

City of Northfield
Greenhouse Gas Assessment
for
City Operations 2015-2017

April 2019

Prepared for the City by



ACKNOWLEDGEMENTS

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Executive Summary

Background: In late 2018, the City of Northfield (City) contracted with the Great Plains Institute, LHB Architects, and ORANGE Environmental to prepare a climate action plan for the City. ORANGE Environmental was responsible for the subject report, which is a greenhouse gas (GHG) assessment for City operations (Assessment) for a 3-year Study Period, 2015-2017. Accompanying this Assessment is an Excel spreadsheet file with scores of tables and charts that generated the data for this Assessment. The most important tables and graphs are included in this Assessment to enable it to function as a stand-alone document. The final data has also been entered in the City’s ClearPath account.

Every city prepares annual operating and capital improvement budgets. A city operations assessment is akin to the environmental budget for the City. GHG emissions offer a unique way to compare the effectiveness of various energy and sustainability choices and their related costs. GHG emissions serve as a common denominator for the comparison of kilowatts, natural gas therms, and gallons of vehicular fuels consumed; vehicle and air miles traveled; tons of municipal solid waste processed; gallons of sanitary sewage treated; and gallons of potable water produced. Emissions are expressed in metric tonnes.¹

The Assessment methodology is consistent with the *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories*, produced by ICLEI— Local Governments for Sustainability (ICLEI Protocol), and The Climate Registry.

Overall results: The adjacent table lists the source categories (sectors) and the associated GHG emissions from 2015-2017, and the following pie chart illustrates those sources graphically for 2017. Wastewater treatment was the largest source, accounting for half of the total emissions. Buildings, park facilities, potable water, liquid fuels, and streetlights and signals each accounted for 9-12% of the total in 2017. Emissions associated with waste management were the smallest component at 1% of the total for City operations.

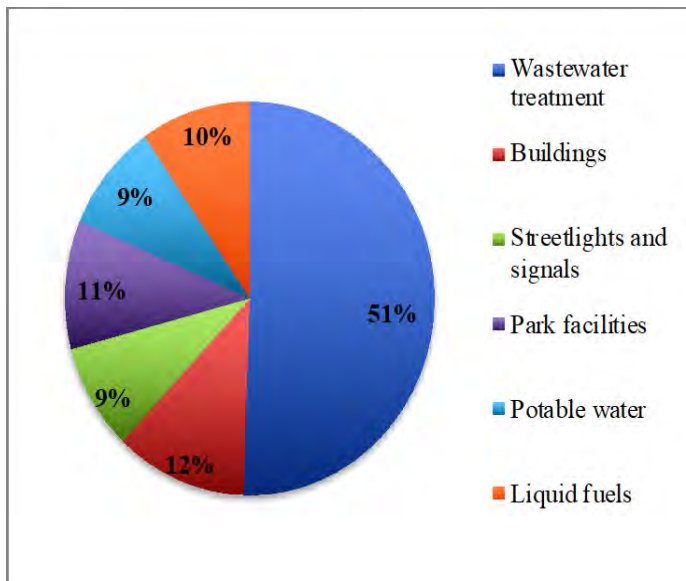
Greenhouse Gas Emissions, 2015-2017 (tonnes)				
Category	2015	2016	2017	Change from 2015
Buildings	524	471	455	-13%
Park Facilities	474	444	418	-12%
Streetlights and Signals	377	344	346	-8%
Potable Water	408	363	354	-13%
Liquid Fuels	383	446	381	-1%
Wastewater Treatment	2,275	2,232	1,998	-12%
Total Scope 1 & 2 emissions	4,441	4,300	3,951	-11%
Solid Waste (Scope 3)	37	35	38	5%

Change in emissions: All sectors experienced decreases by 2017, with the exception of solid waste management. Overall, total GHG emissions were -11% lower in 2017 than in 2015. When counting change year by year, GHG reductions totaled 491 tonnes. Because the emissions associated with wastewater treatment exceed the emissions from all other sectors combined, separate line charts below best illustrate the changes over the study period for the various sectors.

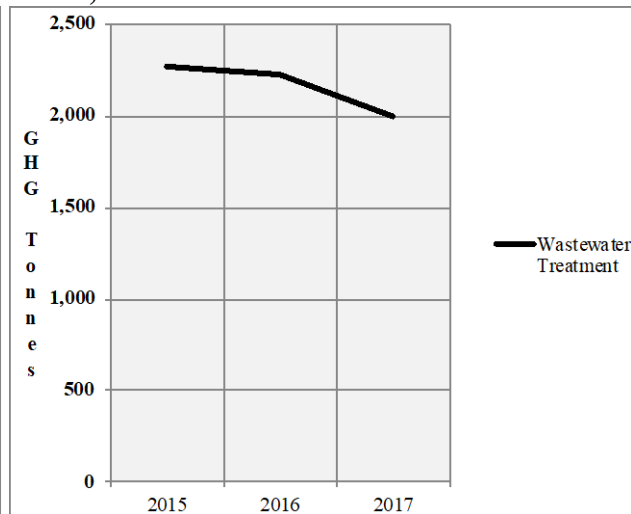
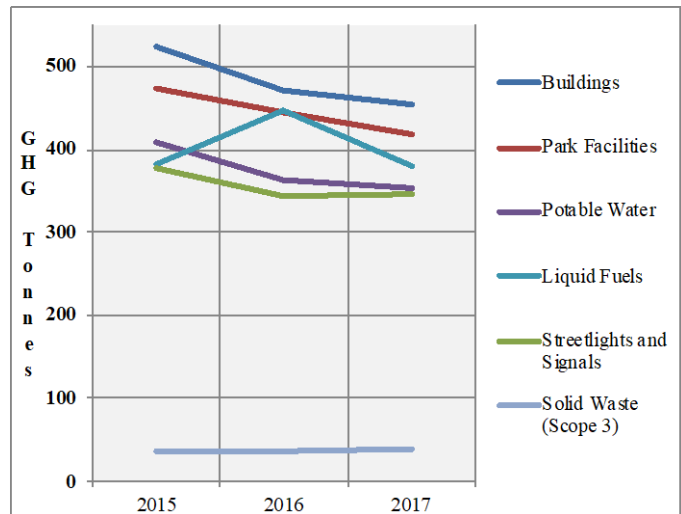
¹ A metric tonne is equal to 1,000 kilograms and 2,204.6 pounds.

**City of Northfield Greenhouse Gas Assessment
City Operations, 2015 to 2017**

Sources for reduced emissions: The substantial drop in wastewater treatment emissions in 2017 equaled 30% of the total reductions from all of the sources (refer to table and pie chart below). The table adds another factor; in fact, it is the main reason that accounts for the -11% reduction in GHG emissions: Xcel Energy’s reduced emission factor for electricity. Xcel’s emission factor has continually decreased for more than a decade and was -9% lower in 2017 than in 2015. Since electricity consumption is the largest source of emissions (about 70% over the 3 study years), Xcel’s -9% emission reduction played a crucial role. The table shows that over the Study Period, it was responsible for more than half of the reduced GHG tonnes.

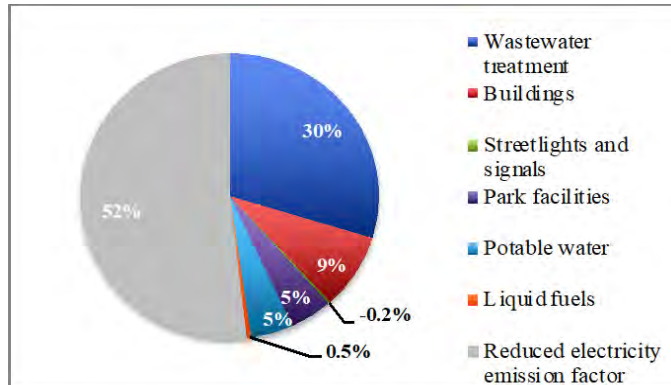


Greenhouse Gas Emissions, 2015-2017



Sources for Greenhouse Gas Reductions, 2015-2017

Category	2017 GHG Emissions (tonnes)	GHG Reductions (tonnes)	Percent of Total
Wastewater treatment	1,997.6	(147)	30%
Buildings	454.9	(42)	9%
Streetlights and signals	346.2	1	-0.2%
Park facilities	418.2	(23)	5%
Potable water	353.8	(23)	5%
Liquid fuels	380.6	(2)	0.5%
Reduced electricity emission factor		(255)	52%
Total	3,951.2	(491)	100%



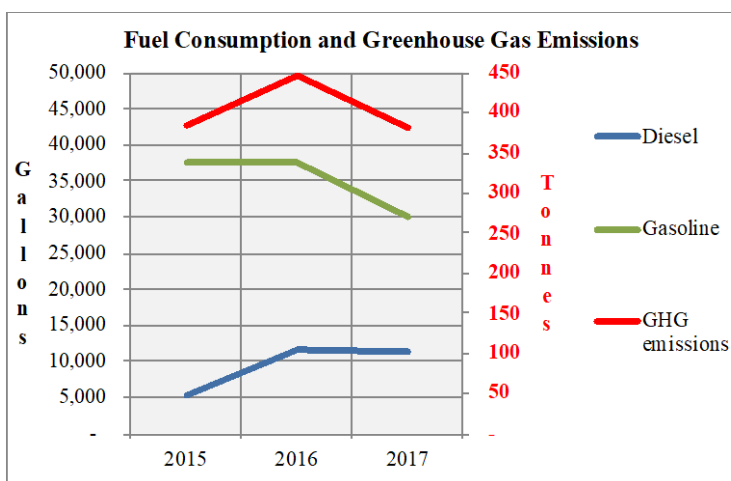
**City of Northfield Greenhouse Gas Assessment
City Operations, 2015 to 2017**

Buildings, park facilities, and potable water production accounted for the remaining 18% of the reductions over the Study Period (refer to pie chart above).

The adjacent table lists the changes in energy consumption from 2015 to 2017 for major facilities.

Facility	Change in Consumption and GHG Emissions		
	Electricity (kWh)	Natural Gas (therms)	GHG (tonnes)
Wastewater treatment	(436,931)	6,193	(278)
City Hall	(23,600)	(7,626)	(57)
Potable water	(53,231)	(144)	(54)
Memorial Park	(16,160)	(4,522)	(34)
Streetlights	2,727	-	(31)
Police Department	(5,520)	(2,687)	(23)
Public Works Street Dept.	(720)	(1,357)	(10)
Northfield Ice Arena	42,560	(478)	(10)
Municipal Liquor Store	(1,680)	176	(5)
Northfield Public Library	62,640	1,400	27

Liquid fuels: The adjacent line chart illustrates the change in consumption over the Study Period for diesel and gasoline fuel consumption as well as their associated GHG emissions. (Note that GHG emissions are shown in a red line based on the right-hand vertical scale.) Total consumption and GHG emissions were significantly higher in 2016 compared to 2015 (16% higher) but then dropped back down in 2017 to slightly below the 2015 levels.



Waste management: The GHG emissions associated with the management of the solid waste generated by City operations varied slightly over the study period and averaged about 37 tonnes for all City operations. These emissions are considered Scope 3 emissions and according to the ICLEI Protocol, can't be counted with the Scope 1 and 2 emissions.

1. Background and Assessment Design

In late 2018, the City of Northfield (City) contracted with the Great Plains Institute, LHB Architects, and ORANGE Environmental to prepare a climate action plan for the City. ORANGE Environmental was responsible for the subject report, which is a greenhouse gas (GHG) assessment for City operations (Assessment) for a 3-year Study Period, 2015-2017. Accompanying this Assessment is an Excel spreadsheet file with scores of tables and charts that generated the data for this Assessment. The most important tables and graphs are included in this Assessment to enable it to function as a stand-alone document. The final data has also been entered in the City's ClearPath account.²

1.1. Benefits of Measurement: As described by Osborne and Gaebler in their book, *Reinventing Government* (1992), "If you don't measure results, you can't tell success from failure. If you cannot see success, you cannot reward it. If you can't see failure, you can't correct it."

Every city prepares annual operating and capital improvement budgets. A city operations assessment is akin to the environmental budget for the City. GHG emissions offer a unique way to compare the effectiveness of various energy and sustainability choices and their related costs. GHG emissions serve as a common denominator for the comparison of kilowatts, natural gas therms, and gallons of vehicular fuels consumed; vehicle and air miles traveled; tons of municipal solid waste processed; gallons of sanitary sewage treated; and gallons of potable water produced. Emissions are expressed in metric tonnes.³

This Assessment will:

- Inform the analyses, plans, and policy recommendations that comprise the other components of the City's climate action plan.
- Highlight opportunities to save resources and money.
- Provide baselines for estimating the effectiveness of many sustainability measures.
- Enable comparison with future inventories and peer cities.
- Improve the City's competitiveness for federal and state funding opportunities that are targeted to cities that have taken steps to measure and improve their energy efficiency and reduce their carbon footprints.
- Assist in promoting public understanding of the City's effects on climate change.
- Serve as a model for other cities.

Experience with prior assessments indicates that important benefits often result from the preparation process as well. It can spark common interest among the involved city staff in understanding why energy consumption fluctuates from year to year; it can

² From the website: "ClearPath™ is the leading online software platform for completing greenhouse gas inventories, forecasts, climate action plans, and monitoring at the community-wide or government-operations scales."
<http://icleiusa.org/clearpath/>

³ A metric tonne is equal to 1,000 kilograms and 2,204.6 pounds.

identify meters that are no longer in use but still costing fees (“orphan meters”); it can encourage the sharing of ideas among different departments, and it can foster a common desire to reduce emissions.

- 1.2. Assessment Design:** The Assessment methodology is consistent with the *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories*, produced by ICLEI— Local Governments for Sustainability (ICLEI Protocol), and The Climate Registry.⁴ Consistent with the ICLEI Protocol, greenhouse gases (GHG) are expressed in metric tons (tonnes), which equal 1,000 kilograms, or 2,204.6 pounds. It includes all pertinent and available data for the study years chosen by City staff: 2015, 2016, and 2017.

The source information for the tables and charts included in the body of the report can be found in the spreadsheets that have been provided to the City as a technical supplement to this Assessment. City staff are the source for data that pertains to City operations unless otherwise noted. All of the sources of data for the Assessment are transparent, fully identified, verifiable, and reliable. They consist of City records and staff reports; utility records and reports to the Minnesota Public Utilities Commission; internationally recognized methodologies and published scientific papers regarding the calculation of GHG emissions; federal, state, and county agencies (USDOT, USEPA, MNDOT, MPCA, Metropolitan Council, Metropolitan Airports Commission, Dakota County); and other published sources.

- 1.3. Assessment Scopes:** The ICLEI Protocol categorizes GHG emission sources into 3 groups called *scopes* as follows:

- **Scope 1:** All direct GHG emissions from City operations such as consumption of liquid fuels in City vehicles, natural gas consumption in City buildings, and process emissions from wastewater treatment.
- **Scope 2:** Indirect GHG emissions associated with the consumption of purchased electricity from Xcel Energy and the solar garden that provide power.
- **Scope 3:** All other indirect emissions not covered in Scope 2, e.g., employee commute and business travel. At the direction of City staff, this Assessment does not include any Scope 3 emissions.

⁴ The greenhouse gases of carbon dioxide (CO₂), nitrous oxide (N₂O), and methane (CH₄) are aggregated and reported as carbon dioxide equivalents, a commonly used unit that combines greenhouse gases of differing impact on the earth’s climate into one weighted unit. The use of the term *greenhouse gasses* herein implies the carbon dioxide equivalents of these 3 key greenhouse gases. The source information for the tables and charts included in the body of the report can be found in the detailed tables that have been provided to the City as a technical supplement to this Assessment. City staff provided all data that pertains to City operations unless otherwise noted. Energy consumption data for City buildings and facilities are from Xcel Energy and the Minnesota Buildings, Benchmarks, and Beyond (B3) Program when available.

2. Overall Results

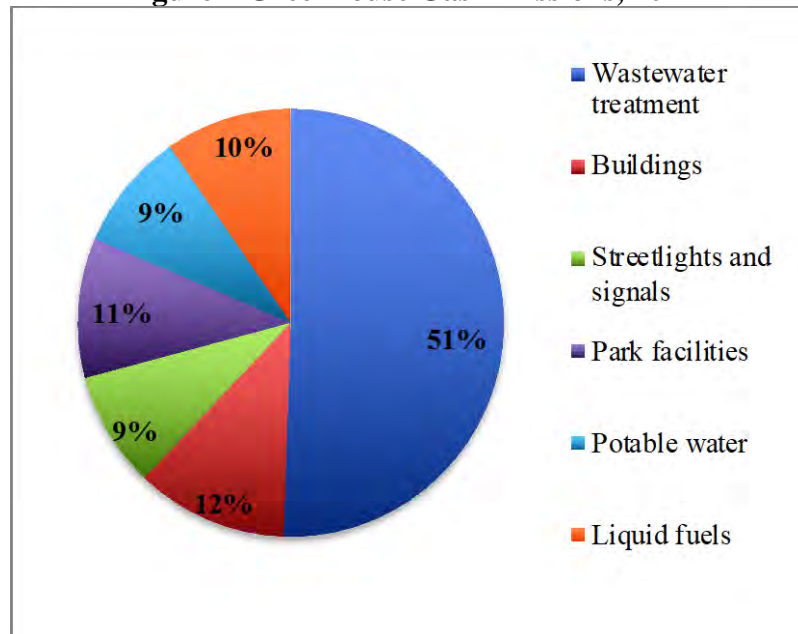
2.1. Sources of Greenhouse Gas Emissions

Table 1 lists the source categories (sectors) and the associated GHG emissions, and Figure 1 illustrates the sources graphically for 2017. Wastewater treatment was the largest source, accounting for half of the total emissions. Buildings, park facilities, potable water, liquid fuels, and streetlights and signals each accounted for 9-12% of the total in 2017. Emissions associated with waste management were the smallest component at 1% of the total.

Table 1: Greenhouse Gas Emissions, 2015-2017 (tonnes)

Category	2015	2016	2017	Change from 2015
Buildings	524	471	455	-13%
Park Facilities	474	444	418	-12%
Streetlights and Signals	377	344	346	-8%
Potable Water	408	363	354	-13%
Liquid Fuels	383	446	381	-1%
Wastewater Treatment	2,275	2,232	1,998	-12%
Total Scope 1 & 2 emissions	4,441	4,300	3,951	-11%
Solid Waste (Scope 3)	37	35	38	5%

Figure 1 Greenhouse Gas Emissions, 2017



2.2. Changes in Greenhouse Gas Emissions and Their Causes

Table 1 and Figure 2 show the change in GHG emissions over the 3-year Study Period. Because the emissions associated with wastewater treatment exceed the emissions from all other sectors combined, separate line charts best illustrate the changes over the study period for the various sectors. Overall, total GHG emissions were 491 tonnes less in 2017 than in 2015, a reduction of -11% (refer to the green highlighted cells in Table 1).

Table 2 shows that all sectors had emission reductions (excepting solid waste management) that contributed to the overall -11% reduction. However, the substantial drop in wastewater treatment emissions in 2017 equaled almost 1/3 of the total reductions from all of the sources (Figure 3). Subsequent sections will explore these changes in more detail.

The table in Figure 3 adds another factor; in fact, it is the main reason that accounts for the -11% reduction in GHG emissions: Xcel Energy’s reduced emission factor for electricity. Xcel’s emission factor has continually decreased for more than a decade and was -9% lower in 2017 than in 2015. Since electricity consumption is the largest source of emissions (about 70% over the 3 years), Xcel’s -9% emission reduction plays a crucial role. Figure 3 shows that over the Study Period, it was responsible for more than half of the reduced GHG tonnes.

As Figure 3 shows, wastewater treatment accounted for the second highest portion of the GHG reductions, 30% of the total. Buildings, park facilities, and potable water production accounted for the remaining 18% of the reductions over the Study Period.

Figure 2: Greenhouse Gas Emissions, 2015-2017

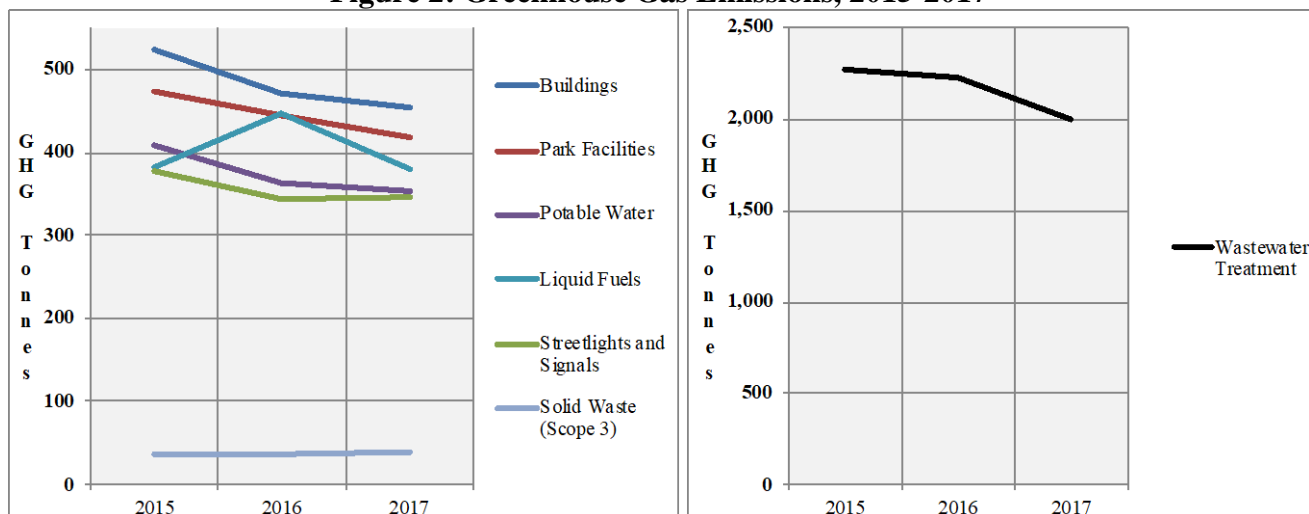
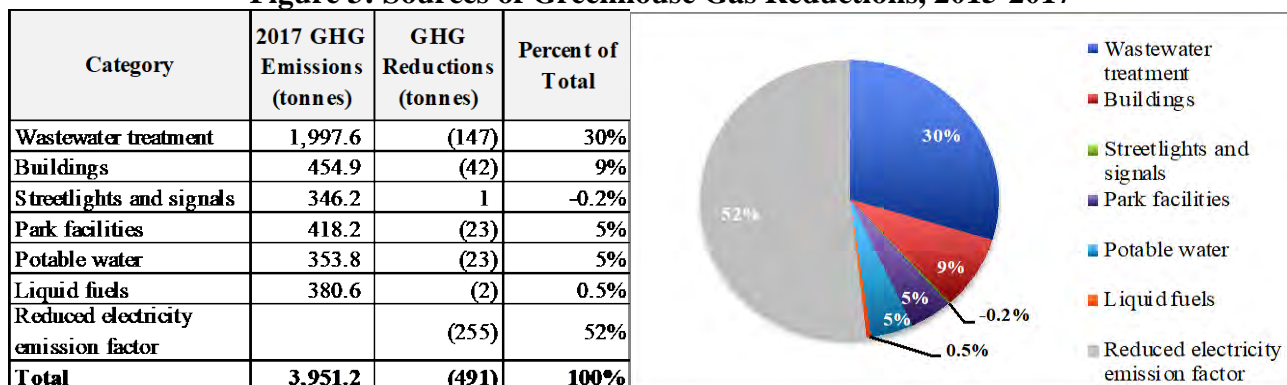


Figure 3: Sources of Greenhouse Gas Reductions, 2015-2017



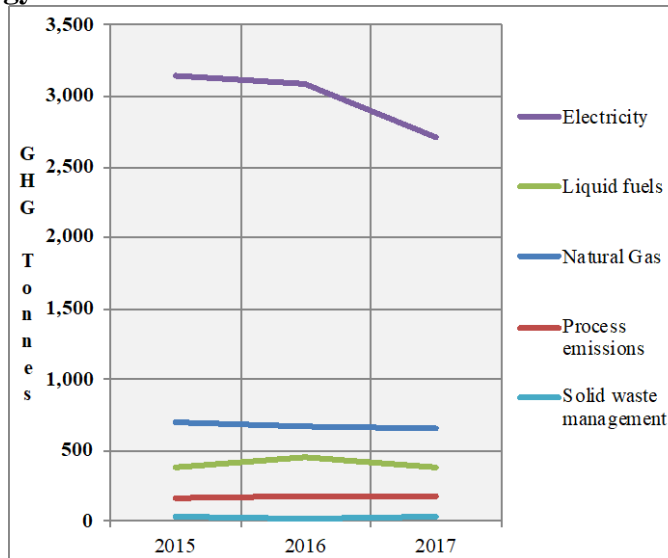
2.3. Energy and Process Sources of Greenhouse Gas Emissions

Table 2 and Figure 4 arrange the data according to the energy and other sources of GHG emissions. They demonstrate the importance of electricity; it was the source of about 70% of the emissions over the 3-year Study Period. *Process emissions* refer to fugitive emissions of nitrogen oxides during the treatment of wastewater.

Table 2: Energy and Process Sources of Greenhouse Gas Emission, 2015-2017 (tonnes)

Source	2015	2016	2017	Change from 2015	Percent of Total, 2015	Percent of Total, 2016	Percent of Total, 2017	Change From 2015	Percent of Change
Electricity	3,184	3,010	2,744	-14%	71%	69%	69%	(440)	90%
Natural Gas	704	673	655	-7%	16%	16%	16%	(49)	10%
Liquid fuels	383	446	381	-1%	9%	10%	10%	(2)	1%
Process emissions	171	171	171	0.4%	4%	4%	4%	1	0%
Solid waste management	37	35	38	4.6%	1%	1%	1%	2	0%
Total	4,478	4,335	3,990	-11%	100%	100%	100%	(489)	100%

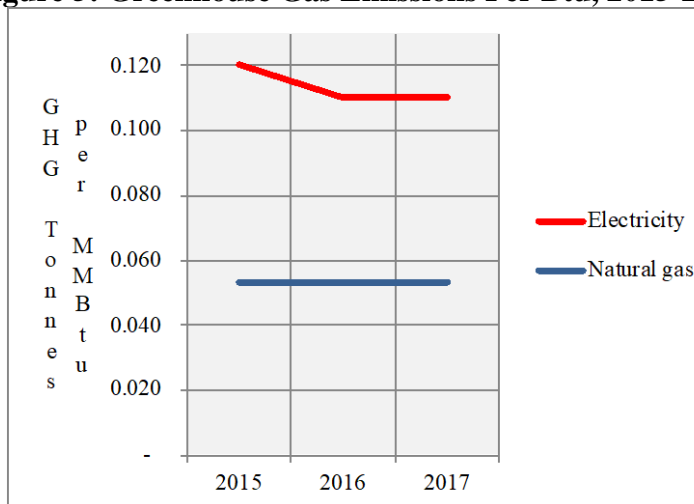
Figure 4: Energy and Process Sources of Greenhouse Gas Emissions, 2015-2017



The table and chart illustrate the important -14% decline in emissions that resulted from reduced electricity consumption and Xcel’s -9% reduction in its emission factor. Natural gas consumption declined by -7% while the other sources were largely unchanged.

Figure 5 further illustrates the importance of electricity’s impact on GHG emissions. When compared on a per-Btu basis, a Btu of electricity from Xcel’s NSP system results in more than twice as many GHG emissions as a Btu from natural gas consumption. Obviously, improvements to electrical efficiency generate the greatest impact on GHG reductions.

Figure 5: Greenhouse Gas Emissions Per Btu, 2015-2017



3. Changes in Energy Consumption: This section will take a closer look at the factors that changed energy consumption.

3.1. Electricity Consumption

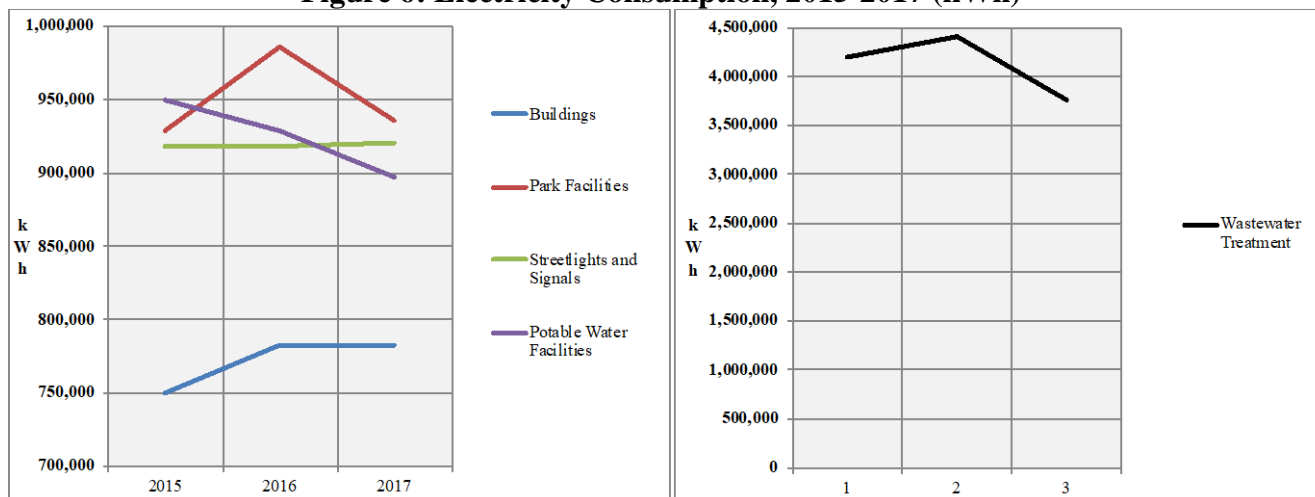
As mentioned above, electricity consumption is the major source of GHG emissions (about 70% over the Study Period), and reduced electricity consumption is the second most important factor that resulted in the overall GHG reduction after Xcel’s reduced emission factor. Electricity consumption was 4% higher in 2016 than in 2015 but then decreased by -9% in 2017. Compared to 2015, consumption in 2017 was -6% lower.

Table 4: Electricity Consumption, 2015-2017 (kWh)

Category	2015	2016	2017	Change from 2015
Buildings	750,080	783,094	782,369	4%
Park Facilities	928,577	986,553	935,300	1%
Streetlights and Signals	917,913	917,888	920,640	0%
Potable Water Facilities	950,035	928,223	896,804	-6%
Wastewater Treatment	4,199,999	4,410,763	3,763,068	-10%
Total	7,746,604	8,026,521	7,298,181	-6%

Table 4 and Figure 6 show that the wastewater treatment facilities were not only the largest consumer of electricity (actually more than the other 4 sectors combined), but also responsible for the greatest decline in electricity consumption in 2017 compared to 2015 (-10%). As with Figure 2 above, Figure 6 shows wastewater treatment on a separate chart because it is so out of scale with the other sectors. (Note that the vertical scale on the left chart does not go to zero in order to highlight the changes in consumption.)

Figure 6: Electricity Consumption, 2015-2017 (kWh)



Consumption for the potable water facilities was -6% lower in 2017 than in 2015, and buildings and park facilities used more electricity in 2017.

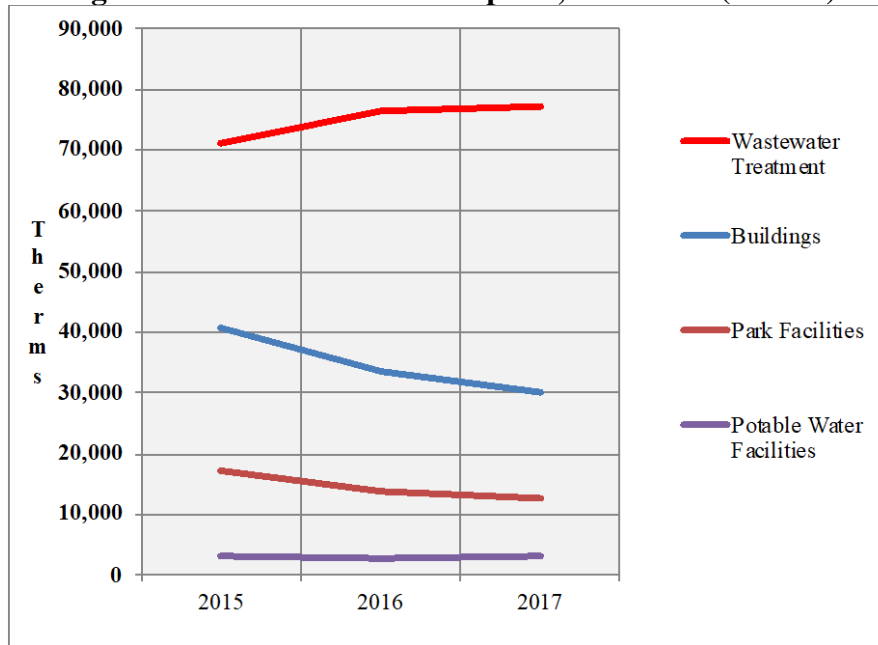
3.2. Natural Gas Consumption

Table 5 and Figure 7 describe natural gas consumption over the Study Period. Consumption decreased slightly in 2016 and 2017 compared to the prior years (-4% and -3% respectively). Consumption (and GHG emissions) was lower in 2017 compared to the 2005 Base Year (-7% fewer therms and GHG tonnes, Table 1).

Table 5: Natural Gas Consumption, 2015-2017 (therms)

Category	2015	2016	2017	Change from 2015
Buildings	40,645	33,440	30,233	-26%
Park Facilities	17,317	13,886	12,520	-28%
Potable Water Facilities	3,261	2,739	3,117	-4%
Wastewater Treatment	71,141	76,527	77,334	9%
Total	132,364	126,592	123,204	-7%

Figure 7: Natural Gas Consumption, 2015-2017 (therms)



Buildings and the park facilities sectors had the largest reductions (-26% and -28% respectively). Consumption for the wastewater treatment facilities increased both in 2016 and in 2017 over the 2015 level. Section 5 looks more closely at why.

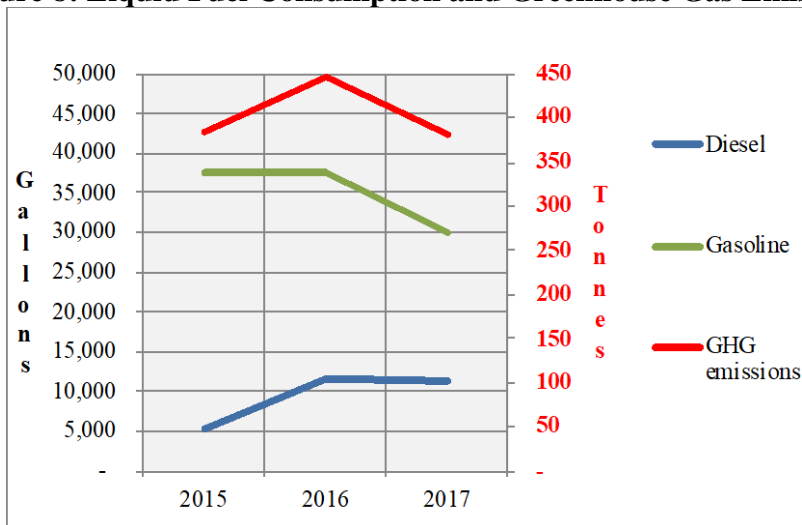
4. Liquid Fuels

Table 6 and Figure 8 illustrate the change in consumption over the Study Period for diesel and gasoline fuel consumption as well as their associated GHG emissions. (Note that GHG emissions are shown in a red line based on the right-hand scale.) Total consumption was significantly higher in 2016 compared to 2015 (16% higher) but then dropped back down in 2017 to slightly below the 2015 level. The reason for the overall increase was because diesel consumption in 2016 was more than double (121% higher) 2015 levels, but gasoline consumption dropped by -20% over the period. GHG emissions reflected these changes with a 16% increase in 2016 compared to 2015 and then a drop in 2017 back to just below the 2015 level.

Table 6: Liquid Fuel Consumption, 2015-2017

Fuel	2015	2016	2017	Change from 2015
Diesel (gal.)	5,157	11,476	11,407	121%
Gasoline (gal.)	37,630	37,431	30,082	-20%
Total consumption (gal.)	42,787	48,907	41,489	-3%
Total emissions (tonnes)	383.0	445.8	380.6	-1%
Percent change		16%	-15%	

Figure 8: Liquid Fuel Consumption and Greenhouse Gas Emissions



5. Potable Water and Wastewater

Table 7 shows the volumes of potable water and wastewater the City manages.

