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RESILIENCE

Resilience describes the capacity of a system to maintain functionality or recover in the event of a disruption or disturbance. Ramsey County will work to strengthen the capacity of communities so that residents - particularly the poor and vulnerable- survive and thrive no matter what stressors or shocks they encounter. This plan lays out strategies to mitigate and adapt to a rapidly changing climate.

KEY THEMES:

- ▶ Reduce greenhouse gas emissions by 80% by 2050 from 2008 levels.
- ▶ Complete climate vulnerability assessments, as well as develop and implement mitigation tools to protect the county's infrastructure and environment.
- ▶ Develop and implement a countywide renewable energy plan.
 - ▶ Recover the greatest value from waste to add value to the local economy.
 - ▶ Work with community partners to eliminate food insecurity by 2040.
- ▶ Transition the county vehicle fleet to electric vehicles when appropriate.
- ▶ Increase understanding and recognition of social capital in communities often considered vulnerable.
- ▶ Prevent disruption in health coverage for individuals on public insurance.

Purpose

The Interdepartmental Panel on Climate Change (IPCC) recently reported that by 2040 the effects of a warming world will be widespread and dire. Without immediate action by all local governmental units to reduce greenhouse gases, climate change will cause catastrophic impacts to communities around the world. Ramsey County recognizes the need to take action for the health and resilience of the community. Existing work has laid the vision for this chapter. This includes the Public Health Strategic Plan and the Climate Change Health Vulnerability Assessment.

Resilience is a complex issue that involves the interaction of a community's strengths and vulnerabilities. The factors that increase a community's vulnerability to climate-related impacts often contribute to other vulnerabilities as well, such as language barriers, fiscal instability and lack of access to safe and affordable housing. It will be impossible to address climate change without addressing the foundational needs of Ramsey County's residents. While the reader will find resiliency referenced in other chapters (such as transportation, surface water, and housing), this chapter is home to an intentional conversation on resiliency. The chapter describes resilience and vulnerability, provides findings from the Vulnerability Assessment, and identifies key concerns and potential strategies regarding infrastructure and environment, energy infrastructure and resources, healthy communities.

DEFINITIONS AND CONCEPTS**Resilience**

Resilience describes the capacity of a system to maintain functionality or recover in the event of a disruption or disturbance. The importance of a resilient city, or county, is important when chronic stressors or sudden shocks threaten widespread disruption or the collapse of physical or social systems. Ramsey County will address the stressors and shocks of climate change that will significantly impact our residents.

Resiliency includes:

- Planning for extreme weather events, such as prolonged heatwaves.
- Improving health and well-being of residents.
- Ensuring economic prosperity and opportunity for all.

Ramsey County's resiliency strategies will focus on mitigation and adaptation. Mitigation strategies will emphasize minimizing our contribution to climate change through reduced energy use. Adaptation strategies will focus on how to change policies and practices to plan for and adjust to the effects of climate change. Our adaptation strategies will need to be increasingly flexible due to the uncertainty of how climate change will develop.

Like the rest of the 2040 Comprehensive Plan Update, resiliency will be viewed through the lens of racial equity and "health in all policies." Ramsey County, in collaboration with its communities, is committed to ensuring that all residents can live healthy lives by expanding access to housing, economic opportunity, healthy food options and recreational opportunities. Equity and justice increase a community's resilience.

Climate Vulnerability

Vulnerability refers to characteristics that negatively affect a person or community's ability to anticipate, adapt to, and recover from the effects of a climate hazard. Examples include:

- living in poverty
- social isolation
- pre-existing physical or mental illnesses
- communications or language barriers
- homelessness
- very old or very young age
- inadequate healthcare
- limited mobility
- lack of financial savings
- structural racism

Climate impacts will affect each person differently and will disproportionately impact vulnerable communities. Vulnerability can be situational, meaning an individual may only be vulnerable in the wake of a climate hazard, not necessarily inherently vulnerable. Vulnerability can be temporary, such as with the case of pregnancy, homelessness or some illnesses. Vulnerability is a dynamic condition that affects all Ramsey County residents at some point in their lives. Understanding how vulnerability contributes to the impact of climate change stressors and shocks will prove beneficial as the county works with its businesses, residents and communities to develop and implement strategies. To ensure healthy people, healthy communities, and a healthy environment. Strategies to address climate-related health impacts must consider all residents and businesses, including the most vulnerable.

Resiliency and vulnerability are not mutually exclusive. Individuals may encounter resiliency within the same identities and experiences that make them vulnerable to climate change. For example, an individual who faces housing and food insecurity regularly may have experience navigating local resources and be more comfortable accessing aid in a disaster. The recognition of inherent social capital among individuals otherwise considered vulnerable will be incorporated into plans for resiliency and climate change adaptation in Ramsey County.

Risks include:

Factors that could worsen the negative impacts of a hazard.

- Environmental risks and challenges (e.g., poor air quality days, likelihood of flooding of homes and businesses, pollution from storm events that affect public health and surface water quality)
- Social risks and challenges (e.g., social unrest, lack of citizen engagement, high crime rate, migration)
- Economic risks and challenges (e.g., loss of income, extraordinary public expenses for infrastructure replacement, extraordinary expenses to residents and businesses to accommodate changes and damage to assets)

Shocks:

- Single or multiple events of short duration (e.g., tornado, heavy rain, heat wave, ice storm)

Stressors:

- On-going and or longer-term issues (e.g., chronic unemployment, housing instability, PTSD from previous shocks or life experiences, affordable and reliable energy supply)

Mitigation:

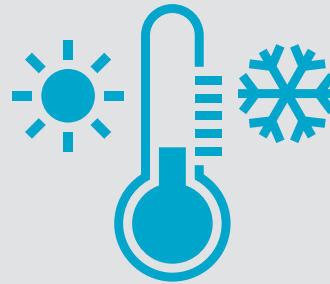
- Reducing GHG emissions (e.g., switching from fossil fuel-based energy to renewable energy, reducing vehicle miles traveled, reducing energy use in buildings).

Adaptation:

- Lowering the risks posed by climatic changes (e.g., sizing storm drains to accommodate bigger rain events, moving appliances off basement floors, establishing cooling centers for use during heat events).



AVERAGE OF
30.44
inches of rain per year



AVERAGE
TEMPATURE OF
44
degrees Fahrenheit

THE LOCAL CLIMATE

Ramsey County has an extreme climate with major seasonal shifts in temperature and weather. The county averages 30.44 inches of rain per year and an average temperature of 44 degrees, with warm summers and cold winters. Temperatures can range from a high of 100 degrees Fahrenheit in the summer to a low of -40 degrees Fahrenheit in the winters. Annual snowfall averages approximately 45 inches. During the summer, Ramsey County is on the northern edge of "tornado alley" and severe thunderstorms are commonplace. Ramsey County is also vulnerable to effects of natural disasters such as floods, tornadoes, drought and winter storms. Extreme weather has become more frequent and severe as the effects of climate change continue to worsen.

Ramsey County can expect a changed climate by 2040. Climate change will bring milder winters, hotter summers, more threatening storms and longer allergy seasons to the county. Milder winters will result in additional ice events and allow disease-carrying insect populations that historically die out during severe winter weather to survive. Also, climate change is anticipated to bring more summer days of high humidity with higher than average overnight temperatures. Ramsey County's high population density and urbanized land use mean that climate change will have a more significant impact compared to nearby counties. Environmental risks will increase the impact of climate change and are more visible in certain areas of the county, especially Saint Paul.

