

Transportation Emissions

Of total community-wide GHG emissions, the transportation sector makes up 12%. Transportation emissions include all in-boundary emissions that come from mobile sources, like cars, trucks, and motorcycles. In-boundary emissions are determined based on the number of miles driven within the City boundary, the assumed breakdown of vehicle type (light vs. heavy duty), and the fuel efficiency of those vehicles. Through Regional Indicators Initiative data, vehicle miles traveled (VMT) and associated emissions have been recorded from 2006 through 2017 and are shown in Figure 5. VMT data comes from the Minnesota Department of Transportation (MNDOT), which collects on-road vehicle counts on an annual basis. Over this time period, VMT have grown steadily with a decline beginning in 2011 and rising again after 2013, likely due to the economic recession and relatively higher fuel prices at the time.

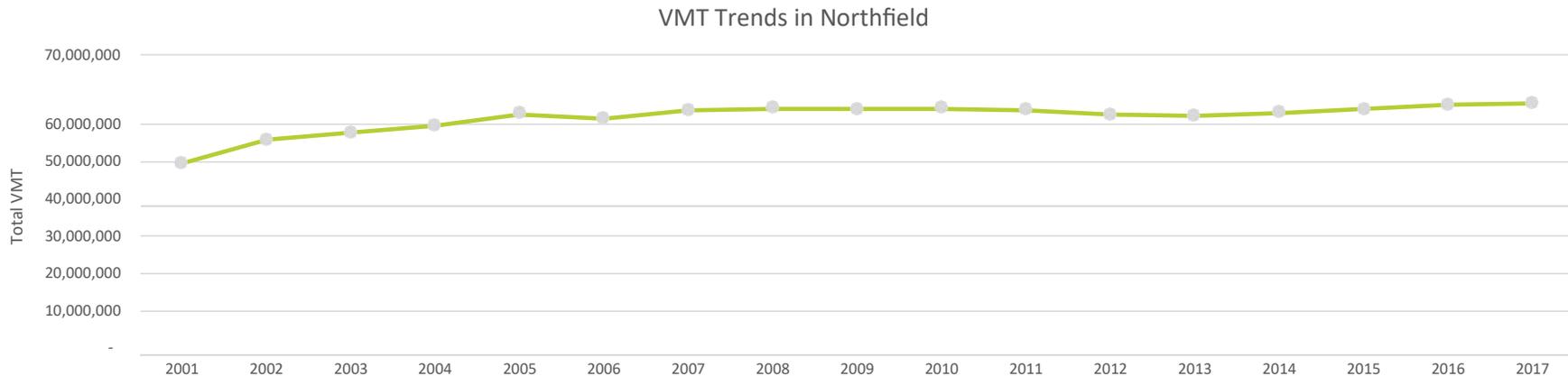


Figure 5. Total Vehicle Miles Traveled by year, 2006 - 2017. Source: Minnesota Department of Transportation. Generated by Regional Indicators Initiative.

According to the U.S. Census Bureau 5-year American Community Survey conducted in 2017, 52% of Northfield residents drove alone to work, nearly 11% carpooled, 8% biked or walked, and 32.6% of residents worked from home. The percent of residents who drive alone is relatively low compared to the state (78%). This may be reflected in the college-town characteristics of the community as many students and faculty are more likely to walk or bike to campus. Further, 32.6% of residents telecommute, which is relatively high compared to the state and may merit deeper analysis.

Utilization of mobility options – like walking, biking, or public transportation – is largely facilitated by availability of infrastructure and accommodating land use to support and encourage it. In Northfield, there are nearly 26 miles of combined bike and walking trails that cross the City. These trails, coupled with on-street routes for cyclists, offer many options for non-motorized travel. However, many of the trails have gaps and would benefit from better connectivity and protection. Currently, the primary transit option available to Northfield residents is through Hiawathaland Transit, operated by Three Rivers Community Action. Approximately 0.5% of residents reported using public transit through the American Community Survey.



Photo Credit: Great Plains Institute

In conversations with students and community organizations serving Latinx community members, people identified barriers to using the transit system, such as timing, frequency, route efficiency, and accessibility. Increasing the availability of and access to low- or no-carbon transportation options provides co-benefits that improve community-wide equity and health. Walking and biking offer health benefits by allowing people to incorporate exercise into their commute or recreation. Further, improved access to multiple mobility options allows all residents more choices to get to work, provides access to more employment opportunities, and facilitates involvement in community events.