Table 7: Potable Water and Wastewater Volumes, 2015-2017

Year	Amounts (millions of gallons)					Per Capita (thousands of gallons)	
	Potable Water	City Wastewater	Carlton College	City of Dundas	Wastewater Total	Potable Water	City Wastewater
2013	766.1						
2014	763.5						
2015	749.6	661.2	26.3	28.7	716.2	36.9	32.5
2016	724.6	734.2	24.9	31.7	790.9	35.6	36.1
2017	680.8	803.6	27.0	32.0	862.6	33.4	39.4
Change from 2015	-9%	22%	3%	11%	20%	-10%	21%

5.1. Potable Water

Table 7 and 8 and Figure 9 show the following as regards potable water:

- **Volumes:** Table 7 shows that both on an absolute and per-capita basis, the City’s usage of potable water has declined since 2015. Volumes in 2017 were about 9% lower in 2017 than in 2015.
- **Energy consumption:** In terms of Btus, both electricity and natural gas consumption were lower in 2017 than in 2015 (-6% and -4% respectively).
- **Energy efficiency:** The facilities produced -9% less water in 2017 compared to 2015, and a Btu of energy produced -4% fewer gallons in 2017 than in 2015. Figure 9 illustrates this change in production efficiency (note that gallons per kBtu of electricity are based on the right-hand vertical scale). Since the City does not have a water treatment plant, reduced economies of scale from fixed energy demands are not a significant factor.

- GHG:** Emissions were -13% lower in 2017 compared to 2015. The reduced water production and accompanying reduced energy consumption plus the lowered electricity emission rate are the reasons. Potable water production accounted for 11% of the total GHG reductions from 2015-2017 (Table 1).

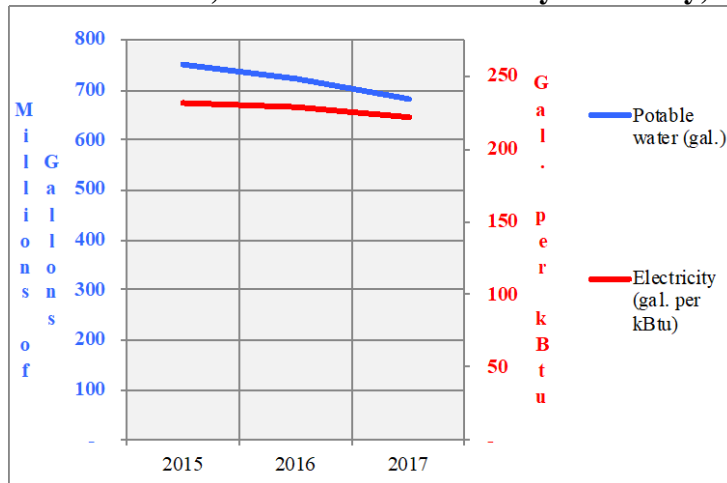
Table 8: Potable Water and Wastewater, Energy Consumption, 2015-2017

Facility	2015	2016	2017	Change from 2016	Change from 2015
Potable water:					
Amount (M gal)	750	725	681	-6%	-9%
Electricity (MMBtu)	3,242	3,167	3,060	-3%	-6%
Percent of total MMBtu	91%	92%	91%		
Gallons per kBtu	231	229	222	-3%	-4%
Natural gas (MMBtu)	326	274	312	14%	-4%
Percent of total MMBtu	9%	8%	9%		
Gallons per kBtu	2,299	2,646	2,184	-17%	-5%
Total (MMBtu)	3,568	3,441	3,372	-2%	-5%
Gallons per kBtu	210	211	202	-4%	-4%
Wastewater treatment:					
Amount (M gal)	716	791	863	9%	20%
Electricity (MMBtu)	14,331	15,050	12,840	-15%	-10%
Percent of total MMBtu	67%	66%	62%		
Gallons per kBtu	50	53	67	28%	34%
Natural gas (MMBtu)	7,114	7,653	7,733	1%	9%
Percent of total MMBtu	33%	34%	38%		
Gallons per kBtu	101	103	112	8%	11%
Total (MMBtu)	21,445	22,703	20,574	-9%	-4%
Gallons per kBtu	33	35	42	20%	26%

Notes:

(1) The City treats more wastewater than it produces. The City also treats the wastewater from the City of Dundas and Carleton College (both produce their own water) along with limited amounts of inflow and infiltration into the system.

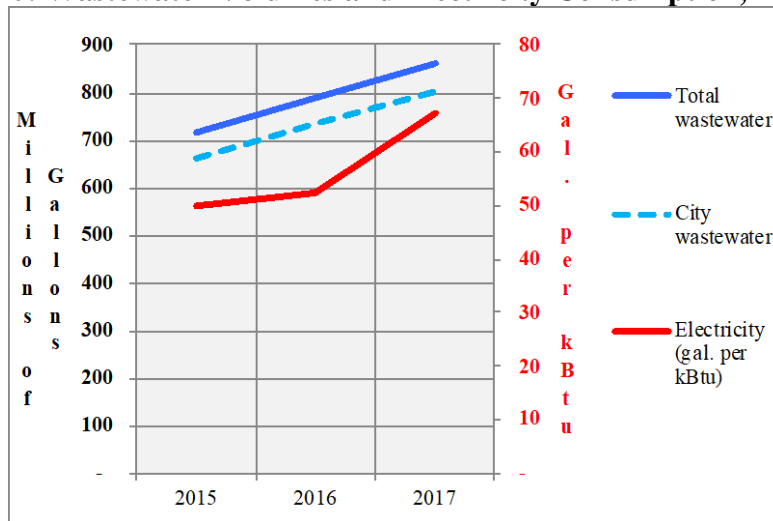
Figure 9: Potable Water, Volumes and Electricity Efficiency, 2015-2017



5.2. **Wastewater:** The following describes the findings regarding wastewater treatment, and Table 7 and 8 and Figure 10 illustrate changes over the Study Period:

- **Volumes:** In addition to City wastewater, the treatment plant also processes wastewater from Carlton College and the City of Dundas, which total about 7% of the total amounts treated. Volumes from all 3 sources increased from 2015-2017, with the total being 20% higher in 2017 compared to 2015. On a per-capita basis, wastewater just from the City was 21% higher in 2017 than in 2015.
- **Energy consumption and efficiency:** Wastewater treatment is heavily reliant on electricity (about 75% of its GHG emissions) and it is, by far, the largest source of emissions. The facility treated 20% more wastewater in 2017 compared to 2015 yet electricity consumption was -10% less. However, natural gas consumption was 9% higher. To put it in terms of energy, a Btu of electricity treated 34% more gallons in 2017 compared to 2015, and a Btu of natural gas treated 11% more gallons. Combined, a Btu of energy treated 26% more gallons.
- **Fixed costs:** Because most of the HVAC energy (heating ventilation, air conditioning) needs of the water treatment plants are fixed, there are increased economies of scale for treating a larger amount of wastewater.
- **Summary of change:** Put differently, the 34% increase in electrical efficiency affected 62% of the total energy consumption in the facility in 2017 and resulted in a 26% increase in overall efficiency.
- **Facility changes:** A new ultraviolet disinfection system was installed for the 2017 disinfection season (April 1- October 31). This is a major electrical consumer.
- **GHG:** Emissions were -12% lower in 2017 compared to 2015. The reduced electricity consumption, increased energy efficiency, and the lowered electricity emission rate are the reasons. Wastewater treatment accounted for 28% of the total GHG reductions from 2015-2017 (Figure 3).

Figure 10: Wastewater Volumes and Electricity Consumption, 2015-2017



6. Changes in Major Facilities

The following section looks at 9 facilities that were relatively large consumers of energy, and Table 9 shows the changes in 2017 relative to 2015 (wastewater treatment and potable water are addressed in Section 5).

Table 9: Significant Changes, 2017 Compared to 2015

Facility	Change in Consumption and GHG Emissions		
	Electricity (kWh)	Natural Gas (therms)	GHG (tonnes)
Wastewater treatment	(436,931)	6,193	(278)
City Hall	(23,600)	(7,626)	(57)
Potable water	(53,231)	(144)	(54)
Memorial Park	(16,160)	(4,522)	(34)
Streetlights	2,727	-	(31)
Police Department	(5,520)	(2,687)	(23)
Public Works Street Dept.	(720)	(1,357)	(10)
Northfield Ice Arena	42,560	(478)	(10)
Municipal Liquor Store	(1,680)	176	(5)
Northfield Public Library	62,640	1,400	27

- City Hall:** A boiler was repaired in 2016. Compared to 2015, electricity consumption was -11% lower in 2017 and natural gas consumption was -55% lower. As a result, the number of GHG tonnes reduced (-57 tonnes) was only exceeded by the wastewater treatment plant.
- Memorial Park:** The facility used -15% less electricity in 2017 compared to 2015 and -51% less natural gas. The reduced electricity emission factor combined with the increase in energy efficiency resulted in GHG emissions that were lower by -34 tonnes in 2017 compared to 2015.
- Streetlights:** Electricity consumption was stable throughout the Study Period (under 1% larger in 2017 than in 2015) but the reduced electricity emission factor resulted in GHG emissions that were -9% lower in 2017.
- Police Department:** The facility used -3% less electricity in 2017 compared to 2015 and -21% less natural gas. This improved energy efficiency and the reduced electric emission factor resulted in -23 fewer tonnes of GHG.
- Public Works garage:** There was increased reliance in 2015 on radiant heaters (fueled by natural gas) instead of less efficient air handlers. The facility used -1% less electricity in 2017 compared to 2015 and -15% less natural gas. This improved energy efficiency and the reduced electric emission factor resulted in -10 fewer tonnes of GHG.

- **Ice Arena:** The facility used 6% more electricity in 2017 compared to 2015 but -6% less natural gas. The reduced electricity emission factor overcame the increase in electricity consumption such that GHG emissions were lower by -10 tonnes in 2017 compared to 2015. There was a virtually complete change-out of indoor and outdoor lighting to LED in 2018.
- **Liquor store:** Electricity consumption was stable, only -1% lower in 2017 than in 2015, but natural gas was 10% higher. The reduced electricity emission factor resulted in -5 fewer GHG tonnes emitted in 2017 than in 2015. There was a change-out of lighting to LED in the coolers and some ceilings.
- **Library:** The renovation in 2015 included a 1,000 sq. ft. expansion and improvements to HVAC using a heat pump system. From August 2015 boiler did not run during some of that time. The larger size resulted in an increase in electricity consumption (60% higher in 2017 than in 2015) and natural gas consumption (47% higher). As a result, 27 additional GHG tonnes were emitted in 2017 compared to 2015.

7. Solid Waste Management

Table 10 lists the GHG emissions associated with solid waste management. The citywide GHG assessment is the source for the City operations data. The assumption is that a job at the City will generate approximately the same emissions as the citywide average-per-job rate. The table shows that emissions varied slightly over the study period and averaged about 37 tonnes for all City operations.

These emissions are considered Scope 3 emissions and according to the ICLEI Protocol, can't be counted with the other emissions (Scope 1 and 2).

Table 10: Greenhouse Gas Emissions from Solid Waste Management

Greenhouse Gases (tonnes)	2015	2016	2017	Average 2015-2017
Citywide Data				
Total GHG from solid waste management	3,437	3,374	3,737	3,516
FTE jobs in City ¹	9,759	9,982	10,148	9,963
GHG per FTE	0.35	0.34	0.37	0.35
City FTE	104	104	104	104
City operations GHG ²	36.6	35.2	38.3	36.7
Notes:				
1	Jobs Source: North American Industry Classification System (NAICS) and the Quarterly Census of Employment Wages (QCEW): (http://www.positivelyminnesota.com/apps/lmi/qcew/ResultsDisp.aspx). Data is from "Total of All Ownerships" and "Total, All Industries." The Quarter 2 data was chosen because it tends to be the least affected by seasonal fluctuation. The annual data was not chosen because it is an average of the four quarters and, thus, does not provide for optimal comparison purposes. https://apps.deed.state.mn.us/lmi/qcew/ResultsDisp.aspx			
2	The assumption is that on a per-FTE basis, a job at the City of Northfield has roughly the same emissions as a job elsewhere in the City.			

The background image shows a park scene. On the left, a large tree trunk is in the foreground. In the middle ground, there is a white, multi-story building with a tower-like section, situated near a body of water. The water reflects the building and the sky. To the right, there are more trees, some with green leaves, and a black metal bench on a paved path. The sky is clear and blue.

Appendix B

Climate Resilience Assessment

Climate Adaptation and Resilience

Climate change is having demonstrable impact on the Earth's natural systems and Northfield must prepare for and adjust to these changes. Minnesota has begun to see some of the most dramatic effects from a changing climate. Average annual temperatures are rising at a faster rate than most other parts of the country. Our winters are warming faster than average, especially overnight lows. Heavy precipitation events are more common throughout the state, with both annual precipitation level averages and the occurrence of mega-rain events on the rise — Northfield has seen two major flooding events since 2012. The City of Northfield recognizes the need to adapt to changes that are already occurring by improving the resilience of all residents, as well as the City's built and natural infrastructure.

Resilience describes the ability of an individual or community to respond, adapt, and be minimally impacted by a changing climate. This Resilience Assessment was developed for the City of Northfield as part of its Climate Action Plan (CAP). Sections of this report are included in the CAP, while this document contains the complete assessment. This document analyzes Northfield's resilience through two sections. The first is an overview of anticipated climate hazards in Northfield. The second is an assessment of Northfield's ability to adapt, react, and be resilient to these climate hazards.

Climate change will have far-reaching effects that will impact communities, infrastructure, resources, and individuals differently. Assessing where and what a City and community's vulnerabilities to climate hazards are will allow for proactive decision-making and intervention to enhance the safety and resilience of all Northfield residents.



Photo Credit: Carleton College

Local Climate Hazards

As greenhouse gas levels in the atmosphere continue to rise, temperatures will increase, ecological functions will be altered, and precipitation and weather patterns will change. In 2018, the Climate & Health Program of the Minnesota Department of Health conducted a study analyzing current climate trends and examining climate projection data to forecast temperature and precipitation trends through 2075. The study found two major climate trends happening now and expected to continue in Southeast Minnesota: an increase in winter and summer temperatures, and an increase in heavy precipitation events, with longer periods of dry spells between.¹

The increase in winter and summer temperatures is well documented: average winter low temperatures are rising, and winters are warming nearly 13 times faster than summers. The Minnesota Department of Health projects the average maximum summer temperature to increase by 7.7°F (4.2°C) through 2075 compared to 1981 under a business-as-usual scenario. The same projection forecasts a 9.1°F (5° C) increase in average winter minimum temperatures through 2075. Warmer temperatures have direct and indirect effects on climate, ecology, and people, further outlined below.

Warming temperatures also cause more extreme and variable precipitation patterns through an increase in evaporation and the increased capacity for warmer air to hold water vapor. More moisture in the atmosphere then produces more intense precipitation events. The graphic below provides a visualization of climate change impacts in Minnesota and some human health effects associated with these changes. This graphic does not represent all impacts associated with climate change, but rather a summary of major impacts associated with climate change.

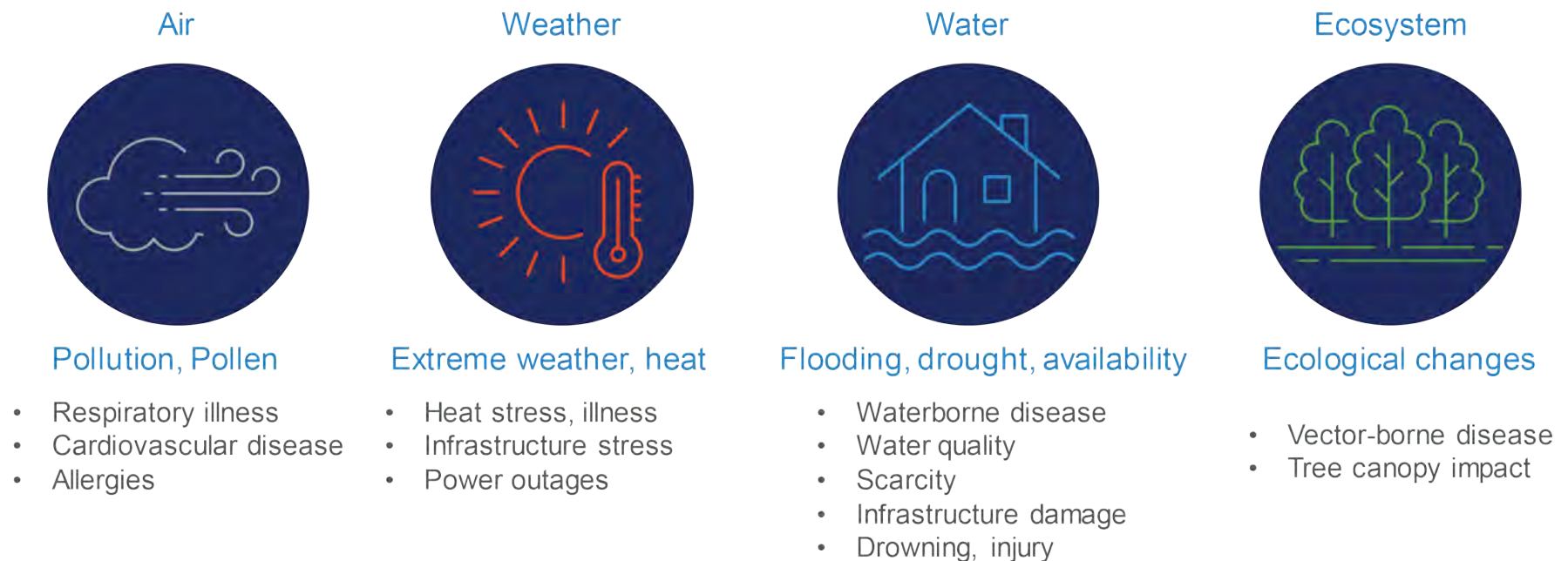


Figure 1. Climate impacts on health and well-being. Adapted from Minnesota Department of Health, “Minnesota Climate and Health Profile Report Summary,” 2016.

¹ Minnesota Climate & Health Program, Planning for Climate & Health Impacts in Southeast Minnesota, https://www.health.state.mn.us/communities/environment/climate/docs/hsem_region1.pdf (accessed June 2019).

In 2014, the Minnesota Department of Health (MDH) completed a statewide climate change vulnerability assessment. In its analysis, MDH identified five major climate hazards of increasing concern in Minnesota as our climate changes: extreme heat events, flooding and flash flooding, air pollution, vector-borne disease, and drought.² Additionally, in its own vulnerability assessment, the Metropolitan Council identified extreme weather as an additional, separate hazard, encompassing snow events, storms (rain, hail, etc.), and other extreme weather events. These climate hazards provide a lens through which to examine resources and populations that are more vulnerable to climate change, and the geographic vulnerabilities of both. Each of these six events has been ranked as having a high, moderate, or low likelihood of occurring in Northfield when compared to the rest of the state of Minnesota in the MDH Vulnerability Assessment, as listed below. These indicators are in comparison to the rest of the State, rather than an indicator of their general likelihood to occur in Northfield.







HAZARD	DESCRIPTION
 <p>Extreme Heat</p>	<p>Extreme heat is measured by number of days of heat advisories and excessive heat warnings. By mid-century, projections indicate 5-15 more days with a maximum temperature above 95° F (35°C).</p> <p>Extreme heat is moderately likely to occur in Northfield when compared to the rest of Minnesota.</p>
 <p>Flooding & Flash Flooding</p>	<p>With increasing precipitation events, models predict increasing frequency and intensity of flooding and flash flooding events. Geographies specifically vulnerable to flooding and flash flooding have seen increases in mega-rain events in recent years.</p> <p>Flooding and flash flooding are highly likely to occur in Northfield when compared to the rest of Minnesota.</p>
 <p>Air Pollution</p>	<p>Climate change causes temperature and precipitation changes that change air quality in a variety of ways.</p> <ul style="list-style-type: none"> • Particulate Matter: Dust from industry, particulates from fossil fuel combustion, and air stagnation from wildfires in other parts of the country can cause increased particulate matter of various size. • Allergens: Lengthening allergy season can create more potent allergens. • Ground-level Ozone: The natural emission of Volatile Organic Compound(s) (or VOCs) from plants & vegetation increase as temperatures and sunlight increases. Upon release into the atmosphere, VOCs react with nitrogen oxides (NOx) to create ozone molecules. <p>Air pollution is highly likely to occur in Northfield when compared to the rest of Minnesota.</p>
 <p>Extreme Weather</p>	<p>Extreme weather events such as thunderstorms, tornados, and hail events are less certain to occur because of climate change than warmer temperatures and increased precipitation themselves. Damage caused by these storms may be distinct from damage caused by flooding.</p> <p>Extreme weather is moderately likely to occur in Northfield when compared to the rest of Minnesota.</p>
 <p>Vector-Borne Disease</p>	<p>Climate changes cause ecological changes. Warmer weather facilitates a thriving tick and mosquito populations, which has the potential to carry and transmit diseases, like Lyme or West Nile Virus.</p> <p>Vector-borne disease is less likely to occur in Northfield when compared to the rest of Minnesota.</p>
 <p>Drought</p>	<p>Decreases in water can cause drought. Although climate change can cause increased frequency and intensity of rain events, the precipitation events also become less predictable and more variable, with potential of increased dry spells in between major events.</p> <p>Drought is less likely to occur in Northfield when compared to the rest of Minnesota.</p>

Table 1. Likelihood of climate hazards in Northfield. Adapted from: Minnesota Department of Health, "Minnesota Climate Change Vulnerability Assessment 2014," 2014.

² Minnesota Climate & Health Program, Environmental Impacts Analysis Unit, Minnesota Climate Change Vulnerability Assessment 2014, <https://www.health.state.mn.us/communities/environment/climate/docs/mnclimvulnreport.pdf> (accessed June 2019)

Resilience Assessment

Resilience is measured by the strengths and vulnerabilities of a community, including population, built infrastructure, and natural infrastructure. Understanding a community's resilience to climate change requires an analysis of existing community strengths: aspects of infrastructure and community character that make a City more able to swiftly and safely adapt to a changing climate. At the same time, to improve its resilience, a community must know what its vulnerabilities are.

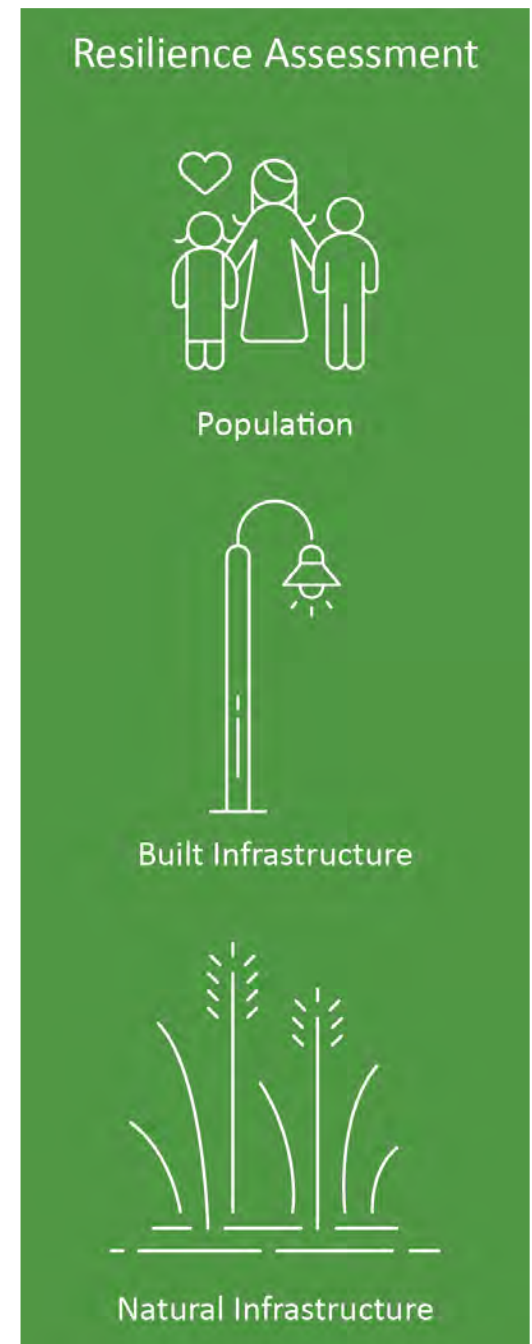
Vulnerabilities to climate hazards are a result of a confluence of factors including geographic location, pre-existing characteristics, and situational context. This assessment looks at the strengths and vulnerabilities of natural infrastructure, built infrastructure, and community population.

People are impacted differently by climate hazards. The ability to recover from a climate event like a major flood may depend on a variety of factors. Vulnerability in populations can be assessed through inherent and situational factors. Situational factors mean that an individual may only be vulnerable at the moment of a climate hazard, rather than inherently more vulnerable to impacts from climate events. For example, preexisting health conditions are likely to make an individual more inherently vulnerable to certain climate hazards, whereas vulnerability can also be temporary and dynamic, as is the case with certain health conditions, pregnancy, and homelessness. Some opportunities for increased population resilience focus on individual action, while others focus on community-wide strategies to increase resilience.

Built infrastructure can also be vulnerable to climate hazards. Its vulnerability may damage the built environment like City assets, private buildings, and the well-being of the community. Built infrastructure includes buildings, transportation infrastructure (roads and bridges, public transportation, and active mobility), water infrastructure (stormwater, drinking water, and wastewater), and critical infrastructure (back-up generation facilities and energy infrastructure).

Natural infrastructure like trees, native plants, water, and ecosystems are simultaneously susceptible to climate hazards and crucial to help improve the resiliency of the City. For example, saplings in a flood zone may be vulnerable to damage from flooding, but increased tree cover community wide will sequester carbon, increase soil health, and provide shade during heat waves. This analysis focuses on trees and native plants, water supply and quality, and parks and natural spaces in Northfield.

The following analysis examines vulnerabilities, strengths, and opportunities for increased resilience in the face of the six climate hazards identified previously.



Climate Vulnerability

The resiliency of a population depends on individual and community-wide strengths and vulnerabilities; a community is only as strong as its most vulnerable. Resilience is a measure of how an individual may be impacted by different climate hazards and their ability to recover. Population resiliency and vulnerability is dynamic and may change depending on context and time. This population resilience assessment examines a variety of demographic and situational factors, the impact of climate hazards, and opportunities for increased resilience. The below table displays each climate hazard anticipated in Northfield, that may be vulnerable to those hazards, and the potential impacts.







HAZARD	VULNERABLE POPULATIONS	IMPACTS
Extreme Heat 	<ul style="list-style-type: none"> • Older adults - particularly those living alone • Young children and babies • People experiencing homelessness • People living in poverty - particularly those without access to air conditioning • People of color • People with preexisting health conditions • Outdoor workers 	<ul style="list-style-type: none"> • Heat-related illness • Heat stress • Heat stroke • Dehydration • Cardiovascular health • Respiratory illness
Flooding & Flash Flooding 	<ul style="list-style-type: none"> • Older adults - particularly those living alone • Young children and babies • People with preexisting physical or mental health conditions • People living in poverty • People with limited English proficiency • People with limited mobility options • Outdoor workers 	<ul style="list-style-type: none"> • Drowning, injury • Mold or waterborne disease • Economic loss • Property damage • Travel limitations • Food Insecurity
Air Pollution 	<ul style="list-style-type: none"> • Young children • Older adults • People of color • People with preexisting cardiovascular or respiratory diseases • Outdoor workers 	<ul style="list-style-type: none"> • Severe allergies • Cardiovascular health • Asthma attacks • Respiratory illness
Extreme Weather 	<ul style="list-style-type: none"> • Older adults • Residents with limited English proficiency • Residents with mobility limitations • Low-income residents: renters, homeowners, folks experiencing homelessness 	<ul style="list-style-type: none"> • Property damage • Injury/death • Travel limitations • Economic losses
Vector-Borne Disease 	<ul style="list-style-type: none"> • Young children • People with weakened immune systems • People who live near or spend time in wooded areas 	<ul style="list-style-type: none"> • Lyme disease • Human anaplasmosis • West Nile Virus
Drought 	<ul style="list-style-type: none"> • Older adults • Young children • People with respiratory diseases • People of color 	<ul style="list-style-type: none"> • Respiratory illness and other illness • Property damage • Economic losses • Food Insecurity

Table 2. Climate hazard impact on population. Source: Minnesota Department of Health, "Minnesota Climate Change Vulnerability Assessment 2014," 2014.

Population Factors

Population vulnerability to climate hazards is impacted by where people live, the buildings in which they live and work, and demographic factors. Vulnerability and resilience are dynamic metrics and should not be taken only individually by demographic categories, but rather considered as indicators for potential impacts from climate hazards. Understanding residents' needs can help the City to better direct its resources to both help prepare vulnerable residents for climate hazards and to provide support in the aftermath of a major event.

This analysis is based on a vulnerability assessment completed at the county-level by the Minnesota Department of Health, the corresponding demographic data provided by the U.S. Census American Community Survey, and county-level data regarding individual health related to disabilities and hospital visits for asthma. Further information was provided through focus group discussions with community organizations working with the Latinx residents of Northfield. Priority areas identified through those focus group discussions included concerns and opportunities related to housing (quality, access, affordability), mobility (transportation options and access), and health (food security, air quality, asthma and allergies). The following section describes existing demographic data, followed by an assessment of strengths, vulnerabilities, and opportunities.

Age

The age of resident is an indicator of potential vulnerability to climate hazards. Those under the age of 5 (4.6% of population) and over the age of 65 (14.2% of population) are more likely to be vulnerable to various climate hazards largely due to physiological differences and potential reliance on others for safety and care. These age cohorts are also more susceptible to extreme weather impacts due to reliance on others for evacuation or mobility needs. Young children, under the age of 5, are particularly vulnerable to heat-related illnesses and deaths, as well as more susceptible to air pollution related health impacts and vector-borne illnesses. Young children tend to spend more time outdoors engaging in activities that increase their breathing rate.

Children who live or play near heavily trafficked roads are most susceptible to hazards from poor air quality. Additionally, because children are likely to be outside for longer periods there is a greater chance for exposure to ticks and mosquitoes that carry diseases. Children are less likely, for instance, to check for ticks after playing in wooded or grassy areas.

Older residents over the age of 65 have the highest rates of heat-related illnesses and fatalities, mostly due to physiological changes that affect the ability to control body temperature. Because of this, they may be more vulnerable to extreme heat events, compounded by existing cardiovascular or respiratory diseases. These same physiological qualities result in increased vulnerability to flooding, particularly for those living alone or who require assistance to evacuate or receive care throughout the flood event, as well as extreme heat.

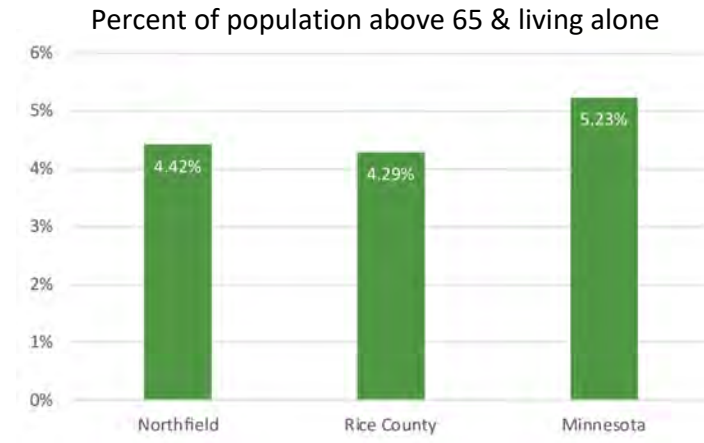


Figure 2. Source: U.S. Census Bureau; American Community Survey, 2013 - 2017 5-Year Estimates.

Income & Housing

Low-income residents may be more susceptible to climate hazards as they may lack the resources needed to afford adequate housing and may have limited or no access to a vehicle. In Northfield, the median household income is \$62,032, with 11.7% of residents living below the poverty line and 31.3% qualifying for heating assistance. In addition, 5.4% of residents do not have access to a vehicle.

Poor housing quality can impact resident health and increase financial stress. For example, a home with little insulation and air sealing will result in colder indoor air temperatures in the winter and warmer in the summer; poor ventilation or water infiltration can cause mold spores to form, leading to respiratory illness. Often, homes in poor condition will cost more to heat and cool, increasing the energy burden of residents. A more energy efficient home protects inhabitants from extreme weather such as extreme heat, and helps to lower energy use, increasing grid resilience as electricity demand decreases.

Access to health or home insurance is an indicator for how well people can respond to damage from climate hazards. Low-income residents living in rental or mobile housing may be less likely to recover from extreme weather events and flooding events that cause property damage. Flooding is more likely to negatively impact houses that are poorly built. Community members experiencing homelessness or transitional housing are particularly susceptible to damage and health effects from these climate hazards as they may lack resources to protect themselves and their property from damage. Through focus group discussions, it was revealed that some Northfield community members are forced to run water continuously during the coldest days of winter to avoid freezing pipes — a weatherization and efficiency issue that has a noticeable impact community-wide water consumption, as well as an added cost burden to those residents, demonstrated in the Local Water Supply Plan.

Housing location can also increase or decrease vulnerability. There are 29 homes in Northfield that have flood insurance through the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP). Between 1998 and 2016, \$2.32 million have been paid out in claims for damage to structures and belongings from flooding in Northfield.

Percent of population living below the poverty threshold

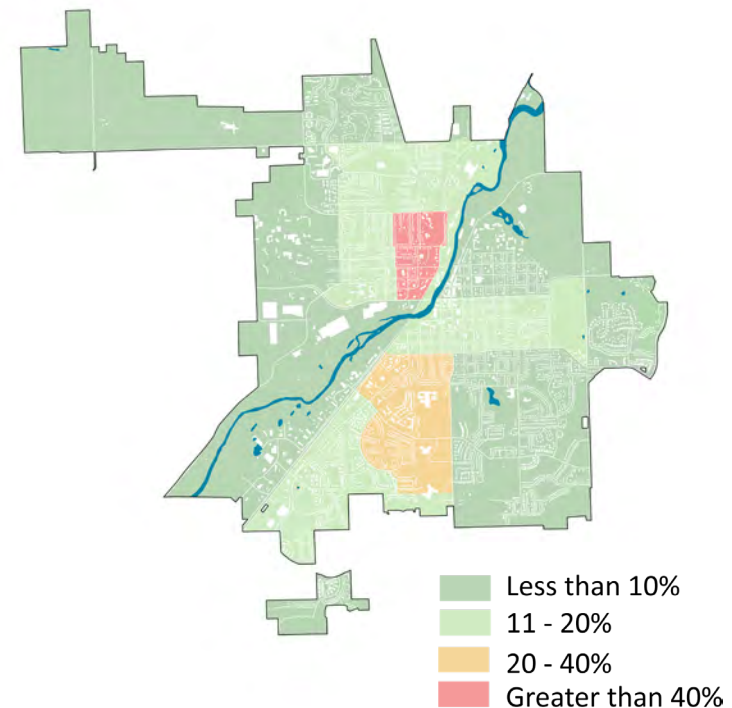


Figure 3. Vulnerable populations by income. Source: U.S. Census Bureau; American Community Survey, 2013 - 2017 5-Year Estimates; all estimates are normalized by census block population. Map generated by Jessi Wyatt.

Language & Race

Residents with limited English proficiency may be more vulnerable to climate hazards, primarily due to barriers in understanding and/or receiving emergency response or evacuation information. The most commonly spoken language besides English in Northfield is Spanish. 2.9% of Northfield residents speak English “less than very well,” according to the 2017 5-year American Community Survey.

Race can be an indicator of vulnerability to climate hazards. In Minnesota, not all residents have benefitted equally from environmental improvements. The routing of roadways, siting polluting industries near communities of color, and limiting access to resources have created inequities that impact health and economic mobility. The Minnesota Pollution Control Agency found that people of color are more likely to be exposed to more pollution than middle and upper income white residents; are more vulnerable to health impacts from pollution and experience greater incidences of disease and death, often due to underlying health disparities; and that climate change disproportionately threatens vulnerable groups, amplifying existing economic and health challenges .

According to the U.S. Census, 88.5% of Northfield residents identify as white, with Latinx-identified population as the next largest at 8.7%. Figure 4 shows Northfield’s population by race. The areas of the community where 30% or more of the population is non-white overlaps with the map in Figure 3 (previous page) that shows that the highest concentration of poverty in the same area, indicating that residents in those neighborhoods may be more vulnerable to climate hazards as compared to other areas of the community.

Food Security

Access to healthy and affordable food is a critical issue for low- and moderate-income families. Food security measures the availability and ability to access food. Food secure households have both the ability to afford healthy food and live in close proximity, or can travel further, to buy local food. Food insecure homes may not have access to healthy food due to an inability to afford it or complicated by how far they may need to travel to access it. In Rice County, 9% of the population are considered food insecure. While there are more healthy food options available within Northfield compared to surrounding communities, those options are not always affordable to all residents.

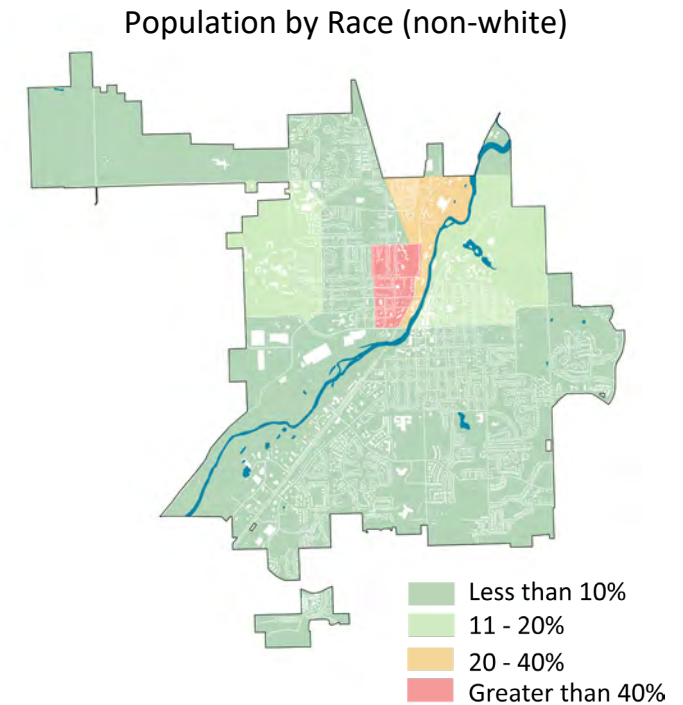


Figure 4. Vulnerable populations by race. Source: U.S. Census Bureau; American Community Survey, 2013 - 2017 5-Year Estimates; all estimates are normalized by census block population. Map generated by Jessi Wyatt.