Environmental risk factors that increase the impact of naturally occurring hazards on people and the built environment:

- Impervious surfaces (such as blacktop, roofs, compacted soils and concrete)
- Absence of grass, trees and other natural areas
- Ratio of land to water cover (water moderates temperature)
- Concentration of ground-level ozone
- Concentration of particulate matter
- Concentration of pollen
- Proximity of housing relative to roadways
- Topography
- Soil characteristics



INFRASTRUCTURE & ENVIRONMENT

Climate change has the potential to have major impacts on infrastructure and environmental assets across the county. These assets are most directly threatened by the increased frequency and intensity of rainstorms and heat waves, which often lead to flooding and power outages. Ice storms damage power lines, trees and buildings, and make streets impassable. Higher temperatures can increase the freeze-and-thaw cycles that deteriorate road surfaces and building structures.

Ramsey County is vulnerable to a variety of both climate enhanced natural disasters such as severe summer storms, floods, tornadoes, and unusual winter weather as well as human-caused hazards such as hazardous materials accidents, major transportation accidents, nuclear power plant incidents, civil disorders, terrorism, nuclear attack, acts of war, dam failures, and research and development incidents.

Ramsey County's high population density and small geographic area may pose significant risk to persons and property. The potential scope and impact of these emergencies may vary from a minor local emergency requiring minimum response to a major national catastrophe that requires maximum response. Time of day, weather conditions, time of year, warning time, location and/or the type of emergency or disaster will further influence the risk posed by any hazard.

Completing assessments, developing and implementing resiliency tools, and using best practices are essential for protecting Ramsey County communities and the region's infrastructure and environmental assets. This process will support the county in acknowledging and actively combating economic, racial and gender injustices that arise from inequitably distributed resources before, during and after climate catastrophes. The assessments and strategies should recognize that first recovery and response priorities immediately following any hazard, disaster or emergency are the preservation of human life.

Emergencies of various types are expected to result in damage to private and public property, including homes, businesses and critical infrastructure. The ability of either the county or the local municipalities to provide critical services depends upon the ability to recover the use of certain infrastructure such as buildings, roads, telecommunications and equipment. Consideration should also be paid to the current design of county infrastructure and its inclusiveness to vulnerable communities.

Infrastructure Supporting Emergency Response

Following an adverse event, effective response and recovery revolves around the assumption that such activity can occur. To assure our basic ability to respond and recover, certain public and private sector infrastructure must be maintained or, if compromised, be the first systems recovered. These include the county's power infrastructure, government computers, internet, data and voice telecommunications systems, transportation systems, and systems for communicating with the population.

Vulnerable Populations

There are some populations within the county who are unable to relocate. These include areas used by dependent populations in publicly owned facilities or individuals who are in the custody of a jurisdiction. Ramsey County is responsible for the Ramsey Care Center, the Lake Owasso Residence, the Ramsey County Correctional Facility, the Law Enforcement Center, the Adult Detention Center, the Juvenile Detention Center and Boys Totem Town. Other jurisdictions within the county may have other residential centers such as public housing and non-residential programs such as schools. Private organizations provide services for homeless people, group homes for people with disabilities, day program centers for seniors and people with disabilities, nursing homes, child care facilities, and other programs. For these facilities emergency planning and strategies should address routes of egress and ingress, shelter, and relocation venues, animal resources and similar topics. Longer term operational and infrastructure strategies should include facility planning and improvements that incorporate resiliency.

Infrastructure Critical to Health and Safety

Certain systems sustain the basic needs of all residents' health and safety. Once the initial response is protected, and adequate services for those persons fully dependent on specific facilities are assured, these basic needs must be addressed for all remaining persons and properties. These systems include but are not limited to housing, medical facilities, energy systems, sites containing potential hazards, utilities, and food and medical supplies.

Government Administrative Buildings and Other Facilities

Governmental functions are a critical part of our communities. The restoration of these functions is another essential priority. Government and private sector facilities are necessary to protect the economic viability of the county, municipalities, and our citizens. Local resources, available through public, volunteer and commercial means will be utilized first. State and federal support will augment ongoing disaster operations. Local jurisdictions will enter into mutual aid agreements with each other as necessary to effectively use resources in response to emergencies and disasters.

Climate and Environment

During extreme temperature and weather events, particularly with resulting power outages, it may be necessary to open heating or cooling centers to provide affected persons a respite from the impact of these events. Ramsey County Emergency Management has existing agreements with the county library system to operate for extended hours during extreme heat events. Shelter agreements are in place with city and county recreation centers to operate for overnight protection from heat or in response to power outages. Ramsey County and City of Saint Paul Emergency Management will develop additional facility agreements to assist with reunification and family assistance for natural or man-made disasters that result in family separations, mass injuries and/or casualties.

The appropriateness of a facility will depend on the nature, scope, and geography of the disaster and the status of the facilities at that time. To help ensure comprehensive and appropriate responses

to any given situation, Ramsey County will invest in conversations with community and faith-based partners to identify barriers to access of currently identified facilities and assess the need for diverse facilities that can and will accommodate populations with limited mobility and complex health conditions. Arrangements with facility owners/operators will need to be made at the time for their use. Prior to public messaging, it is imperative that the owner/operator of the facility that is going to be recommended as a heating or cooling center has formally consented to such use. Some facilities may have a regular fee for use, such as fitness centers, movie theaters, swimming pools, etc. and an agreement with the owners may be necessary to temporarily waive or reduce fees for the purpose. Heating and cooling centers may need help with staffing, traffic and parking issues, and/or security to handle the surge in visitors.

Mutual Aid

Ramsey County is prepared to render assistance to any jurisdiction in the county or elsewhere upon request. Ramsey County is able to supplement its own emergency resources with those provided by other counties, private organizations, and volunteers. If at any point a municipality concludes that its resources are (or are likely to become) overwhelmed, the jurisdiction could declare a local emergency and request Ramsey County resources. Those resources, along with those of other jurisdictions would then be made immediately available.

Emergencies require cooperation between agencies and jurisdictions. While all emergencies are local, the planning, response, recovery, and mitigation efforts needed to cope with them must be regional. Resources are always limited and will need to be distributed equitably before, during and after a disaster. Careful planning and close cooperation are needed to set priorities and assign resources in an effective manner including human resources that can help residents and small businesses return to their place of residence/business following a disaster and not be burdened with excessive red tape or bureaucracy that causes them undue economic hardship and the possibility of displacement.

Emergency Planning

The county has a well-developed culture for planning for and responding to emergency situations. The emergency communication system includes 800 MHz radio, emergency notification, and outdoor siren warning for all municipalities in the county and their public safety agencies. The county's emergency communications center is the largest in the Upper Midwest, handling one million calls for assistance annually. The county's emergency communications system are fully integrated as subsystems of regional and state-wide systems, providing redundancies during emergencies. Moreover, public safety agencies in the county have networks of mutual aid agreements to support each other across the county and region, which are coded into the county-wide computer aided dispatch system used for public safety dispatch communications throughout the county.



