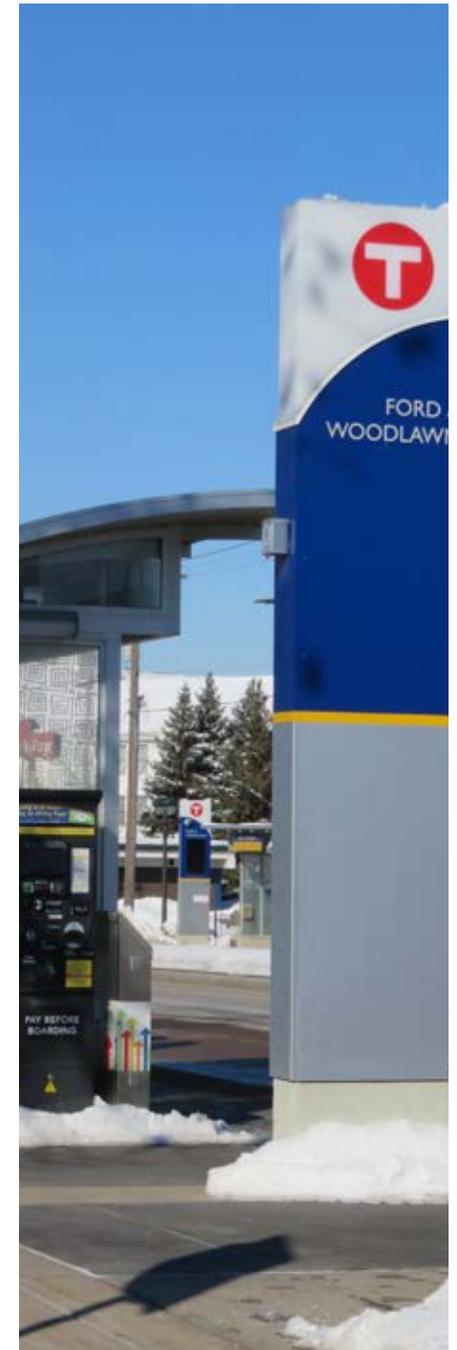
## TRANSIT RIDERSHIP

There are many transit options for Saint Paul residents, including light rail, bus rapid transit (BRT), express buses, and local bus lines. However not all parts of the City are serviced equally with transit options – and as transit ridership increases, we must ensure that deployment of transit options is equitable. For those who take transit, the Metropolitan Council offers GoTo Cards and has a mobile app so that riders don't need to carry cash for fares, and some employers subsidize transit ridership if used as the primary method of commuting.

Increase Transit Ridership	Transit Targets	2030 Targets	2040 Targets	2050 Targets
Increase transit availability, frequency and reliability to ensure parity with automobile travel times, focusing on the transit market areas defined by Metropolitan Council.	Increase mode share of transit from 2015 levels	6% increase in ridership	25% increase in ridership	40% increase in ridership

### Key Initiatives:

- Ensure mobility hubs are located within .25-mile of transit service to increase options for the first and last mile
- Work with city, state, regional and federal stakeholders to identify long-term sustainable funding strategies to complete the planned build out of transit lines
- Create high-frequency rapid transit in all parts of the transit market areas defined by Metropolitan Council
- Increase transit coverage in concentrated areas of poverty to increase access to jobs and destinations in the downtown core
- Support transit with last mile solutions including autonomouc-electric car-share, standard e-bike share, and scooters that will become more broadly available at mobility hubs
- Streamline service to prevent redundancy and enable passengers to easily understand routes and schedules
- Strategically place stops to improve transit speed and reliability
- Upgrade and refurbish highly used transit stops to include amenities such as benches, shelters, trash cans, way finding signs and lighting
- Relocate stops that feel unsafe or are placed near high-speed car traffic
- Invest in all-door boarding and off-board fare payment
- Improve accessibility at transit stops for those in wheelchairs or with limited mobility. Continue to add ADA compliant pads and prioritize improvements in neighborhoods experiencing poverty
- Create a framework where ride-hailing services reduce overall trips by combining them with other tools such as walking, biking, transit, shared rides and compact development