Ability Level & Health

Residents with limited mobility or pre-existing medical conditions may be more vulnerable to climate hazards. Residents with respiratory illnesses are more susceptible to health issues associated with poor air quality days, exposure to allergens from pollen, and exposure to mold.

In Rice County, 673 people visited the emergency room for asthma-related illnesses between 2013-2015. The rate of emergency department visits was 34.4 in Rice County, compared to 37.6 statewide for 2013-2015. The rate is a ratio of the number of emergency room visits divided by the number of people at risk in a population. Hospitalization rates for pulmonary disease (age-adjusted) are 19.8 in Rice County and 14.6 statewide.

Residents in wheelchairs and with other mobility limitations are vulnerable to health impacts in recovering from hazards including extreme weather and floods, as they may have more difficulty evacuating or avoiding sidewalks that are flooded. Disability status is measured through the American Community Survey and encompasses many forms of disability. Statewide, 11.2% of the population has a disability and in Northfield that rate is 7.5%.

Population Strengths and Opportunities

While individual factors can compound situational or inherent vulnerability to a changing climate, there are also strengths and opportunities associated with each metric that works toward mitigating and responding to inherent and social vulnerabilities to climate change.

Strengths

- Northfield has a moderately high livability index score as measured by the AARP, which accounts for a variety of factors such as environment, health, civic engagement, and housing for aging populations. This score indicates that the infrastructure to support older populations in Northfield is generally available and in good condition
- Many organizations in Northfield serve Spanish-speaking community members, including Greenvale Community School, a bilingual elementary school serving many of Northfield's students and families. Northfield has many community groups that serve the Latinx community and that focus on decreasing economic and educational disparities among the Latinx population
- Rice County has lower air pollution levels than most other geographies in Minnesota due to its distance from heavy-industry metropolitan areas and low likelihood of wildfires
- The City and County are well-prepared to respond to emergencies, utilizing City emergency operation procedures and the Rice County All Hazard Mitigation Plan

Vulnerabilities

The greatest vulnerabilities for Northfield residents are at intersections of two or more indicators described above. For example, those who are low-income and living in poor housing quality may be at greater risk during and after an extreme weather event. Vulnerability would increase if there are additional factors, like limited mobility or other physical limitations.



Opportunities

- Northfield has many opportunities to increase the resilience of young and old populations in the face of climate hazards. The City can partner with local organizations and schools to develop mobility and evacuation programs for young and old residents in the face of climate hazards. Similarly, older populations can increase resilience to climate hazards with increased social cohesion and networks, which the City can also partner.
- Northfield has opportunity to increase its locally grown food. Through partnerships with local farmers, schools, and other programs, the City can create programming to increase access to healthy food, create educational opportunities, and encourage more people to get involved in local gardening and farming practices.
- In the City's strategic plan, Diversity, Equity, and Inclusion is one of six strategic priorities, with an initiative focused on the creation and implementation of a Racial Equity Action Plan. The City is participating in a cohort of Minnesota cities working to advance racial equity implementation through the Government Alliance on Racial Equity (GARE). These plans on their own will not solve systemic racial inequities that make people of color more vulnerable to climate hazard impacts, but the commitment of the City to addressing these issues can be built upon to also specifically address climate vulnerabilities.
- Focusing City services, outreach materials, and support for community-led initiatives on low-income populations in Northfield can address vulnerabilities and increase resiliency. Programs in support of safe, efficient, affordable housing and increased mobility options accessible to low-income residents can increase community resiliency.

Built Infrastructure

The built infrastructure of a City includes facilities constructed for water distribution and treatment, transportation and mobility, buildings, and critical infrastructure such as the delivery of energy. These features are crucial to the functioning of a City and the safety of its residents. Built infrastructure may be susceptible to climate hazards, especially when not maintained regularly nor constructed with consideration of future climate impacts. Built infrastructure can be particularly vulnerable to increased precipitation and freeze/thaw cycles, which can shock and stress pipes, roads, and bridges, leading to structural damage. This section provides a snapshot of climate hazards of greatest concern for built infrastructure in Northfield, highlighting existing conditions, strengths, vulnerabilities, and opportunities for increased resilience. Information for this section was gathered from City staff, existing reports, plans available on the City website, and data from State agencies.

Water Infrastructure

Water infrastructure includes drinking water, stormwater infrastructure (gray and green), and wastewater treatment. Access to clean, potable water is central to the safety and vitality of Northfield residents and businesses. Water infrastructure may be susceptible to climate hazards including prolonged heatwaves, heavy precipitation, extreme weather events, and freeze/thaw cycles. Power outages caused by extreme weather can impact the functioning of wastewater and drinking water infrastructure. With increased heavy precipitation events, stormwater infrastructure may be stressed or overwhelmed, limiting its ability to effectively convey or allow water to infiltrate as designed. Further, flooding and flash flooding events can increase the likelihood of surface water contamination, reducing water quality. Power outages caused by extreme weather can impact the functionality of wastewater and drinking water infrastructure.

Stormwater Infrastructure

Stormwater infrastructure supports community resiliency during periods of heavy rainfall. Conveyance systems help to move water quickly to rivers, streams, and lakes - away from the built environment. While this strategy works for most rainfalls, it may have negative impacts in times of heavier than anticipated rain events. Systems that are not designed to handle heavy rains may not have the capacity to intake large volumes of water, leading to back-ups and potential for flash flooding. Further, there may be downstream impacts related to sending too much water, too fast, and sometimes carrying debris or pollutants, into bodies of water.

Supplementing stormwater conveyance systems with green infrastructure can help mitigate some of these challenges. Green infrastructure, like bioretention ponds and rain gardens, as well as other infrastructure changes like permeable paving surfaces, can help slow the flow of stormwater and filter contaminants. According to Northfield's Comprehensive plan, the City's stormwater drainage system consists of detention and quality treatment ponds, creeks, drainage ways, roadway gutters, overflow and yard drainage swales, catch basins, storm sewer lateral and storm sewer trunk main facilities.



Photo Credit: Great Plains Institute

Conveyance Systems: In Northfield, there are about 40 miles of stormwater pipes, including gravity mains and drain tiles. Stormwater pipes primarily direct water into the Cannon River. Most pipes that the City has data on range from 12 to 36 inches in diameter. The City does not have a complete record on the age and condition of storm lines City-wide. As rainfall and precipitation increase, stormwater will increase, raising the concern of burdening the capacity of these conveyance systems.

Green Infrastructure: Northfield's green stormwater infrastructure includes 57 bioretention ponds and one infiltration basin. The stormwater ponds are an average of 20.5 years old. In 2017, a water quality assessment was completed for the City of Northfield.³ The assessment examines stormwater ponds and measured their water quality against the state quality standard. Eight bioretention ponds were identified as high priority to be improved as they have reached or are approaching their sediment accumulation capacity. When stormwater runoff enters impaired ponds, the runoff is not adequately filtered, and therefore is less effective at mitigating flooding and improving water quality because the ponds can no longer hold water at their designed capacity. When ponds reach or exceed their design capacity, more polluted water enters the river. The City of Northfield provides incentive programs for residents to install rain gardens, native plantings, and rain barrels. These programs encourage residents to manage stormwater runoff in their own yards and residences.

Drinking Water

Water demand is forecasted to increase as summer days become warmer: community members will drink more water to cool themselves down and use more water for distressed trees and other vegetation. Potable water in Northfield comes from five ground-water wells originating from the Jordan-St. Lawrence, Jordan and Jordan-Prairie-du-Chien aquifers.⁴ The wells range from 365 to 415 deep. There are three storage facilities for potable water. The water distribution system is made up of water mains ranging from 4 to 24 inches in diameter. In 2006, Northfield conducted a comprehensive water plan, which identified the water distribution system as effective and serving its purpose well.⁵ To ensure resilience to climate events, the City must ensure maintenance and expansion of the water system as population trends increase and climate hazards introduce new threats to the system. As extreme weather is projected to increase, however, the City should be prepared to respond to quality and age issues of wells in the event of a pipe burst.

Wastewater Infrastructure

Wastewater infrastructure is made up of sewage lines and wastewater treatment facilities. This infrastructure may be more vulnerable to climate hazards as it ages and if maintenances is deferred. In Northfield, the sewage system serves 7.66 square miles and was originally constructed in the early 1900s.⁶ The pipes range from 4 to 52 inches in diameter and the system is primarily a gravity pipe network. About 10% of the sewage lines are older than 50 years old, which is an indicator of system vulnerability to performance issues. Inflow/infiltration is a problem that may occur when clean water enters the sanitary sewer system, potentially causing back-up problems and the unnecessary treatment of clean water. In 2008, the Sewage Comprehensive Plan for Northfield indicated no significant infiltration or inflow issues in Northfield.

3 City of Northfield, City of Northfield Stormwater Pond Assessment, <https://www.ci.northfield.mn.us/DocumentCenter/View/6170/Northfield-Pond-Assessment---Final-Report---12212017?bidId=> , (accessed June 2019).

4 <https://ci.northfield.mn.us/DocumentCenter/View/7825/2018-Northfield-CCR>

5 City of Northfield, Comprehensive Water Plan, <https://www.ci.northfield.mn.us/DocumentCenter/View/608/ComprehensiveWaterPlan?bidId=> , (accessed June 2019).

6 City of Northfield, Comprehensive Sanitary Sewer Plan for the Northfield/Dundas Area, <https://www.ci.northfield.mn.us/DocumentCenter/View/607/ComprehensiveStormsewerPlan?bidId=> , (accessed June 2019).

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.⁷ 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.

Strengths

Northfield has strategically and preemptively sought to mitigate concerns for inflow/infiltration and increasing frequency of high-volume precipitation events through green stormwater infrastructure policies and incentives for residents to install rain gardens, rain barrels, and native plantings. The City passed an ordinance giving the City engineer authority to require a stormwater management study as part of site plan review.⁸ The upgrades to the wastewater treatment facility will include a specific focus on energy efficiency and upgraded safety features, as well as features that will increase the load served. These upgrades will ensure that the facility can operate efficiently and effectively as wastewater loads continue to increase with increased population.

Vulnerabilities

Northfield’s water infrastructure may be most vulnerable to stormwater runoff issues due to design capacity in the face of increased climate hazards. As flooding events become more prevalent, stormwater infrastructure may become more strained and reach maximum capacity for high performance. Older pipes are more susceptible to leaks and bursts in the face of increased stress. In Northfield, 10% of sanitary sewer pipes are older than 50 years. Eight of Northfield’s stormwater ponds have sediment levels indicating their ineffectiveness at adequately filtering stormwater before it enters other water bodies. The wastewater treatment facility is also situated in the northern portion of the City, immediately next to a FEMA-designated (Federal Emergency Management Association) area. This proximity indicates that the facility is vulnerable to river and flash flooding.

Opportunities

Supplementing conveyance systems with green infrastructure increases stormwater filtration and eases the capacity pressure of the stormwater management system. By tracking and monitoring condition and age of the stormwater lines, the City can better perform regular maintenance and monitor for stress and quality. Actions that improve impaired stormwater ponds will increase capacity for filtration and prevent contamination of surface water bodies. For drinking water infrastructure, the City has an opportunity to address the expanded need for new wells in the coming years, as climate hazards may impact the functionality of current well infrastructure. Wastewater treatment presents several opportunities for increased resilience. Smart sewers help to control wastewater and stormwater flow into waterways through sensors and monitoring. These systems can also lessen sewer overflow and backup issues. The wastewater treatment plant updates currently being undertaken by the City include resilience opportunities, such as installing a microgrid for increased energy resiliency and reliability.

⁷ 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).

⁸ City of Northfield, Land Development Code (Section 2.4.4 Public Institution District (PI-S), B), <https://www.ci.northfield.mn.us/DocumentCenter/View/5005/Complete-2017-LDC-3-27-17?bidId=>, (accessed June 2019).

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.

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.



Photo Credit: Great Plains Institute

Pedestrian and Bike Trails

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 5, 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.⁹ 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 around 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.



Figure 5. Pedestrian and bicycle trails in Northfield, MN. Source: City of Northfield Public Works Department, 2019; generated by Jessi Wyatt.

⁹ 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).



Photo Credit: Great Plains Institute

Strengths

Much of the City road infrastructure is in better than fair condition, with all roads planned for reconstruction by 2021. This maintenance and upgrading of roads will improve the overall resilience of the transportation system that is dedicated to vehicles. Bridges in Northfield are in good condition as well.

Vulnerabilities

Active mobility trails in Northfield are fragmented across the community, making them more difficult to maintain and to use. Public transportation systems in Northfield are limited in availability, coverage, accessibility, and convenience. There are no public bicycle shares, electric scooters, or other active mobility options.

Opportunities

As streets age and are scheduled for maintenance, replacement, or upgrade, there is opportunity to think creatively about enhancing the existing design. This can be done to incorporate additional transportation capacity or redesign for alternative transportation modes, also allowing an opportunity to include natural stormwater infrastructure. The community can further prioritize completing the bike and pedestrian networks throughout the

community, with emphasis on improving connectivity for low-income neighborhoods where residents may have few options for travel.

Buildings and Critical Infrastructure

Protecting buildings and critical infrastructure from extreme weather and heavy precipitation events can help minimize damage, sustain function, reduce costs, and keep people safe. Buildings most vulnerable are those with deferred maintenance, structures in flood plains or in areas prone to flash flooding, or those with poor construction material. Both public and private buildings should be considered. The City owns seven buildings and 25 park facilities, there are 130 industrial buildings, 546 commercial buildings, and more than 5,000 residential buildings in Northfield.

Critical infrastructure can include hospitals, schools, emergency services, and community centers. It also includes telecommunication and energy services, and modes of travel. Such entities and systems are vulnerable to electric power outages, which can increase in frequency with extreme weather and prolonged heatwaves. Damage to critical infrastructure can disrupt emergency response, reduce access to necessary power or communication, and impact the health of those in need of emergency and other health services. Protecting and reinforcing these assets to withstand extreme weather will help the City better prepare for extreme events.

Xcel Energy provides electricity and natural gas to Northfield. Reliability and safety are among the company's top priorities. Any event impacting the distribution system that leads to power failure must be addressed as quickly as possible. Xcel Energy owns the distribution system and is responsible for ensuring it delivers power. Extreme weather events and ice storms pose threats to distribution infrastructure that 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 and businesses that rely on electricity. Building a resilient grid — burying power lines where feasible, incorporating micro-grids, and having back-up power — can help minimize risk.

Strengths

Most buildings are outside of the Cannon River floodplain, reducing their risk to damage from flooding events. While Xcel Energy has low outage rates, there are times when the power is disrupted due to a number of factors. According to its restoration process, Xcel estimates power is typically restored within 24 hours of a storm. The City has back up power generation for many of its buildings and water pumps. There are also portable generators available as needed. All generators are powered with diesel or natural gas.

Vulnerabilities

The wastewater treatment facility is located within a FEMA designated flood zone, putting it at risk for damage from rising waters after heavy precipitation or a rapid spring thaw. Inefficient or poor-quality homes are at greater risk for damage from extreme weather and are susceptible to higher energy costs due to inadequate air sealing and insulation, as well as inefficient appliances.

Opportunities

There are opportunities to replace diesel and natural gas-powered back-up generators with on-site solar and storage options, which are less-polluting and don't require refueling. As buildings and homes are updated to be more energy efficient, resilience considerations should be factors in any major renovation or new development project.

Natural Infrastructure

The natural infrastructure of a City includes ecological features that supplement built infrastructure to provide essential services such as water infiltration, air quality improvements, carbon sequestration, and quality of life enhancement. Natural infrastructure includes trees, rain gardens, native landscaping, as well as wetlands and water bodies. These features can be both vulnerable to climate hazards and help mitigate impacts of climate hazards. For example, a healthy and extensive tree canopy sequesters carbon, provides shade on the increased extreme heat days, and filters stormwater.

This section provides a snapshot of climate hazards that threaten natural infrastructure, describing existing conditions, strengths, vulnerabilities, and opportunities.

Trees and Native Plants

Trees are an important asset that provide ecological, environmental, social, and economic benefits to communities. Trees improve air quality, support healthy ecosystems and biodiversity, sequester carbon, help to manage stormwater run-off, enhance community aesthetics, and provide shade. Similarly, native plants provide habitat to pollinators, improve surface water quality, and enhance aesthetics. During times of extreme heat events, shading from trees becomes particularly important. Likewise, improved infiltration of stormwater runoff provided by tree and plant root systems is critical as major rain events become more frequent and intense.

The health of a community's tree canopy has broad-reaching implications for climate resilience and mitigation. Northfield has a tree canopy coverage of 30.3%, indicating moderately healthy coverage and an opportunity to add more trees.

A significant concern for trees in Northfield is the prevalence of Emerald Ash Borer (EAB), a beetle whose larvae is lethal to ash trees. The invasive insect is increasing in prevalence partially due to warming winters in Minnesota. In Northfield, 20.3% of all trees are ash, meaning the canopy is particularly susceptible to EAB. Additionally, the highest percent of a single genus is Maple, accounting for 27.4%, well above the 10% recommended level of a single genus. Northfield has six private and eight public rain gardens, totaling 0.8 acres of coverage across the 14 rain gardens.

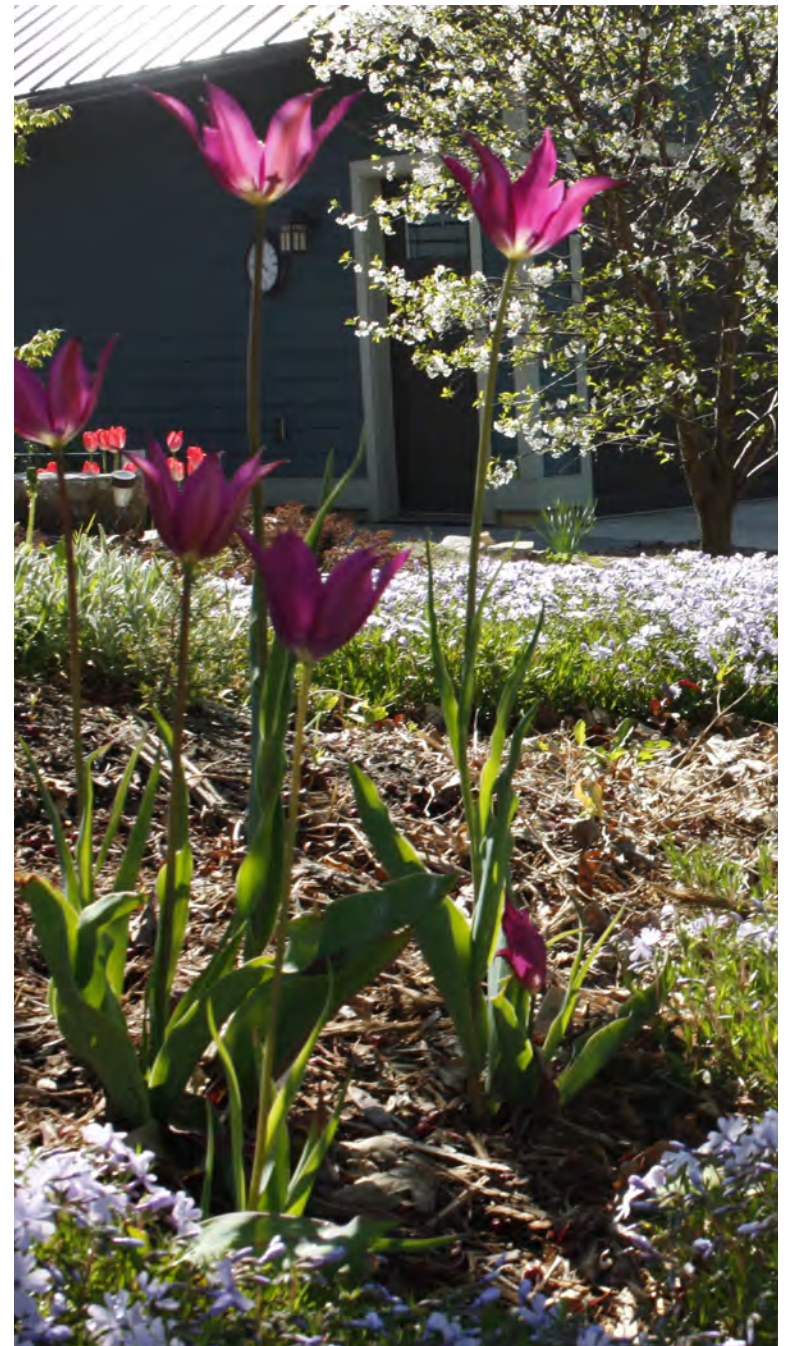


Photo Credit: Great Plains Institute

Rain gardens help to capture stormwater runoff and allow it to slowly infiltrate the ground, alleviating the volume of water that enters the conveyance system of the built stormwater system.

Soil health is also critical for a healthy urban forest. The establishment of a local waste processing facility could provide compost material that can be used for soil restoration and enhancement.

Strengths

The Cowling Arboretum within Northfield's City limits has a large tree canopy and extensive land management plan to build climate resiliency. Similarly, the St. Olaf Natural Lands provide significant natural vegetation cover. The urban tree canopy coverage is healthy with moderate diversity. The City has also adopted a tree preservation ordinance, which helps ensure canopy health and vitality.

Vulnerabilities

Northfield's most significant vulnerability for natural infrastructure is the high percentage of ash trees susceptible to the spread of EAB. Northfield has a high percentage of maple trees. While there is not currently a significant threat to maple trees, the City should consider increasing the diversity of its trees as more are planted. In addition, some projections for Minnesota's warming climate predict that different types of trees may be better suited for a changing climate, which could mean that existing coverage in Northfield may not be resilient in the long-term, as hardiness zones begin to change.¹⁰ There is also concern that a warming climate will create increasing opportunity for insects and viruses that host in trees to add stressors to Northfield's canopy.

Opportunities

In Midwest communities, urban tree canopy targets can range from 40% to 60% or more, depending on the preference of the community. A denser urban canopy will provide multiple benefits to the community. The City should look to prioritize tree replacement and planting in areas of low coverage and minimize the impact of Emerald Ash Borer.

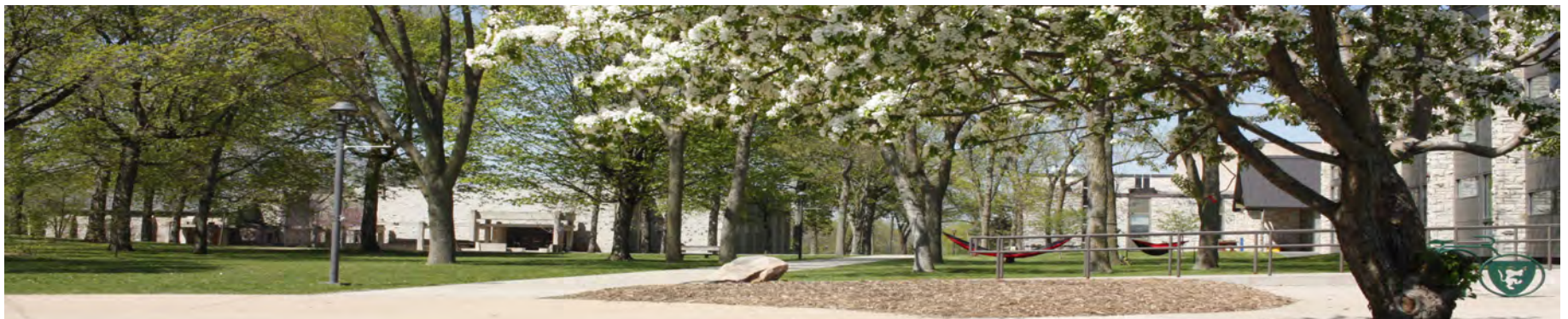


Photo Credit: Great Plains Institute

¹⁰ United States Department of Agriculture, Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the Northwoods Climate Change Response Framework Project, https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs133.pdf. (Accessed June 2019).



Photo Credit: Great Plains Institute

Water Supply and Quality

Stable water supply and good water quality are high priorities for communities. A stable, clean water source provides a resilient asset to the community as temperatures warm and extreme weather events increase. Increased precipitation and changing freeze-thaw cycles may impact stormwater management practices that help to maintain the health of surface water.

Groundwater

Potable water in Northfield is drawn from a series of wells throughout the City. According to the City's website, all municipal wells draw from the Jordan bedrock aquifers. The geology of the aquifer is primarily composed of sandstone, which has porous characteristics and is prone to fractures. Due to the permeability and the potential for wellheads to be compromised, the aquifer is most vulnerable to contaminations, especially to nitrates. Well surveys have already identified elevated nitrate levels in some of the supply wells. Risk of contamination is further exacerbated during heavy rain events.¹¹ Many Northfield residents also have private wells.

Surface Water

There are five major water bodies that convey and store water through Northfield: The Cannon River, Heath Creek, Spring Creek, Rice Creek (also called Spring Brook), and Lyman Lakes (wide spots of Spring Creek located at Carleton College). The Cannon River, Heath Creek, and Rice Creek/Spring Brook are listed as impaired by the Minnesota Pollution Control Agency.¹² The Cannon River is designated as impaired for aquatic life, aquatic consumption, and aquatic recreation due to *Escherichia coli* (*E. coli*). Heath Creek is designated as impaired for aquatic life and aquatic recreation due to the presence of *E. coli*. Rice Creek/Spring Brook is designated as impaired for aquatic life, aquatic recreation also due to *E. coli*, and drinking water due to nitrate contamination.

¹¹ Metropolitan Council, Groundwater Digest, <https://metro council.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/Groundwater-Digest,-Twin-Cities-Metropolitan-Area,.aspx>. (Accessed June 2019).

¹² Inventory of All Impaired Waters, Minnesota Pollution Control Agency (2018). <https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list>. (Accessed June 2019).

Wetlands

Wetlands encourage water infiltration, filtering out toxins and pollutants from runoff or fertilizers, and providing habitat and carbon sequestration. Wetlands also provide erosion and flood control and habitat for plants and vegetation, as well as facilitating groundwater recharge and discharge and creating recreation opportunities and economic value for communities.¹³

According to the National Wetland Inventory in collaboration with the Minnesota Department of Natural Resources, there are an estimated 1,695.8 acres of wetlands in Northfield, inclusive of the Riverine designations (e.g. the Cannon River). The most prominent wetland type by area after Riverine is Freshwater Emergent Wetland. This wetland type is characterized by its temporal nature, which may make it seem like there is not wetland during parts of the dry season.

Strengths

As noted, the Jordan aquifer is at a stable level and quality for drinking water, although vulnerable to contamination. The shoreland overlay district in the Land Development Code protects shoreland areas in Northfield to preserve and enhance its surface waters. The Wellhead Protection Plan includes an extensive inventory of potential contaminants and identified land use and adjacent land classification as contributing factors to wellhead protection.

Vulnerabilities

The Cannon River, a central community feature, is an impaired water designated by the MPCA. Heath Creek and Rice Creek/Spring Brook are also impaired waters according to the MPCA. For impaired surface waters like these, heavy precipitation events can have negative impacts to nitrate concentration, as well as increasing turbidity and water flow/volume – all of which have subsequent impacts on wildlife, vegetation, and water quality.

The 2013 Wellhead Protection Plan (Part 1) identified the Jordan aquifer and supply wells as vulnerable to contamination.¹⁴ As Northfield adds

¹³ Wetlands, Minnesota Department of Natural Resources Ecological and Water Resources. <https://www.dnr.state.mn.us/wetlands/index.html>. (Accessed August 2019).

¹⁴ City of Northfield Drinking Water Supply Management Plan (Part 1 and 2) (2013). <https://www.ci.northfield.mn.us/DocumentCenter/View/644/Northfield-WHPP-Part-2-Feb-19-2013-T15102880>.

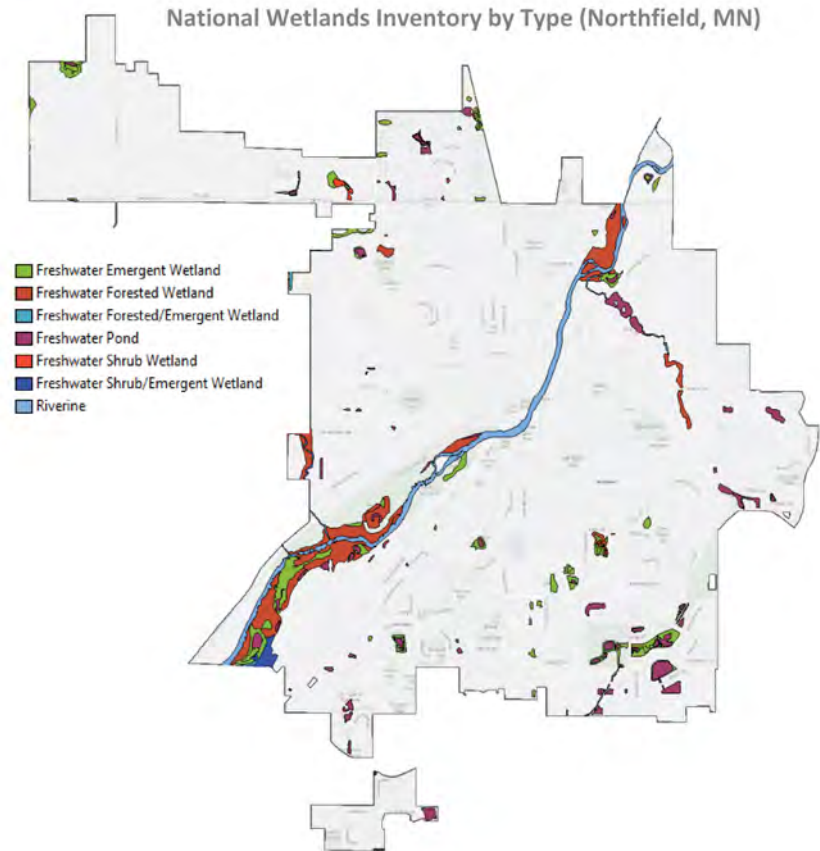


Figure 6 Inventory of all wetlands in Northfield. Source: Statewide Wetland Inventory (Minnesota DNR, 2018); map generated by Jessi Wyatt.

development with population growth and increased housing needs, impervious surface will likely increase. Higher impervious surface percentages can increase runoff and exacerbate warming water temperatures. Tertiary land use and management decisions, like agricultural fertilizer application and winter road salt use, can also negatively impact water quality. Additionally, the proximity of the geologic bedrock to the surface, particularly in downtown Northfield, makes stormwater infiltration difficult.

Opportunities

Green stormwater infrastructure elements can help ensure the health of surface water systems as water quality levels are managed and runoff is controlled. The stormwater management ordinance in Northfield is an opportunity to incorporate and prioritize green infrastructure elements. Preserving and restoring wetland areas can also improve water quality and enhance stormwater function.

The City can strengthen relationships with local farmers to continue encouraging producers to adopt agricultural best practices regarding water, such as perennial plants and/or green manure cover crops. There is additional opportunity to partner or collaborate with surrounding municipalities and water management authorities to plan more comprehensively for water use needs and risk management. This could be particularly valuable at the watershed scale, and with partnership or input from state agencies. Because resilience requires long-term consideration, the City should begin discussions with surrounding Townships to ensure that the 50- and 100-year recharge of the aquifer is protected.

Land Use and Agriculture

Northfield is a thriving, rural community with agricultural characteristics located about an hour south of the Twin Cities metro. It was mentioned previously that there are numerous land uses and practices that contribute to climate change, but there are also many climate and resilience benefits that can be realized through sustainable land use and agricultural practices. Specifically, land use decisions can help mitigate effects of rainfall, reduce urban heat island effect, store carbon, and support local food production.

In consideration of the increasing likelihood of heavy precipitation events, land cover practices that incorporate stormwater management best practices will help improve the City's ability to withstand such events. Impervious surface refers to non-vegetated land – typically buildings, roads, parking lots, and other concrete areas. About 40% of land in Northfield is classified as impervious surface. High impervious cover can exacerbate and contribute to climate hazards like heavy precipitation events and urban heat island effect. Increasing vegetative cover and pervious surface, on the other hand, helps to minimize the impact of those hazards in addition to other benefits like storing carbon.

The agricultural nature of the community presents an opportunity to expand local food options. The Inter-Governmental Panel on Climate Change (IPCC) recently released a report highlighting sustainable land management and food security. The report points to declines in crop yields and global instability around food access, suggesting major shifts to the food system. Northfield has opportunity to leverage its local agricultural resources to expand food production and increase access to healthy food. Rice County conducted a survey in 2016 as part of its comprehensive plan update. One question asked about the importance of local food production in the county — 55.8% of respondents strongly agreed and 36.8% agreed, underscoring its importance to community members. Encouraging edible urban tree canopies, community gardens, and partnerships with local farms and community-supported agriculture can help minimize large climate hazards that risk interruption of traditional food supply chains to Northfield residents.

(Accessed July 2019).

Strengths

Northfield is a developed community with rural characteristics. Many of the neighborhoods and edge areas of the community have low impervious surface and greater vegetative cover. The proximity of the agricultural community can support a local food system. A number of CSAs already operate in the Northfield area, including Spring Wind Farm, Simple Harvest Farm Organics, Open Hands Farm, Waxwing Farm, Seeds Farm, and Thorn Crest Farm. Increasing both utilization and opportunity for CSA participation supports the type of local agricultural resilience that Northfield community members want to see and could help improve production practices on some farmland around the community. Ensuring that local food purchase opportunities are available to all residents – regardless of income level – can further improve resilience while also addressing disparities in food security and access to healthy food options.

Vulnerabilities

Much of Northfield’s downtown and industrial areas have greater than 50% impervious surface coverage, increasing runoff during heavy rain events and contributing to urban heat island effect. Thoughtful consideration of impervious surface and its alternatives, particularly if Northfield continues to grow as a community, can help mitigate some of the consequences incurred from impervious cover.

Opportunities

Impervious surfaces can be reduced by decreasing parking lot surface areas, narrowing streets, and committing to land cover conversion where appropriate (from impervious to pervious). Northfield’s rural characteristics and proximity to agricultural resources create an opportunity to improve food security and support the local agricultural economy. Supporting local food enterprises both reduces emissions from the transportation of food and boosts local businesses, while providing healthy sustenance for residents. Further, available land within the community can also offer opportunity to convert land into food production through community gardens and school programming, but also through innovations in edible urban landscapes.

Impervious Surface Cover

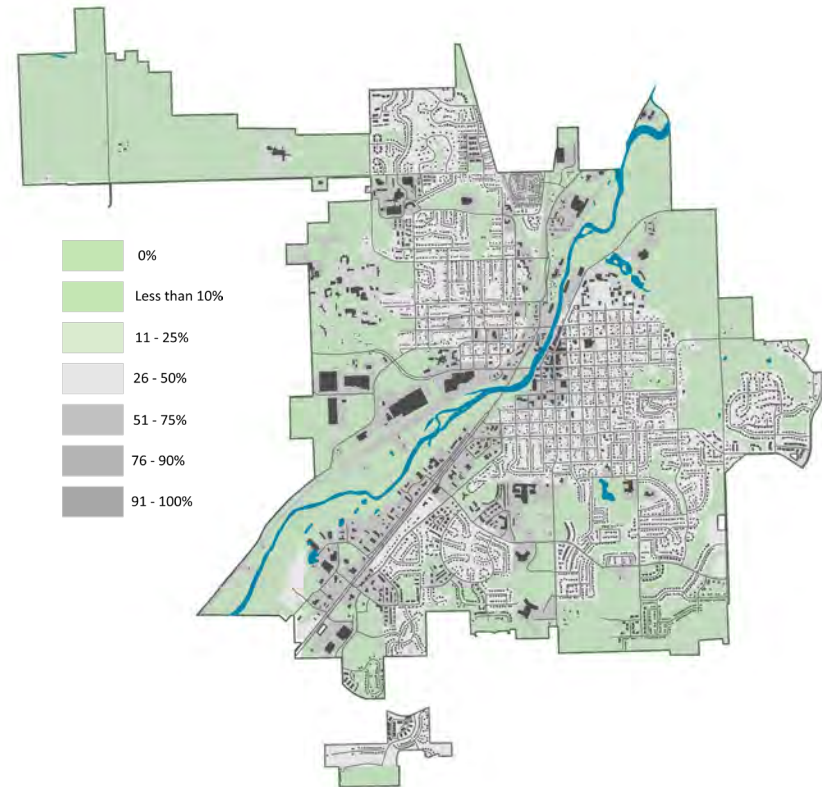
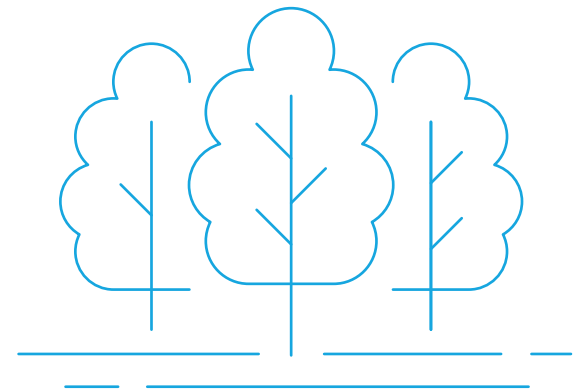


Figure 7. Impervious surfaces in Northfield, MN. Source: City of Northfield Public Works; generated by Jessi Wyatt.