RESILIENCE

Ramsey County Emergency Management and Homeland Security (EMHS) coordinates the emergency planning and response for events that occur in municipalities across the county (outside of Saint Paul). Saint Paul's Emergency Management Department leads planning and response for incidents that occur within the city limits. The University of Minnesota has an Emergency Management Team that responds to incidents on the section of the campus located in Ramsey County. Many municipalities have additional emergency management staff, all of whom have an integral voice in the county's ongoing planning around community hazards.



EMHS's mission is to foster resilience in Ramsey County through development of a community-wide culture of preparedness, as well as focused efforts on coordination of public safety to prevent, plan for, respond to, mitigate and recover from all hazards disasters and emergencies. Creating this culture of preparedness is a key component of building resilience in Ramsey County. Ramsey County became the first county in Minnesota to adopt a common Emergency Operations Plan (EOP) for the entire county, outside of Saint Paul. All suburban municipalities agreed to participate and subsequently created a coordinated approach for emergency management through the EOP. The Plan establishes common terminology and standardized incident management processes and assessments. The adoption of a county-wide plan has drastically reduced the duplication of efforts otherwise required of municipal and county emergency managers. Most importantly, it fosters greater trust and improved relationships between county and municipal leaders, and reduces the time needed to bring assistance to any municipality impacted by emergency or disaster.

EMHS was tasked with developing the Ramsey County Multi-Jurisdictional Hazard Mitigation Planning Committee. This committee revised the [Ramsey County Hazard Mitigation Plan \(HMP\)](#) as required per state and federal guidelines in 2012. Public health, social services, healthcare facilities, school districts and community partners have a strong interest in collaborating in ongoing hazard mitigation efforts and have been active participants in planning since 2012. In addition, collaboration with other local public health agencies, state response entities, and the federal Centers for Disease Control and Prevention, the Saint Paul-Ramsey County Health Department has developed an all-hazards response plan that supports community health protection. This all-hazards plan is shared across agencies, as it provides critical capacity to Ramsey County residents in the event of a public health emergency.

Ramsey County is primarily urban with limited agricultural production capability. As such, protection of the food supply and natural resources requires the county and municipalities cooperate with neighboring counties, states and state and federal agencies. Emergency support functions regarding natural resources require cooperation between Ramsey County, state, federal, and local authorities to provide nutrition assistance; control and eradication of highly contagious diseases, and outbreaks of economically devastating plant pests or disease. This helps ensure the safety and security of the commercial food supply, as well as protection of natural and cultural resources and historic properties during an emergency response or evacuation.

Recovery from a disaster relies not only on government agencies like Emergency Management, but neighbors, faith-based organizations, and small businesses that are generous with food and supplies. Ramsey County will engage internally and externally around the topic of personal emergency preparedness and business continuity planning. The county should share assessments of hazards and climate make evidence-based infrastructure updates that will protect resources and mitigate financial loss.



Utility Disruptions

Limited and/or short-term energy disruptions are not uncommon, especially as a result of seasonal storms, scheduled repair outages, and small-scale construction accidents (such as accidental severing of a utility pipeline or wire). Most energy disruptions are handled internally by the service provider or in coordination with local first response departments and do not trigger the activation of an emergency support function. Even moderately widespread power outages, though very inconvenient for residents and businesses, do not normally cause life safety and property protection issues beyond what local resources can manage. The same holds true for other utility and power disruptions such as fuel shortages or water use restrictions; they are managed by their service providers and require little government resources to support response and restoration.

A utility or energy service disruption can have potentially serious consequences depending on the timing, location and facilities affected. Emergency support functions may need to be activated when utility or energy disruptions have, or are expected to have significant impact on the county's capabilities or its population. Significant impacts can include but are not limited to the need to provide for heating, cooling or other mass care services during power outages in inclement weather; loss of power affecting other utilities and energy sources (such as lift stations not being able to adequately move storm, waste water and potable water); and fuel pumps not working. Loss of power and/or water may also have significant longer term and financial impact for businesses, particularly those that serve food. Residents who rely on powered in-home medical devices can have serious issues in longer term outages.

When the county is requested to assist an affected municipality, or if the county activates emergency support functions to coordinate the provision of temporary emergency power (electrical, petroleum fuels etc.) and the restoration of damaged energy and utilities (electrical, natural gas, water, sewer, telecommunications etc.) within Ramsey County during and following disasters on its own due to the situation, the county and the affected municipalities will coordinate on any emergency support function efforts. If activated, the county emergency support function's lead for Energy and Utilities will be the coordination point for these issues. The county will ensure that it coordinates its efforts with the State Emergency Operations Center when it is activated for any incident placing energy infrastructure and resources at risk in Ramsey County. In planning for resiliency, the county will mitigate potential risk by incorporating micro-grids, energy storage and independent renewable energy supplies.

¹⁰ Xcel Energy Annual Community Energy Report, 2016

County Energy Vision

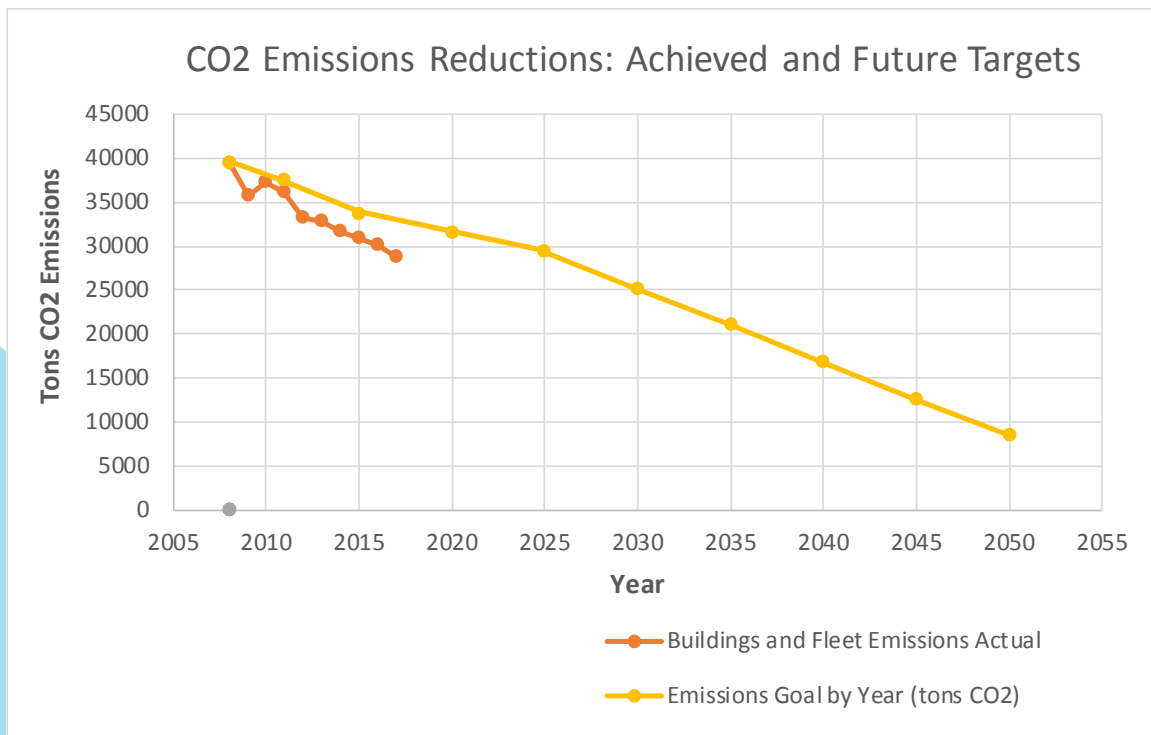
Ramsey County's programs, policies, and practices reflect a commitment to energy and environmental stewardship as a cornerstone of healthy and vibrant communities, in alignment with the county's vision, mission and goals.