For trips that must be made by a car, electric vehicles (EVs) are a cleaner alternative to internal combustion vehicles, both in terms of local air pollutants and GHG emissions. Of passenger vehicles in Northfield in 2016, 99.5% used gasoline.⁷ The growing availability of EV charging infrastructure supports increased adoption for electric vehicles. As of 2019, there are three public Level 2, dual-head electric vehicle charging stations in Northfield, one located at Carleton College, one at St. Olaf College, and one on Water Street and 5th Street. There are 32 registered electric vehicle owners in the City of Northfield and the surrounding area.⁸ Although most charging is done at home, adding EV charging stations in more public spaces will help to enable EV adoption beyond Northfield. There may also be an opportunity to create a network of shared electric vehicles within the community and enable more people to have access to a clean vehicle without owning one.

Land Use Emissions

Although not included in the community-wide inventory, emissions from how land is used and maintained is an important consideration for the Northfield community. The development patterns of land can dictate transportation and building density, creating barriers and opportunities for where people live and how they travel. More compact land use with adequate options for non-motorized travel or transit can help reduce emissions from transportation. Conversely, low-density land use patterns that are designed for the movement of vehicles will create an auto-centric community that results in higher emissions. GHGs can also be stored or emitted depending on specific land use and cover. Land cover is the physical material on Earth's surface, like trees, grass, pavement, or buildings. Undeveloped land, natural areas, and wetlands all provide important carbon benefits by capturing and storing the gas in plant matter and soils. Disturbing natural areas through land conversion (e.g., development, agricultural practices) releases the stored carbon, resulting in GHG emissions.

In Northfield, much of the natural land cover has been converted for development or agricultural use. Emissions that come from developed land are captured in Scope 1 and Scope 2 building and transportation emissions. Emissions that can be attributed to agricultural practices in Northfield are not included in this plan. Fertilizer application, soil tillage, and farm animals significantly contribute to global emissions (9% of U.S. emissions).⁹ By modifying practices, local farmers can not only reduce emissions associated with agriculture but can also provide carbon benefits to the community. For example, conservation tillage and grazing can reduce emissions and provide opportunities for additional sequestration.

As part of this plan, the City should continue to consider its approach to land use and land cover change as it pertains to emissions – particularly with respect to growth and urban boundary expansion opportunities to store and sequester carbon through wetlands and soil, as well as goals outlined to ensure preservation of agricultural and rural character. Further, the City can look to its natural areas and underutilized spaces to store additional carbon through tree planting and converting turf to native plantings.

⁷ Department of Energy State and Local Energy data (2016), <https://www.eere.energy.gov/sled/#/>, (Accessed June 2019). ⁸

Minnesota Department of Motor Vehicles, Statewide Vehicle Registration Data (2017).

⁹ Environmental Protection Agency, sources of Greenhouse Gas Emissions, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

EE – 4 Large Consumer Energy Engagement

Description: Engage Northfield’s top energy consumers in efforts to achieve community-wide energy reduction targets and encourage them to share or develop their own in-house energy or carbon reduction plans and targets. These consumers use the largest percentage of energy and therefore can implement the highest impact energy reduction and renewable energy projects.

Recommended Actions

	General	GHG Impact
EE 4.1	Implement Xcel Energy Partners in Energy “18-month Energy Action Plan” for large and small commercial consumers <i>GSC best practice 2</i>	
EE 4.2	Build a stakeholder coalition group among large users to identify shared goals and potential coordinated actions <i>GSC best practice 2</i>	
EE 4.3	Develop and distribute education and outreach tools that provide local builders and building owners with information on energy efficiency resources such as Xcel Energy’s Energy Efficient Buildings and Energy Design Assistance (EDA) evaluations, or similar programs	
EE 4.4	Partner with the public schools to create energy educational materials tied to real-world, local projects	

EE – 5 Travel Engagement

Description: There are increasingly more options available for travel within and outside a community. Often, people rely on travel modes that are most convenient and those they find most familiar. Education around travel helps people to see the different choices that are available to them whether it’s by foot, bike or rolling, transit, or shifting to an electric vehicle. Making the decision easier for an individual will enable people to make cleaner and healthier choices.