Climate Resilience Strategies

Building community resilience to changes in climate events is crucial to climate action and to ensuring the safety and well-being of the community. Strategies for increasing community resilience and addressing community vulnerabilities to climate hazards are divided into three main categories: improve population resilience, enhance built infrastructure resilience, and enhance natural infrastructure resilience. Improving community resilience presents many other opportunities, including addressing inequities within Northfield’s population that can exacerbate climate vulnerabilities.

RS – 1 Improve Population Resilience
Description: Improve community resilience by enabling community members to prepare for and recover from climate-related impacts through education, ensured food security, safe housing conditions, and emergency preparedness.
Recommended Actions
<p>Preparedness and Response</p> <ul style="list-style-type: none"> • Lead and support emergency preparedness measures: <i>GSC best practice 29</i> <ul style="list-style-type: none"> ◦ Aid in response to food scarcities due to extreme weather ◦ Support a local, healthy food shelf <i>GSC best practice 27</i> ◦ Develop and support plans for evacuation measures, particularly for populations vulnerable to hazards and within flood zones and those with limited mobility considerations ◦ Ensure that emergency alerts are available in Spanish and can be received through a variety of channels ◦ Provide education materials on the health impacts of air pollutions and extreme heat <i>GSC best practice 24</i> ◦ Partner with community organizations to reach vulnerable populations • Support active living through mobility options that are equitably available and accessible throughout the community, especially in underserved communities <i>GSC best practice 12</i> • Establish a food coordinator position to lead local food programming to support locally produced foods and businesses <i>GSC best practice 27</i>
Education and Resources
<ul style="list-style-type: none"> • Develop educational materials about warming temperatures, increased precipitation events, and potential health impacts to help residents become more resilient to climate impacts
<p>Equity</p> <ul style="list-style-type: none"> • Incorporate climate considerations and resilience strategies into Racial Equity Action Plan; ensure climate and equity are integrated into the comprehensive plan update <i>GSC best practice 6</i> • Increase affordable housing, emergency and transitional housing in Northfield, and ensure safety of these homes <i>GSC best practice 7</i> • Strengthen community connectedness across cultural groups through more inclusive community events and more intentional engagement with underrepresented groups <i>GSC best practice 29</i> • Consider climate migrants (unexpected growth in population) in City planning efforts <i>GSC best practice 29</i> • Ensure access to local, healthy food to all residents through partnerships to improve food security • Ensure sidewalks are well-maintained and accessible for those who have difficulty walking or use wheelchairs
Housing
<ul style="list-style-type: none"> • Explore opportunities to require energy improvements for quality affordable housing that is safe and energy efficient

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 lanes, 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](#)

RS – 3 Natural Infrastructure

Description: Protect and enhance natural infrastructure to ensure resilience to climate hazards and ability to mitigate impacts from climate hazards

Recommended Actions

Education

- Host workshops to provide opportunities for interested parties to learn about actions they can take to improve resilience including: [GSC best practice 24](#)
 - Soil remediation best practices
 - Increasing tree canopy and caring for existing trees on private property
 - Changing landscaping practices to consider beneficial plantings and practices that provide stormwater benefits, improve soil health, and increase pollinator habitat
 - Water conservation measures to reduce consumption of potable water and treatment of wastewater
- Incorporate food education and farming programs into Northfield school districts [GSC best practice 27](#)

Urban Forest and Vegetation

- Update and adopt the Urban Forestry Asset Management Plan [GSC best practice 16](#)
- Incentivize expansion of boulevard gardens on private property; expand boulevard gardens and rain gardens on City-owned lands, and incorporate pollinator gardens in all parks and encourage / incentivize them on private property [GSC best practice 11](#)
 - Increase tree canopy through City-sponsored program to plant trees [GSC best practice 16](#)
 - Prioritize tree replacement and plantings in areas of low canopy coverage to reduce the impact of Emerald Ash Borer damage
 - Proactively pursue increased canopy coverage to improve long-term resilience
 - Encourage the planting of fruit-bearing trees; support programs that harvest fruit
- Pursue pervious pavement alternatives
- With the development of City parks and green spaces, ensure accessibility for all residents through connected trails, proximity to low-income neighborhoods, and signage in English and Spanish

Soil, Agriculture, and Food

- Create Advisory Board that represents agricultural sector in Northfield, supporting best practice models for carbon reduction farming and equal access and affordability of sustainable food [GSC best practice 16](#)
- Enable and encourage more community gardens throughout the City [GSC best practice 16](#)
- Incentivize and reward soil best management practice for urban lawns, gardens, landscaping, parks, open spaces, prairies, environmentally sensitive areas, and agricultural land uses [GSC best practice 16](#)
- Support creation of local compost process facilities and system to deliver organic material [GSC best practice 22](#)
- Increase conversation with agricultural producers to support local food systems and ensure sustainable agricultural land use practices, learn with and from community to better improve and achieve community resilience [GSC best practice 27](#)

Northfield: Sustainable Energy for All Energy Subcommittee Report

Climate Action Plan Advisory Board
May 2019

DRAFT TO CITY COUNCIL
July 23, 2019



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Forward: Northfield's Energy Future

Affordable energy is the essential resource of the industrialized world. Our modern lives depend on it, as do the economies of the world, the security and stability of nations, and the well-being and resilience of our communities. Everything we consume, construct, and operate requires quantities of energy our pre-industrial ancestors could not have imagined. And these modern energy demands — resulting from urbanization, the industrial and agricultural revolutions, and new modes of transportation — have been magnified by the explosion of humanity's population.

Climate change is the largely unexpected and daunting consequence of our wild success in meeting explosive worldwide energy demand through the extraction and burning of fossil fuels. The science of climate change is undeniable in its broadest conclusions: the atmospheric accumulation of carbon dioxide and other greenhouse gases (GHGs) generated by human activity has reached a level that is changing the climates of all places on earth, with compounding and cascading consequences that will soon be unstoppable. And, we are told, that requires that we wean ourselves off fossil fuels as fast as possible. Can we do that and still meet the world's astounding energy demands?

The good news is that we have the knowledge and resources to address this unprecedented challenge in ways that could improve quality of life for all of earth's inhabitants. Industry, science, and technology have already given us the tools we need to replace fossil fuels with green, clean, abundant, affordable, reliable energy. It's a revolution already well underway, and Northfield is off to a great head start. St. Olaf College now runs on 100% green electricity, Carleton College is transitioning its 100-year old steam system to geothermal heating and cooling, many local industry leaders have comprehensive sustainability plans, and 145 Northfield residents and businesses are subscribed to community solar. Electricity from Northfield's public utility, Xcel Energy, is currently 58% carbon-free,¹ and Xcel Energy is committed to providing 100% carbon-free electricity by 2050. Continuing and expanding these transformative actions will not only help avert the worst effects of climate change, it will generate hyper-growth of our economy, enhance our national security, diminish international tensions by reducing climate change migration, and promote the resilience and viability of communities everywhere.

The choices made in small cities and towns all across America will have a profound effect on our nation's ability to deal with consequences of climate change. The City of Northfield's 2017 Strategic Plan recognizes this by prioritizing climate action as one of its six strategic priorities. This Energy Subcommittee Report offers the City actionable goals based on local energy data and identifiable community resources. The report was written as a working document to be updated regularly — always striving to raise the bar on its own goals. It isn't meant to be perfect, but rather to use the tools at hand to take advantage of immediate opportunities, and to act knowing we have a vital responsibility to do our part.

Although the City is asked to lead these actions, the success of this plan depends on the will, participation, dedication, and enthusiasm of the community as a whole. With the help of its conscientious residents, vibrant businesses, and anchor institutions, Northfield is poised to be a leader on our path to a clean energy future.

¹ [Xcel Energy Upper Midwest Energy Plan](#)

1. Executive Summary

1.1 Background

The Energy Subcommittee Report was prepared by the Northfield Energy Subcommittee, which included over two dozen volunteers from Northfield residences, nonprofits, businesses, institutions, and industries. The subcommittee was appointed by the Northfield Climate Action Plan Advisory Board (CAPAB) as part of its charge by the City Council to advance the City of Northfield's Strategic Plan priority #6: Address climate change impacts. It is intended that the Energy Subcommittee Report serve as a standalone document, but that select portions will also be folded into a more comprehensive Northfield Climate Action Plan. The City engaged Xcel Energy's Partners in Energy offering to collaborate on developing and implementing our community's energy goals. Through a series of facilitated workshops, the subcommittee created this report. The report also draws upon energy and sustainability-focused text from many past Northfield planning documents (e.g. the Comprehensive Plan, 2008 Mayor's Energy Task Force Report) and various state, federal, and global goals and targets.

1.2 Where are we now?

Current Northfield area energy consumption and production provide a data-based understanding of where we are now. Data from the Northfield substation in 2017 shows that of the 7,421 premises served by Xcel Energy, 88% are residential and 12% are commercial/industrial.

In 2017, Northfield consumed 2.7 million MMBTU² of energy.³ About two-thirds of Northfield's 2017 energy consumption was from natural gas (67%) and one-third from electricity (33%). Energy data shows that of the 2.7 million MMBTU consumed by Northfield, 21% is consumed by residential premises and the remaining 79% is consumed by commercial/industrial premises. This means that the highest impact opportunities for energy conservation, energy recovery, and renewable energy are with commercial/industrial premises.

Northfield is also experiencing rapid growth in renewable energy produced by three college-owned wind turbines, 81 solar panel installations, 145 community solar garden subscribers, and almost 26 million kWh⁴ of purchased green energy. For a full report of Northfield energy consumption data and participation in Xcel Energy's energy conservation programs, see Appendix 2.

1.3 Where are we headed?

This report proposes the following vision and energy emissions reduction goal supported by eight guiding principles implemented via fifteen strategic priorities.

1.3.1 Vision

Northfield strives to ensure all citizens have access to clean, renewable, reliable, and affordable energy systems that will adapt to a changing climate by conserving energy, reducing our community-wide carbon footprint, and supporting sustainable energy solutions.

² Reference Appendix 8: Glossary of Terms.

³ Behind-the-meter renewable energy from two of the college wind turbines plus privately-owned solar PV is not included in the energy supplied by Xcel Energy via the Northfield substation.

⁴ Reference Appendix 8: Glossary of Terms.

1.3.2 Carbon reduction goal

For community-wide energy metered at the Northfield substation plus local, behind-the-meter renewable sources, achieve a 50% reduction in energy-related carbon emissions from 2015 levels by 2030, and achieve 100% carbon-neutrality no later than 2050.

This goal is based on the International Panel on Climate Change [Guide for Policy Makers](#), which says that to limit global warming to 1.5 degrees Celsius, “global net human-caused emissions of carbon dioxide (CO2) would need to fall by about 45% from 2010 levels by 2030, reaching ‘net zero’ around 2050.”

1.3.3 Guiding principles

- Pursue a sustainable energy future with clean energy available to all businesses and residents, with particular support for under-resourced households.⁵
- Increase overall energy literacy among residents and business owners and operators, including knowledge of where energy comes from, the environmental impacts of different types of energy generation, and what can be done to reduce energy use.
- Expand renewable energy generation.
- Lead by example and offer recognition for successful energy efforts
- Make energy efficiency feasible, affordable, and achievable for both residents and businesses.
- Promote economic growth while increasing energy conservation and renewable energy generation.
- Empower future generations to be self-motivated in working toward a sustainable energy future.
- Inspire and support a high quality of life for future generations.

1.3.4 Strategic priority summary matrix

This report intends to be highly actionable and is centered on a set of specific strategies and recommended actions that address future-focused approaches to energy reduction, renewable energy, and energy resilience.

Area A: Education and Engagement (EE)	
EE-1	Small Consumer Energy Engagement
EE-2	Large Consumer Energy Engagement
EE-3	Energy Marketing and Tourism
EE-4	Energy Reporting and Transparency
Area B: Policy and Planning (PP)	
PP-1	Building Energy Use Benchmarking and Disclosure
PP-2	Building Energy Efficiency Standards

⁵ Includes households on a fixed-income, experiencing energy burden, or are eligible for income qualified programs.

PP-3	Energy Conscious Strategic Growth
PP-4	Forward-Thinking Utility System Expansion
PP-5	Renewable Energy Development Plan
PP-6	Community Energy Resilience Plan
Area C: Innovation and Demonstration (ID)	
ID-1	Deep Energy Efficiency Retrofits
ID-2	Net Zero Energy Buildings
ID-3	Strategic Electrification
Area D: Supporting and Continuing the Plan (SC)	
SC-1	City Energy Coordinator Position
SC-2	Advancing and Updating the Plan

1.4 Resources and funding

Northfield benefits from no-cost resources in the form of active civic engagement from community volunteers, a strong network of nonprofit organizations, and partnerships with two liberal arts colleges. Furthermore, the Xcel Energy Partners in Energy offering provides 18 months of free implementation support to help facilitate and market the small and large consumer energy engagement strategies described in Appendix 3. Past Northfield planning documents and the charters of many existing City Departments and Commissions already align with many of the strategic priorities listed in this plan. The report can achieve many of its stated strategic priorities based on these existing City and no-cost community resources, but the plan also recommends hiring a full-time energy coordinator to provide leadership, continuity, and dedicated support to make the most of these willing partners and ripe opportunities. Additional resources, potential partners, and funding opportunities are listed in Section 8.

2. Planning Process

2.1 Climate Action Plan Advisory Board

In 2017, the City of Northfield published its strategic plan, which included six strategic priorities. One of these priorities was to address climate change impacts, and a desired outcome was to write a City of Northfield Climate Action Plan. In 2018, Mayor Rhonda Pownell appointed the Northfield Climate Action Plan Advisory Board (CAPAB) and two city staff members to take on this task. The advisory board was guided by an emphasis on economic health, physical health, environmental health, and quality of life in six focus areas: energy, water, food, transportation, land, and waste.

2.2 Northfield Energy Subcommittee

CAPAB member Martha Larson was assigned to be the Energy Subcommittee chair. In partnership with Northfield Public Works Director, David Bennett, and GIS Technician, Bryanna Paarmann, Ms. Larson recruited more than two dozen Northfield Energy Subcommittee volunteers representing Northfield's residents, businesses, industries, nonprofits, and institutions. See Appendix A for a full list of participants.

2.3 Xcel Energy's Partners in Energy offering

The committee utilized the Xcel Energy Partners in Energy offering, which dedicates at no cost a team of Xcel Energy and Center for Energy and Environment staff to help city staff and community members develop an energy action plan. Xcel Energy's free services include a six-month planning period, five workshops, and an 18-month implementation period during which the Xcel Energy Partners in Energy team will provide marketing and communications support, data tracking and measurement, program expertise, and project management for a set of specific, near-term strategies outlined in the Energy Subcommittee Report. The Xcel Energy Partners in Energy offering also provides access to Northfield's energy data, energy plan examples from other community energy action plans, webinars, and other resources to support plan creation and implementation.

2.4 Strategic priorities

The core team consisting of the Energy Subcommittee chair, city staff, and the Xcel Energy Partners in Energy team compiled a list of proposed strategic priorities to be included in this report. These were meant to capture the wide variety of ideas and discussions generated at the Northfield Energy Subcommittee workshops. Energy Subcommittee members were surveyed on whether they agreed with each priority and had opportunities to review and comment on each proposed priority during various workshop activities and discussions. In the end, the core team reviewed the rankings of each priority and the associated comments to determine what appeared to be the best strategies to include in the Energy Subcommittee Report.

2.5 Review Process and approval

The final Energy Subcommittee Report will be reviewed and endorsed by the Northfield Climate Action Plan Advisory Board, the Planning Commission, and the Environmental Quality Commission before going to the City Council. The City Council will review and approve the full Climate Action Plan at a later date.

3. Planning Context

3.1 Northfield history of energy action

The City of Northfield has a long-standing commitment to energy stewardship as part of a broad and dedicated focus on sustainability as a key component to quality of life. This report aligns with, and builds on, the work of many prior Northfield planning documents as noted below.

Title	Year	Purpose	Summary of Recommendations
Comprehensive Plan	2008	A community “blueprint” for the future, the broadest policy document a community can have to guide decision-making on long-term physical development.	Northfield comprehensive plan emphasizes sustainability, energy efficiency, and “smart growth” (e.g. prioritizing infill development over expansion). See Appendix 5 for specific strategies from the implementation matrix that align with this energy plan.
Mayor’s Energy Task Force Report	2008	This task force was created by a City Council resolution to address the challenges related to fossil fuel energy: 1) supply and price uncertainty and 2) global climate change, driven largely by the release of carbon dioxide from fossil fuel combustion.	This plan recommends various strategies for community engagement in energy efficiency, expansion of local renewable energy developments, and growth of a local “green economy.” It also examined, but recommended against, forming a separate municipal utility. See Appendix 4 for a summary report. <i>Note: This report was submitted to, but never adopted by City Council.</i>
Northfield GreenStep Cities	2010	A voluntary challenge, assistance, and recognition program to help cities achieve their sustainability and quality-of-life goals.	In 2015, Northfield achieved “Step 3” in this program, the highest level at the time. Many of the “steps” include energy efficiency and renewable energy actions.
Northfield City Council Strategic Plan	2017	To examine the current state of the organization, determine a desired future state, establish priorities, and define a set of actions to achieve specific outcomes.	Strategic priority #6 is “Climate Change Impacts.” Desired outcomes are a clear vision for climate action, an economy resilient to energy and environment impacts, and reduced net carbon emissions.
Northfield Climate Action Plan Advisory Board	2018	An advisory board to lead and engage the Northfield area community in responding strategically, rapidly, and responsibly to a changing climate by developing a Climate Action Plan that includes a carbon reduction goal to be presented to the City Council.	Work in progress, draft plan will be presented to City Council in 2019. Select portions of the Energy Subcommittee Report will be included in Northfield’s Climate Action Plan.

3.2 State, Federal, and Global Energy Action

The Energy Subcommittee Report comes at a time of rapidly increasing global awareness of the threats posed by fossil fuel consumption and rising concentrations of greenhouse gases in the atmosphere. It is therefore bolstered by many existing state, federal, and international energy and carbon reduction targets, reports, and recommendations including:

Title	Created	Applies to	Description
Minnesota Renewable Energy Standard	2007	Electric utilities operating in Minnesota	Requires electric utilities to generate at least 25% of their energy from renewable sources by 2025. The state's largest utility, Xcel Energy, must hit a higher standard of 30% by 2020.
Next Generation Energy Act (Minnesota Statutes Chapter 216H)	2007	State of Minnesota	Requires a reduction by 80% between 2005 and 2050 for state GHG emissions, while supporting clean energy, energy efficiency, and supplementing other renewable energy standards in Minnesota. Interim goals were also set: 15% reduction by 2015, and a 30% reduction by 2025.
MPCA Climate Solutions and Economic Opportunities (CSEO) Initiative	2016	State of Minnesota	A report written to evaluate strategies for Minnesota policy makers to reduce GHG emissions while growing our state economy.
Xcel Energy 100% carbon-free electricity by 2050 commitment	2018	Xcel Energy customers	Xcel Energy commitment to deliver 100% carbon-free electricity to all customers by 2050. Interim targets are to reduce carbon emissions 80% by 2030, from 2005 levels in the eight states it serves.
International Panel on Climate Change (IPCC)	2018	International	The IPCC is the United Nations body for assessing the science related to climate change. Its 2018 report states "With clear benefits to people and natural ecosystems, limiting global warming to 1.5°C compared to 2°C could go hand in hand with ensuring a more sustainable and equitable society."

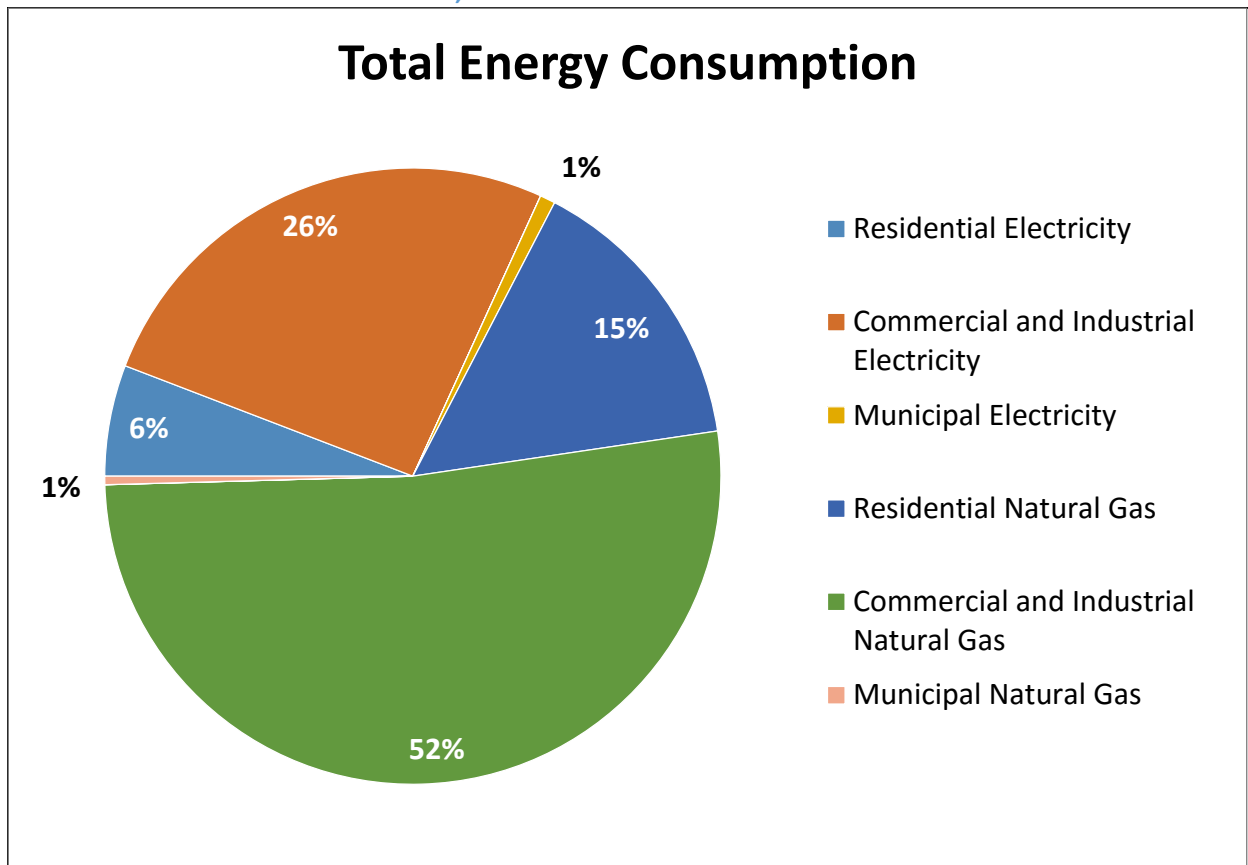
4. Where We Are Now?

An integral part of the Partners in Energy planning process is reviewing historic energy data for Northfield. Xcel Energy provided data on energy use and participation in utility energy conservation programs, as well as savings associated with participation in those programs. The summary below is for 2017. See Appendix 2 for a complete picture of Northfield’s baseline energy data.

4.1 Summary of grid energy use

Xcel Energy is the electric and natural gas utility provider for Northfield. Of the 7,421 premises served, 88% are residential, 11% are commercial/industrial, and 1% are municipal. In 2017, Northfield consumed 2.7 million MMBTU of energy. About two-thirds of Northfield’s 2017 energy consumption is from natural gas (67%), and one-third from electricity (33%). Energy data show that of the 2.7 million MMBTU consumed by Northfield, 21% is consumed by residential premises, 78% is consumed by commercial/industrial premises, and 1% is consumed by municipal premises. See Figure 1 for a breakdown of energy consumption by sector and fuel type.

FIGURE 1: 2017 ENERGY CONSUMPTION, BY SECTOR AND FUEL TYPE⁶



⁶ Electricity and natural consumption for all premises in Northfield served by Xcel Energy. Behind-the-meter energy generation is not included in energy consumption data.

4.2 Off-site renewable energy

Off-site renewable energy subscriptions offer residents and businesses the opportunity to use renewable energy without having to install equipment. Two popular examples are utility-sponsored renewable programs and community solar gardens. In 2017, 613 Northfield residential premises subscribed to renewable energy,⁷ totaling more than 1.8 million kWh of electricity. Sixteen commercial/industrial premises subscribed to renewable energy for a total of 33.6 million kWh of electricity.⁸

4.3 On-site renewable energy

On-site renewable energy, sometimes called “behind-the-meter,” includes solar panels and wind turbines installed on-site to supply some or all of the power for a building.

In 2017, 76 residential and five commercial/industrial premises had solar panels on their home or facility with a total capacity of 554 kW. Two wind turbines — one at Carleton College and one at St. Olaf College — also generated power for those organizations totaling just over 6.7 million kWh.

4.4 Summary of energy conservation program participation

Northfield residents and businesses have actively participated in Xcel Energy’s energy conservation programs, saving an average of 1.2% of electricity consumed and 0.7% of natural gas consumed between 2015 and 2017.⁹ In 2017, 813 total premises participated in Xcel Energy’s programs, including 11% of residential premises and almost 8% of commercial/industrial premises. By participating in energy conservation programs, premises saved a total of 18,710 MMBTU (0.7% of total energy use in 2017). The most popular programs for residents include Saver’s Switch and rebates for heating and cooling equipment. For commercial/industrial premises, lighting, heating, and cooling efficiency rebates are the most popular programs for saving energy.

⁷ Subscriptions include both Xcel Energy’s Windsource® and Renewable*Connect® subscription programs, and community solar garden subscriptions.

⁸ Ibid.

⁹ Xcel Energy’s energy conservation programs include the portfolio of approved utility energy efficiency and demand management programs.

5. Where We Want to Go

5.1 Vision

Northfield strives to ensure all citizens have access to clean, renewable, reliable, and affordable energy systems that will adapt to a changing climate by conserving energy, reducing our community-wide carbon footprint and supporting sustainable energy solutions.

5.2 Carbon reduction goal

For community-wide energy metered at the Northfield substation, achieve a 50% reduction in energy-related carbon emissions from 2015 levels by 2030, and achieve 100% carbon-neutrality no later than 2050.¹⁰

5.3 Guiding principles

- Pursue a sustainable energy future with clean energy available to all businesses and residents, with particular support for under-resourced households.
- Increase overall energy literacy among residents and business owners and operators, including knowledge of where energy comes from, the environmental impacts of different types of energy generation, and what can be done to reduce energy use.
- Expand renewable energy generation.
- Lead by example and offer recognition for successful energy efforts.
- Make energy efficiency feasible, affordable, and achievable for both residents and businesses.
- Promote economic growth while increasing energy conservation and renewable energy generation.
- Empower future generations to be self-motivated in working toward a sustainable energy future.
- Inspire and support a high quality of life for future generations.

¹⁰ This goal is based on the International Panel on Climate Change [Guide for Policy Makers](#) which says to limit global warming to 1.5 degrees Celsius “global net human-caused emissions of carbon dioxide (CO₂) would need to fall by about 45% from 2010 levels by 2030, reaching ‘net zero’ around 2050.”

6. Strategic Energy Action Priorities

This report draws on the City of Northfield’s responsibility to protect our community from crises and insecurity while also providing services that maintain order and enhance quality of life. Modern energy supply has become a basic human right, but the negative impacts of its production and consumption — devastated landscapes, air and water pollution, depleted resources, climate change — present fundamental challenges to the rights of future generations. The City is in the unique position of addressing problems that require collective action — from business, industry, institutions, and residents — and a “systems thinking” approach to benefit everyone in our community. The City can facilitate such an approach by engaging the whole community in energy literacy, awareness, and action; enacting policies and plans that guide us toward a more energy-conscious future; and serving as a role model through innovation and demonstration projects that help normalize forward-thinking concepts. Although it is intended that the City will lead these actions, the success of this plan rests on the will, participation, dedication, and enthusiasm of a broad array of local community members, businesses, and institutions.

6.1 Area A: Education and engagement

When considering the immense challenge of reducing carbon emissions while maintaining high quality of life, a fundamental task is to provide our whole community with an understanding of why carbon reduction and “clean” energy is important, plus actions they can take to reduce their own energy footprint and that of their business or organization. The strategies in this section also seek to actively engage Northfield residents, businesses, and institutions in implementation of energy conservation measures and renewable energy options to reduce their operating costs, energy consumption, and carbon emissions. Strategies in this category are focused on easy access to information, knowledge-sharing pathways, and outreach efforts that bring solutions to consumers rather than relying on them to actively seek out information.

EE-1 SMALL CONSUMER ENERGY ENGAGEMENT

- **Description:** Give households, small institutions, and small businesses easy access to energy education, energy conservation, and renewable energy programs that are directly applicable to their energy needs. Residents, small institutions, and small businesses represent the highest number of premises in the Northfield energy data, so broad and accessible outreach strategies will be the primary focus for this group. The City will ensure information will be accessible to all residents, regardless of age or income.
- **Recommended Actions:**
 - Implement the small consumer section of the “18-month Energy Action Jump Start” described in Appendix 3.
 - Establish an energy information “one-stop shop” on the City’s website and at City Hall.
 - Update and refresh information on an ongoing basis with current programs, incentives, and project resources.
 - Establish a Northfield Energy Task Force including local neighborhood “energy captains” to assist with outreach efforts described in Appendix 3 and the one-stop shop.
 - Partner with the public schools to create energy education curricular materials and youth-focused events.

EE-2 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:**
 - Implement the large consumers section of the “18-Month Energy Action Jump Start” outlined in Appendix 3.
 - Conduct 2–3 voluntary gatherings per year for at least three years after Energy Subcommittee Report adoption to facilitate and compare energy and carbon reduction plans, share knowledge and conduct tours of energy conservation and renewable energy projects.
 - Conduct at least five energy efficiency or renewable energy tours within three years of adopting this report.
 - In coordination with EE-4, develop an opt-in public energy and carbon emissions reporting platform for Northfield’s largest energy consumers.

EE-3: ENERGY MARKETING AND TOURISM

- **Description:** This strategy focuses on outward engagement by marketing Northfield’s energy conservation and renewable energy projects and programs in a way that attracts and retains tourists, residents, and local businesses. Northfield can position itself as an innovative, future-focused community that couples economic vitality with environmental stewardship in ways that enhance overall quality of life. This strategy takes advantage of existing innovations, such as the college wind turbines, community solar gardens, and community sponsored agriculture, while also envisioning future attractions such as net zero energy buildings and green developments. This strategy also hopes to position Northfield as a model city for energy innovation and sustainability.
- **Recommended Actions:**
 - Incorporate local energy initiatives into Northfield’s tourism marketing materials.
 - Create a “sustainability tour” of local turbines, solar developments, CSAs, etc.
 - Consider strategies for recruiting sustainability- and energy-focused businesses to existing Northfield spaces and/or a future green business park or industrial development.
 - For any new residential or industrial development, evaluate the potential marketing value of green building construction and energy strategies.

EE-4: ENERGY REPORTING AND TRANSPARENCY

- **Description:** Increase energy awareness and engagement in Northfield’s energy reduction efforts by making community-wide energy data readily available.
- **Recommended Actions:**
 - Develop a consistent reporting format for both Xcel Energy data from the Northfield substation and behind-the-meter data from privately owned renewable energy systems.
 - Establish a permanent page on the City’s website to publish community-wide energy use from Xcel Energy data at the Northfield substation, renewable energy production, and green power purchases.
 - Compile calculations showing how much of Northfield’s current total energy use (total of both substation data and behind-the-meter use) is renewable.
 - Publish annual updates by March 31 of each year including progress toward energy reduction targets.
 - Consider launching a real-time City building energy use dashboard for public/online display and education.

6.2 Area B: Policy and planning

The City of Northfield will join other leading communities and reinforce consistency with its own Comprehensive Plan by incorporating more specific energy and carbon reduction language in existing policies and planning documents. The goal of this section is to evolve Northfield’s built environment into one that is more affordable, equitable, and resilient, as well as to institutionalize a low-carbon approach by weaving practical energy conservation and renewable energy opportunities into formal City of Northfield policies and planning activities. Strategies in this category are particularly focused on the existing environment, but overlap with practices related to land use and transportation.

Energy efficiency policies and programs that may have seemed far-fetched in the recent past are becoming increasingly common. Cities across the country are beginning to implement zero-energy building performance codes,¹¹ efficiency standards for rental housing,¹² and energy disclosure policies for buildings,¹³ and home sales and rentals.¹⁴ The U.S. Department of Energy has a [Zero Energy Ready Home](#) program that “supports and recognizes builders for their leadership in increasing energy efficiency, improving indoor air quality, and making homes zero energy ready.” Policy examples and resources like these are growing rapidly as cities strive to have more efficient, more affordable, and better quality building stock.

PP-1 BUILDING ENERGY USE BENCHMARKING AND DISCLOSURE

¹¹ The California Public Utilities Commission now enforces net zero energy performance statewide for all single family homes and Washington D.C. is currently working toward adopting a residential zero-energy policy.

¹² The City of Boulder adopted the country’s first standard for rental housing. Source: Rocky Mountain Institute: [Better Rentals, Better City](#)

¹³ City of Minneapolis: [Energy Benchmarking and Transparency, Commercial and Multifamily Residential Buildings](#)

¹⁴ City of Minneapolis: [Time of Rent Energy Disclosure \(2021\) and Time of Sale Energy Disclosure \(2020\)](#)

- **Description:** Protect consumers, encourage better buildings and raise energy awareness by establishing a building energy benchmarking program and exploring policies that require owners to disclose building utility use relative to benchmark data as a pre-condition of any building sale or space lease. This could include providing information such as an energy audit report, benchmark data, or housing energy rating score (HERS).
- **Recommended Actions**
 - Establish an opt-in energy benchmarking program for commercial buildings including tools, resources and engagement.¹⁵
 - Research energy benchmarking requirements in other cities.¹⁶
 - Research energy use disclosure policies in other states or cities (e.g. Minneapolis, MN and Boulder, CO) and reference other disclosure requirements (e.g. radon) as examples.
 - Develop an educational fact sheet for realtors, lenders, city building officials, and others to educate buyers and renters about things they should know related to building energy use before making a purchase or signing a lease.
 - Make instructions on how to access building energy use, obtain a HERS rating, or conduct Xcel Energy audits available at City Hall and on the City website.
 - Support any future state-level legislation regarding building energy use disclosure.

PP-2 BUILDING ENERGY EFFICIENCY STANDARDS

- **Description:** There is never a better time to achieve meaningful energy efficiency than during new construction and gut renovations. This strategy proposes strengthening energy efficiency requirements for both of these key moments of opportunity.
- **Recommended Actions:**
 - Develop processes and procedures to enforce the existing energy-related goals of the Northfield Comprehensive Plan (See Appendix 5).
 - Develop procedures that will strongly enforce existing energy codes.
 - Consider requiring that all publicly funded buildings participate in Xcel Energy’s Energy Efficient Buildings (EEB), Energy Design Assistance (EDA), or other similar programs that provide comprehensive energy efficiency recommendations.
 - Develop guidelines for City-funded buildings to achieve an energy use intensity (EUI) 30% or more below the suggested ENERGY SMART® Portfolio Manager® average for that building type.
 - 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 Efficient New Home Construction, Energy Efficient Buildings (EEB),

¹⁵ City of St. Paul: [Energy Benchmarking Program](#)

¹⁶ City of Chicago: [Energy Benchmarking Program](#)

and Energy Design Assistance (EDA) evaluations, the US Department of Energy Net Zero Homes certification, or similar programs.

- Explore ways of incorporating more specific energy efficiency requirements or stretch codes¹⁷ into new building or gut renovation projects.

PP-3 ENERGY-CONSCIOUS STRATEGIC GROWTH

- **Description:** Identify the energy and emissions impacts of new growth due to industrial or residential developments. Enforce and build on existing strategic growth policies in the Comprehensive Plan that prioritize infill and redevelopment before expansion (See Appendix 5).
- **Recommended Actions:**
 - Develop procedures to review energy and carbon emissions impacts of new developments relative to City of Northfield carbon reduction goals.
 - Report annually to the Planning Committee, Environmental Quality Commission and City Council on how strategic growth strategies in the Comprehensive Plan that emphasize infill over expansion or energy efficiency have been implemented to date and how they are being applied to upcoming developments.
 - Meet with City Departments and Commissions that have authority over applicable Comprehensive Plan strategies to review how their responsibility for implementing those strategies intersects with advancement of the City's energy and climate goals.
 - Model projected City growth over the next 50 years and resulting effect on energy consumption and greenhouse gas emissions. Report results to the Community Development Department, Planning Commission, Environmental Quality Commission and related City Departments & Commissions.
 - Consider how renewable energy and net zero energy buildings can be incorporated into new residential or commercial/industrial developments

PP-4 FORWARD-THINKING UTILITY SYSTEM EXPANSION

- **Description:** Evaluate opportunities to incorporate forward-thinking district and renewable energy systems into City planning for new and existing developments.
- **Recommended Actions:**
 - As part of any new development conversation, study the cost, energy and carbon impacts in comparison to utility options that propose lower energy and carbon intensive outcomes verses a business-as-usual approach.