Energy Use Reduction Goals

- Reduce energy use 25 percent by December 31, 2020 from 2008 levels.
- Reduce energy use 30 percent by December 31, 2025 from 2008 levels.

Ramsey County's Goals for Reducing Greenhouse Gas (GHG) Emissions

- Reduce greenhouse gas emissions by 30% by 2025 from 2008 levels.
- Reduce greenhouse gas emissions by 80% by 2050 from 2008 levels.



Success within Ramsey County's operational systems will not ensure an energy-efficient and resilient county overall. There are opportunities to look outward to support and/or assist cities within the county with their energy and resiliency goals that encompass not only the cities' operations but also their residential, commercial and industrial sectors. Municipalities in the county have expressed interest in working more collaboratively with the county and other local units of government to facilitate achievement of their energy, carbon reduction and resiliency goals. Going forward, the county will seek out opportunities to support local communities in these areas and support the state's broader goals set forth in the Next Generation Energy Act of 2007¹¹.

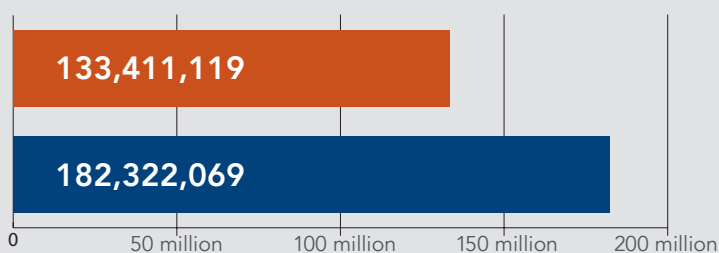
¹¹ <https://www.leg.state.mn.us/docs/2010/other/101582/www.governor.state.mn.us/mediacenter/pressreleases/printerfriendly/PROD008146.html>

CURRENT REALITY**Energy consumption**

Xcel Energy is the primary producer and supplier of electricity and natural gas in Ramsey County. The measurement and evaluation of energy consumption from this source is key to understanding which strategies will be most effective to create a resilient county. Business customers in Ramsey County are the biggest consumers of energy in Ramsey County. The approximately 14,000 business customers in Ramsey County have an oversized impact when compared to the 161,000 residential customers. View a detailed breakdown: [Ramsey County's 2017 energy consumption](#).

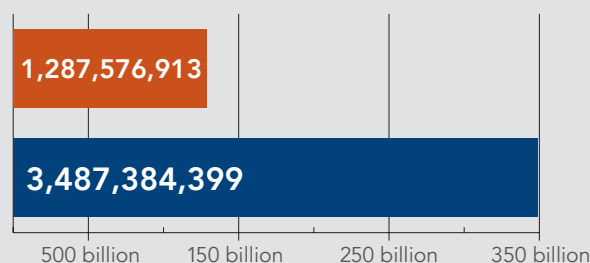
Natural Gas Consumption by Sector (therms)

■ = 161,132 RESIDENTIAL customers
 ■ = 14,140 BUSINESS customers



Electricity Use by Sector - (kWh)

■ = 204,924 RESIDENTIAL customers
 ■ = 22,572 BUSINESS customers

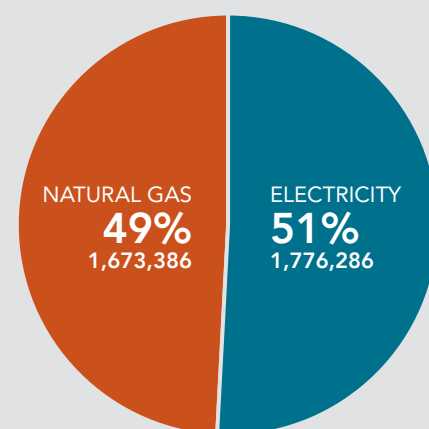


In absolute numbers, business customers make up roughly 10% of Xcel Energy's total customers as compared to the number of individual residential customers. However, total annual carbon emissions generated by businesses in Ramsey County are nearly double those of the residential sector. In addition to electricity and natural gas, transportation fuels are a major contributor to total greenhouse gas (GHG) emissions in Ramsey County and represent a significant portion of total energy expenditures by businesses and residents. Emissions from other sources of fuel such as propane, fuel oil, the transportation sector and the consumption or provision of goods and services are not accounted for in these graphs. Therefore, it will be important for the county and its municipalities to include non-residential audiences in energy efficiency and GHG emission reduction strategies as they are developed. (insert emissions chart on right)

Residential and commercial buildings typically consume 41% of a community's energy and are responsible for approximately 40% of total GHG in the U.S. Therefore, it is essential for Ramsey County to encourage commercial, residential and institutional building improvements and new construction to be as energy efficient as possible and to be "renewable energy ready" and "electric vehicle ready" and/or incorporate renewable energy wherever possible. Improvements to housing stock and other buildings create economic development challenges by potentially increasing construction costs yet also create long term value for the owners by increasing the long-term affordability of these facilities. As such, Ramsey County will adopt the Minnesota Sustainable Buildings Energy Standard for all county projects and will encourage municipalities within the county that have not already done so to adopt this or an equivalent standard.

Carbon emissions by energy type for buildings served by Xcel Energy in Ramsey County

(metric tons CO₂)^[9]



[9] Estimated total carbon emissions from natural gas for a customer class are equal to the total therms consumed by the customer class, multiplied by the standard CO₂ coefficient of 11.7 lbs/therm.

ENERGY EFFICIENCY AND CONSERVATION

Ramsey County's interests in energy fall into six categories that go beyond the daily use of electricity, natural gas and other fuels to carry out the county's work.

These include:

- County as an energy consumer.
- County as an energy generator.
- County as a service provider in the context of equity.
- Economic development.
- Environmental issues.
- System reliability and resiliency.

Residents and businesses depend on affordable and reliable energy. Residents on fixed modest incomes and residents on fixed incomes, or other vulnerable communities as referenced on page 126, can become "energy burdened" when energy prices rise while their incomes remain flat. Maintaining stable, reliable, affordable energy for residents is a necessity in today's energy dependent world. Ramsey County supports continued innovation in energy efficiency, conservation, clean energy generation, transmission and distribution to keep electricity affordable for its residents while improving the electric grid so that it can meet the demands of the 21st century.

For businesses, the ability to expand business development is affected by energy policy decisions and system design. Depending on how it occurs, changes in energy policy and service delivery could help businesses control and reduce costs and improve reliability. The cost of energy affects the ability of businesses to pay for labor and continued growth, and is related to the economic viability of communities. Encouraging commercial, industrial and residential energy efficiency and energy generation can have a positive impact on the local economy. In 2016 commercial, industrial and residential energy customers spent more than \$600 million dollars for energy to heat, cool and operate buildings and manufacturing processes, and other infrastructure. Much of this money leaves the local economy, unlike energy efficiency and on-site renewable energy that can reduce the outflow of cash and create local jobs and lifelong careers and opportunity for economic prosperity.