Recommended Actions

	General	GHG Impact
EE 5.1	Host workshops to provide opportunities for interested parties to learn about actions they can take: <ul style="list-style-type: none"> Using and improving the Hiawatha Land transit system Walking, biking, rolling (e.g., scooters), including plans for future trails and street designs Switching to an electric vehicle through ride and drive events Emerging technologies or programs, like car-share programs Time of day pricing and charging options available from Xcel Energy for electric vehicles 	
EE 5.2	Host ride and drive events where EV owners lend their vehicles for others to experience, or in cooperation with local dealerships	
EE 5.3	Include information about travel options on the One-Stop-Shop site	
EE 5.4	Provide information about the benefits of electric vehicles at public charging stations	

PP 3.4	Encourage rooftop solar on commercial buildings where there is an economically viable solar resource (i.e. available space with adequate sunlight, and a structurally sound roof) <i>GSC best practice 26</i>	
PP 3.5	Promote Renewable*Connect or other green power purchase programs for businesses and residences	
PP 3.6	Promote community solar garden subscriptions; identify opportunities for low-income access to subscriptions	

PP – 4 Transportation and Land Use Policy

Description: The built environment, development patterns, and transportation systems influence energy consumption and emissions.

Recommended Actions

	General	GHG Impact
PP 4.1	Adopt a policy for market-based pricing for parking in commercial areas and dedicate funds to go toward transportation for biking, walking, and public transit <i>GSC best practice 12</i>	
PP 4.2	Work with Hiawathaland transit and other partners to explore a subsidized bus pass program and/or simplify the payment method to increase ridership on the existing transit system <i>GSC best practice 12</i>	
PP 4.3	Work with Hiawatha Land Transit and other partners to move toward a fully electric local and regional transit system <i>GSC best practice 12</i>	
PP 4.4	Collaborate with community partners, particularly St. Olaf and Carleton, to explore bike, scooter, car-sharing or other mobility options; ensure motorized options are electric and accessible to all residents	
PP 4.5	Continue to implement the current bike/ped plan to improve access and safety of bike and pedestrian infrastructure <i>GSC best practice 12</i>	
PP 4.6	Provide adequate public charging spaces that can accommodate multiple charging ports for additional mobility options; connect to solar energy systems when possible	
PP 4.7	Partner with local businesses to catalyze EV charging infrastructure	
PP 4.8	Engage landowners and surrounding communities to implement the Greater Northfield Area Greenway System (2007) <i>GSC best practice 12</i>	

PP – 5 Sustainable Products and Waste

Description: Implement policies and actions to support substantial waste reduction.

Recommended Actions

	General	GHG Impact
PP 5.1	Develop a green purchasing policy for City operations and public events <i>GSC best practice 15</i>	

Innovation and Demonstration

The City of Northfield shall pursue these and other innovative projects that can also serve as demonstrations for Northfield residents and businesses as well as other communities locally, state-wide, and nationally wherever applicable. These projects will require a new approach that will test unfamiliar concepts and prepare to scale up those that demonstrate viability.

Impact on Emissions: These projects have the potential to achieve significant reductions in emissions.

Desired Outcome: The desired outcome of these strategies is to identify where the City can focus its efforts on deep GHG reductions through the successes and lessons learned.

IN – 1 Advanced Building Energy		
Description: While many of these technologies are currently available, they are not necessarily widely used for a variety of reasons.		
Recommended Actions		
	General	GHG Impact
IN 1.1	Seek partners and opportunities to encourage development projects that can demonstrate a net zero energy building design <i>GSC best practice 2</i>	
IN 1.2	Explore opportunities to be a test/demonstration community for alternative building design, materials, and land management with promise to reduce energy use, incorporate recycled materials, enhance natural assets, or educate others on innovative solutions not presently permitted by codes/policies	
IN 1.3	Work with the Minnesota Department of Commerce to map heat waste with heat loads to see if there are opportunities for combined heat and power and district heating technologies to be utilized <i>GSC best practice 2</i>	
IN 1.4	Partner with local businesses, institutions, and Xcel Energy to explore pilot micro-grid with renewable power and battery storage project <i>GSC best practice 26</i>	
IN 1.5	Partner with Dakota and Rice Counties and surrounding communities to understand opportunities and barriers for an anaerobic digester for food and agricultural waste <i>GSC best practice 22</i>	

IN – 2 Transportation and Land Use		
Description: Innovative transportation and land use projects that may take additional research and buy in before they are implemented.		
Recommended Actions		
	General	GHG Impact
IN 2.1	Partner with businesses to catalyze public EV charging	

IN 2.2	Update and strengthen the comprehensive plan and Land Development Code to increase residential density within City limits through infill best practices, such as the elimination of minimum parking requirements <i>GSC best practice 6</i>	
IN 2.3	Research and promote land management practices to encourage carbon sequestration through trees and soil <i>GSC best practice 16</i>	

IN – 3 City Operations

Description: City operations can lead by example through implementation of best practices for City buildings and facilities, fleet, and water and wastewater operations, as well as forestry and land management.