¹⁷ Stretch codes are jurisdictional energy efficiency requirements that exceed state or federal codes.

- Conduct a concept study to assess opportunities for district energy systems that utilize current resources and envision a lower carbon approach to new developments.
- Conduct a comprehensive life cycle cost–benefit analysis (considering cost, energy, and carbon) on any new development over 100 acres to determine whether district energy or on-site renewable energy should be considered in combination with — or in lieu of — running existing utilities to a new location.

PP-5 RENEWABLE ENERGY DEVELOPMENT

- **Description:** Renewable energy technologies are rapidly becoming less expensive, more productive, and easier to deploy on both private and public properties. Large-scale renewable energy projects including commercial-scale wind turbines and community solar gardens are predominant in Northfield, thanks to our rural environment and availability of undeveloped land. As both small and large scale renewable energy technologies advance, the City and its citizens could benefit from a more intentional, planned approach to incorporating them into our buildings and landscapes to assure we are taking full advantage of the energy production and resilience benefits, balanced with other land use priorities.
- **Recommended Actions:**
 - When evaluating current and future land development plans including any updates to the Northfield Land Development Code, consider intentionally incorporating areas for large-scale renewable energy developments.
 - Develop ways to support and encourage privately owned on-site renewable energy and energy storage technology.
 - Compile renewable energy grants and other funding opportunities, partner with local organizations, such as Northfield Area Community Solar and Growing Up Healthy, and develop targeted outreach campaigns that will support on-site renewable energy installations for income-qualified residents and affordable housing properties.
 - Develop policies that require all new homes and businesses be electric vehicle (EV) ready by a fixed date.
 - Develop ways to encourage solar installations or solar-ready construction strategies on homes and businesses that are well-situated to take advantage of solar technologies.

PP-6 COMMUNITY ENERGY RESILIENCE PLAN

- **Description:** Power outages and energy-related emergencies can have especially profound impacts on Northfield’s most vulnerable populations and its small business community. These events could result from floods, tornadoes, excessive heat, extreme cold and snow or non-weather related utility system outages. Given the increasing

frequency and intensity of extreme weather events in Northfield, it is important to plan for these events in ways that both protect vulnerable citizens, particularly senior citizens and under-resourced community members, and ensure business continuity. A community energy resilience plan would help identify and connect people in need with available resources in an energy emergency.

- **Recommended Actions:**
 - Inventory local backup generator locations and capacity at schools, colleges, businesses, and residences. Identify which facilities can support local residents in an extended power outage.
 - Identify vulnerable households and conduct targeted outreach and energy reliability assistance to help them avoid or react during an energy emergency.
 - Develop outreach materials that will assist and encourage local businesses and residents to proactively develop their own energy resilience plan in preparation for energy outages and emergencies.

6.3 Area C: Innovation and demonstration

Meeting ambitious carbon emissions reduction targets will require a new approach to many standard practices. We therefore need ways to test unfamiliar concepts as we prepare to scale up those that prove to be both feasible and effective. The goal of this section is to develop and learn from pilot projects that demonstrate innovative solutions to lowering community-wide carbon emissions. Demonstration projects could be fully implemented by the City of Northfield, Northfield residents, businesses, and institutions, or implemented through public–private partnerships. The City of Northfield could spearhead such projects or provide grants, loans, or other incentives that encourage others to lead by example. City buildings, public school buildings, and affordable housing are called out as priorities given their potential to maximize the outreach and educational opportunities associated with innovative demonstration projects.

ID-1 DEEP ENERGY EFFICIENCY RETROFITS

- **Description:** Deep energy retrofits are improvements to existing buildings intended to significantly increase their energy efficiency. They could include updated insulation, windows, energy efficient heating and cooling systems, or installation of on-site renewable energy technologies. There is never a better time to achieve deep energy efficiency than during new construction and gut renovations, so this strategy proposes encouraging demonstration projects that promote this type of building retrofit and providing construction firms with the education and resources to implement successful deep energy efficiency projects.
- **Recommended Actions:**
 - Develop educational information and a targeted outreach campaign to owners, developers, and contractors.
 - Build, partner on, or incentivize at least three deep energy efficiency projects within City limits and highlight as demonstration projects.

- Evaluate opportunities, grants, and other incentives to support weatherization and deep energy efficiency retrofits in all housing with particular focus on affordable housing developments.¹⁸

ID-2 NET ZERO ENERGY BUILDINGS

- **Description:** In order to meet local, state, and international carbon reduction goals, building construction must become net zero energy. Net zero energy buildings produce as much or more of their own energy with onsite renewable energy as they use within a year. The design industry recognized this and developed the [Architecture 2030 challenge](#) which aims to “rapidly transform the global built environment from the major contributor of greenhouse gas (GHG) emissions to a central part of the solution to the climate crisis.” The U.S. Department of Energy focused on the construction industry by developing its [Zero Energy Ready Home](#) certification. Cities and states are already implementing policies that require all new homes to be net zero energy by certain dates. A concept which once seemed futuristic is now poised for broad implementation. This section aims to begin bringing net zero energy buildings to Northfield.
- **Recommended Actions:**
 - Develop educational information and a targeted outreach campaign to qualified owners, developers, and contractors. Reference the U.S. Department of Energy [Zero Energy Ready Home](#), the [Net Zero Energy Coalition](#), and the Rocky Mountain Institute’s [Pathways to Zero](#) programs as a starting point.
 - Identify firms qualified to design, develop, or construct net zero energy buildings and encourage them to lead by example through projects in Northfield.
 - Explore opportunities to build, incentivize, or partner on at least one net zero energy project within City limits. Prioritize municipal and education building projects with high potential for educational outreach, and affordable housing developments that will reduce operating costs and improve quality for under-resourced residents.

ID-3 STRATEGIC ELECTRIFICATION

- **Description:** The public electric grid is getting rapidly greener thanks to large-scale wind and solar development. Xcel Energy has recently pledged to provide 100% carbon-free electricity by 2050. Privately owned, on-site, renewable electricity technologies, such as rooftop solar PV, are being rapidly deployed thanks to financial incentives and technological advances that have increased productivity and decreased cost. Energy storage technologies (including electric vehicles) are becoming more mainstream, and smart grid infrastructure will allow renewable energy to be used at all hours of the day.

¹⁸ [U.S. Department of Energy: Low Income Community Energy Solutions](#)

The path to carbon neutrality is truly conceivable given a willingness to lean into electricity as the primary form of energy. This requires electrification of equipment and appliances that are commonly powered by gas, oil, or propane.

- **Recommended Actions:**
 - Review existing nationwide programs promoting electrification and present a written summary to the Environmental Quality Commission for consideration of ideas that could be implemented in Northfield.
 - Establish outreach and incentive programs to promote a switch to electricity for specific equipment and appliances (e.g. lawn mowers, hot water heaters, etc.).
 - Develop education and outreach information on electric forms of heating, such as cold climate heat pumps.
 - Require that all new homes and businesses be built electric vehicle (EV) ready.
 - Develop ways to encourage solar installations or “solar ready” construction strategies on homes and businesses that are well-sited to take advantage of solar technologies.

6.4 Area D: Support and continuation

The goal of this section is to establish a reliable, multi-level approach to implementing and sustaining this plan into the future. We must also establish processes that allow the recommendations and resources listed in this plan to be regularly updated in alignment with technological, financial, and policy advancements at the local, state, and federal level. The greater our dedication and commitment to implementing the strategies in this plan, the greater its benefits will be. There is no quick fix to the environmental challenges that now demand strong focus on how we create and use energy. Thus, dedicated staff, strong, community-wide collaboration, and a long-term approach are key to making progress on the Energy Subcommittee Report and moving our community toward a lower-carbon future.

SC-1 CITY ENERGY COORDINATOR POSITION

- **Description:** Assure the goals of this plan are met by establishing a City Energy Coordinator position, on its own or as part of a City Sustainability Coordinator position, to facilitate the above recommendations. This plan proposes a wide array of engagement activities, policy research, and demonstration project facilitation efforts. Although volunteers can be recruited to assist with some of these tasks, a full-time paid position will provide much-needed continuity and dramatically increase the rate of success.
- **Recommended Actions:**
 - Hire a qualified energy coordinator that reports to the City Administrator. This person shall create and implement the programs described in this plan.
 - Establish an Energy Task Force to assist the Energy Coordinator with energy outreach efforts, development partnerships, etc. See Appendix 6 for a sample energy task force description.

SC-2 ADVANCING AND UPDATING THE PLAN

- **Description:** Regularly update and advance the Energy Subcommittee Report in response to progress to date and ongoing technological, financial, and policy developments. This plan should be seen as a working document that can only be effective if it keeps pace with rapidly changing energy-related developments and opportunities.

- **Recommended Actions:**
 - Energy Coordinator and Energy Task force shall deliver a bi-annual Northfield energy “report card” to the Planning Commission, Environmental Quality Commission noting progress on this plan, recognizing achievements, and targeting areas in need of further action.
 - Present a bi-annual progress summary to the City Council.
 - Every five years, update the goals and strategic priorities to align with current technological, economic, and policy developments.

7. Resources and Funding

There are a variety of City and community partners that are poised to assist with implementation of the Energy Subcommittee Report goals. A vigorous outreach campaign will help to bring potential partners on board and build collective action. Furthermore, key strategies from this plan will be incorporated into the broader Climate Action Plan and supported within that context. These local resources are long-term and thus offer continuity through the useful life of this plan and momentum for future updates. The external resources and funding suggestions noted here are by no means complete and will change over time. It is essential for the lead implementers of this plan to frequently review these resources and funding opportunities to stay abreast of current options.

7.1 Existing and potential city resources

- City of Northfield Community Development Department.
- City of Northfield Program Coordinator.
- Energy Coordinator position — a dedicated facilitator recommended as part of this report.
- Environmental Quality Commission — provides review and endorsement to City Council, assists with marketing engagement, and recognition programs.
- Planning and Zoning — aligns Comprehensive Plan goals, updates and implementation with Energy Subcommittee Report recommendations.
- Housing & Redevelopment Authority — reviews and collaborates on energy efficiency policies, building energy audits and efficiency, and net zero energy demonstration projects.
- Northfield Economic Development Authority (EDA) — adopts the goals of this report as it promotes the economic, commercial, housing, industrial development and redevelopment of the city.
- Engineering Department — considers incorporating strategic priorities in this report as it proposes and executes projects.
- Utility bill credits from community solar subscription — potential fund source for energy coordinator position or small grants and incentives.
- Utility savings from energy efficiency projects — potential fund source for more energy projects.

7.2 Potential community partners

- Northfield Energy Task Force and “energy captains” (recommended as part of this report).
- Greater Northfield Sustainability Collaborative (GNSC) — a collective group of representatives from the colleges and community that implement projects and assist with facilitating connections between community needs and college contacts.
- Northfield Public Schools.
- Carleton College — resources include the community and civic engagement office (CCCE), sustainability office, plus faculty, staff, and students engaged in sustainability and energy projects.
- St. Olaf College — community engagement office, facilities office, plus faculty, staff, and students.
- Rotary Club — the Northfield Rotary Climate Action Team (RCAT) has a sustainability committee focused on implementing projects that enhance the sustainability and resilience of the Northfield community.

- Northfield Earth Day committee — the annual Northfield Earth Day Celebration is a forum for the community to come together to celebrate progress on issues related to climate action and mobilize next steps toward a more sustainable Northfield.
- Northfield Chamber of Commerce — The Northfield Area Chamber of Commerce helps cultivate a healthy business environment for the Northfield area.
- Northfield Enterprise Center — conducts lunch and learns and provides business resources and assistance.
- Northfield Convention and Visitors' Bureau.
- Northfield Downtown Development Corporation (NDDC) — founded to support, strengthen, and grow Northfield's unique downtown district. The NDDC is made up of business owners, buildings owners, and engaged residents who value the role downtown plays in Northfield's vibrancy.
- Other local businesses, service clubs, building managers, developers, and contractors
- Northfield community members and volunteers.

7.3 External resources and potential funding opportunities

- Xcel Energy's Partners in Energy offering — committed to supporting 18 months of implementation efforts focused on energy engagement, audits, and efficiency.
- [State of Minnesota Commerce Department](#) — offers loans, grants, credits, or rebates for energy-related improvements to homes, seeking assistance with energy bills, and other programs available to Minnesotans to help with energy conservation, efficiency, and renewable energy projects.
- [Clean Energy Resource Teams](#) (CERTs) — connects individuals and communities in Minnesota to the resources they need to identify and implement community-based clean energy projects.
- [United States Department of Energy](#) — mission to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.
- [Bush Foundation](#) — the Bush Prize celebrates organizations with a track record of successful community problem solving.
- [Rocky Mountain Institute](#) — RMI engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables.

As noted above, this is not a comprehensive list and should be regularly reviewed, expanded and updated.

8. Conclusion

This report and the action items included is a first attempt by the City of Northfield to aggressively work on energy efficiency and reduction of energy use. The City of Northfield staff, elected officials, residents, businesses and institutions will all need to be involved in a variety of ways to carry out the actions. As changes in technology and other opportunities arise the actions in this report will be amended.

Given the extremely serious nature of anticipated effects of our changing climate we have a responsibility to our community and beyond to take action. The City has made a commitment in its Strategic Plan and has begun to carry that out by starting to increase staff capacity. Implementing the actions in this document will require an even stronger commitment in terms of staff time, financial resources and policy choices that help reach the goals that have been set forth.

Northfield is a community which cares about its residents, businesses and the natural environment. Achieving the goals outlined in this plan will increase engagement with under-served populations, promote economic development of our businesses, strengthen our tourism and improve public health for our entire community. We believe the strategic priorities identified in this report will put Northfield on its path towards achieving carbon neutrality.

9. Appendices

Appendix 1: Acknowledgements

Appendix 2: Northfield's Baseline Energy Analysis

Appendix 3: 18-month Energy Action Jump Start

Appendix 4: 2008 Mayor's Energy Task Force Report Summary

Appendix 5: Comprehensive Plan Implementation Matrix Excerpts

Appendix 6: Sample Energy Task Force Solicitation

Appendix 7: Xcel Energy Partners in Energy Plan Development Process

Appendix 8: Glossary of Terms

Appendix 1: Acknowledgements

Thank you to the following individuals and organizations who contributed many hours of service to the Northfield’s Climate Action Plan Advisory Board’s Energy Subcommittee. Their perspective and input were essential to developing this plan.

Climate Action Plan Advisory Board Representatives	
Bruce Anderson	Dakota County Weatherization & Energy Efficiency Programs
Martha Larson	Manager of Campus Energy and Sustainability, Carleton College Energy Subcommittee Chair
Climate Action Plan Advisory Board Energy Subcommittee	
Bill Jokela	Community representative
Bruce McKendry	Community Representative
Charles Hayes	Sheldahl, a Flex Company
David Frost	Just Food Coop
Joe Gasior	Northfield Plant Engineering Manager, Post Consumer Brands; Northfield Planning Commission
David Higgs	Educational Associate, Carleton College
Don Anderson	Community representative, Retired energy engineer
Eric Johnson	Community representative, Former teacher at Northfield Public Schools
Jennyffer Barrientos	Coordinator, LINK Center
Jerry Ehn	Northfield Hospital and Clinics
Jim Kulseth	Director of Facilities and Grounds, Northfield Public Schools
Kevin Larson	Facilities Director, St. Olaf College
Laura Tiano	Growing Up Healthy; Healthy Community Initiatives
Lee Dilley	Rotary Climate Action Team (RCAT); 2008 Mayor’s Energy Task Force
Matt Rohn	Professor, St. Olaf College; Board Member, Northfield Area Community Solar
Richard Debeau	Rotary Club
Tony Huettl	Community representative
City of Northfield	
Beth Kallestad	Program Coordinator
Bryanna Paarmann	GIS Technician
David Bennett	Public Works Director/City Engineer
Rhonda Pownell	Mayor
Partners in Energy Team	
Marisa Bayer	Partners in Energy Lead Community Facilitator
Jamie Johnson	Partners in Energy Community Facilitator
Tami Gunderzik	Manager of Partners in Energy, Xcel Energy
Trisha Duncan	Community Relations Manager, Xcel Energy
Yvonne Pfeifer	Community Energy Efficiency Manager, Xcel Energy

Appendix 2: Northfield’s Baseline Energy Analysis

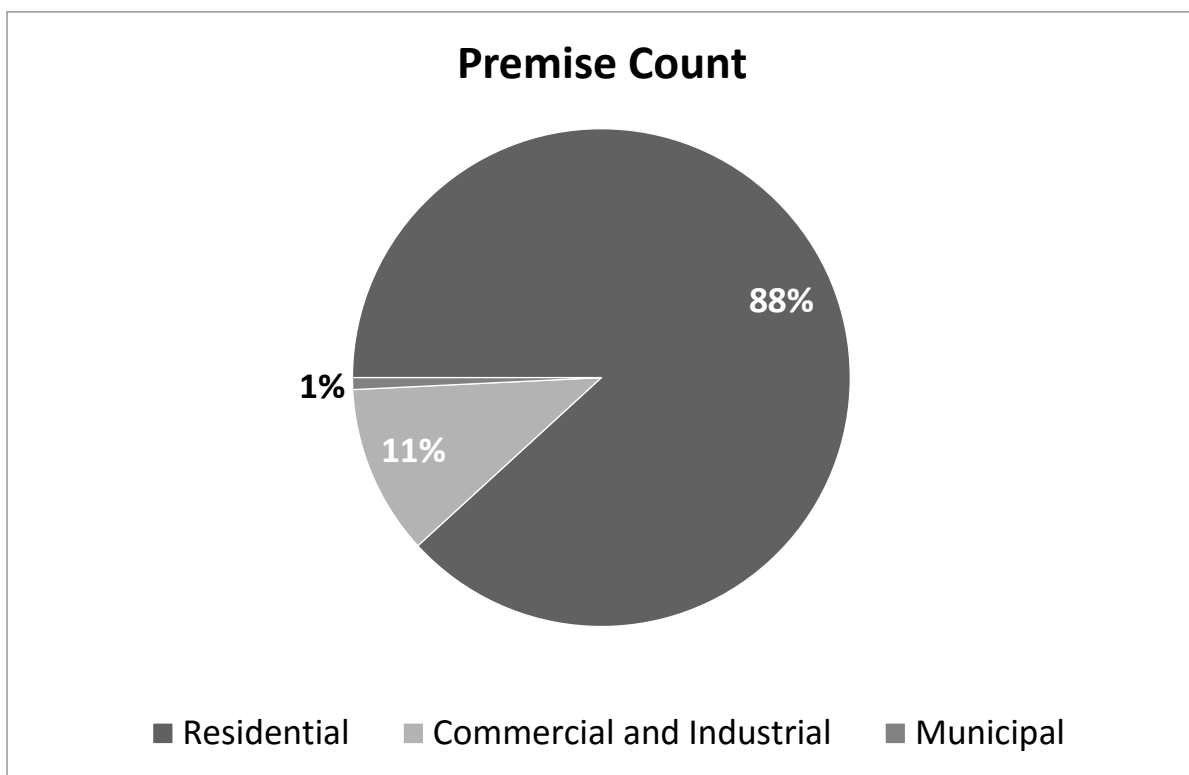
An integral part of the Partners in Energy planning process is reviewing historic energy data for Northfield, which includes data on energy use, participation in utility energy conservation programs, and

savings associated with participation in those programs. Data was provided by Xcel Energy for all Northfield premises for 2015–2017.¹⁹ The data helped the Energy Subcommittee understand Northfield’s energy use and opportunities for energy conservation and renewable energy. Data included in this section will also establish a baseline against which progress toward goals will be compared to in the future.

Premises

A premise is a unique identifier for the location of electricity or natural gas service. In most cases, it is a facility or building location. In Northfield, there are 7,421 premises served by Xcel Energy. The distribution of premises among residential, commercial and industrial, and municipal sectors is shown in Figure 2.

FIGURE 2: DISTRIBUTION OF PREMISES, 2017



Energy consumption

Northfield premises consumed a total of 265.7 million kilowatt-hours (kWh) of electricity and 18.7 million therms of natural gas in 2017. Combined, all sectors spent \$31.2 million dollars on energy in 2017.²⁰ Although the majority of premises are residential, most electricity and natural gas are consumed by commercial and industrial premises (

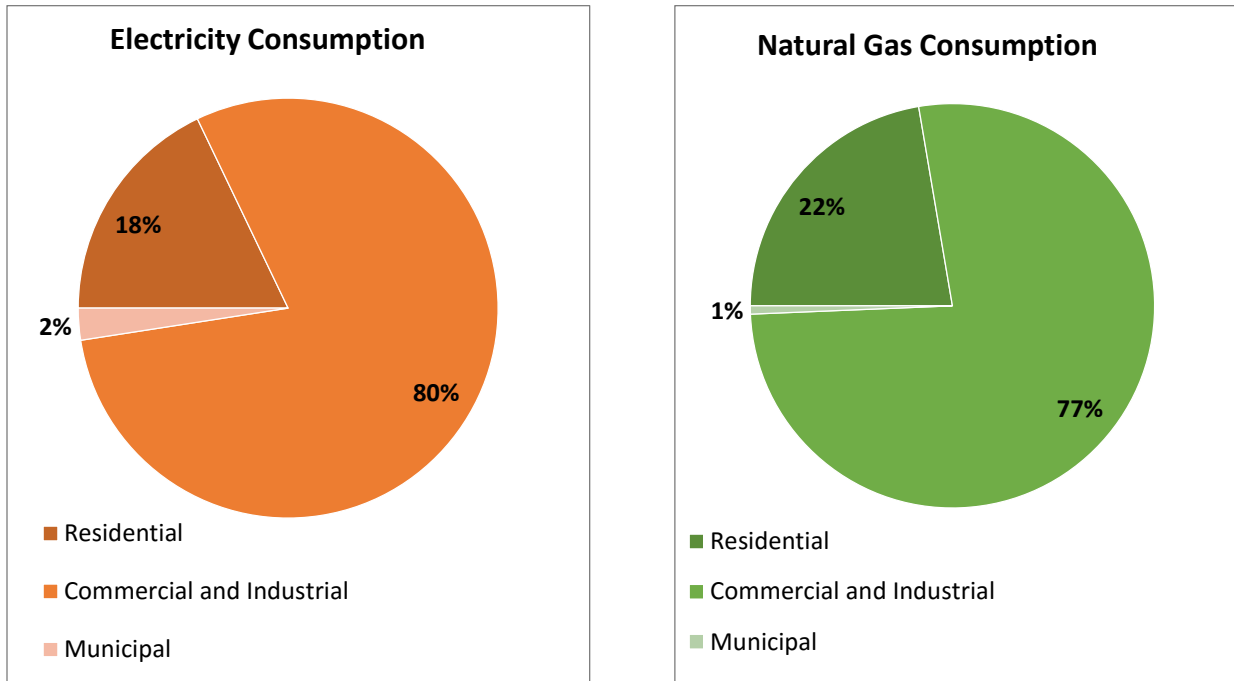
Figure 3).

¹⁹ The electricity and natural gas data in this plan complies with Xcel Energy’s 15 x 15 privacy rules. No premises were removed from the summary.

²⁰ This excludes any taxes and fees.

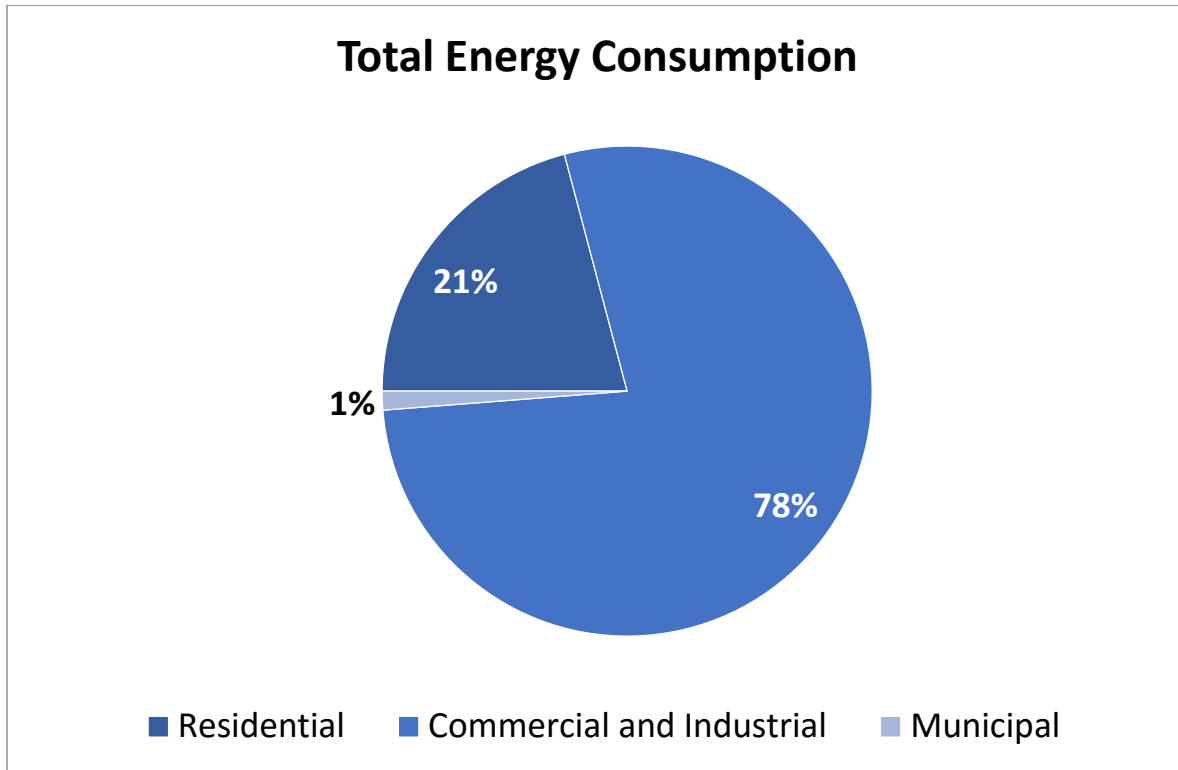
Commercial and industrial premises consumed 80% of the electricity and 77% of the natural gas consumed in Northfield in 2017, spending an average of \$27,000 on electricity and \$4,600 on natural gas per premise per year.²¹ Residential premises consumed 18% of electricity and 22% of natural gas, spending an average of \$900 on electricity and \$400 on natural gas per premise in 2017. The remaining energy was consumed by municipal premises, representing 2% of electricity and 1% of natural gas.

FIGURE 3: ENERGY CONSUMPTION BY FUEL SOURCE, 2017



²¹ The commercial and industrial customer usage and spending can be highly variable, which can have an impact on customer averages.

FIGURE 4: TOTAL ENERGY CONSUMPTION, 2017



Greenhouse gas emissions

Energy-related greenhouse gas (GHG) emissions have slightly decreased since 2015. The commercial and industrial sector accounts for most of Northfield's emissions (Figure 5), but has reduced its carbon emissions since 2015 by almost 4%. When looking at emissions by fuel source for baseline years,²² electricity has consistently contributed to just over half of Northfield's annual GHG emissions (Figure 6).

²² 2015, 2016, and 2017.

FIGURE 5: ENERGY-RELATED GREENHOUSE GAS EMISSIONS, BY SECTOR

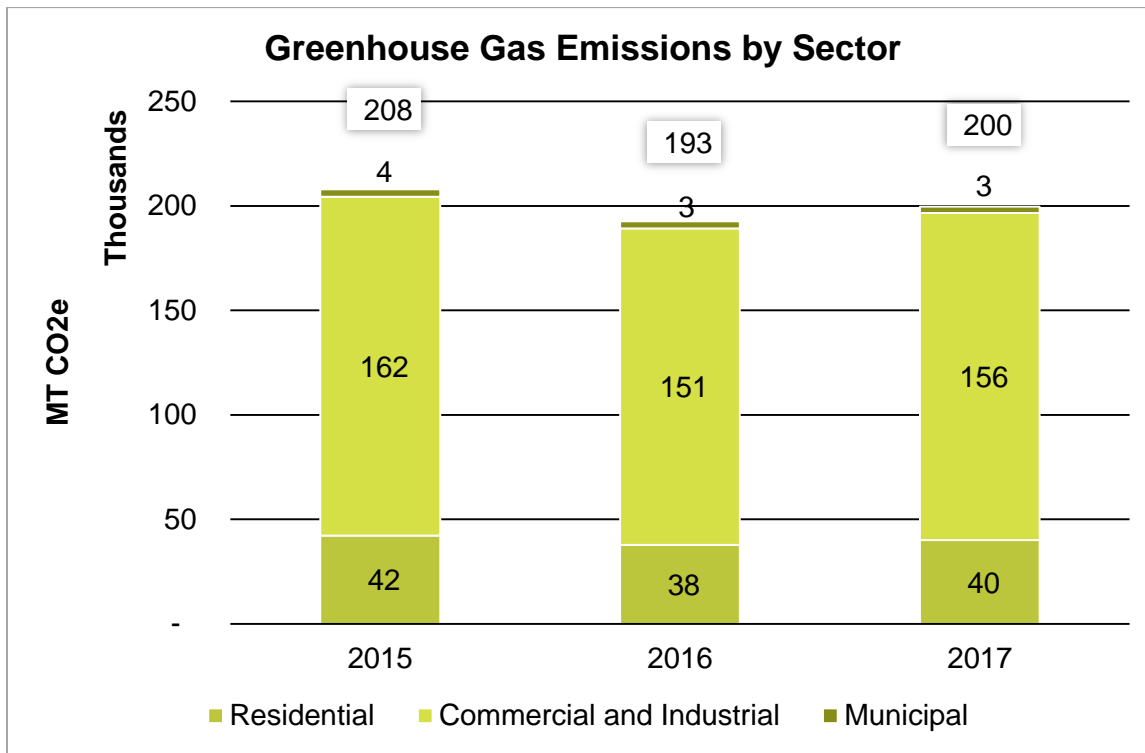
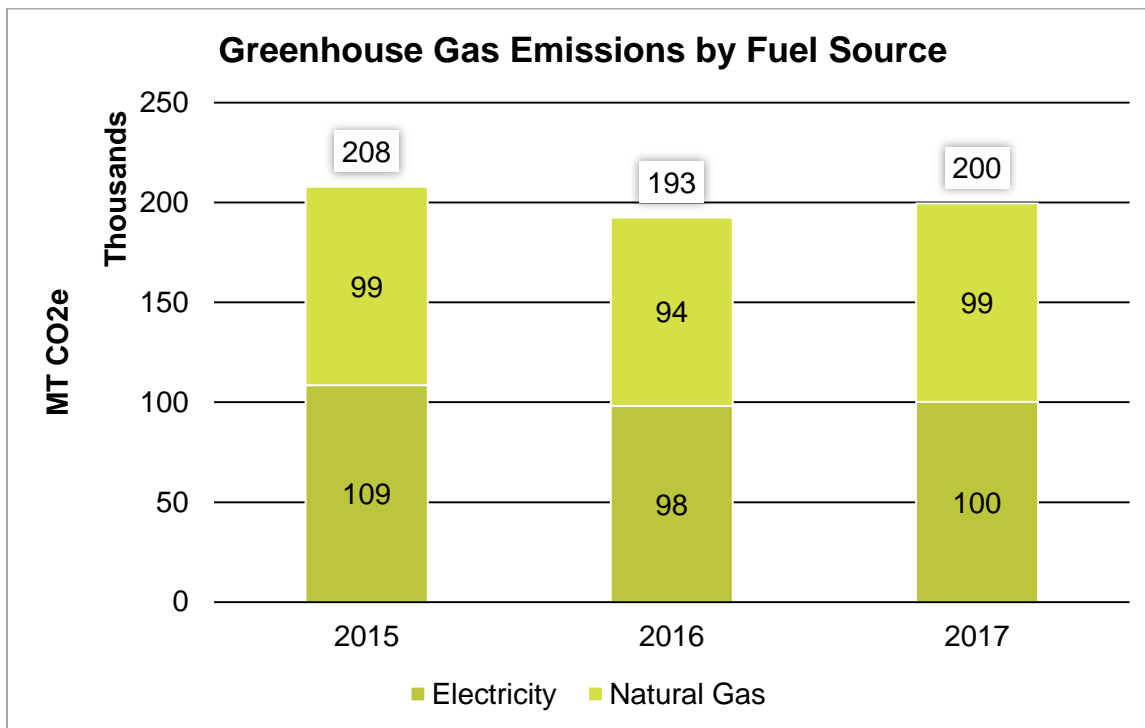


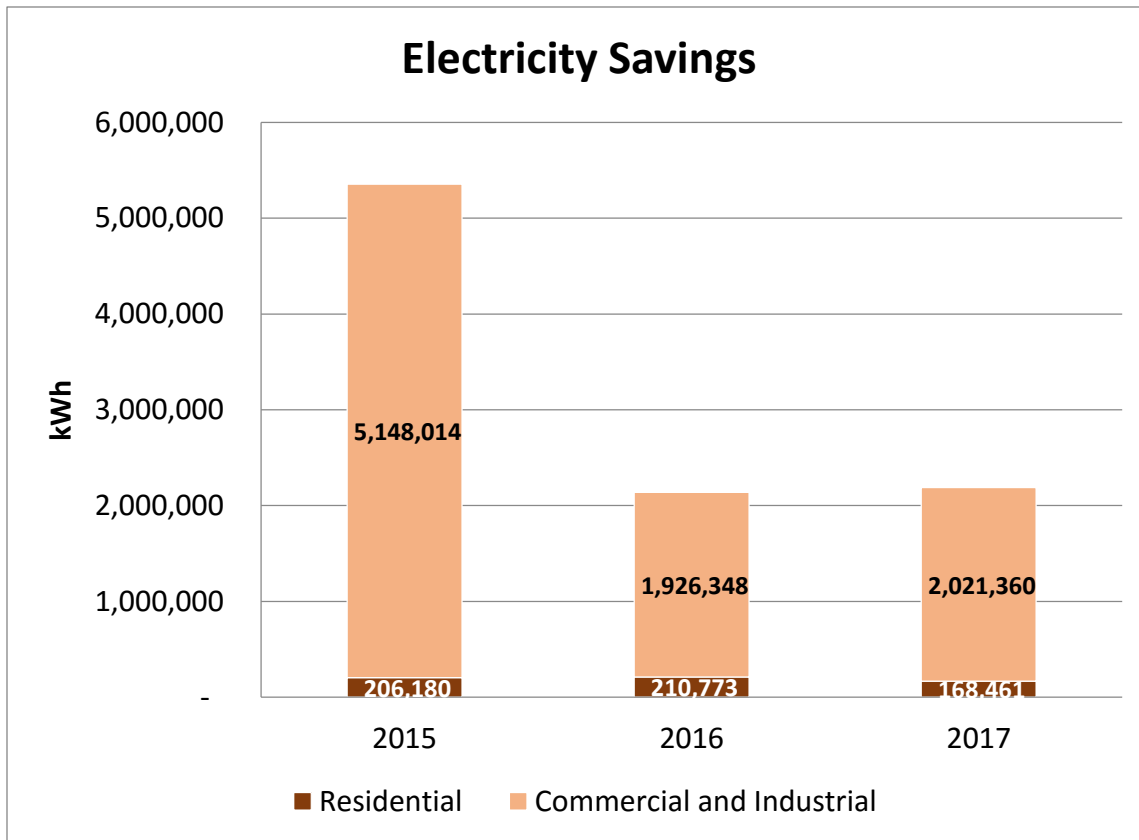
FIGURE 6: ENERGY-RELATED GREENHOUSE GAS EMISSIONS, BY FUEL SOURCE



Energy conservation

Energy conservation is an important first step toward energy resiliency. By increasing efficiency, residents and businesses can save energy and money. Xcel Energy offers a wide variety of energy conservation programs to help residents and businesses increase energy efficiency. Between 2015 and 2017, annual energy conservation savings have amounted to an average of 1.2% of electricity consumption and 0.7% of natural gas consumption.

FIGURE 7: ELECTRICITY SAVINGS FROM ENERGY CONSERVATION PROGRAM PARTICIPATION, BY SECTOR²³



²³ Commercial and Industrial electricity savings includes municipal premises.