Within the county, energy efficiency and conservation efforts continue. Planning for and integrating renewable energy, energy storage capabilities, micro grids and other strategies and technologies into its energy systems will reduce the county's risks and build greater resiliency into its infrastructure and operations. Diversity in energy supply, continued integration of technology and storage can help the county manage price increases and bounce back more quickly from disasters and minimize disruption of services to residents and local businesses. Success in this work will require partnerships with multiple stakeholders across the county and the region.

RENEWABLE ENERGY

Local renewable energy resources are available for economic capture in Ramsey County. Two of the most abundant energy resources available in Ramsey County are solar and energy-efficiency resources.

Less abundant resources include wind, biogas and bioenergy. As solar installations become increasingly cost competitive with grid-provided natural gas, nuclear, and fossil fuel energy resources, a small number of residents and businesses are integrating solar energy into their energy supply. At the same time, Xcel Energy continues to commit to higher levels of renewable energy in its grid supplied energy mix over the next three decades and this will help all Ramsey county businesses and residents achieve lower carbon emissions from electricity use if consumption levels remain the same or go down.

SOLAR RESOURCE CALCULATIONS AND POTENTIAL

To meet county goals, it is important to plan for the protection and development access of solar energy. The total capacity of the rooftop solar resource in Ramsey County is 24,310,786 MWh/year. This is equal to approximately 20 percent of the electricity consumed in the county as of 2016. However, Ramsey County's solar potential is lower than surrounding counties (30 to 60% solar potential) and thus careful planning will be needed to preserve solar potential. However, Ramsey County's solar potential is lower than surrounding counties (30 to 60% solar potential) and thus careful planning will be needed to preserve solar potential. There are 352 grid-tied solar projects in the county as of 2016 with a total capacity of 3,516 kW/year.¹³ The opportunity for solar energy development in the county remains high. These are estimates of how much electricity could be generated using existing technology and assumptions on the efficiency of conversion.

Community	Gross Potential	Rooftop Potential	Gross Generation Potential ¹⁴	Rooftop Generation Potential ¹⁵
RAMSEY COUNTY	191,692,400 MWh/yr	24,310,786 MWh/yr	19,169,240 MWh/yr	2,431,079 MWh/yr

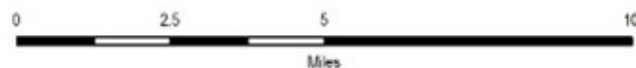
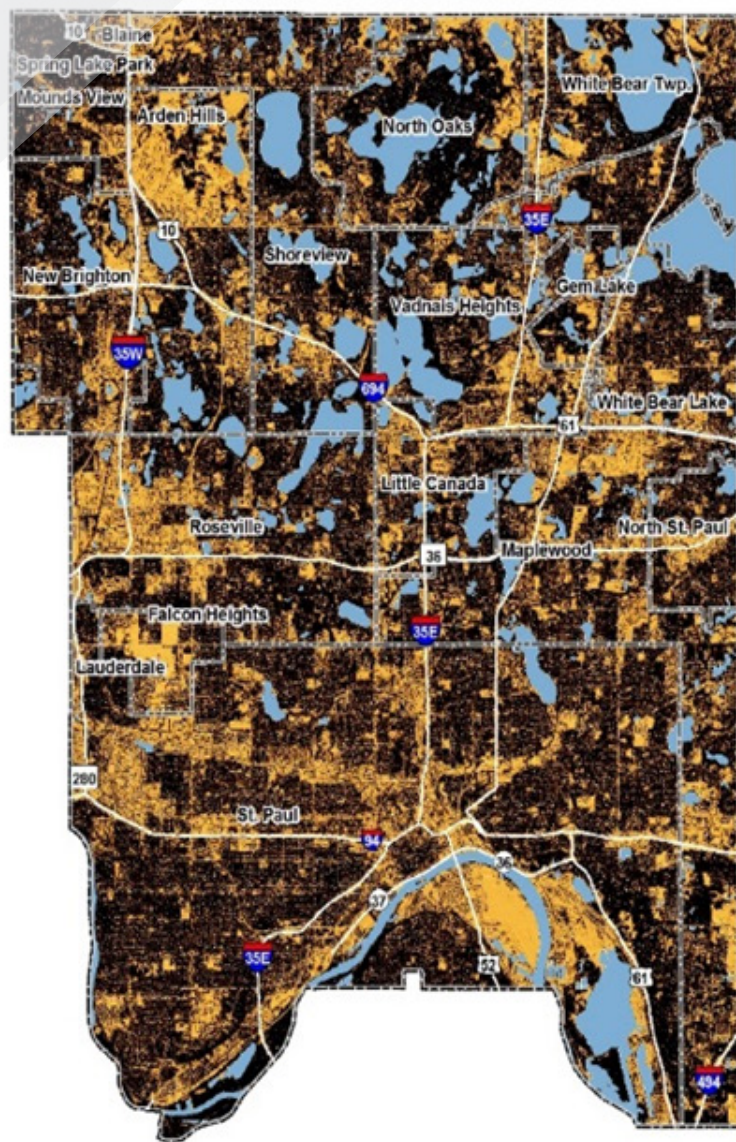
The gross solar generation potential and the gross solar rooftop generation potential for Ramsey County are calculated by the Metropolitan Council and are expressed in megawatt hours per year (MWh/yr). These estimates are based on the solar map, figure shown on the next page, developed for Ramsey County by the Metropolitan Council. These values represent gross totals and are not reflective of the amount of solar likely to develop within Ramsey County. Instead, the calculations estimate the total potential resource before removing areas unsuitable for solar development or factors related to solar energy development or factors related to solar energy efficiency.

¹³ Source: Xcel Energy, Annual Community Energy Report, 2017

¹⁴ In general, a conservative assumption for panel generation is to use 10% efficiency for conversion of total insolation into electric generation. These solar resource calculations provide an approximation of each community's solar resource. This baseline information can provide the opportunity for a more extensive, community-specific analysis of solar development potential for both solar gardens and rooftop or accessory use installations. For most communities, the rooftop generation potential is equivalent to between 30% and 60% of the community's total electric energy consumption. The rooftop generation potential does not consider ownership, financial barriers, or building-specific structural limitations.

¹⁵ *ibid*

Gross Solar Potential – Ramsey County

Gross Solar Potential
(Watt-hours per Year)

■ Solar Potential under 900,000 watt-hours per year

□ County Boundaries

□ City and Township Boundaries

■ Wetlands and Open Water Features

Source: University of Minnesota U-Spatial Statewide Solar Raster.