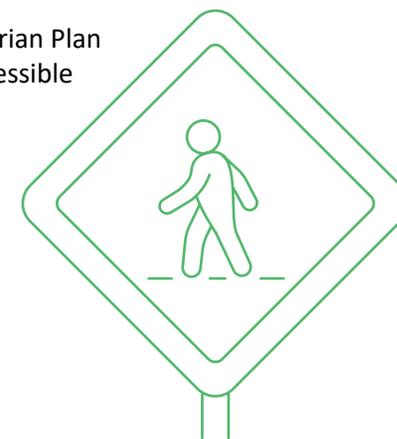
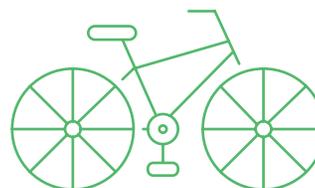
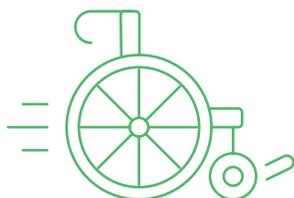
## MOBILITY OPTIONS

Ensuring that transportation alternatives are feasible and safe for Saint Paul residents is crucial to see changes in the ways that people move around the city. The presence and quality maintenance of mobility infrastructure like bicycle lanes and curb cuts for all types of wheels and walkers can help improve user experience.

Enable and increase in biking and walking	Alternative Modes Targets	2030 Targets	2040 Targets	2050 Targets
Ensure that 85% of Saint Paul residents have safe access to protected active transportation facilities.	Miles of bike/rolling infrastructure	85 miles of new bikeway constructed	195 miles of new bikeway constructed	300 miles of new bikeway constructed
	Walking infrastructure	150 miles of sidewalk gaps closed	327 miles of sidewalk gaps closed	All sidewalk gaps are closed

### Key Initiatives:

- Accelerate the build of the full bicycle network planned in the Saint Paul Bicycle Plan to add a total of 195 miles of new bikeway
- Invest in driver education programs to improve the visibility and acceptance of bikers on city streets and enhance safety
- Outline clear policies for electric bikes, skateboards and scooters on city bike lanes, paths and trails
- Implement a road-diet on all four-lane city streets
- Incorporate accessibility options for wheelchairs and other mobility devices in build out of protected lanes
- Enable the ubiquitous availability of shared bicycles in all the transit market areas defined by Metropolitan Council
- Work with stakeholders to incentivize bike usage by providing bike share memberships and increase the availability of bike showers and lockers
- Improve bicycle access and parking at transit stations and stops and expand the number of transit routes that allow bikes to be brought on board
- Redesign roads to be safer for people by narrowing streets through four-to-three lane conversions, reduced street widths, curb extensions, and refuge medians
- Increase and dedicate funding for the Bicycle, Pedestrian and Traffic Safety Fund annually to move toward relative parity with investments in vehicle infrastructure
- Complete filling in the 327 miles of sidewalk gaps in the city, focusing on the high-priority areas defined in the City's Pedestrian Plan
- Prioritize safe walking to transit stops. Ensure that pedestrian facilities near transit stops feel safe, comfortable and are accessible
- Continue to support and fund the city's Safe Routes to School plan to ensure the safety of children walking to school
- Invest in street crossing treatments that highlight pedestrian visibility slow drivers
- Invest in proactive sidewalk inspections after heavy snowfalls and provide city resources to clear snow where needed



## VEHICLE ELECTRIFICATION

The cost of an electric vehicle continues to become more affordable. In order to better enable wider adoption of electric vehicles, there needs to be investment in charging infrastructure (EVSE). Providing and prioritizing mobility hubs, allows residents to access cars without having to own one.