FIGURE 8: NATURAL GAS SAVINGS FROM ENERGY CONSERVATION PROGRAM PARTICIPATION, BY SECTOR²⁴

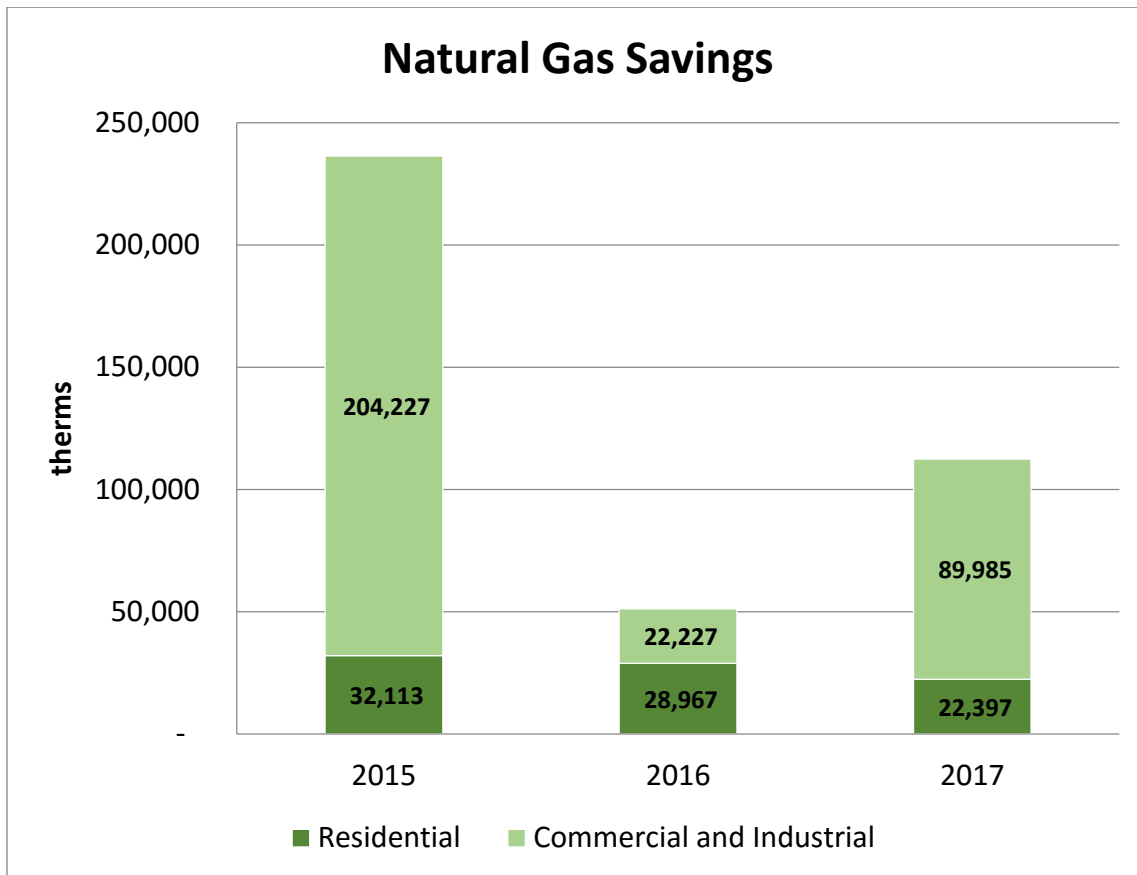


Table 1 summarizes residential and commercial/industrial participation in Xcel Energy’s energy conservation programs for the past three years. Total participation in residential conservation programs has increased slightly since 2015. In 2017, Northfield residents saved 168,000 kWh and 22,000 therms, 0.5% of total residential energy use. Residential program participation has been highest in the Saver’s Switch rate savings program. Participation in home efficiency rebates, including the replacement of heating and cooling equipment, has also seen high participation. Lighting rebates have been most popular among commercial and industrial customers. In 2017, commercial and industrial premises saved 2 million kWh and 90,000 therms, representing 0.7% of total sector energy use.

²⁴ Commercial and Industrial natural gas savings includes municipal.

TABLE 1: RESIDENTIAL AND COMMERCIAL/INDUSTRIAL CONSERVATION PROGRAM PARTICIPATION SUMMARY²⁵

Program Name		2015	2016	2017
Residential	Efficient New Home Construction	9	16	3
	Home Energy Audit	29	11	17
	Home Energy Savings Program	4	7	-
	Home Energy Squad	26	4	8
	Insulation Rebate	2	2	5
	Low-Income Home Energy Squad	8	-	1
	Multi-Family Energy Savings Program	-	8	-
	Refrigerator Recycling	24	20	19
	Residential Cooling	108	135	123
	Residential Heating	137	147	145
	Residential Saver's Switch	20	45	383
	Smart Thermostat	-	47	22
	Whole Home Efficiency	-	1	-
	Water Heater Rebate	19	19	20
	Total	386	462	746
Program Name		2015	2016	2017
Commercial/Industrial	Computer Efficiency	-	1	-
	Cooling Efficiency	2	7	6
	Custom Efficiency	6	-	6
	Data Center Efficiency	-	-	-
	Efficiency Controls	-	-	-
	Electric Rate Savings	3	7	1
	Energy Design Assistance	-	-	2
	Energy Efficient Buildings	1	-	-
	Fluid System Optimization	-	3	-
	Foodservice Equipment	-	1	5
	Heating Efficiency	4	5	8
	Lighting Efficiency	19	22	18
	Motor Efficiency	1	6	5
	Multi-Family Building Efficiency	-	6	5
	Process Efficiency	-	-	-
	Recommissioning	4	12	-
	Saver's Switch For Business	2	28	1
	Turn Key Services	-	-	-
Small Business Lighting	8	4	10	
Total	50	102	67	

Renewable energy

Northfield has made strides to support both off-site and on-site renewable energy generators. Supporting renewable energy development is important to ensuring Northfield remains resilient to future impacts of climate change.

Off-site renewable energy

Renewable energy generators, such as solar panels or wind turbines, are off-site from the facility or home that they are powering. We see support for this type of renewable energy through participation in

²⁵ Commercial and Industrial Conservation Improvement Program participation includes municipal premises.

utility-sponsored renewable energy subscription programs and community solar garden subscriptions. Table 2 shows the breakdown of renewable energy subscriptions in 2017.

TABLE 2: RENEWABLE ENERGY SUBSCRIPTIONS, 2017

Windsorce®	Residential	Commercial & Industrial
Subscribers	437	3
Subscription Amount (kWh)	1,370,700	14,707,249
% of Sector Electricity Use	2.9%	6.8%
Community Solar Gardens		
Subscribers	143	2
Production Allocation (kWh)	252,528	9,223,272
% of Sector Electricity Use	0.5%	3.6%
Renewable*Connect ²⁶		
Subscribers	33	11
Subscription Amount (kWh)	196,031	9,711,809
% of Sector Electricity Use	0.4%	4.6%

On-Site renewable energy: Behind the meter

Renewable energy generators, such as solar panels or wind turbines, are installed on-site to supply some or all of the power for that facility or home.

TABLE 3: BEHIND THE METER ENERGY GENERATORS, 2017

Solar*Rewards ²⁷	Residential	Commercial & Industrial
Installations	76	5
Total Capacity (kW)	487	67
Total Energy Produced (kWh)	310,468	43,677
Wind Turbines		
	Carleton College	St. Olaf College
Total Energy Produced (kWh)	3,863,546	2,840,218

²⁶ Renewable*Connect subscriber data for 2018.

²⁷ Solar*Rewards is an incentivized program, so monthly payments are made to the owner of the solar system in exchange for Renewable Energy Credits (RECs) for the energy produced by the solar system. Data for 2017.

Appendix 3: 18-month Energy Action Jump Start

The 18-month Energy Action Jump Start includes 14 strategies and near-term targets to help Northfield hit the ground running towards meeting our carbon reduction targets. Implementation of these strategies and achieving near-term targets will require a lot capacity building and problem solving. The City of Northfield will lead these strategies, but additional human, financial, and policy resources will be needed to ensure we are successful. Xcel Energy's Partners in Energy will provide marketing and communications support, data tracking and measurement, program expertise, and project management to keep our team on track during the 18-month implementation.

At the core of the 18-month Energy Action Jump Start is accessible education and outreach. This will ensure everyone in the Northfield community is aware of the benefits of energy efficiency and renewable energy, and resources are available. The City of Northfield will make an effort to ensure materials are available in different formats and other languages, as needed.

Our outreach is focused on two target audiences:

- **Small Consumers:** inclusive of all residents, including homeowners and renters, small businesses, and nonprofit organizations.
- **Large Consumers:** inclusive of local institutions, such as the colleges and hospital, large businesses, and industrial businesses.

Detailed strategies were created for each target audience and include specific tasks, near-term targets, outreach tactics, implementation team, and resources. Near-term targets will be achieved by the end of 2020 and measured against a 2017 baseline.

Part 1: Small consumer strategies

Small Consumer Strategy A) Create centralized, quick-reference guide on energy efficiency and renewable energy options for residents	
Description	The centralized, quick-reference guide will make it easy for residents to learn about different energy efficiency and renewable energy options. The guide will be available electronically and hard copy.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Provide recommendations for information and tips to include in guide • Print hard copies of guide • Host guide on City website • Post social media content on City social media to promote guide’s availability • Share guide with community partners to share with their network • Support Energy Task Force distribution at community events <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Provide recommendations for information and tips to include in guide • Distribute guide at City and community events <p>Partners in Energy</p> <ul style="list-style-type: none"> • Draft content for guide • Format and design guide • Create social media content promoting guide’s availability
Timeline	<ul style="list-style-type: none"> • Q3 2019
Goal(s)	<ul style="list-style-type: none"> • Create and publish guide
Resources	<ul style="list-style-type: none"> • Webpage(s) to host guide on City website • Hard copy of guide • Information and tips to include in guide • Partners in Energy hours to help write and design guide • Community partners for dissemination, such as Greater Northfield Sustainability Coalition, Rotary Club, Carleton College, St. Olaf College, Northfield School District, and By All Means Graphics • Funding to assist with printing costs

Small Consumer Strategy B) Promote home energy audits through city-wide marketing campaign

Description	Home energy audits are an easy way for residents to learn about energy efficiency opportunities in their home. Home Energy Squad® offers custom energy-saving solutions in one visit. Homeowners and renters who live in 1–4 unit buildings are eligible to participate and free visits are available to income-qualified households.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Identify communication channels to promote information • Host information on City website • Promote home energy audits on City social media • Share information materials with community partners to share with their network <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify City and community events to table at • Identify volunteers to help with tabling • Identify neighborhood captains to help promote Home Energy Squad in their neighborhood • Table at City and community events <p>Partners in Energy</p> <ul style="list-style-type: none"> • Create informational flyer/postcard • Create social media posts promoting energy audits • Train neighborhood captains • Create tabling kit for volunteers <p>Neighborhood Captains</p> <ul style="list-style-type: none"> • Attend training • Conduct targeted outreach in neighborhoods <p>Home Energy Squad</p> <ul style="list-style-type: none"> • Share eligibility and program information with implementation team • Deliver energy audits
Timeline	<ul style="list-style-type: none"> • Q4 2019–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • 100 Home Energy Squad visits completed in 2020 <ul style="list-style-type: none"> ○ Baseline: 8
Resources	<ul style="list-style-type: none"> • Information materials about • Webpage(s) to host materials • Community events for tabling • Volunteers to table • Tabling kits • Volunteers to be neighborhood captains • Training materials for volunteers • Community partners for dissemination, such as the Greater Northfield Sustainability Coalition, ISIAAH, Northfield Rotary Club, Northfield School District, and Northfield Community Education

Small Consumer Strategy C) Design city-wide challenge for residents to subscribe 100% to renewable energy

Description	Renewable energy is important to helping our community reduce its carbon footprint. A renewable energy challenge will help promote renewable energy subscriptions, which are an easy way for all residents to access renewable energy. The challenge will be for residents to subscribe to 100% renewable electricity.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Promote challenge on City communication channels • Provide input on challenge structure and rules • Identify dates for challenge • Identify prizes or incentives to offer to participants • Create entry form • Engage Neighborhood Captains and Energy Task Force to conduct door-to-door outreach or host block parties to promote • Share challenge information with community partners to share with their network <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Table at City and community events to encourage registration • Engage in door-to-door marketing or energy block parties • Provide input on challenge structure and rules <p>Partners in Energy</p> <ul style="list-style-type: none"> • Assist with creating challenge structure and rules • Create promotional materials for challenge, including flyers and social media content • Provide funding towards prize or incentives to offer to participants • Create structure and materials for energy block parties
Timeline	<ul style="list-style-type: none"> • Q1 2020–Q2 2020
Goal(s)	<ul style="list-style-type: none"> • Double the number of residents who subscribe 100% of their electricity to renewable energy <ul style="list-style-type: none"> ○ Baseline: 86
Resources	<ul style="list-style-type: none"> • Challenge structure • Challenge rules • Prize or incentive for challenge participants • Webpage(s) to host challenge information • Informational materials to promote challenge • Entry form for prizes or incentives • Data to track progress towards challenge goal • Volunteers to table and promote during events • Community partners to promote challenge, such as Greater Northfield Sustainability Coalition, ISIAAH, and Northfield Rotary Club

Small Consumer Strategy D) Targeted outreach to under-resourced residents at manufactured home parks to promote energy efficiency upgrades

Description	Under-resourced households, which include low-income and fixed-income residents, typically experience energy burden at a higher rate than others. These
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	households can greatly benefit from energy efficiency upgrades. There are free programs and resources available to income-qualified households that would be the focus of this outreach.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Identify local service provider partners • Coordinate outreach with service provider partners • Identify date(s) for outreach • Support door-to-door outreach • Share information with service providers and community partners to distribute within their network • Share newsletter article about success <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Support door-to-door outreach <p>Partners in Energy</p> <ul style="list-style-type: none"> • Coordinate outreach with service provider partners • Create information materials and handouts • Translate information materials (if needed) • Write newsletter article about outreach and success <p>Growing Up Healthy</p> <ul style="list-style-type: none"> • Identify manufactured homes for outreach • Identify date(s) for outreach • Conduct door-to-door outreach • Distribute flyers or emails to manufactured home park residents about outreach <p>Home Energy Squad</p> <ul style="list-style-type: none"> • Share eligibility and program information with implementation team • Deliver energy audits
Timeline	<ul style="list-style-type: none"> • Q3 2019–Q4 2019
Goal(s)	<ul style="list-style-type: none"> • Conduct outreach at both manufactured home parks in Northfield • 50 participants in Xcel Energy’s low income programs: Home Energy Savings Program (HESP) and Low Income Home Energy Squad <ul style="list-style-type: none"> ○ HESP Baseline: 0 ○ Low Income Home Energy Squad Baseline: 1
Resources	<ul style="list-style-type: none"> • Co-branded information materials targeting under-resourced residents and programs • Volunteer time to assist with door-to-door outreach • Partnership with local service providers to help with outreach • Staff hours/volunteers to help coordinate outreach between partners • Translation services for materials and outreach (if needed) • Service providers and partners, such as Community Action Center of Northfield and Northfield Housing and Redevelopment Authority • Community partners to support outreach, such as Greenvale Park Community School, ISAIAH, Neighbors United, and Northfield Rotary Club.

Small Consumer Strategy E) Co-host free electric vehicle ride and drive events at existing community events, places of employment, and/or destinations

Description	Electric vehicles have the potential to drastically reduce emissions and air pollution by utilizing increasingly green electricity fueled by renewables. Electric vehicle ride and drives help educate the public about the benefits of owning an electric vehicle. Ride and drives give community members an opportunity to sit in and in some cases, test drive a vehicle.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Promote ride and drive events on City website and social media • Share event information with local business associations and community partners to distribute to their network <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify existing events, places of employment, and destinations to host ride and drives • Outreach to local event organizers and places of employment to assess interest in partnering to host ride and drive • Outreach to local electric vehicle groups to assess interest in providing vehicles for event • Coordinate event logistics with event coordinators • Table at event to share utility program information, such as rate structures and incentives • Promote ride and drive events using the host event or host destination’s network and marketing materials <p>Partners in Energy</p> <ul style="list-style-type: none"> • Create informational materials about EVs and charging
Timeline	<ul style="list-style-type: none"> • Q3 2019–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • Host 3 ride and drive events
Resources	<ul style="list-style-type: none"> • Volunteers to conduct outreach to potential event co-hosts • Existing community events to co-host ride and drive • Informational materials about electric vehicles and charging rates to share during event • Partnership with local electric vehicle groups to supply vehicles • Partnership with Northfield Area Chamber of Commerce & Tourism and Northfield Downtown Development Corporation • Community partners to host, such as Greater Northfield Sustainability Coalition, Northfield Rotary Club, Northfield School District, Carleton College, and St. Olaf College, and local car dealers that sell electric vehicles. • Community events to host, such as Riverwalk Market Fair, Defeat of Jesse James Days, Crazy Days, Home & Garden Show • Local businesses or destinations with parking lots to host, such as local car dealerships who sell electric vehicles.

Small Consumer Strategy F) Survey small businesses and nonprofit organizations about how they use and think about energy to develop a targeted outreach campaign

Description	Small businesses and nonprofit organizations are an important part of our action plan. Identifying how they use and think about energy will allow the City of Northfield and Energy Subcommittee to further identify and refine strategies for engaging businesses and nonprofits. The survey will include questions about energy efficiency and renewable energy generation.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Distribute survey using City communication channels • Share survey with local business associations and community partners to distribute to their network • Partner with Northfield Economic Development Authority for engaging businesses to complete survey • Assist with creating small business strategies to further engage business community <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify business associations to help with promotion and outreach • Assist with creating small business strategies to further engage business community <p>Partners in Energy</p> <ul style="list-style-type: none"> • Gather input on questions from implementation team • Create survey • Set timeline for survey responses • Review and analyze survey results • Assist with creating small business strategies to further engage business community
Timeline	<ul style="list-style-type: none"> • Q1 2020–Q2 2020
Goal(s)	<ul style="list-style-type: none"> • Distribute one small business/nonprofit organization survey
Resources	<ul style="list-style-type: none"> • Survey platform • Survey questions • Partnerships with local business associations to disseminate survey, such as Northfield Area Chamber of Commerce & Tourism, Northfield Downtown Development Corporation, and Northfield Rotary Club • Community partners to disseminate survey, such as the Greater Northfield Sustainability Coalition, ISIAAH, Carleton College, and St. Olaf College

Small Consumer Strategy G) Engage small businesses and nonprofit organizations in energy efficiency action through door-to-door outreach with energy coaches

Description Door-to-door outreach, sometimes call a “business blitz,” can be an effective way to engage small businesses and nonprofit organizations to spread the message of energy efficiency and renewable energy. As part of a blitz, volunteers will go door-to-door with a simple call to action, such as sign up for a free energy assessment. Energy coaches act as points of contact for businesses to answer questions and encourage action.

Implementation Team and Tasks

City of Northfield

- Support coordinating volunteers and energy coaches for door-to-door outreach
- Identify dates for door-to-door outreach
- Promote outreach on City communication channels
- Distribute information materials on City communication channels
- Identify date and host for a celebration event for organizations and volunteers who participated in blitz
- Send invitations and collect RSVPs for celebration event
- Order refreshments and food for celebration event
- Issue a final report celebrating the total number of businesses reached during the blitz, and the number of projects completed with savings

Northfield Energy Task Force

- Identify call to action for businesses to take
- Identify volunteers to serve as energy coaches
- Establish partnerships with local business associations and civic associations
- Share information materials, door-to-door outreach dates, and final report with local business associations to distribute to their network
- Support celebration event coordination, including identifying date, space, and inviting attendees

Partners in Energy

- Use business/organization survey (see Small Consumer Strategy F) results to create information materials with call to action information
- Support coordinating volunteers and energy coaches for door-to-door outreach
- Train volunteers and energy coaches
- Create informational materials for distribution
- Create final report celebrating final number of businesses
- Provide funding support for refreshments and food for celebration event

Energy Coaches

- Support door-to-door outreach to businesses and nonprofit organizations
- Conduct follow up to encourage action and follow through on recommendations

Clean Energy Resource Teams (CERTs)

- Coordinate volunteers and energy coaches for door-to-door outreach
- Support training energy coaches

	<ul style="list-style-type: none"> • Conduct door-to-door outreach to businesses and nonprofit organizations
Timeline	<ul style="list-style-type: none"> • Q2 2020–Q3 2020
Goal(s)	<ul style="list-style-type: none"> • Conduct one door-to-door “blitz” campaign in downtown Northfield • Sign up 30 businesses or nonprofit organizations to complete/move forward with the call to action
Resources	<ul style="list-style-type: none"> • Volunteers to help with outreach • Volunteers to act as energy coaches • Training materials and talking points for energy coaches • Information materials with call to action information, such as free assessment and audit information • Local business organizations to support outreach, such as Northfield Area Chamber of Commerce & Tourism, Northfield Downtown Development Corporation, Northfield Enterprise Center, and Northfield Rotary Club • Community partners to support outreach, such as the Greater Northfield Sustainability Coalition, Carleton College, and St. Olaf College • Space for celebration event • Invitation platform for celebration event • Refreshments and food for celebration event

Small Consumer Strategy H) Host an “energy” booth for the 2020 Northfield Home & Garden Show, Earth Day Celebration, River Walk Market Fair and other city-wide events

Description	The Northfield Home & Garden Show is an excellent opportunity to reach small consumers about energy efficiency and renewable energy information. An “energy” booth will share information about how to integrate energy efficiency into a home renovation and programs available to help keep costs low.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Engage Northfield Area Chamber of Commerce about adding booth to 2020 event • Promote energy booth on City communication channels <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify and mobilize volunteers to table • Leverage existing marketing for event by Northfield Area Chamber of Commerce <p>Partners in Energy</p> <ul style="list-style-type: none"> • Create tabling materials, including flyers about energy efficient renovations
Timeline	<ul style="list-style-type: none"> • Q4 2019–Q2 2020
Goal(s)	<ul style="list-style-type: none"> • Energy booth at 2020 Northfield Home & Garden Show
Resources	<ul style="list-style-type: none"> • Volunteers for tabling • Information materials • Tabling kit and materials

Part 2: Large consumers strategies

Large Consumer Strategy A) Host best practice energy workshops and tours with case studies	
Description	Energy workshops and tours are an effective way to share energy efficiency and renewable energy success stories with other large consumers. Workshops are a great way to share best practices and ROI information that resonates with businesses. Tours can show attendees real life application of energy efficiency and renewable energy measures.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Coordinate initial tour and or workshop structure • Assist with creating distribution list with contact information for large consumers and other attendees to invite • Promote workshops/tours on City communication channels • Share tour dates and information with local partners to share with their network • Share press release to promote workshops/tours <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify potential workshop/tour hosts • Assist with creating distribution list with contact information for large consumers and other attendees to invite • Send invitations for tour(s) • Follow up with attendees to encourage action and to host their own workshop or tour <p>Partners in Energy</p> <ul style="list-style-type: none"> • Draft case study/flyer about improvements • Write press release to promote workshops/tours <p>Xcel Energy</p> <ul style="list-style-type: none"> • Attend tours to share information about Xcel Energy rebates and programs <p>Energy Subcommittee Large Consumer Representatives</p> <ul style="list-style-type: none"> • Volunteer to host tour
Timeline	<ul style="list-style-type: none"> • Q4 2019–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • Host 5 tours, per year
Resources	<ul style="list-style-type: none"> • Structure for tours • Invitation and RSVP platform • Workshop/tour hosts • Presenters • Presentation materials for workshop/tour hosts • Refreshments and food for event • Local partners to support outreach, such as Greater Northfield Sustainability Coalition, Northfield Area Chamber of Commerce & Tourism, Northfield Downtown Development Corporation, Northfield Enterprise Center, Economic Development Authority, and Northfield Rotary Club • Local institutions to act as initial hosts, such as Carleton College, St. Olaf

Large Consumer Strategy B) Facilitate a large consumer energy coalition to share best practices on action plans and carbon reduction goals

Description	Each large consumer must be entrusted to develop their own action plan tailored to their specific organizational mission and operations. The purpose of this strategy is to encourage large users to compare existing action plans and goals, create a plan and set goals (for those who haven't already done so), and share resources, approaches and best practices with respect to large consumer energy conservation and carbon reduction strategies.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Identify group facilitator/convener • Create platform or process for sharing best practices with coalition <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Invite large users to join coalition • Engage existing network of institutions and large consumers to promote network and best practices <p>Energy Subcommittee Large Consumer Representatives</p> <ul style="list-style-type: none"> • Volunteer to join coalition
Timeline	<ul style="list-style-type: none"> • Q3 2019–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • Create energy coalition • One action plan created by member of energy coalition
Resources	<ul style="list-style-type: none"> • Large consumers and institutions willing to share best practices for creating action plan and carbon reduction goals, such as Carleton College, St. Olaf College, and Northfield Hospital • Network of large consumers to engage and work together • Volunteer(s) to coordinate and conduct initial outreach to join coalition

Large Consumer Strategy C) Recognize large consumers’ renewable energy investments and energy efficiency upgrades through different communication channels

Description	Promoting local efficiency and renewable energy investments can help demonstrate action and leadership by Northfield’s large consumers. Actions of large consumers can inspire others to take action.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Promote success stories on City communication channels • Feature articles in City’s Economic Update Newsletter • Identify location to archive success stories in a single location <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify large consumers to feature • Engage local business organizations to share information with their network • Assist with identifying additional platforms where success stories will be featured <p>Partners in Energy</p> <ul style="list-style-type: none"> • Interview or collect information about investments • Create case studies and testimonials to be distributed in different formats
Timeline	<ul style="list-style-type: none"> • Q4 2019–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • Feature one large consumer each quarter
Resources	<ul style="list-style-type: none"> • Large consumer contact information • Interview questions to collect success story information • Different communication channels to feature success stories • Local business organizations to disseminate information, such as Northfield Area Chamber of Commerce & Tourism, Northfield Downtown Development Corporation, Northfield Enterprise Center, and Northfield Rotary Club

Large Consumer Strategy D) Targeted outreach to large consumers to complete energy assessments and audits

Description	Energy assessments and audits are a great way for a business to learn how they use energy and to identify areas of opportunity for efficiency and conservation. Ranging from free assessments to full service audits, there are different options available for large consumers to identify energy saving opportunities.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Include audit and assessment information on City website • Share information materials with local business organizations to share with their network • Support targeted outreach using business organization networks <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify communication channels for large consumers • Support targeted outreach using business organization networks • Track number of 1-1 contacts and resulting actions <p>Partners in Energy</p> <ul style="list-style-type: none"> • Identify all assessment and audit options • Create information materials about energy audits and assessment options • Write article about free and low-cost assessments in local newspaper • Connect with Xcel Energy account managers to share information with customers
Timeline	<ul style="list-style-type: none"> • Q3 2019–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • 10 participants total in Xcel Energy energy assessment and audit programs: Process Efficiency, Recommissioning, and Turn Key Services <ul style="list-style-type: none"> ○ Baseline: 0
Resources	<ul style="list-style-type: none"> • Information materials on assessment and audit options • City webpage(s) to host information materials • Local business organizations to disseminate information, such as Northfield Area Chamber of Commerce & Tourism, Northfield Downtown Development Corporation, Northfield Enterprise Center, and Northfield Rotary Club

Large Consumer Strategy E) Promote fleet electrification by sharing information with large consumers and organizations with fleet vehicles to encourage electrification

Description	Electric vehicles have the potential to drastically reduce emissions and air pollution by utilizing increasingly green electricity fueled by renewables. Fleet electrification is an opportunity for organizations to reduce their carbon impact, and find cost savings in maintenance and fuel.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Assist with identifying relevant information and best practices to include in informational materials • Leverage City communication channels to share information materials <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify local businesses and organizations with fleet vehicles • Develop a list of available financing options, grants, incentives and other resources • Outreach to fleet vehicle owners to share information materials <p>Partners in Energy</p> <ul style="list-style-type: none"> • Identify relevant fleet electrification information • Identify fleet electrification case studies and best practices • Create fleet electrification information materials
Timeline	<ul style="list-style-type: none"> • Q3 2020–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • Create information materials and distribute to community
Resources	<ul style="list-style-type: none"> • Fleet electrification information • Examples/case studies for fleet electrification • Volunteers to conduct outreach and share information with local fleet owners

Large Consumer Strategy F) Encourage transparency in annual energy and carbon footprint reporting to help track progress by Northfield's large consumers

Description	Transparency in large consumers’ energy use and carbon footprint will demonstrate to the community the benefits of energy efficiency and renewable energy, as well as give a clear picture of their contribution towards achieving our community-wide goal.
Implementation Team and Tasks	<p>City of Northfield</p> <ul style="list-style-type: none"> • Support Northfield Energy Task Force outreach • Feature annual article in City’s Economic Update Newsletter listing large consumers who participate <p>Northfield Energy Task Force</p> <ul style="list-style-type: none"> • Identify the desired format and frequency for reporting • Identify how/where the data will be displayed and used • Identify large consumers for outreach and specific point person • Identify volunteer to conduct outreach • Conduct outreach <p>Partners in Energy</p> <ul style="list-style-type: none"> • Create talking points for outreach • Identify how this data will be incorporated into annual reporting of total community energy data received from Xcel Energy <p>Energy Subcommittee Large Consumer Representatives</p> <ul style="list-style-type: none"> • Volunteer to participation in annual reporting
Timeline	<ul style="list-style-type: none"> • Q1 2020–Q4 2020
Goal(s)	<ul style="list-style-type: none"> • Points of contact made with 10 large consumers to encourage transparency
Resources	<ul style="list-style-type: none"> • List of large consumers to contact • Volunteers to conduct outreach • Talking points for volunteers • Platform or resource to share reporting for all participants in a single place

Appendix 4: 2008 Mayor's Energy Task Force Report Summary

With Hope: A Resilient Community

An Action Plan for Northfield Area Energy Sustainability

Introduction

Northfield, along with the rest of the world, faces twin energy challenges: fossil energy supply with price uncertainty and global climate change, driven largely by the release of carbon dioxide from fossil fuel combustion. The recent surges in oil, gasoline, and diesel prices; accompanying economy-wide inflation concerns; and the growing scientific consensus on climate change highlight the urgency of these problems. The Northfield Energy Task Force (NETF) was created by resolution of the Northfield City Council in May 2007 to respond to these challenges.

Four charges and summary of recommendations

1. To assess opportunities to develop local energy efficiency and clean energy projects that will a) protect the community from future energy price and supply instability, b) enhance local economic development, and c) provide local, regional and global environmental benefits
 - a. **Six viable opportunities for city government listed in the report**
2. To assess the efficacy of creation of a municipal electric utility or special energy district in achieving parts a, b, and c of Charge 1.
 - a. **Recommend not to pursue a municipal utility at this time because costs are so great**
 - b. **Ensure any new industrial park be powered by renewable energy, developed using best environmental practices and attract green businesses.**
 - c. **Work toward establishing a special energy district for high efficiency combined heat and power (CHP) and cooling to service existing industrial and institutional users**
3. To recommend citywide target greenhouse gas emissions reductions to fulfill Milestone 2 of the city's commitment to the Cities for Climate Protection Campaign (CCPC)
 - a. **"Carbon-free by '33" (100% reduction) with milestones of 15% reduction by 2013 and 50% reduction by 2028**
 - b. **Begin annual measurement /inventory and update annually**
4. To develop an action plan to meet the CCPC targets identified in Charge 3 and report to City Council by the end of May 2008.
 - a. **Use local government policy tools to facilitate achievement of CCPC targets**
 - b. **Recommend a Climate Action Plan of ten items**

City Action Steps

1. Lead clean energy projects and model energy conservation/efficiency efforts within the community to create social norms of energy conservation/efficiency for all.
2. Direct City staff to consider climate, energy, environmental, economic, and social impact of all decisions using life cycle analysis and monetary impact analysis. Life cycle analysis should include social cohesion and dislocation, community resiliency and vulnerability, physical, economic, environmental, security, energy, and climate assessment. In addition monetary

impact analysis would include financial cost/benefit analysis and consideration of available funding resources (see Appendix 5)

3. Develop local policies and initiatives that help create demand for green collar occupations through public sector investments and incentives and requirements that drive private sector investments.
4. Create a permanent Energy Commission reporting directly to the City Council.
5. Set up a 1-Stop-Shop for energy and staff it with a professionally qualified Energy Coordinator.
6. Create/expand city policies, ordinances, plans and guidelines (see full report for suggestions)

Community Action Steps

1. Citizen group reports and next steps (see list of reports below)
2. Alliance organizations (CERTS, Green workforce education, America in Bloom CRWP, etc.)
3. Suggestions for residential energy users (green, greener, greenest)
4. Suggestions for commercial / industrial / institutional energy users (green, greener, greenest)
5. All-community challenge: greening up your organization

Future Opportunities

- **Systems integration** – coordinate all elements of energy supply, demand and production in a holistic manner that maximizes Northfield’s resiliency. (e.g. the Natural Step Program).
- **Transportation** – Significant reduction in transportation fuel use will likely require the slow creation of a new fleet of highly efficient vehicles. Suggestions include develop local transportation infrastructure, use van and car pools, use existing and explore additional transit bus services, continue to explore creation of the Dan Patch Line.
- **Hydro-electric power** – Based on advice from experts, the group determined [hydro power] was not feasible at this time due to the condition of the dam, the negative environmental impact and the economic cost. However, suggest the city continue to monitor the availability of run-of-the-river or other appropriate technologies.
- **Wastewater management** – The Task Force looked at anaerobic digestion as a means to generate power but the cost to convert the current plant to add digestion while maintaining quality water treatment makes the conversion unprofitable.
- **Solid waste management** – The City of Northfield may decide to manage the collected city waste by directing the waste to a “waste to energy” plant that generates electricity, or may decide to develop a combined heat and power plant or gasification plant as described in the Appendices.

Ideas on how to pay for climate work (see report for full list)

- City department budgets
- Operating savings from energy efficiency
- 2% bond issue
- Third party agreement (private / public partnership)
- Corp of Engineers funding
- Financing initiatives
- Federal tax credits

- Carbon tax
- Employee bonus programs
- Give departments a greenhouse gas budget to live within
- Reduce commuting
- Parking fees
- Local government roadmap
- EPA
- Streamline permitting for those who adhere to standards
- Loans
- Clean renewable energy bonds

Citizen reports – see report appendices for details

- **Biomass gasification and combined heat and power** – using biomass feedstocks to produce gas, capturing the heat off an electric generator and/or producing electricity as a byproduct of making heat.
- **Cluster heat pump system** – for new development that shares a common “green space” that can be used for horizontal or vertical ground source heating and cooling loop.
- **Minnesota energy challenge** – energy conservation measures pledged by households, businesses, schools, and religious organizations.
- **Small and large wind turbines** – currently difficult to develop a single or small number of large turbines but Northfield area could support wind farming (20 or more large turbines). Small wind production should also be promoted and encouraged as housing codes, regulations, etc. are developed in the city. But fragmentation of energy, rather than constructive focusing, is a direct concern. Some don’t see wind as the most viable means for Northfielders reducing their carbon footprint, could focus instead on solutions like conservation, solar thermal, etc.

Appendix 5: Comprehensive Plan Implementation Matrix Excerpts

The following are examples of Comprehensive Plan strategies that intersect with the goals of the Energy Subcommittee and could be enhanced or enforced through implementation of the Northfield Energy Plan recommendations.

Community Identity

CI 1.1 Preserve the scenic quality of the rural landscape by defining the edge of the community and maintain the rural character of roadways on the edges of the community.

C 1.4 Ensure that all development, redevelopment and expansion be compatible with the desirable features of the natural and man-made environment.

CI 3.2 Provide economic incentives and design flexibility to aid in the restoration and long-term economic vitality of historically significant buildings in the Downtown.

CI 4 Encourage a traditional development pattern – could this also include requirements to rethink utility structures, integrate renewables, etc.?

CI 7.1 Coordinate with the school district on population growth and residential developments in order to reserve sites for future school facilities as population growth may require – *can these facilities soon be built as net zero energy buildings?*

Land Use

LU 1.6 Annually monitor the land use of residential as compared to commercial and industrial land use as a means to accomplish the overall planning objectives of the city.

LU 2.4 Encourage pedestrian paths and trail connections from commercial uses to adjoining residential developments and places of employment.

LU 2.5 Encourage more compact housing as a component of infill, redevelopment or land intensification projects.

LU 3.1 Create incentives to encourage infill, redevelopment, and land intensification.

LU 3.2 Work collaboratively to identify structures and sites for redevelopment, intensification or reuse.

LU 3.3 The EDA with assistance of City staff will prepare a marketing program for targeted structures and/or sites for infill, redevelopment, and land intensification.

LU 3.4 Establish priorities for capital improvements that are directed toward infill sites and mature neighborhoods.

LU 3.5 Facilitate redevelopment of uses that do not fit the development pattern of downtown but which with better design could increase density and provide more commercial, office or housing opportunities.

LU 6.2 Prepare educational material on alternative development choices for protecting natural areas – for the public and development community. *Can these be created for energy efficiency outreach also?*

LU 6.4 Identify and prioritize land for open space preservation.

LU 6.5 Create a program to acquire open space and environmentally significant lands.

LU 7.4 Encourage the use of conservation easements as a means to preserve productive agricultural land, greenways and environmentally significant areas.

LU 7.5 Work with other units of government, including Rice and Dakota Counties, to preserve agricultural land uses.

LU 8 Provide locations that facilitate economic development opportunities –*are there ways to integrate new approaches to utilities, i.e. district energy and integration of renewables?*

LU Improve the development review process – *Can it incorporate energy efficiency requirements?*

Environmental Resources

ER 1.1 Promote education about energy and resource conservation in the community.