WIND ENERGY

Current wind energy technology and a lack of sustained wind speeds at lower heights typically needed for wind development in dense urban areas, does not facilitate significant development of wind as an energy resource in the highly densified confines of Ramsey County. Some volume of wind energy may be able to be harvested in suburban and semi-rural areas of the county with current technology but this is unlikely to be a significant resource in the county. Residential and commercial customers of Xcel Energy can purchase wind energy through the utility's Windsource™ program. As of 2017 there were 67 businesses and nearly 11,000 residential customers signed up for the Windsource™ program for a total subscribed energy load of 31,545,261 kWh.¹⁶

BIOENERGY RESOURCES**Biogas**

Anaerobic digestion is a process that uses organic matter and converts it to methane and carbon dioxide that can be captured as a biogas. Biogas is also known as "renewable natural gas" and if processed to a specific standard, can be used as a replacement fuel for natural gas. Municipal wastes, wood debris, food processing residue and other organic materials (biomass) can be used to create biogas. Through the Ramsey/Washington Recycling & Energy Board (R&E Board), Ramsey County owns and operates with Washington County the Recycling & Energy Center in Newport, MN. This is a refuse derived fuel facility that uses shredding, magnetic separation and density separation to convert waste received at the plant into a shredded material that is then transported to Red Wing and Mankato, MN to be burned as fuel to generate electricity. Ferrous metals and aluminum are separated and recovered for recycling as part of the processing done in Newport.

Through the R&E Board, the two counties are also exploring additional technologies to increase energy produced, create fuels, make compost, and/or provide recyclable materials for manufacturing. These technologies include improved mixed waste processing, anaerobic digestion, and gasification.

Biomass

District Energy, St. Paul operates a district heating and cooling system within Ramsey County that serves facilities in downtown Saint Paul. This facility uses natural gas and local wood debris to generate electricity and heat. Metro area wood debris is the main biomass source for this facility.

District Energy, St. Paul Operations Information and Benefits ¹⁷

- Simultaneously produces 65 megawatts of heat and up to 33 megawatts of electricity.
- Up to 25 megawatts of this renewable electricity are supplied to the local electric utility, enough for 20,000 homes.
- Excess thermal energy heats enough water for approximately 65% of District Energy's heating needs.
- Utilizes approximately 280,000 tons of urban wood residuals (biomass) annually.
- Captures the wasted thermal energy to make energy production more efficient and effective.
- Helps with managing urban wood waste and puts more than \$10 million annually into the local economy.
- Reduces the risk of energy price spikes, power outages, and power quality problems.
- Improves energy security and community resiliency.
- Significantly reduces air emissions and greenhouse gases that contribute to climate change by using biomass and combined heat and power (CHP) together.

¹⁶ Xcel Energy Annual Community Energy Report, 2017

¹⁷ <http://www.districtenergy.com/technologies/combined-heat-and-power>

ACTION AND POLICIES

To meet its goals of reducing energy use and emissions Ramsey County will develop key strategies, actions and policies. By focusing on mitigation and adaptation strategies Ramsey County will help create more resilient communities. Partnership and collaboration with municipalities, government agencies, community partners, residents and business will be important pieces of all resiliency efforts.

In 2019 Ramsey County will develop a renewable energy plan as part of its broader efforts to increase the use of on- and off-site renewable energy. The renewable energy plan will guide development of solar energy and will include specific goals and policies for integrating solar energy resources into county facilities, fleet and infrastructure operations. Ramsey County recognizes that for county operations to meet the state's carbon emissions reduction goals it will require much greater integration of energy efficiency and renewable energy by all sectors of the county's economy. The county will initiate collaborative efforts with cities within the county to support their efforts to create and expand energy efficiency and renewable energy programs in their communities. As a SolSmart member, the county will encourage all communities to join the Green Step Cities program, to become certified under the national SolSmart program, explore future community solar opportunities and to use the Metropolitan Council's solar calculations as a planning and decision-making tool for local land use development before removing areas suitable for solar energy production.

As business customers are the primary producer of carbon emissions in the county it is important to partner with them to create a more resilient county. To assist non-residential property owners, the county participates in the Property Assessed Clean Energy (PACE) program implemented by the Saint Paul Port Authority. This program assists property owners with energy efficiency and renewable energy project financing that can facilitate deep energy retrofits to facilities and operations. The county anticipates continuing its support for this program and is reviewing current legislative proposals to expand this program to residential properties in the state.

To address emissions and energy usage from the transportation sector Ramsey County will reduce vehicle miles travelled by employees, clients, and the providers of goods and services related to county business. We will encourage electric vehicles and cleaner burning fuels be used for transportation of goods and people. Major county investments will continue in transitway corridors that will provide residents with more energy efficient alternatives to driving alone. Electrification of the overall transportation system and expanded public transit, sidewalks and bikeways will be important components of this work and will require multi-sector collaboration to facilitate a rapid and smooth transition. Ramsey County has installed seven public electric vehicle charging stations and owns three all electric vehicles. The county will continue to integrate hybrid and electric vehicles into its fleet to meet its fleet needs and will expand its use of technology that results in lower vehicle miles travelled to conduct county business.

RAMSEY COUNTY WILL...

...develop a solar energy plan as part of its broader efforts to increase the use of on- and off-site renewable energy.



...initiate collaborative efforts with cities within the county to support their efforts.



...encourage all communities to join the Green Step Cities program.



...reduce vehicle miles travelled by employees, clients, and the providers of goods and services related to county business.



...continue investing in transitway corridors that will provide residents with more energy efficient alternatives.



...continue to integrate hybrid and electric vehicles into its fleet.

Additional Resiliency Opportunities

Ramsey County will continue to discuss, evaluate and plan for building additional resiliency into its policies, plans and programs. Identifying opportunities to build more flexible systems and supporting the continued development of resilient communities are key to long term growth, stability and prosperity for the people and businesses within the county while protecting natural resources.

The complexity of mitigating climate impacts while planning for climate adaptation requires the county to balance current economic and social realities with prudent long-term planning. Some of the challenges and opportunities facing the county include:

- Improving and maintaining energy reliability and climate resilience of critical emergency response facilities such as police, fire, emergency communications and hazard response centers.
- Designing and constructing infrastructure to meet the changing and unpredictable nature of climate enhanced weather events and longer term climate changes.
- Increasing the use of local energy resources to capture job creation opportunities and diversifying the local economic base while maintaining economic competitiveness.
- Encouraging investment in electric grid infrastructure and solar development that makes electric service more flexible, reliable and resilient to weather-related and other disruptions.
- Supporting the development of zero net carbon residential and commercial buildings.
- Use of local renewable and energy efficiency resources especially for affordable housing and small business development in the county.



HEALTHY COMMUNITIES

Resiliency and Health

Climate change is both directly and indirectly linked to a variety of negative health outcomes. Climate change affects the social determinants of health by disrupting access to clean air, safe drinking water, food access and safe housing. The health repercussions of climate hazards arise from a combination of environmental risk factors and the vulnerability of the individuals affected. Understanding how environmental risk and vulnerability together contribute to the impact of climate change will prove beneficial as the county moves forward in our mission to protect all Ramsey County residents by ensuring healthy people, healthy communities, and a healthy environment.

The impact of climate change on health occurs at the intersection of the type of hazard, vulnerability of the public and environmental risk. Resiliency is the enhancement of the system to counter these factors. Some communities may be more vulnerable to climate change due to social, economic and environmental risks. Young children and the elderly are biologically less able to regulate body temperature and will experience more respiratory distress. As people age their lungs become less elastic and less able to filter out polluted air. The effects of poor quality air will be exaggerated within aging populations who are fighting infections or who have respiratory or cardiovascular disease. These populations are also more vulnerable in a disaster scenario and it is critical to consider the infrastructure resiliency of child care centers and nursing homes.