Increase Electric Vehicle Ownership	EV Targets	2030 Targets	2040 Targets	2050 Targets
Incentivize the sales of electric vehicles and expand charging infrastructure so that 40% of vehicles on city streets are electric by 2030.	Number of Level 2 chargers deployed	364 Level 2 Chargers	600 Level 2 Chargers	As needed
	% of on-road vehicles that are EVs	33%	80%	100%
	Number of mobility hubs	75	100	300

### Key Initiatives:

- Continue to increase access to shared electric vehicles in partnership with car-sharing services and Xcel Energy
- Expand access to public charging infrastructure
- Ensure all residents are within a quarter mile of a mobility hub
- Incentivize electric vehicle sales by providing lower cost charging at city owned parking lots and working with employers to provide workplace charging
- Provide a regulatory framework to permit charging on residential streets in front of multifamily dwellings
- Proactively encourage the safe use of non-car electric vehicles such as e-bikes and scooters on city rights of way
- Implement building ordinances that require new developments to have wiring capacity to charge electric vehicles and reserve a percentage of new parking spots for exclusive EV use
- Encourage electric car sharing programs to help familiarize residents with EVs, while reducing total driving demand. Prioritize deployment of these programs in areas with low levels of car-ownership
- Incentivize electric vehicle sales by providing lower cost charging at city owned parking lots and working with employers to provide workplace charging



### Existing Transportation and Land Use Programs and Resources:

- [City of Saint Paul Comprehensive Plan](#)
- [Parking Reform Made Easy](#)
- [City of Saint Paul, Downtown Parking Management Strategy](#)
- [Accessibility In Practice, A Guide for Transportation and Land Use Decision Making, SSTI, 2017, 2013](#)
- [Metropolitan Council Transportation Policy Plan](#)
- East Metro Strong Transit Study (upcoming)
- Arterial Bus Rapid Transit Plans (upcoming)
- [Saint Paul Bicycle Plan](#)
- [Safe Routes to School Plan](#)
- [Saint Paul Bike Equity Report](#)
- [2017 Pedestrian and Bike Count Report](#)
- [City of Saint Paul Capital City Bikeway: Network Study and Design Guide](#)
- [Preliminary Saint Paul Pedestrian Plan](#)
- [Plugging In: Readyng America's Cities for the Arrival of Electric Vehicles](#), Frontier Group
- [Existing charging stations, City of Saint Paul](#)

## WASTE TARGETS AND ACTIONS

The waste targets are aligned with Ramsey County waste goals.

Reduce waste generation	Waste reduction targets	2030 Targets	2040 Targets	2050 Targets
<b>The City of Saint Paul, through Resolution 14-519, established goals of diverting waste 40% by 2020 and 80% by 2030. Saint Paul contracts with haulers to provide recycling and garbage services to residential households.</b>	Total waste diverted from landfill or resources recovery.	65%	80%	85%
	% reduction of annual tons	2%	5%	5%
	% of waste stream composted	5%	10%	15%
	% of waste stream recycled	50%	55%	60%

### Key Initiatives:

- Develop and implement a waste prevention plan to keep items out of the trash
- Develop and adopt an ordinance to place a fee on disposable shopping bags
- Promote county compost and yard waste drop off sites
- Develop and implement a curbside organics collection
- Expand recycling for business and public facility
- Adopt a deconstruction/diversion ordinance to require the reuse or recycling of construction and demolition materials
- Adopt a “to go” packaging ordinance requiring containers to be recyclable or compostable
- Coordinate with Ramsey and Washington County to identify opportunities to support anaerobic digestion of organic materials
- Work with the MPCA to identify opportunities to capture and utilize any methane leaking from closed Pig’s Eye landfill

### Existing Waste Programs and Resources:

- [2019 Annual Guide](#)



## WATER AND WASTEWATER TARGETS AND ACTION

Water is a critical asset to the city. Maintaining a stable water supply is important to ensure a sustainable source for years to come. The amount of water that is treated and distributed also has an impact on the city’s GHG emissions as there is significant electricity used in this process. Water conservation measure will help to reduce GHG emissions and ensure the capacity of the system is adequate to meet future needs.

Reduce water consumption	Water reduction Targets	2030 Targets	2040 Targets	2050 Targets
Water conservation helps to save money, reduce energy use, and reduce the use of a valuable resource.	Percent reduction in per/person annual water consumption	2%	2%	5%
	Percent reduction in per/job annual water consumption	5%	5%	5%

### Key Actions:

- Create greater awareness and adoption of water conservation through educational and promotional material
- Include low-flow shower head use as part of energy efficiency outreach programs
- Encourage replacing water-intensive turf with native plantings at office spaces
- Identify and support opportunities for residents and small businesses to electrify water heaters and use as thermal storage
- Identify opportunities for businesses with significant hot water loads (laundromats and hospitals) to install solar thermal technology



## MUNICIPAL LEADERSHIP

A focus on municipal buildings lets the city lead by example and demonstrate a commitment to climate leadership first within its own operations. Saint Paul has already invested in energy efficiency within several of its buildings. The municipal focus area will include continued energy efficiency and renewable energy purchases in buildings, as well as efficient street lighting.