ER 1.2 Incentives should be developed to promote energy efficiency in the design, construction and operation of residential, commercial and industrial buildings.

ER 4.1 Encourage the use of energy conservation technologies and techniques and promote the exploration and innovation of new methods to conserve energy.

ER 4.2 Strive to build or renovate city-owned buildings to meet LEED standards.

ER 4.3 Building design standards will allow for and accommodate changing solar technologies.

ER 4.4 Evaluate the recommendations of the Energy Task Force and promote implementation of the strategies as appropriate.

ER 10 The City will remain responsive to issues of climate change and will act to reduce Northfield's contribution to climate change.

ER 10.3 Promote the reduction of greenhouse gas emissions at residential, industrial and commercial scales.

ER 10.4 Encourage conservation standards at residential, industrial and commercial scales.

Sewer and Water Resources

SW 1.4 Address legal limitations, fairness, property benefits and responsible use of public funds when financing public utility extension that force the City's growth and redevelopment objectives. Priority will be given to infill and redevelopment of the existing urbanized area to maximize efficiency of the existing water and sewer infrastructure systems *and energy utilities?*

SW 3 Heighten community awareness of sustainability issues through education and training.

CR 1.1 The City's Capital Improvement Plan should include funding for future building renovations and / or new construction. *Can we include emphasis on energy efficiency requirements, LEED, net zero energy, integration of renewables in city funded renovations or construction?*

CF 2.3 Construction or renovation of publicly-owned buildings should be environmentally responsible and energy efficient.

Economic Development

ED 1.2 Assure availability of key informational resources to support decision-making of existing businesses.

ED 1.3 Offer leveraging financial tools to strengthen businesses and promote business expansions. *Can public funding come with energy efficiency requirements?*

ED 1.4 Adopt a regulating policy that accommodates and provides incentives for infill and redevelopment opportunities. *What are these incentives and can they also come with energy efficiency requirements?*

ED 2.2 Land resources that are adjacent to the city limits of Northfield and are relatively easy to serve with the extension of infrastructure should be pursued for future commercial and industrial development.

ED 2.3 The City will support strategies of annexation that are designed to provide additional land resources for commercial and industrial development, and that are in compliance with the overall objectives of the Comprehensive Plan. *Can new development be net zero?*

ED 2.4 The areas that have been identified west of the Northfield Hospital, west of the existing industrial area and south of Hwy 19 and north of the city limits in Waterford Township along the Thye Parkway corridor should be viewed as priority areas for additional evaluation and possible annexation into the city. When these areas are considered for annexation the City will review the requests with a Master Plan for the area. *Can this plan include renewable energy, net zero, district energy development?*

ED 3.4 Encourage further redevelopment / intensification in downtown as a means to maintain the vitality of this area. Downtown redevelopment / intensification should focus on retail uses, professional services, arts activities including opportunities for live-work development, businesses that support other businesses, and downtown housing.

ED 4.2 Seek opportunities for the Northfield Hospital to be a stimulus for economic development.

ED 4.4 Seek ways to better integrate the economically-challenged into the economic life of Northfield, such as providing for affordable housing and targeting small business incentive programs to this segment of the economy.

ED 4.6 Support programming efforts to further tourism in Northfield, e.g. historic and festival programs, arts and culture programs and tours. *How about eco/energy tourism?*

Housing

HS 1.2 Revise zoning and subdivision ordinances to ensure opportunities for development of alternative housing types and styles, including mixed-use neighborhoods, accessory or mother-in-law apartments, modular homes, manufactured home parks and other innovative approaches to housing.

HS 1.5 As determined necessary, conduct a city-wide housing analysis to identify current housing types, densities, values, vacancy rates and locations for use as a guide to future housing development and as a measure of affordable housing.

HS 1.6 Establish standards for compact residential development and intensified land uses.

HS 1.7 The preference for new residential development should be for infill, then redevelopment, and then greenfields within the city limits, and then within the Priority Growth Area.

HS 1.8 The needed balance between housing and commercial / industry and the current supply of housing will be important factors in consideration of annexation requests for additional housing. *Can growth of carbon emissions also be a consideration?*

HS 2 Preserve the character and style of existing neighborhoods that have created Northfield’s sense of place. *There are many items in here that present opportunities for integrating energy conservation and net zero energy building into our standards.*

HS 3 The City should assist in providing affordable housing. *Especially if this housing is subsidized by City funds, we should be able to integrate energy efficiency or net zero standards into the design and development of these properties.*

HS 4 The City will encourage homes to be well-maintained, environmentally friendly and energy efficient. *All items in this category could be amplified with more stringent energy efficiency, renewable energy or net zero building requirements.*

HS 4.1 Establish standards for and encourage the use of “green” building techniques to provide housing that is energy-efficient and environmentally friendly.

HS 4.2 Investigate “green” practices that would reduce the cost of housing.

HS 4.3 Review the City’s non-conforming structures ordinance for mechanisms to allow homeowners to intensify, rehabilitate and maintain nonconforming structures.

HS 4.4 Enforce rental ordinances that provide for minimums in housing maintenance.

HS 4.6 Revise City zoning and other applicable ordinances to ensure implementation of these Objectives and Strategies.

Appendix 6: Sample Energy Task Force Solicitation



Are you passionate about energy conservation and renewable energy? Do you want to help Northfield residents and businesses save money on their energy bills? Join Northfield's Energy Task Force.

Northfield's Energy Task Force will be responsible for leading and supporting implementation activities for Northfield's Energy Subcommittee Report, developed through Xcel Energy's Partners in Energy offering. Partners in Energy will provide Northfield with 18 months of project management support, plus marketing and communications resources, program expertise, and data to measure progress.

Energy Task Force Activities

Level 1

Time commitment: As needed, some nights or weekends

Types of activities:

- Table at events to distribute information about energy efficiency and renewable energy
- Conduct outreach to event organizers to confirm tabling opportunity
- Share information materials with personal network

Level 2

Time commitment: Occasional, less than 5 hours a month

Types of activities:

- Use talking points and information materials to conduct outreach to Northfield residents, small businesses, and large consumers
- Use talking points and information materials to engage local nonprofits, worship facilities, and other partners to support Energy Action Jump Start

Level 3

Time Commitment: Frequent, 5-10 hours a month

Types of activities:

- Keep Energy Task Force informed about Energy Action Jump Start activities
- Participate in monthly check-in calls or emails with City of Northfield and Partners in Energy staff
- Coordinate level 1 and 2 Energy Task Force volunteers
- Support level 1 and 2 activities

Interested? Contact _____

Appendix 7: Xcel Energy Partners in Energy Plan Development Process

Xcel Energy is the main electric and natural gas utility serving the City of Northfield. In the summer of 2014, Xcel Energy launched Partners in Energy to support communities like Northfield to develop and implement energy action plans that supplement existing sustainability plans, strategies, and tools. The content of this report is derived from a series of planning workshops held in the community with a planning team committed to representing local energy priorities and implementing plan strategies.

Partners in Energy will work with the City of Northfield to coordinate support for implementing the plan and will develop a Memorandum of Understanding that outlines specific support Xcel Energy will provide to help Northfield deploy its strategies and achieve its goals over an 18-month period.



Figure 9. Partners in Energy Process for Success



Figure 10. Resources from Xcel Energy for Implementation

Plan Development Process

The CAPAB Energy Subcommittee chair actively recruited a diverse group of community representatives, including representatives from small businesses, industrial businesses, the colleges, community organizations, and greater community to create the Energy Subcommittee Report. Please see Appendix 1 for a complete list of participants.

The Energy Subcommittee met over the course of six months, reviewing community energy use data, identifying energy priorities, and developing strategies to put Northfield on the path towards a carbon free future. A summary of the workshop process can be found in Table 4.

TABLE 4: PARTNERS IN ENERGY PLANNING WORKSHOP SUMMARY

Planning Workshop Summary	
Workshop 1 November 5, 2018	<ul style="list-style-type: none"> • Met members of Northfield’s Energy Subcommittee • Learned about the Partners in Energy offering • Shared thoughts on why an energy action plan is important to Northfield

	<ul style="list-style-type: none"> • Examined data on Northfield’s energy profile and community background • Envisioned Northfield’s energy future
Workshop 2 December 6, 2018	<ul style="list-style-type: none"> • Drafted Northfield’s energy vision and greenhouse gas reduction goal • Reviewed Northfield’s past work towards energy efficiency and reducing emissions • Learned about Xcel Energy’s clean energy future • Identify community assets • Brainstormed near- and long-term strategies
Workshop 3 January 14, 2019	<ul style="list-style-type: none"> • Reviewed results from community climate action survey • Learned about Xcel Energy programs and rebates • Identified communication channels in Northfield • Identified barriers and benefits to energy action • Evaluated feasibility and impact of near-term strategies
Workshop 4 February 27, 2019	<ul style="list-style-type: none"> • Refined Northfield’s energy vision and community-wide goal • Reviewed initial structure of Energy Subcommittee report • Completed a gallery walk to give input on strategic priorities Set near-term goals for 18-month Energy Action Jump Start
Workshop 5 April 3, 2019	<ul style="list-style-type: none"> • Reviewed Northfield’s Energy Subcommittee report outline and structure • Reviewed and discuss strategic priority survey results • Identified implementation leads and support for 18-month Energy Action Jump Start • Completed a SWOT analysis for Northfield’s energy subcommittee report • Celebrated all the work the subcommittee has accomplished

PHOTO 1: NORTHFIELD'S ENERGY SUBCOMMITTEE AT WORKSHOP 5



Appendix 8: Glossary of Terms

15 x 15 Privacy Rule: Xcel Energy's privacy rule, which require all data summary statistics to include at least 15 entities, with no single entity responsible for more than 15% of the total. Following these rules, if an entity is responsible for more than 15% of the total for that data set, it is removed from the summary.

Conservation Improvement Programs (CIP): Portfolio of approved utility energy efficiency and demand management programs. Minnesota electric utilities have a goal of saving 1.5% of their total energy sales each year via customer conservation efforts. Minnesota natural gas utilities have a goal of saving 0.5% of their total energy sales each year via customer conservation efforts.

Energy Burden: Percentage of gross household income spent on energy costs.

Greenhouse Gases (GHG): Gases in the atmosphere that absorb and emit radiation and significantly contribute to climate change. The primary greenhouse gases in the earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

Grid Decarbonization: The current planned reduction in the carbon intensity of electricity provided by electric utilities through the addition of low or no carbon energy sources to the electricity grid.

Kilowatt-hour (kWh): A unit of electricity consumption.

Million British Thermal Units (MMBtu): A unit of energy consumption that allows both electricity and natural gas consumption to be combined.

Metric Tons of Carbon Dioxide Equivalent (MTCO_{2e}): A standard unit of measure for greenhouse gas emissions. The unit "CO_{2e}" represents an amount of a greenhouse gas whose atmospheric impact has been standardized to that of one unit mass of carbon dioxide (CO₂), based on the global warming potential (GWP) of a particular gas.

Net Zero Energy Building: A structure that on an annual basis produces as much energy on site as it consumes

Premise: A unique identifier for the location of electricity or natural gas service. In most cases it is a facility location. There can be multiple premises per building, and multiple premises per individual debtor.

Renewable Energy Certificate (REC): For every megawatt-hour of clean, renewable electricity generation, a renewable energy certificate (REC) is created. A REC embodies all of the environmental attributes of the generation and can be tracked and traded separately from the underlying electricity. Also known as a Renewable Energy Credit.

Resilience: The ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally-occurring threats or incidents.

Therm (thm): A unit of natural gas consumption.

Trade Ally: Trade Allies, or Business Trade Partners, are vendors and contractors who work with business and residential customers servicing, installing, and providing consulting services regarding the

equipment associated with utility rebate programs. Their support for utility programs can range from providing equipment or assisting with rebate paperwork, to receiving rebates for equipment sold.

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Background

In 2018, the City of Northfield's City Council adopted the [2018-2020 Strategic Plan](#). This plan outlines six Strategic Priorities. One of these, Strategic Priority six, is to ensure a community that is resilient and sustainable to climate change impacts. To achieve this end, a Climate Action Plan Advisory Board (CAPAB) was established and tasked to write a climate action plan (CAP) for the City of Northfield. A CAP contains specific strategies the community will undertake to reduce its greenhouse gas emissions (GHG) and adapt to the effects of climate change.

Two major caveats of successful planning for climate change are that climate change adaptation and mitigation projects will not succeed if (1) communities in which they are to be implemented are not understood (Barnes et al. 2013), and (2) broad community involvement in developing and implementing mitigation and adaptation projects is not secured (Boswell et al. 2012). With that in mind, to begin to understand the community's views, the community was surveyed.

The primary aims for conducting the survey were (1) to inform the community that a new city board, the Climate Action Plan Advisory Board (CAPAB), had been established, (2) that the newly formed CAPAB is writing a CAP, and (3) that the CAPAB is seeking citizen input in order to ensure that the strategies in the CAP to reduce greenhouse gases (GHGs) and adapt to climate change will have community support.

This report contains the findings from the survey of the Northfield area citizens. The results from this study will be used to inform the CAPAB about current citizen awareness and views on selected topics, especially how much support there would be for 19 possible future actions. The results will also be used to determine education and outreach efforts. Outreach is distinguished from education in that it is the how, where, and to whom the education is disseminated.

Methodology

Applied Research – Applied research is a type of research that is used to answer a specific question that has direct applications to solve a problem. It is information that can be put to use immediately and has practical real time application.

Survey Design and Data Collection – Developing, deploying, analyzing, and reporting this survey was a collaborative project. A citizen volunteer and City of Northfield student intern under the direction of the CAPAB and city staff liaison developed the survey. The City of Northfield staff assisted with printing paper surveys and building the online survey in Survey Monkey, a software that enables survey design, data collection, and analysis. Data was collected online and from paper surveys during October and November 2018. Data from the paper surveys were entered into the online Survey Monkey account and all data are stored in City of Northfield's Survey Monkey account.

Sample Design – It was agreed to deploy the survey into the community using the non-randomized convenience sampling method. With this technique, individuals are surveyed because of their convenient accessibility and proximity to the survey administrators. A convenience sample means the potential is greater for certain individuals to be left out during the selection process or other individuals to be over represented, and indeed that is exactly what occurred. Sincere attempts were made to give every-

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one in the community an opportunity to take the survey, yet the data show that most of the individuals who took the survey are perhaps more motivated than not to engage with the mitigation and adaptation efforts needed to tackle climate change. The results are more representative of individuals with higher education.

Students and citizens volunteered to be survey administrators. Volunteers assisted with survey administration at 14 public events. These pre-arranged events garnered citizen input at public events such as the farmer's market, grocery stores, and local civic clubs. Citizens had the opportunity to take the 13 question multiple choice 5-7 minute survey on an iPad, on paper, or were given a 4 X 6 postcard with instructions how to access the survey online at home. Information about how to access the online survey was also posted on the City of Northfield's website, included with the City's monthly water bill, and on posters around the city. The City staff also promoted the survey by tabling at two events and was responsible for distributing and collecting paper copies of the survey from several locations around the city.

A strength of the survey is the number of respondents: 1053 responses were achieved. Of those, 1046 were in the English and 7 were in Spanish. Some of the participants who began the survey did not complete all of the questions. Approximately 878 finished the survey (this is an approximate number because all of those respondents may not have answered every single question).

Data Processing and Analysis – Two researchers used Excel software to analyze the survey data to make sure the data was being understood in the same way. Where issues related to the soundness of the data arose, these were discussed and a consensus was reached. For example, not all of the 1053 respondents answered all of the questions. There are several reasons a respondent may not have answered a question, but it was determined to use all of the answers each respondent gave to complete the analysis. The number of respondents answering each question is always given with the results. When there are other issues with the data it is described in the appropriate section of this report.

A descriptive analysis was performed using graphs and tables. For simplicity of describing these results in the written commentary, some 5-point scales have been collapsed into 3-point scales to represent the general opinion. Color-coding of the results correspond to the CAPAB subgroups Energy, Land, Waste, Food, Water, and Transportation. For multiple-choice questions, percentage results have been rounded to the nearest whole percent; therefore some graphs may total slightly more or less than 100%. Some key results have been broken down into various demographic groups to provide more specific understanding about the particular group.

Summary of Main Findings

Awareness and Concern for Climate Change – Survey respondents are aware of climate change. Eighty-two percent (82%) say they are at least moderately well informed about climate change, and eighty-one percent (81%) think about climate change at least weekly. While respondents are more concerned than not about all impacts of climate change, they are most concerned about the temperature and seasonal climate changes (81%) that will impact agriculture and food production (85%), create a loss of habitat and species (83%), decrease lake and river quality (84%), and decrease air quality (80%).

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Support for Possible Future Action – Nineteen possible future actions to decrease GHGs and begin to adapt to climate change were posed to the respondents. While there was greater than 80% support for all of the possible future actions, 10 of the 19 possible future actions will likely have better initial support and easier implementation than the other 9. This is because these respondents are already taking personal action in those areas, want more information about those topics, or are highly concerned about the effects of the impacts associated with climate change.

The top possible future actions are:

- Secure renewable energy and increase energy efficiency standards
- Decrease water pollution and update storm water system
- Plant more trees and have more green space around water
- Make local food more available and have more food recovery programs
- Institute waste diversion programs such as composting and improve waste disposal practices.

Personal Action and Information Wanted – Support for the top 10 future actions is mirrored in the personal actions the respondents are making to reduce waste (91%), reduce consumption of electricity and natural gas (73%), and buy local goods and products (65%). Support for the top 10 future actions is further strengthened by the kind of information related to reducing the impacts of climate change respondents are seeking: renewable energy (64%) and energy efficiency in residential buildings (49%), water conservation (52%), composting (47%) and waste reduction (46%), and carbon sequestration (46%).

Education and Outreach – The topics that respondents are interested in provide initial direction for education (the what) and outreach (the how, where, and to whom education gets disseminated) efforts. Respondents clarified in what format they preferred to learn and how they would like to receive information. To learn about climate change, most respondents want a personal carbon footprint tool (60%), community workshops and events (50%), and informational sheets (39%). To receive information about planning for climate change, respondents want to receive information from the City of Northfield’s website (64%), community workshops and events (54%), the Northfield News (43%), and depending upon age, either social media (51%) or e-subscriptions (41%).

Comments from the Respondents – Four of the 13 survey questions provided an option for the respondents to make comments. There were 398 comments: 84 for taking personal action, 39 for information wanted, 76 for how to become informed about planning for climate change, and 199 open-ended comments. The qualitative information gleaned from these additional comments supports the survey’s quantitative answers. Most comments align directly with the concepts of energy, land, waste, food, water, and transportation embedded in the survey questions to reiterate the concepts or else to put forward entirely new ideas. Many supported the idea that mitigation and adaption strategies will require personal action but also community education and “political will”. Interestingly, a small portion (6%) of the respondents’ comments do not support the City of Northfield’s efforts, do *not* think climate change exists or is man made, or don’t think that individual action is a solution to climate change.

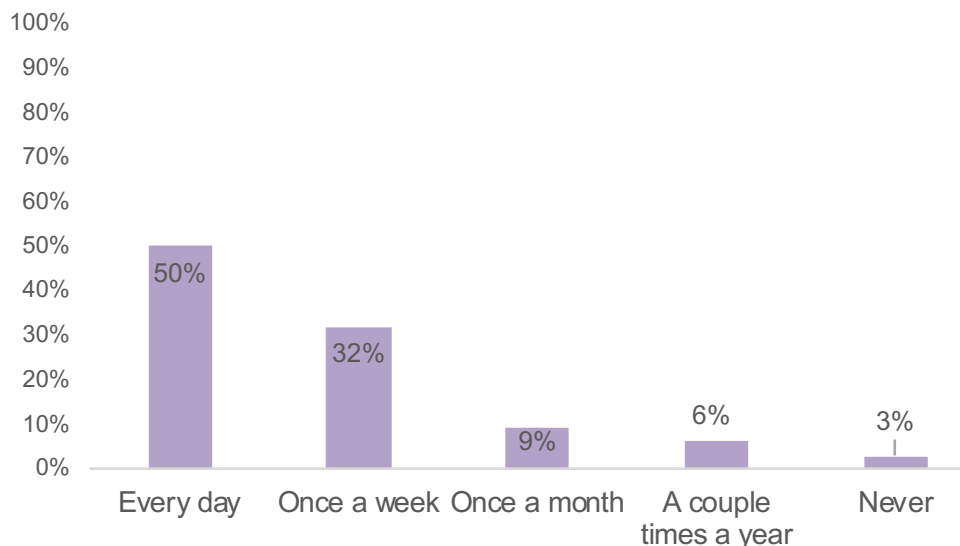
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Detailed Results

Awareness and Concern

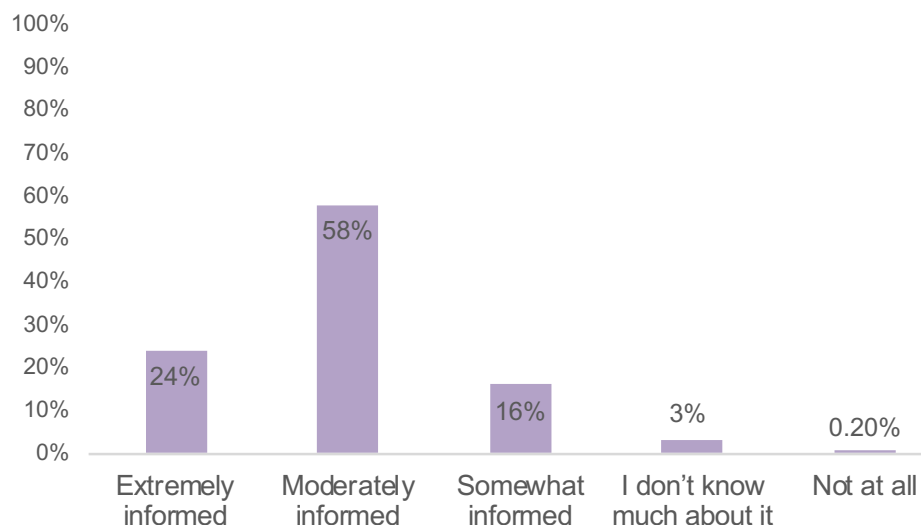
Question 1: How often do you think about climate change? Choose one.



Ninety-one percent (91%) of the respondents think about climate change at least once a month. Eighty-two percent (82%) of the respondents think about it at least once a week.

n = 1041

Question 2: How well informed are you about the effects of a changing climate? Choose one.



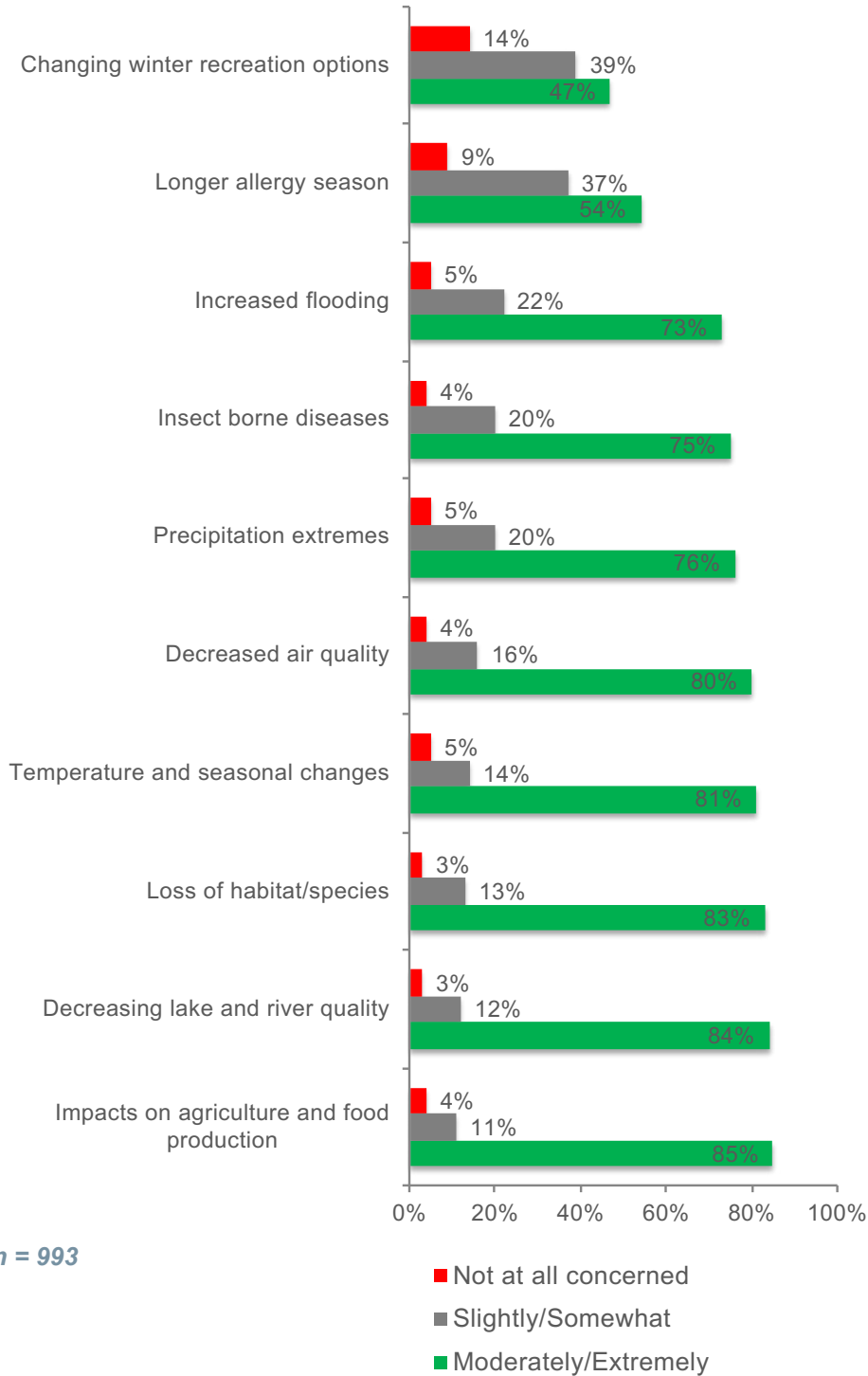
Over 80% of the respondents are moderately to extremely well informed about climate change.

n = 1032

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Question 3: Consequences of Minnesota's climate changes. Please rank each consequence with your level of concern.



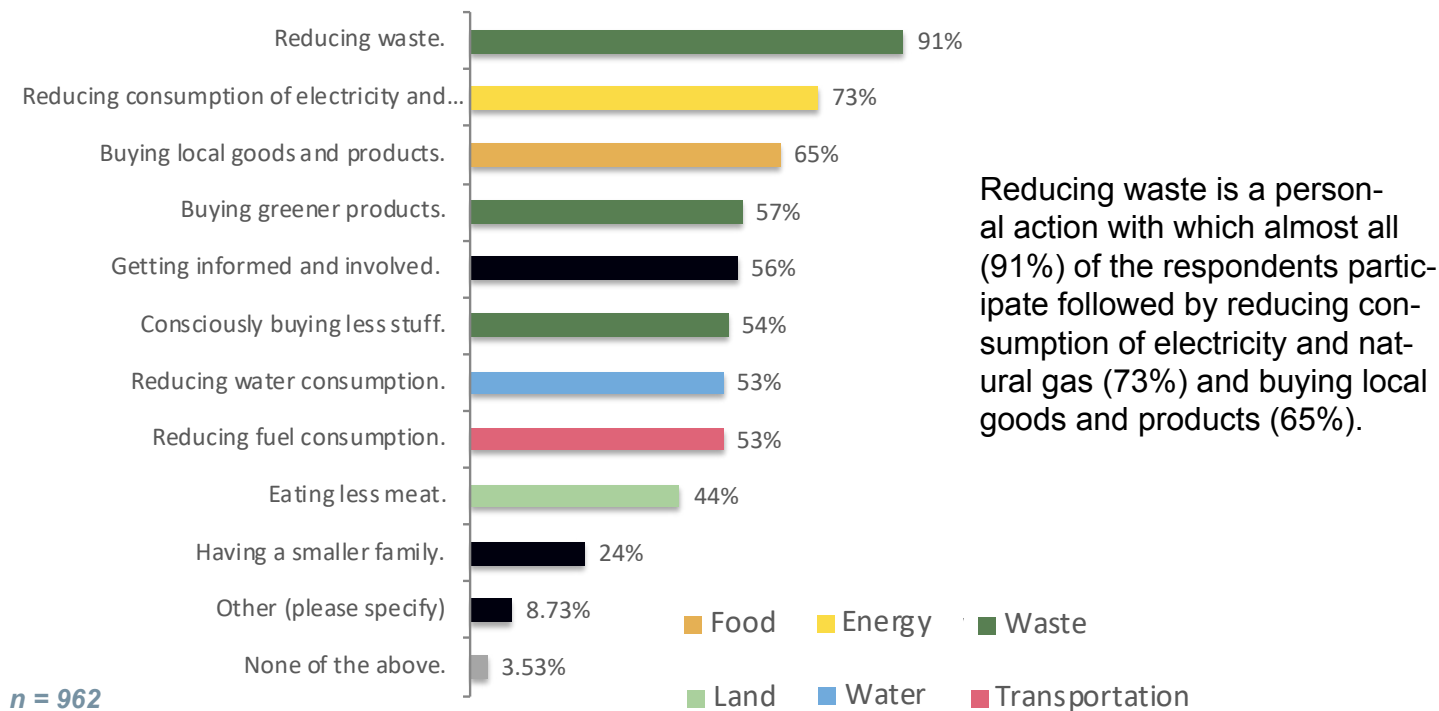
Respondents are moderately to extremely concerned about the temperature and seasonal changes (81%) that impact agriculture and food production (85%), create a loss of habitat and species (83%), decrease lake and river quality (84%), and decrease air quality (80%).

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Personal Actions and Barriers

Question 4: If any, what actions are you currently taking to reduce the impacts of climate change? Check all that apply.



Question 4: Respondent comments

Eighty-four respondents placed a comment about other personal actions they are taking in the comment section of question number 4. The information from their comments helped to reinforce the actual survey question as the comments matched up in similar order to the subgroups of waste, energy, food, transportation, and water. Some simply reiterated the examples given in a survey question (such as saying they are composting) while others wrote about additional actions they were taking such as creating a low maintenance lawn and planting natives species or voluntarily consuming less meat and dairy or foods that are land and water intensive.

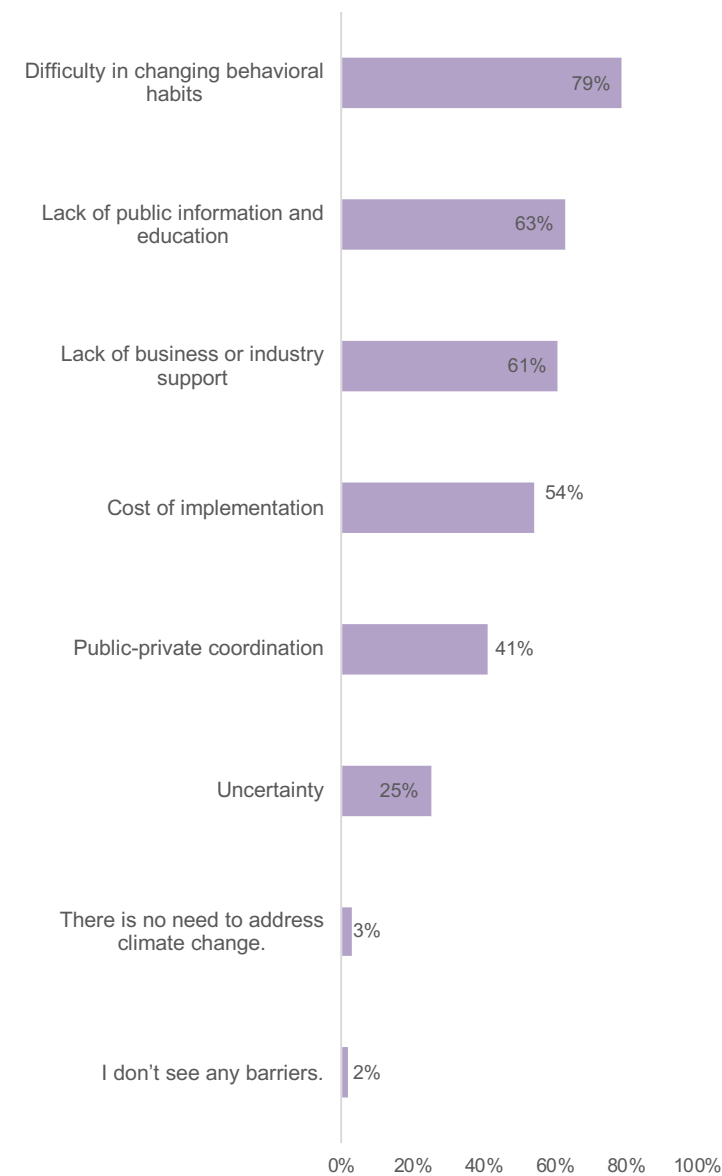
Additional unique comments described action in the area of education and the political process. These include educating oneself in environmental matters and sharing this information with friends, children, and others, and “speaking up when I can”. Others are becoming more involved politically by writing to or connecting with political representatives and serving on local boards and commissions.

Two respondents wrote that climate change is a hoax. One respondent is taking personal action but for reasons unrelated to climate change. Two more questioned having a smaller family saying that “lower levels of immigration” would do more to help than limiting population increases, and that larger families may actually be more conscientious about resource depletion.

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Question 5: If you think there are barriers to addressing climate change, what are they? Choose all that apply.



Seventy nine percent (79%) of the respondents recognize that it is difficulty changing behavior that contributes to addressing climate change, followed by lack of public information and education (63%) and lack of business and industry support (61%).

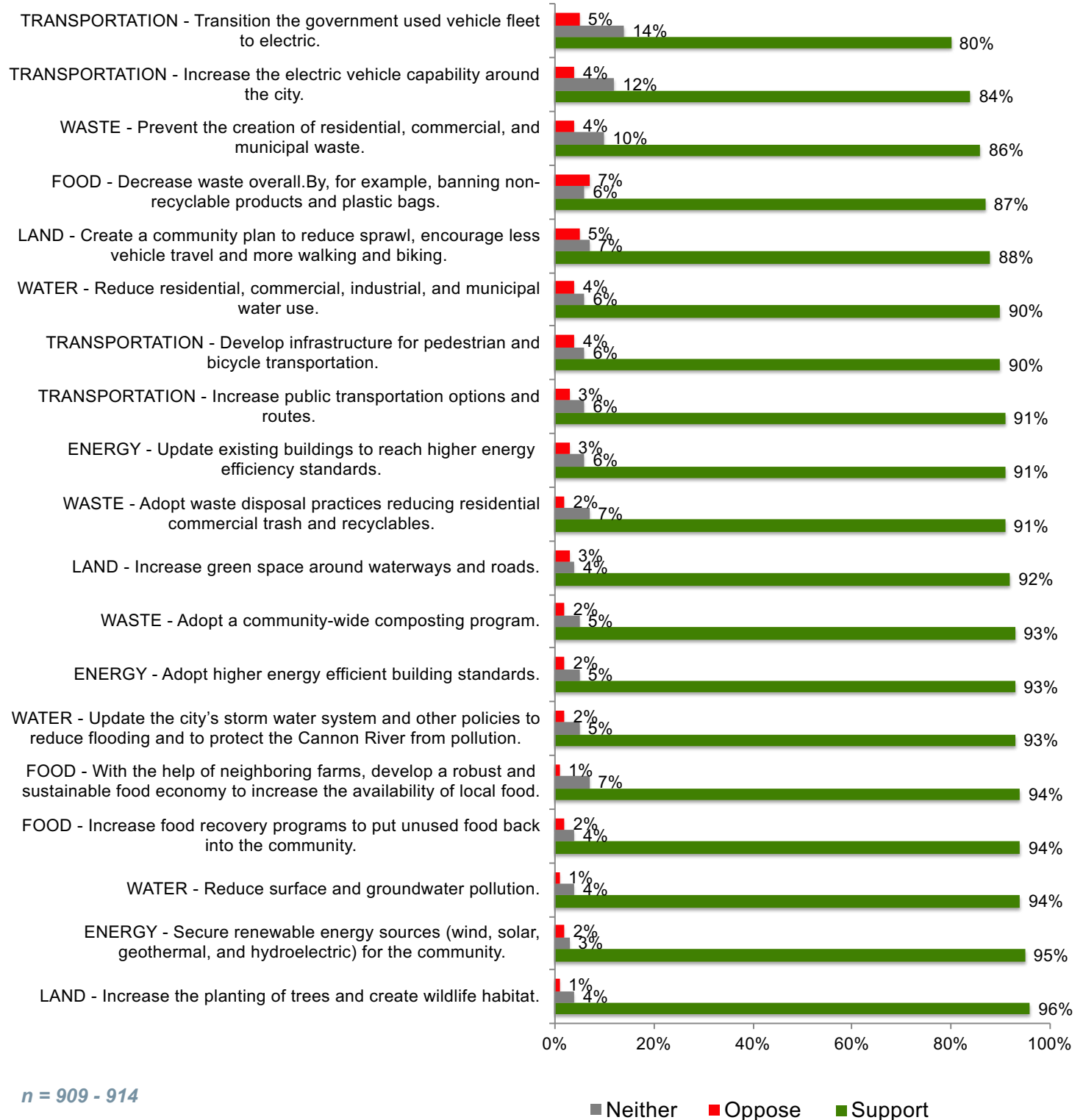
n = 958

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Degree of Support

Question 6: There are several ways to reduce a community's greenhouse gas emissions. Please rate your degree of support for the following suggested possible broad future actions on the core areas below.