People of color, particularly African Americans, experience higher rates of high blood pressure and asthma than their White counterparts. In addition, Ramsey County residents of color have a lower rate of health insurance coverage than other Ramsey County residents, further concentrating the deadly effects of extreme heat and poor air quality within already vulnerable communities. Ramsey County will identify and address disproportionately high adverse health or environmental effects on low-income people and people of color and work to prevent discrimination by race, color or national origin, sexual orientation, and gender in county programs.

Health Care

Access to health care is critical for managing chronic health conditions that are exacerbated by climate change. Ramsey County financially supports several Federally Qualified Health Centers that accept public insurance and offer sliding scale fees. Ramsey County should ensure quality at those health centers and consider innovative partnerships between public health and health care. Collaboration across the Metro Area between public health and health care will further support response and recovery from disease outbreaks or incidents requiring medial surge measures. The Twin Cities Metro is a national model for collaborative planning across hospital systems and will maintain this leadership role. Ramsey County will examine its own programs and processes to prevent disruptions in health coverage for individuals on public insurance. Sharing information across county departments and with other government agencies will ensure continuity of health care and service for households experiencing poverty as well as acute and chronic illness.

Food, Nutrition and Resilience

Access to safe, affordable and nutritious food is essential to health. Food insecurity refers to having limited or inconsistent access to healthy, safe foods.²⁶ Many communities are vulnerable to hunger and other nutritional deficiencies due to inconsistent intake to healthy, affordable foods. Some of the most vulnerable to food insecurity tend to be those in poverty, those with mental and physical disabilities, those who may lack the ability to cook and prepare foods.

Currently, 22.7% of Ramsey County residents are food insecure, the highest rate in the six-county metro area.²⁷ Since the tightening of SNAP (food stamps) access and benefits, many people rely on food shelves; however, limits on the number of times a person can visit each month can be a barrier to healthy nutrition.

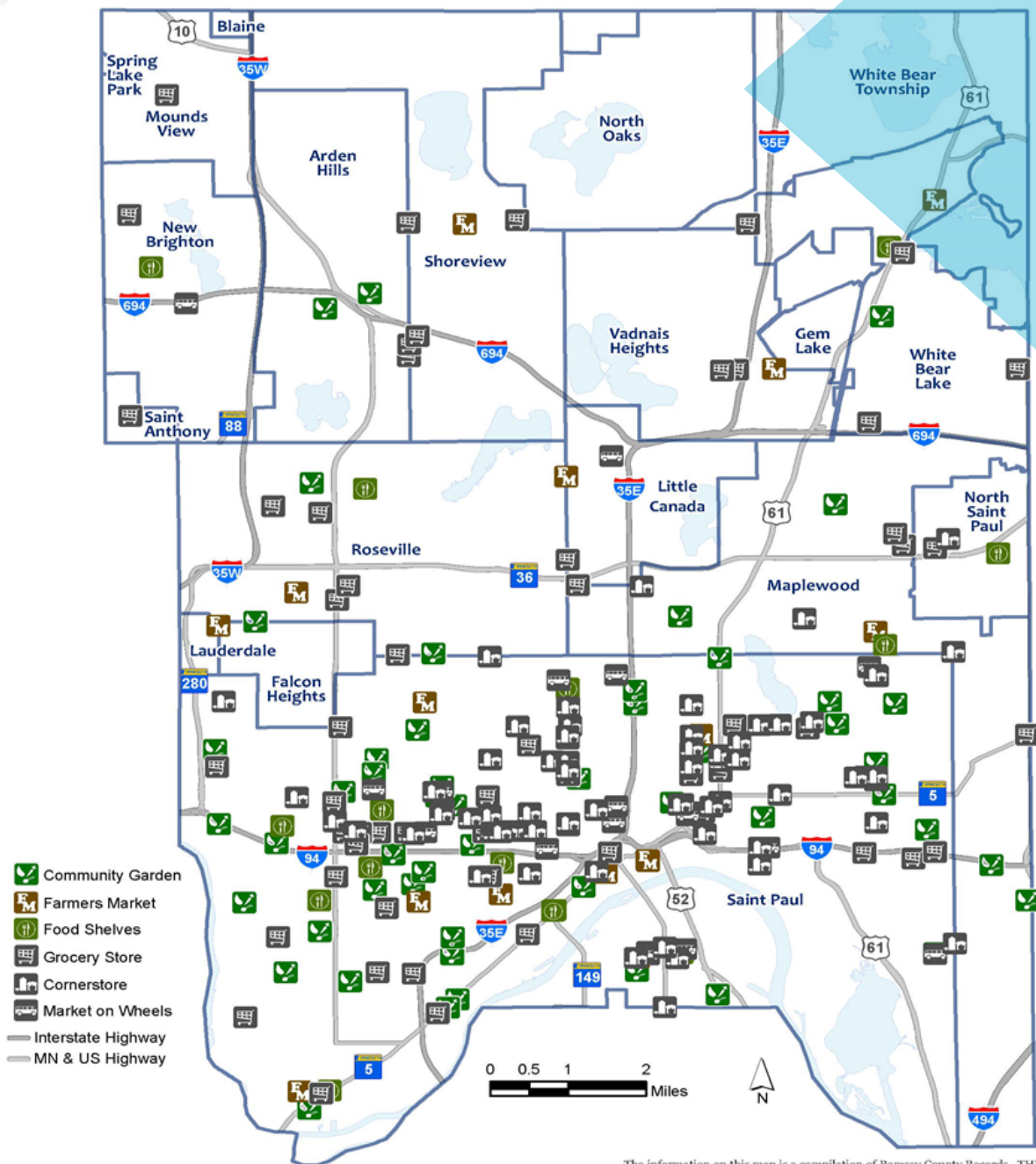
Food insecurity is an existing vulnerability for many Ramsey County residents, and will likely become more widespread and burdensome as climate change aggravates the major stresses and shocks of daily life. As demonstrated in the following image, as of 2017 there are inconsistencies and inadequate food access points in many parts of Ramsey County. For individuals, families and seniors living in the Suburban Ramsey County areas without reliable transportation, it can be difficult to access grocery stores and other food outlets/access points. Additionally, food shelves, grocery and corner stores selling healthy foods do not exist in some areas of concentrated poverty.

In future planning, Ramsey County will expand its partnerships to address lack of access to nutritious food, including working with food shelves, farmers markets, corner and larger grocery stores to eliminate food insecurity.

²⁶ Andersen SA, ed. *Core Indicators of Nutritional Sate for Difficult to Sample Populations.* *The Journal of Nutrition.* 1990: 120:1557S-1600S.

²⁷ Metro SHAPE 2014. *Ramsey County Data Book.*

Food Resources in Ramsey County



Data originally collected for a web mapping application about various food resources located in Ramsey County. Community gardens, farmers markets, food shelves, stores (grocery stores, corner stores and market on wheels) were collected March 2017.

The information on this map is a compilation of Ramsey County Records. THE COUNTY DOES NOT WARRANT OR GUARANTEE THE ACCURACY OF THIS DATA. The county disclaims any liability for any injuries, time delays, or expenses you may suffer if you rely in any manner on the accuracy of this data.