Recommended Actions

	General	GHG Impact
IN 3.1	Set annual targets to reduce energy use and emissions among City operations, including facilities, buildings, and fleet <i>GSC best practice 24</i>	
IN 3.2	Utilize an asset management software tool to track and monitor the operations of City buildings and help plan for maintenance <i>GSC best practice 1</i>	
IN 3.3	When making large capital improvement decisions, utilize a life-cycle cost assessment rather than simple payback	
IN 3.4	Adopt zero waste goals and procedures for all City led events, provide training and technical assistance <i>GSC best practice 22</i>	
IN 3.5	Explore options to host a community solar garden with subscriptions reserved for low to moderate income residents <i>GSC best practice 26</i>	
IN 3.6	Evaluate the feasibility of developing and utilizing green bulk purchases for recyclable or compostable products with all City contracts <i>GSC best practice 26</i>	
IN 3.7	Complete a fleet study to identify opportunities to reduce GHGs from the City fleet, including the potential to replace vehicles with electric models and/or right-sized vehicles <i>GSC best practice 13</i>	
IN 3.8	Identify opportunities for on-site renewable installations, particularly paired with storage for back-up power at critical facilities <i>GSC best practice 26</i>	
IN 3.9	Increase carbon sequestration through reforestation and enhancement of soil health on public lands through conversion of turf to native plantings and plant species that can tolerate a changing climate	
IN 3.10	Accelerate replacement of City-owned outdoor lights with efficient products	
IN 3.11	Encourage and facilitate the creation of businesses to support a zero-waste community such as those that could manage the processing of waste products into usable materials and increase the tax base	

The City of Northfield operates a wastewater treatment facility that discharges into the Cannon River. In 2016, the City completed a plan for Northfield’s Wastewater Treatment Facility that included recommendations for improvements, repairs, and replacements.¹⁹ The facility was originally constructed in 1958, with the latest improvements before 2016 occurring in 2002. The facility was designed to meet the needs of the community until 2020. In 2018, the Northfield wastewater treatment facility experienced overflow issues and a fire. This City is currently updating the facility; upgrades are projected to be complete in February 2020.

Transportation Infrastructure

Transportation infrastructure – roads, bridges, public transportation routes, bike/pedestrian trails and sidewalks – allows for movement of people and goods. Increased extreme weather events, particularly more frequent and intense precipitation events, put stress on built infrastructure systems. Roads, bridges, and routes that are older and maintained less frequently are particularly vulnerable to hazards and potentially increasing overall maintenance costs and inhibit travel. Resilient transportation systems can facilitate active mobility choices, improving public health and enhancing stormwater infrastructure with capture and infiltration systems.

This section assesses the existing transportation network – roads and bridge, public transportation, and active mobility – in Northfield, and identifies strengths, vulnerabilities, and opportunities to improve its resilience.

Roads and Bridges

Roads and bridges are both vulnerable to climate hazards and provide an opportunity for increased resiliency for Northfield residents. Roads and bridges may be particularly susceptible to damage caused by increased freeze/thaw cycles, extreme heat, and flooding. The biggest risk of these climate hazards on roads and bridges is increased maintenance costs for infrastructure to ensure safety. Northfield contains 74 miles of roads – 18% of which (14.4 miles) are in less than fair condition. According to the Capital Improvement Plan, all roads will be reconstructed by 2021. There are 12 bridges in Northfield, all of which are in good or fair condition.

Road and bridge networks present an opportunity for community resilience through stormwater management and mobility. Safe, reliable mobility options are important for residents under normal conditions and will be especially important as residents move away from potential climate hazards.

Public Transportation

Public transportation options not only help to mitigate emissions, but also provide an opportunity for increased community resilience. Hiawathaland Transit serves the internal Northfield-Dundas region and Dial-a-ride bus services are available within the City. Northfield Lines, which has stops between Northfield and the Twin Cities

metropolitan area, stops at Carleton College, downtown Northfield, and St. Olaf College regularly, at least once daily. Of commuters traveling to and from Northfield, 0.50% of commuters use these bus lines to commute according to the 2017 American Community Survey estimates.



Photo Credit: Great Plains Institute

¹⁹ City of Northfield, Wastewater Treatment Facility Plan, <https://kymnradio.net/wp-content/uploads/2018/06/Final-Northfield-Facility-Plan-Adopted-2016-02-16.pdf>, (accessed June 2019).

In focus group discussions with both the Latinx community and college students, many community members noted the frustration with the limited options for transit in the community. In these conversations, it was expressed that the existing services are difficult to navigate, have limited frequency, and are the slowest transportation option for movement throughout the community.