Inspire through Municipal Leadership	Municipal Targets	2019-2025 Targets	2025-2030 Targets
Achieve carbon neutrality in municipal operations by 2030.	Annual GHG reductions	9%	9%
	Annual renewable energy generation	10%	15%
	Annual fleet emissions reductions	9%	9%

### Key Actions:

- Track and manage the energy use of city facilities. Track and organize all city electric and natural gas meters in a benchmarking program (e.g., B3). Use the benchmarking program to identify poor performers and manage energy data. Look for opportunities to automate data management and building controls to reduce staff time
- Accelerate the existing goal for city buildings to be carbon neutral from 2030 to 2025. Make this mandatory for all projects that meet the criteria
- Increase the city’s revolving loan fund to \$5 million
- Convert municipal streetlights to LEDs. Explore other opportunities to for smart lights that can further save energy through conservation with features like motion sensors
- Identify opportunities to deploy renewable thermal technologies
- Increase municipal purchases and installations of renewable energy. Prioritize opportunities that will result in a net cost-savings to the city, including on-site solar or community solar gardens
- Work with eligible schools to participate in Xcel Energy’s low-income solar opportunities
- Assess the city’s vehicle fleet to identify opportunities for electrifying, right-sizing, and improving overall efficiency of vehicles
- Identify opportunities to convert heavy-duty vehicles to alternative fuels like renewable natural gas
- Workforce Development. The recruitment and training of building energy workers provide an opportunity to grow equity while reaching the city’s GHG targets
- Provide electric vehicle charging infrastructure in municipally-owned parking lots.
- Encourage employees to reduce single-occupancy commuting practices through incentives and workplace amenities (bike racks, showers, etc.)

### Existing Municipal Leadership Programs and Resources:

- City efficiency revolving loan fund
- [B3 Benchmarking](#)
- [Guaranteed Energy Savings Program](#)
- [Office of Enterprise Sustainability](#)

# LOOKING FORWARD



The need for climate action is evident. A global issue, climate change calls for local solutions. By leveraging the agility of Saint Paul and the passion and motivation of our residents and staff, this climate action plan outlines a suite of targets and actions to decrease emissions across every sector in the city. It also identifies ways to cultivate long-term resilience, enhance the natural infrastructure of Saint Paul, and imagines a city of the future in which the threats of a changing climate are diminished.

There are many opportunities reimagine the future in light of climate action. From multifamily buildings, to transportation, to the individual Saint Paul resident – there are a multitude of strategies and tactics to reduce emissions, as well as opportunities to be involved with the city’s journey to climate resilience. Many solutions proposed are multi-faceted and provide co-benefits across city sectors and individual residents. Trees that reduce the impact of extreme heat by providing natural cooling also have positive psychological health impacts. Establishing intrapersonal networks for emergency preparedness increases sense of community and fosters long-lasting social connections. Home efficiency and building improvements can reduce monthly bills while using less energy and creating fewer emissions.

This document provides the foundation for implementation and transformation. The preparation for this document assessed vulnerabilities, emissions, and highest impact strategies. Now the city is ready to catalyze action. Taking the steps outlined in this plan will set the city’s progress toward climate resilience and climate change mitigation in motion. It will also reinforce the legacy of the City of Saint Paul as a leader and innovator, undertaking a challenging issue with determination to ensure the preservation of a safe and sustainable place for all Saint Paul residents to call home.

Achieving these objectives will demand active engagement by Saint Paul residents to transform buildings where people live and work, the way people move around the city, and the goods consumed. This transformation comes with equity at the forefront, ensuring that as Saint Paul works toward these goals, the outcome is a better, more equitable future for all residents, current and future.