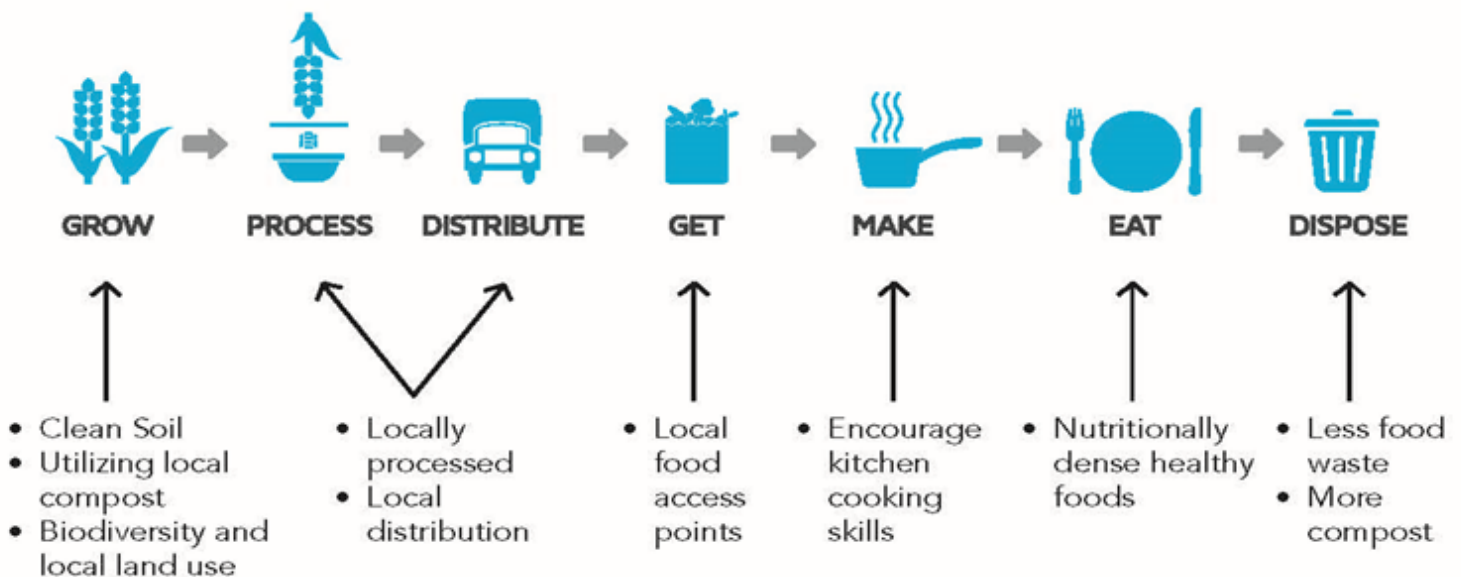
2040ComprehensivePlan_foodaccess

11/17/2017

Resiliency in the Food System

Ramsey County will work with community partners to eliminate food insecurity among Ramsey County residents by 2040. This will include a focus on strategies to build a comprehensive local food system that promotes resiliency and access to healthy, safe foods. The image below²⁸ details a resilient local food system. Strategies to accomplish this goal rely on a whole-system approach, including access to healthy clean soil, local distribution and production, expanding local food access, including food shelves, markets and other food outlets, educating on cooking skills, improving the quality of food offered and reducing edible food waste and composting. Many theoretical and possible stressors and shocks to our landscape and environment could be detrimental to Ramsey county residents' health. This includes climate change, extreme heat events and other extreme weather events that will directly impact our food system.

WHAT A RESILIENT FOOD SYSTEM LOOKS LIKE



Ramsey County will move to implement strategies (listed in the above graphic) to become a more resilient food system. As recommended by the Minnesota Department of Health, a resilient food system is critical to community success including; eliminating food insecurity will contribute to a more resilient community.

²⁸ Adapted from the MN Food Charter. <https://mnfoodcharter.com/the-charter/food-infrastructure/strategies/>

Healthy Homes

There is a clear connection between housing and health. A healthy home is dry, clean, pest-free, safe, contaminant-free, ventilated and well maintained. For three decades Ramsey County has worked to reduce lead hazards in housing to lower the incidence of lead poisoning in children. Saint Paul – Ramsey County Public Health began research into a whole-home approach beginning with referrals to homes of children with severe asthma in economically disadvantaged families. Using investigation and interventions, the approach resulted in a statistically significant reduction in both school absences for the children and work absences for parents, as well as fewer visits to emergency rooms.

As a result of the Healthy Homes program, individual children, families and the broader community benefit from healthier kids spending more days in school, parents who miss less work, and overall reduced health-care costs for families and the public health care system. The approach now implemented by the county uses well-documented, evidence-based interventions to address housing-related health issues. Moving forward, the healthy-homes approach will continue to assess and reduce asthma triggers in the home and identify and minimize other indoor contaminants.

Lead in Homes

There are a significant number of children living in homes in Ramsey County that continue to be at risk for exposure to lead. Overexposure to lead can cause lead poisoning – which is a huge concern for children. Lead poisoning can cause learning, behavioral and health problems. Ramsey County will continue to take a whole-homes approach, especially in areas of concentrated poverty, where making home repairs and improvements is a financial challenge for owners and tenants. This is primary prevention work that reduces health risks for current and future occupants of the home. The focus of this program is to replace lead painted windows. These replacements not only eliminate the lead source but also add comfort and improve energy efficiency to the home.



Waste Management

Solid waste management has an important role to play in addressing a variety of risks: public health, environmental, economic, occupational and property. With regard to environmental impacts, risks associated with greenhouse gas emissions, environmental toxicity, energy consumption and water use are all affected by how waste is managed. There are significant environmental benefits resulting from waste reduction and recycling. Moving materials to their highest and best use and finding alternative disposal options beyond landfilling maximizes these environmental benefits. Effective regulatory programs can assure compliance with laws that are aimed at reducing risks. Reducing risk to health and the environment is a key goal of the county's solid waste management system. Solid waste planning for Ramsey County aligns with our values that focus on prevention, building relationships and health in all policies.

Ramsey County recognizes that how it manages waste can contribute to our changing climate. The county through Ramsey/Washington Recycling & Energy has been exploring new technologies for solid waste management that can help reduce the amount of carbon and methane gas currently produced in its processes, thereby reducing harmful contributions to climate change. In addition, the county, through its Solid Waste Management Master Plan identifies policies and strategies for the proper management of waste that results from emergency situations, such as natural or human-caused disasters. The management of emergency debris, such as trees, building components and hazardous materials is important when building capacity to respond to natural or human-caused disasters.

Ramsey/Washington Recycling and Energy is looking at ways to convert refuse derived fuel into biofuels as a way to minimize the negative environmental health impacts of waste management. In addition, a strong emphasis is placed on reduction, reuse and materials separation. The path forward for solid waste management is guided by the principle of pivoting the view from "waste" to "resources". Thereby recovering the greatest value from trash and adding value to the local economy and the environment. The path forward also includes the goal to move to a circular economy. This is a closed loop system from production to distribution to consumption to reuse, repair and recycling and back to production. In a closed loop system resources are used for as long as possible – with the maximum value extracted before disposal and causing the least negative environmental impacts.

A sustainable community seeks a better quality of life for current and future residents by minimizing waste, preventing pollution, promoting efficiency, and developing resources to revitalize local economies. Ramsey County's waste management system is an integral component of the infrastructure of a sustainable community. Proper management of garbage and recycling conserves resources and assures a high level of community sanitation. Therefore, solid waste will be managed by technologies and methods that support sustainable communities and environments.