Active Mobility

Active mobility options include bicycling, walking, scootering, rollerblading, and other forms of movement and rolling. Benefits of active mobility options include increased exercise, physical and mental health benefits, safer mobility, and reduced emissions. A cohesive, safe, well-maintained network of trails can enhance resiliency to climate hazards, particularly for those residents without access to a personal vehicle. Increased mobility options help people avoid, evacuate from, and adapt to climate hazards, such as a flood near their home.

About 8% of Northfield residents walk or bike to work. Northfield has approximately 26.23 miles of trail – a combination of biking, walking, or combined trails. Many trails, mapped in Figure 14, are fragmented – a notable exception is the Mill Towns State Trail, which loops around the Cannon River. Most of the biking and walking trails are both located and connected in the southern portion of the community and along the Cannon going south from downtown.

In April 2019, Toole Engineering conducted an analysis of different plans and policies in Northfield that impact transportation, with the intention of improving pedestrian, bicycle, and trail networks.²⁰ As a part of this study, Toole Design facilitated an online gap analysis performed by Northfield residents. The analysis identified bicycling and walking network gaps in the City. Generally, Toole Design found that pedestrian problem areas are clustered along three major corridors with both limited pedestrian visibility and protection when crossing, fast-moving traffic failing to yield, a lack of pedestrian protection arounds schools, and a lack of sidewalk. Bicycling problem areas are clustered along similar corridors as pedestrian areas, with common concerns being a lack of safe crossing areas, fast-moving traffic, and poor maintenance and signage of existing routes. This analysis is useful in helping to determine areas that Northfield can prioritize as it expands infrastructure for active mobility.

²⁰ City of Northfield, City of Northfield Pedestrian, Bike, and Trail System, https://www.ci.northfield.mn.us/DocumentCenter/View/7570/City-of-Northfield-Pedestrian-Bike-and-Trail-System_Final-Report?bidId=. (Accessed June 2019).

Pedestrian and Bike Trails



Figure 14. Pedestrian and bicycle trails in Northfield, MN. Source: City of Northfield Public Works Department, 2019; generated by Jessi Wyatt.

RS – 2 Enhance the Resilience of Built Infrastructure

Description: Ensure long-term integrity and reliability of built infrastructure systems through maintenance and integration of resilience into long-term planning and projects.

Recommended Actions

Stormwater

- Incorporate resilience into the capital improvement plan to ensure City infrastructure projects consider projected climate impacts *GSC best practice 17*
 - Conduct an asset management assessment in consideration of life cycle costs and climate risks
 - Develop and utilize a climate lens for all City infrastructure planning
- Increase community energy resilience during power outages through the development of micro-grids with storage and renewable electricity generation *GSC best practice 20*
- Evaluate upstream and downstream impact on the Cannon River of the Ames Mill Dam removal *GSC best practice 17*
- Use the higher historical rain events (500 or 1000-year floods) from Atlas 14 or projections as they become available for stormwater system planning and construction *GSC best practice 17*
- Incorporate smart sewer systems to monitor flows, overflow potential, and backup issues through sensors *GSC best practice 20*
- Increase the utilization of green infrastructure to supplement existing and future stormwater management systems, such as stormwater ponds and infiltration basins *GSC best practice 29*
- Work with upstream jurisdictions to mitigate flooding

Potable Water

- Work with State agencies and other local governments to monitor the stability of the water supply from the Jordan aquifer and support management efforts *GSC best practice 20*
- Ensure the drinking water availability is adequate and balanced to meet future demand without risking the supply *GSC best practice 20*
- Continue to ensure the wastewater system has capacity to support increase demand *GSC best practice 20*

Emergency Response

- Coordinate with Dakota and Rice counties to plan for the management and recovery of waste after extreme weather events *GSC best practice 22*
- Ensure the incorporation of resilient elements such as microgrids, solar plus storage, and backup energy infrastructure *GSC best practice 2*

Land Use

- Incorporate additional transportation modes (such as bike infrastructure, wide sidewalks) and green stormwater infrastructure systems (such as rain gardens) into street maintenance and reconstruction projects *GSC best practice 12*
- Prioritize community multi-modal connectivity in long-term planning *GSC best practice 12*
- Increase bicycle and pedestrian network connectivity through the Complete Streets Policy implementation and implementation of the "Pedestrian, Bike and Trail System Final Report" (April 2019), with an emphasis on connecting low-income neighborhoods with downtown Northfield *GSC best practice 12*
- Continue to include Accessory Dwelling Units as a permitted use in Northfield's Land Development Code to enable more efficient use of land *GSC best practice 14*