Question 6 continued: There are several ways to reduce a community's greenhouse gas emissions. Please rate your degree of support for the following suggested possible broad future actions on the core areas below.

For all 19 of the possible future actions, 80-96% of the respondents support the actions, 3-14% of respondents neither support nor oppose, and 1-7% oppose. The highest support is for these actions: securing renewable energy (95%) and increasing energy efficiency standards (93%), decreasing water pollution (94%) and updating storm water systems (93%), planting more trees (96%) and having more green space around water (92%), making more local food available (94%) and more food recovery programs (94%), and instituting community composting (93%) and improving waste disposal practices (91%).

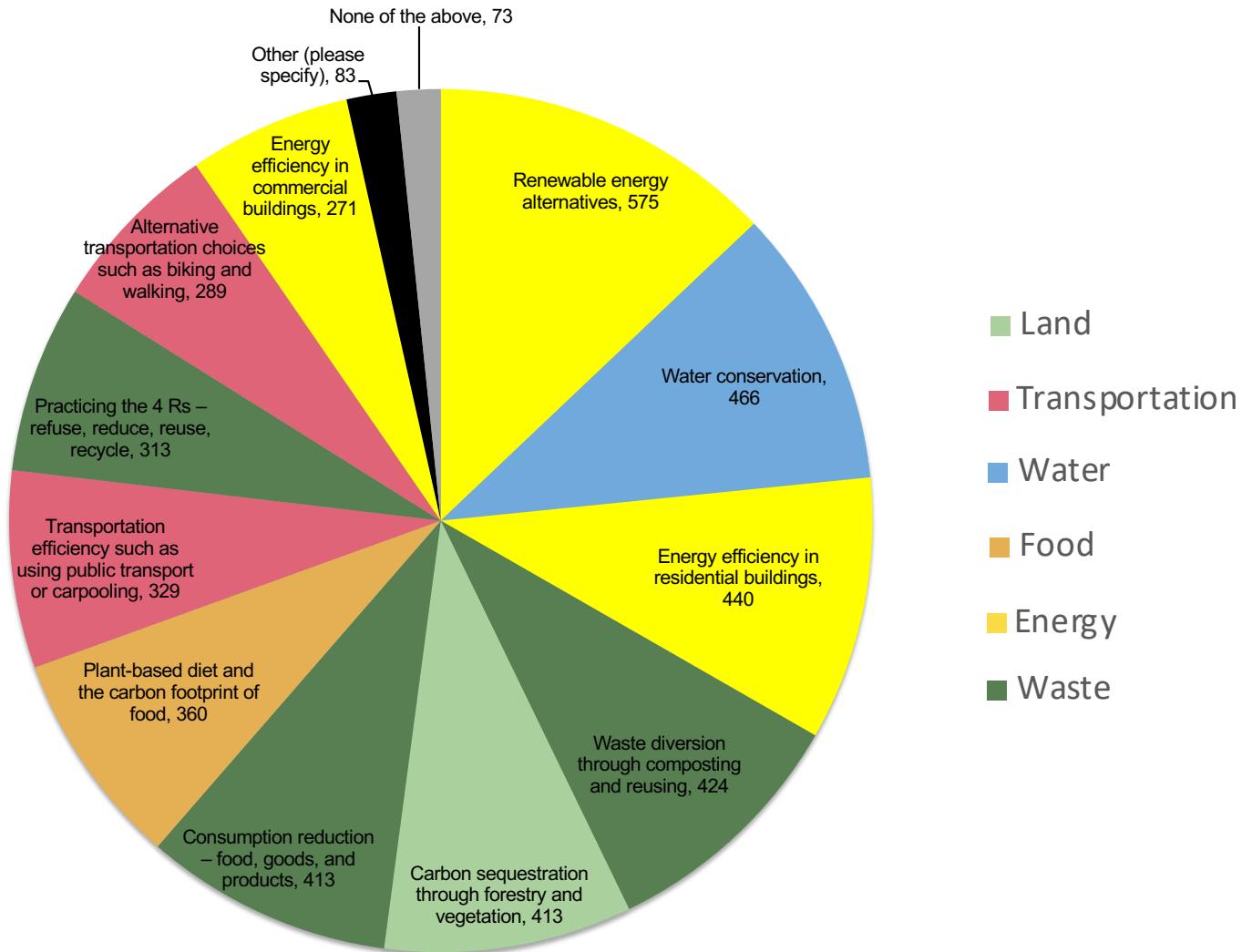
Additional analysis was done to understand why the support group was so large and to confirm the hypothesis that for the 19 possible future actions, 10 of the actions will have better support than the other 9. In a sentence, there is variation in the degree of support for all 19 future actions. See A deeper look at support for the 19 possible actions on page 21.

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Learning more about Climate Change

Question 7a: What topics would you like more information about? Select your top 5 topics.



n = 898

This question asked respondents to choose the top 5 topics that they wanted more information about. Out of 898 respondents, 575 (64%) would like more information about renewable energy, 466 (52%) for water conservation, 440 (49%) for energy efficiency in residential buildings, 424 (47%) for waste diversion, 413 (46%) for consumption reduction, and 413 (46%) for carbon sequestration.

With this question, 73 respondents wrote in the comments section about being forced to choose 5 topics or not being able to simply check the box “None of the above”. This group of respondents was omitted from the data, and the data was re-analyzed to find out if the order of the topics changed. The order remained unchanged.

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Question 7b: Respondent comments

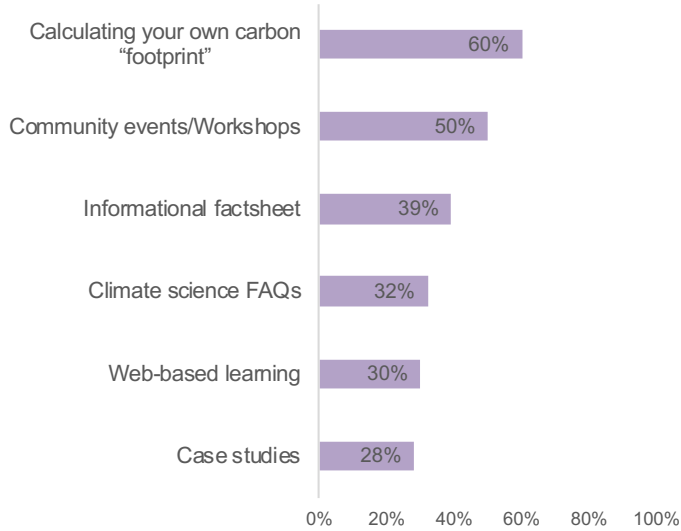
Seventy-six respondents made comments about additional information they would like to receive and provided suggestions for city and community action.

CATEGORY	SPECIFIC INFO OR ACTION WANTED
Energy	Alternative Green Energy besides solar Solar for residential Land fill methane gas capture and use Structures that produce renewable energy
Water	Flexible fee for water use Rewarding homeowners for water conservation Options to stop polluting southern MN lakes
Waste	Flexible fee for trash More ways to reduce plastic Community-wide recycling education Building with recycled materials
Land	Enforcing building codes Native plants and rain gardens Regulating large scale drain tiling Caring for our habitat Why GMOs are good for future environment
Food	Food recovery Strengthen food production in local area to increase outputs
Transportation	Commuting options Better connected bike routes
Political process	Reduce industry emissions Make corporations accountable for energy use County-wide coordination Effective political action Increased capacity in the US to reuse/repurpose our own waste Advocate for change at the state and federal level Make survey information and initiative public Carbon fee and dividend Cost benefit explanation of options listed for survey questions Make community energy use and emissions publicly available Locally focused and relevant vs. general initiatives Finding out what other communities are doing
Education	Anticipated climate refugee patterns Getting accurate information about climate change How city defines local and global climate change issues Northfield's contributions to climate change How to include all of Northfield in this process

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Question 8: If you would like to reduce your impact, what kinds of resources and/or information do you think would help you to achieve that? Choose up to 3.



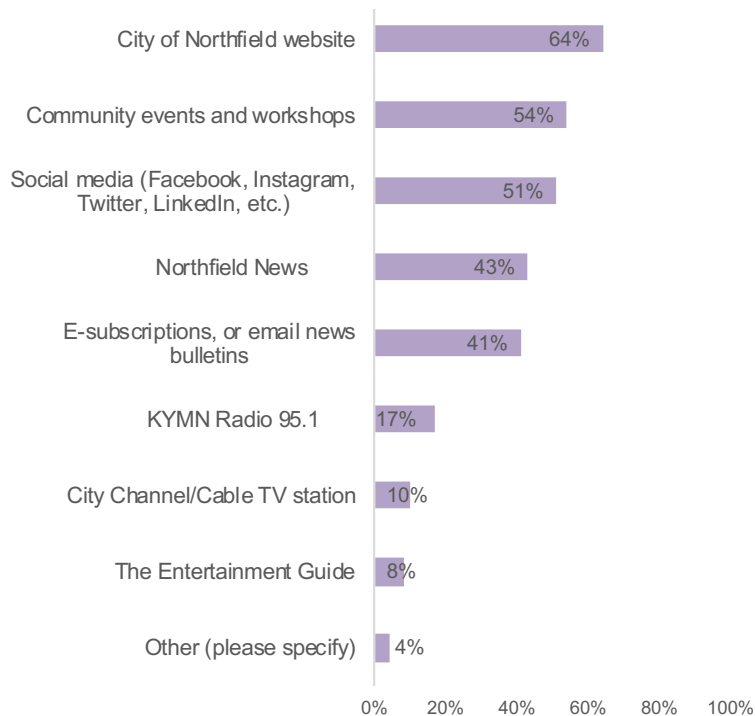
n = 889

The most common way respondents want to learn about reducing personal impacts associated with climate change is a personal carbon footprint tool (60%), community workshops and events (50%), and informational factsheets (39%).

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Question 9: If you wanted to learn more about Northfield’s Climate Action Plan, how would you want to learn about it? Check all that apply.



n = 880

The top delivery methods for becoming informed about planning for climate change are the City of Northfield’s website (64%), community workshops and events (54%), the Northfield News (43%), and depending upon age, either social media (51%) or e-subscriptions (41%).

Question 9: Respondent Comments.

Thirty-nine respondents took the time to give additional suggestions for how they would like to become informed about planning for climate change in Northfield. They said to use as many sources as possible, “to provide options for people”, to “don’t just shove stacks of information in their face” or provide seemingly random information, and to have coordinated and cooperative informational efforts throughout the community.

They would also like

- Long-term exhibits
- A series of coordinated events or informational classes
- Events to be advertised in the community education catalog
- Information to be put into the high school newspaper and to send information home with students
- The City of Northfield’s website easier to navigate
- Information put into the City of Northfield water bill newsletter
- Before implementing climate change initiatives, mailing to residents details about the cost
- The CAPAB get out and speak at schools, churches, businesses, and other groups

In the comment section for question number 9 there was some concern expressed that the city is wasting its money on efforts to combat climate change and that any action the city takes will not make any impact on climate change.

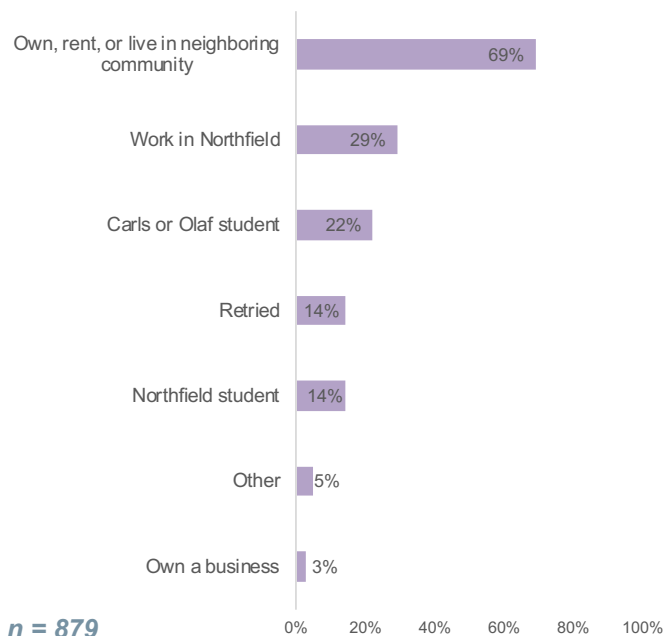
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Demographics

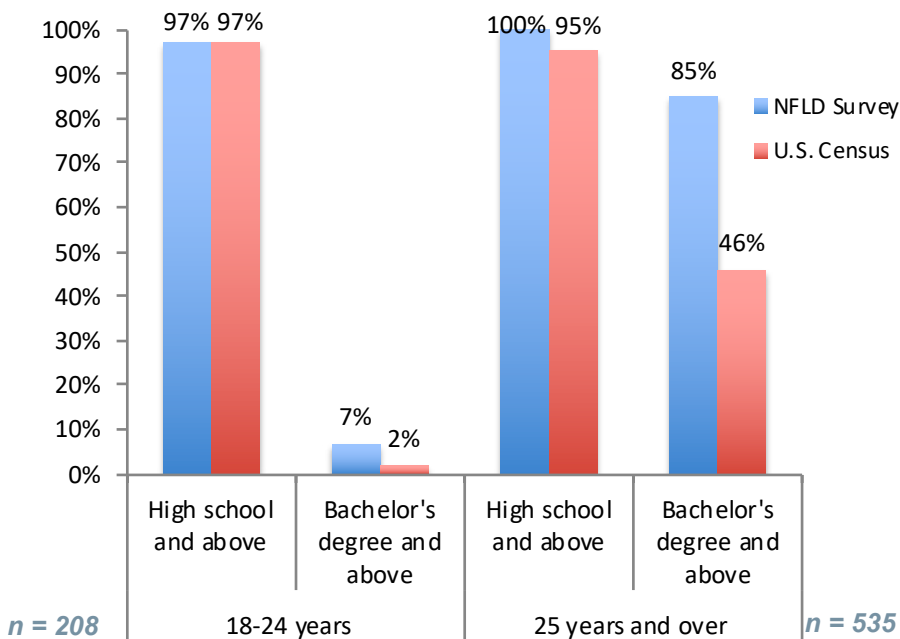
Question 10: Which of the following describes you? Choose all that apply.

Nearly 70% of the respondents own, rent, or live in Northfield or a neighboring community; thirty-six percent (36%) attend school in Northfield; and thirty-two percent (32%) work or own a business in Northfield.



Question 11: What is the highest degree or level of education you have completed?

For all the survey respondents, education level nearly matches the U.S. Census Bureau statistics for Northfield except for the respondents 25 years and over at the bachelor's level and above. The 25 years and over group is significantly above (85%) the U.S. Census Bureau statistic (46%).

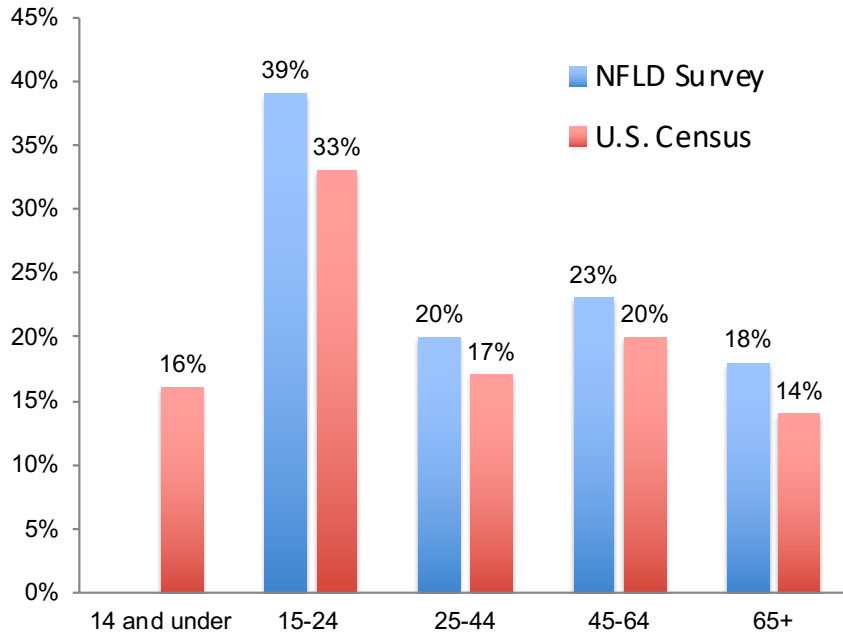


The survey respondents are more highly educated than the general population in Northfield. Where the survey was administered - college locations, the senior center, churches, and Rotary - can explain some of the differences.

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Question 12: What is your age group?



The respondents' ages match well with the U.S. Census Bureau data for Northfield. There was no 14 and under age category on the NFLD survey.

n = 876

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Final Respondent Comments

Question 13: Do you have any other comments or suggestions?

One hundred and ninety-nine respondents took the time to leave a final comment at the end of the survey. Below is a summary of what they said.

CATEGORY	SPECIFIC INFO OR ACTION WANTED
Waste	<ul style="list-style-type: none"> Implement citywide waste program – need better education to teach citizens how to separate to improve recycling efficiency Increase grocery delivery to reduce impulse buying Work to reduce paper that comes in the mail Provide weekly recycling Institute zero waste policy in Northfield No to plastic bags and straws Provide curbside composting and yard waste More recycling options are needed downtown Make more bulk buying available in stores Reward those who create less recycling/trash 4Rs to 5Rs – Redesign, refuse, reduce, reuse, and recycle
Transportation	<ul style="list-style-type: none"> Increase public transportation options to the cities Be mindful of how to serve rural communities Convert all of the City fleets to electric Provide electric outlets powered by clean energy More thoughtfully placed safe bicycle lanes More shoulders on roads for bicyclists More safe sidewalks and tunnels Create a no-idling policy and place signs
Energy	<ul style="list-style-type: none"> Cold Fusion Low Energy Nuclear Reaction (LENR) Land fill waste to methane Secure grants and subsidies for CLEAN renewables Other alternative energy options More education about EE appliances and homes
Land	<ul style="list-style-type: none"> Regulate agricultural use of drain tiles Enhance green space and street tree program Have community garden plots No more lawns/lawn mowers Intensify butterfly and bee habitat Work with community to decrease CO₂, water contamination, and fertilizer and pesticide use.
Water	<ul style="list-style-type: none"> Reward those who use less Decrease agriculture and urban fertilizer and pesticide use Make the Cannon River visible to the public Reduce impervious streets for better storm water management
Food	<ul style="list-style-type: none"> Food recovery from local and big box businesses Cheaper organic food More vegan dining options in town

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<p>Political process</p>	<p>Reinstate and/or make more stringent government standards Incentives and regulations are needed for businesses to reduce waste/pollution Dismantle large extractive corporation and the US military/enact policies for force their reduction in emissions – hold them accountable Apply a carbon fee and dividend Eliminate large confined animal feeding operations Work with Citizen’s Climate Lobby Help individuals, households, and the community to prioritize what is most timely and feasible to avoid future problems Keep the community informed. Let community know what is going on/what individuals can do to help. Don’t place the burden on the resident; encourage – don’t nag or punish How this will be funded? Participate in the Green Economy The City should model and be a leader in sustainability efforts Political will and support is key Regional and state coordination is needed to increase overall effectiveness Focus on what can be done locally to improve day-to-day lives – what can be seen. Entrepreneurs should be responsible to develop innovation for climate change not the government</p>
<p>Education</p>	<p>The City should take the lead on educating the community Publish the results of the poll Create real-life current and future scenarios to show residents how over time Northfield has changed and is changing Use all avenues to keep residents up-to-date on progress and initiatives Create a city report card so citizens can track progress and outcomes Make learning about climate change less exhausting, paralyzing and hopeless but still need to instill a sense of urgency It is difficult to know exactly what is recyclable – need education Need focused bits of information not one big dump Provide more opportunities for citizens to learn how to change personal actions Enhance social outreach and education through the schools Appeal to parents/grandparents on behalf of their children/grandchildren Partner with HS and college students to conduct related research Partner with faith communities – many are already taking actionable steps More demonstrations/classes in the Northfield schools about climate change Conduct seminars/talks at the schools and colleges</p>

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Most of question 13 comments were positive and gave specific suggestions for how to continue to plan for climate change, but some of the respondent's comments were less supportive such as:

"You cannot create a 'green' environment by banning the use of items or forcing them upon people." Or, "While I am for being responsible with the environment, I am against most government regulations toward that effect."

This comment perhaps sums up best the feelings of how overwhelming preparing for climate change is:

"Do not have time or finances to make huge changes to lifestyle or transportation, and HIGHLY, HIGHLY OPPOSED to having anything of the sort imposed upon Northfield residents or businesses."

With respect to whether or not local individual action could help reduce the impacts of climate change, the respondents were divided. For example one respondent said, "It is important to note that personal steps towards decreasing your carbon footprint to help mitigate climate change is in itself minimally effective. The largest contributors towards climate change are around 100 corporations and the US military. Unless policies are enacted to force their reduction in carbon emissions any personal efforts to do such will have no measurable affect on global climate change. They must be the drivers. Personal lifestyle changes will follow through design."

While others said local action would be helpful: "Think globally, act locally is most important when thinking about climate change." And, "Your efforts at the local, municipal and community level are well placed. Corrective actions to address climate change will apparently have to be from bottom-up commitments. For the time being, top down direction and guidance from the federal and state level will be absent."

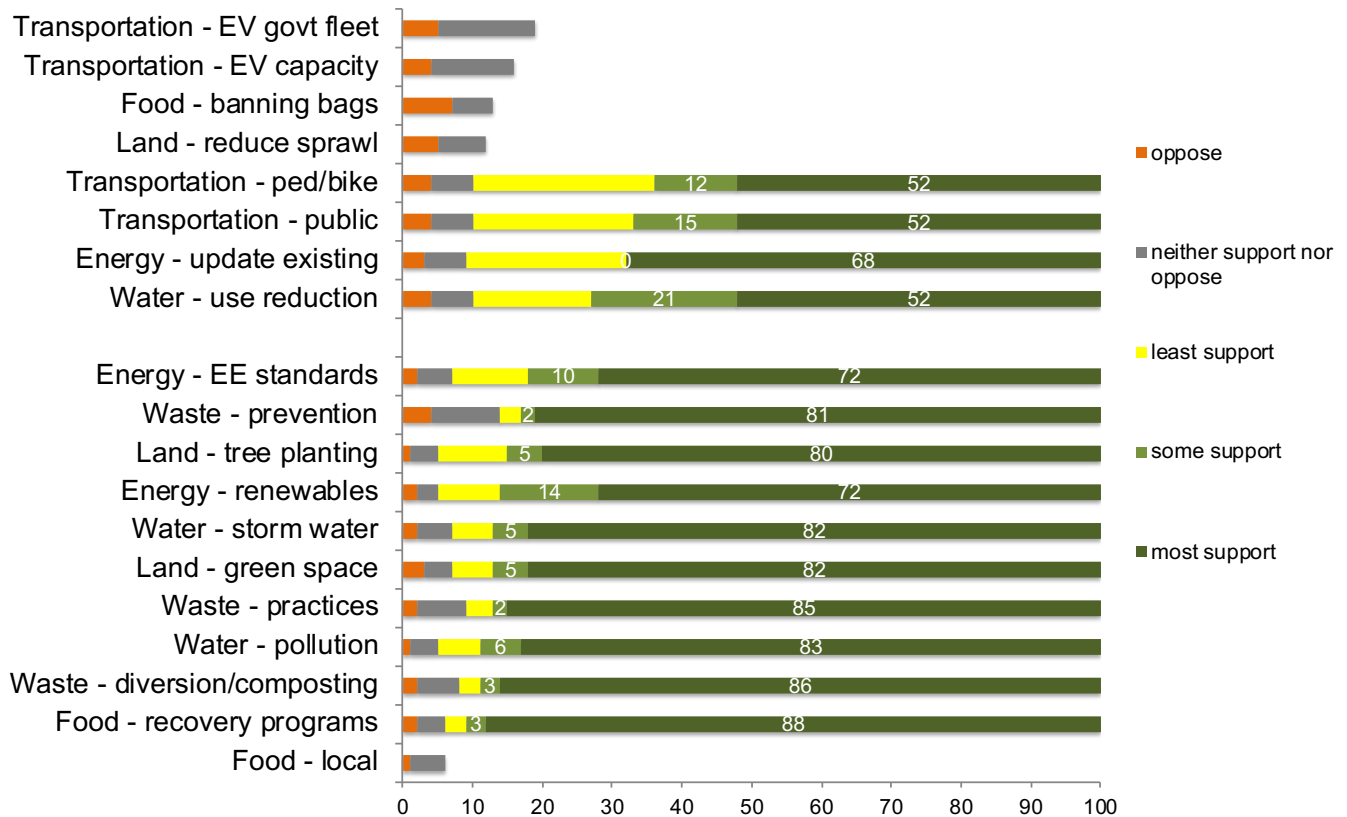
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Deeper Analysis

A Deeper Look at Support for the 19 Possible Aactions from Question 6.

Question 6: There are several ways to reduce a community’s greenhouse gas emissions. Please rate your degree of support for the following suggested possible broad future actions on the core areas below.



Within the support group, support for a possible future action was verified by other measures in the survey: how much personal action people are taking, what kind of information they are requesting, and their concern for climate change impacts.

Using these measures it could be determined which respondents are more fully prepared or knowledgeable and would more easily participate with future action.

The yellow bar represents the least supportive respondents in the support group. These are respondents who simply checked that they support a possible future action but otherwise are not demonstrating personal action, seeking additional information, or do not have high concern for climate change impacts. Removing the least supportive from the support group, more accurately represents support for future actions. Originally, all 19 future actions had greater than 80% support, now the support ranges from 64-91%. Additionally, with this new breakdown of the 19 possible future actions, it could be argued that there are now 11 actions that have better support than the other 8.

Five of the 19 possible future actions – the ones that do not have green or yellow bars - could not be included in the analysis because a corresponding personal action and information wanted about the topic was not available. It has been inferred that those 5 suggested future actions would have a similar trajectory as their neighbors.

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Revised Degree of Support for Possible Future Action

Question 6: There are several ways to reduce a community's greenhouse gas emissions. Please rate your degree of support for the following suggested possible broad future actions on the core areas below.

Degree of Support for Possible Future Action				
Original	%	Rank	%	Revised
Increase trees/habitat	96%	1	≥91%	Sustainable local food economy
Secure renewable energy	95%	2	91%	Increase food recovery programs
Reduce water pollution	94%	3	89%	More waste diversion programs
Increase food recovery programs	94%	4	89%	Reduce water pollution
Sustainable local food economy	94%	5	87%	Improve waste disposal practices
Update storm water system	93%	6	87%	Increase trees/habitat
Increase energy efficiency standards	93%	7	87%	Update storm water system
More waste diversion programs	93%	8	86%	Secure renewable energy
Increase green space around water	92%	9	85%	Increase green space around water
Improve waste disposal practices	91%	10	83%	Prevent community-wide waste
Update energy efficiency in existing buildings	91%	11	82%	Increase energy efficiency standards
Increase public transportation options	91%	12	73%	Reduce community water use
More bike and pedestrian infrastructure	90%	13	68%	Update energy efficiency in existing buildings
Reduce community water use	90%	14	67%	Increase public transportation options
Reduce community sprawl	88%	15	64%	More bike and pedestrian infrastructure
Reduce food packaging waste	87%	16	≤64%	Reduce community sprawl
Prevent community-wide waste	86%	17	≤64%	Reduce food packaging waste
Increase electric vehicle capability	84%	18	≤64%	Increase electric vehicle capability
Transition gov't vehicles to electric	80%	19	≤64%	Transition gov't vehicles to electric

This table contains the revised percentages and rank for each of the 19 possible future actions and is a more accurate reflection of true support.

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Learning more about Climate Change

Topics Breakdown by Age

Question 7: What topics would you like more information about? Select your top 5 topics.

■ Land ■ Transportation ■ Water ■ Food ■ Energy ■ Waste

	Group	24 and under	25-44	45-64	65+
1	Renewable energy alternatives	Renewable energy alternatives	Renewable energy alternatives	Renewable energy alternatives	Renewable energy alternatives
2	Water conservation	Water conservation	Residential energy efficiency	Waste diversion/composting	Water conservation
3	Residential energy efficiency	Carbon sequestration	Reduce consumption	Residential energy efficiency	Carbon sequestration
4	Waste diversion/composting	Residential energy efficiency	Water conservation	Water conservation	Waste diversion/composting
5	Carbon sequestration	Plant-based diet/footprint of food	Waste diversion/composting	Reduce consumption	Refuse, Reduce, Reuse, and Recycle
6	Reduce consumption	Reduce consumption	Carbon sequestration	Carbon sequestration	Residential energy efficiency
7	Plant-based diet/footprint of food	Waste diversion/composting	Plant-based diet/footprint of food	Refuse, Reduce, Reuse, and Recycle	Plant-based diet/footprint of food
8	Public transportation and carpooling	Public transportation and carpooling	Public transportation and carpooling	Public transportation and carpooling	Reduce consumption
9	Refuse, Reduce, Reuse, and Recycle	Commercial energy efficiency	Refuse, Reduce, Reuse, and Recycle	Biking and Walking	Public transportation and carpooling
10	Biking and Walking	Biking and Walking	Biking and Walking	Plant-based diet/footprint of food	Biking and Walking
11	Commercial energy efficiency	Refuse, Reduce, Reuse, and Recycle	Commercial energy efficiency	Commercial energy efficiency	Commercial energy efficiency
	N = 803*	N = 332	N = 160	N = 166	N = 145

*Original number of respondents for this question was 898. In 73 of the cases, respondents did not want any more information but because of the format of the question were forced to choose 5 answers. The answers from those 73 respondents have been removed for analysis. Also, 22 cases did not include age so those had to be removed as well.

This chart shows the topics each age group is most interested in receiving information on. The colors reflect the CAPAB's subgroups: Energy, Waste, Food, Land, Water, and Transportation to visually understand the most and least wanted information across the age groups. There are more similarities than there are differences. Two notable difference are that the 24 and under age group places more priority on learning about a plant-based diet than the 45-64 age group, and learning about carbon sequestration is a higher priority for the 24 and under and 65+ age groups than it is for the 25-44 and 45-64 age group. A final notable difference is that the 24 and under age group places less priority on learning about reducing waste.

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Topics Breakdown by Age - Percentages

Question 7: What topics would you like more information about? Select your top 5 topics.

	TOPIC	Group	24 and under	25-44	45-64	65+
1	Renewable energy alternatives	66%	69%	70%	61%	61%
2	Water conservation	54%	57%	50%	50%	53%
3	Energy efficiency in residential buildings	50%	48%	58%	51%	44%
4	Waste diversion through composting and reusing	48%	42%	49%	56%	50%
5	Carbon sequestration through forestry and vegetation	48%	51%	45%	43%	51%
6	Consumption reduction – food, goods, and products	47%	47%	55%	49%	36%
7	Plant-based diet and the carbon footprint of food	42%	48%	38%	37%	41%
8	Transportation efficiency such as using public transport or carpooling	38%	41%	35%	39%	35%
9	Practicing the 4 R's – refuse, reduce, reuse, recycle	34%	26%	33%	42%	45%
10	Alternative transportation choices such as biking and walking	33%	33%	33%	37%	26%
11	Energy efficiency in commercial buildings	29%	37%	26%	22%	20%
		N=803	N=332	N=160	N=166	N=145

■ Land
 ■ Transportation
 ■ Water
 ■ Food
 ■ Energy
 ■ Waste

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Resources Breakdown by Age

Question 8: If you would like to reduce your impact, what kinds of resources and/or information do you think would help you to achieve that? Choose up to 3.

	Group	24 and under	25-44	45-64	65+
1	Calculating your own carbon “foot-print”	Calculating your own carbon “foot-print”	Calculating your own carbon “foot-print”	Calculating your own carbon “foot-print”	Calculating your own carbon “foot-print”
2	Community events/ Workshop	Community events/ Workshop	Community events/ Workshop	Community events/Workshop	Informational factsheet
3	Informational factsheet	Informational factsheet	Informational factsheet	Web-based learning	Community events/Workshop
4	Climate science FAQs	Climate science FAQs	Web-based learning	Informational factsheet	Climate science FAQs
5	Web-based learning	Case studies	Climate science FAQs	Climate science FAQs	Web-based learning
6	Case studies	Web-based learning	Case studies	Case studies	Case studies

This table represents by age how respondents would like to learn about reducing personal impacts associated with climate change. There are more similarities than there are differences. The most noticeable difference in being informed is through web-based learning.

Resources Breakdown by Age - Percentages

Question 8: If you would like to reduce your impact, what kinds of resources and/or information do you think would help you to achieve that? Choose up to 3.

		Group	24 and under	25-44	45-64	65+
1	Calculating your own carbon “foot-print”	61%	65%	67%	54%	52%
2	Community events/ Workshops	51%	57%	50%	42%	44%
3	Informational factsheet	39%	38%	35%	33%	49%
4	Climate science FAQs	33%	38%	23%	28%	31%
5	Web-based learning	31%	28%	34%	35%	26%
6	Case studies	28%	34%	25%	19%	28%
		N=876	N=338	N=177	N=201	N=160

Conclusions and Recommendations

This community survey was carried out to inform the community that actions are being taken at the city level to plan for climate change. The survey was also carried out to gather citizen views about climate change. The survey results will assist the City of Northfield's CAPAB to write a climate action plan (CAP) that incorporates strategies that fit the community. The survey will also assist with understanding the education and outreach needs of the community. Based on the data presented in this report, the following conclusions and recommendations have been identified.

Northfield citizens who responded to the survey are concerned, informed, and think about climate change. They are taking actions to reduce waste, reduce energy use, and buy local products. They would like to take more action. They are most concerned about temperature and seasonal changes and what these changes are doing to agriculture and food production, the loss of habitat and species, the decrease in the quality of local lakes and rivers, and the decrease in air quality.

Support for all of the suggested 19 possible future actions is very high. A deeper analysis of the survey results shows that 11 of the actions currently have more support than the other 8. It is important to note that respondent support for any of the 19 possible actions may change in the future as information becomes available and understanding increases. The 11 actions are:

- Make more local food available
- Have more food recovery programs
- Institute community composting
- Decrease water pollution
- Improve waste disposal practices
- Plant more trees
- Update the storm water system
- Secure more renewable energy options
- Create more green space around water
- Prevent community-wide waste
- Adopt energy efficiency standards

To help Northfield citizens learn about climate change and take action, a personal carbon footprint tool, informational facts sheets, and community workshops and events should be made widely available. Informing citizens about these learning opportunities should be promoted on the City of Northfield's website, at community workshops and events, in the Northfield News, and via social media or e-subscriptions.

Planned education and outreach efforts should occur while the climate action plan is being written and implemented and should be maintained well into the future (Boswell et al. 2012). From the survey results it is clear that citizens want education and outreach programs that are coordinated, collaborative, community-wide, and even regional. Citizens also want to participate with reducing the community's GHGs, so they need information and guidelines from which to take actionable steps.

While support is high for taking action on climate change, there are a small number of respondents who do not support the suggested efforts. It is important to listen to the voices of those who are less enthusiastic about making efforts to tackle climate change. Listening to all opinions respectfully allows for tailoring better education and outreach efforts. Communication should be open and non-judgmental.

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tal, inviting all into the conversation. Any education outreach should be evidence-based and tailored to meet the needs of the group it is intending to reach.

Survey results should give each of the 6 CAPAB subgroups an idea of initiatives that would be highly supported and those that will take a little more effort. In addition to providing useful additional suggestions for each of the 6 CAPAB subgroup areas -- see respondent comments -- respondents were clear that more “political will” is needed as well as more education for all community groups.

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Appendix A: Putting It All Together

Appendix A was constructed to show how to use the results from the *degree of support for future action* question and 3 other survey questions to gain a better understanding of why some of the 19 possible future actions would be easier to implement than the others.

In the table, each of the six CAPAB subgroups is shown along with each subgroup’s corresponding *degree of support for future action* questions and revised percentages (in the first and second columns). The subsequent columns contain the 3 other survey questions and their percentages, as they are applicable to a subgroup.

Commentary about the relationship between *degree of support for future action* and the other 3 survey questions is provided to illustrate which possible future actions would be easier to develop strategies for, educate the community about, and then implement. Support for a future action is greater when individuals are already taking personal action in that area and want information on a topic related to the action, and in some instances, support for a future action is demonstrated by high concern for Minnesota’s climate changes.

FOOD							
Support future action	%	Taking personal action	%	Concern for MN’s climate changes	%	Topics more information is wanted about	%
More food recovery programs	91	BUY LOCAL PRODUCE	65	IMPACTS ON LAND AND AGRICULTURE	85	PLANT DIET	40
More local food available	≥91	REDUCE MEAT	44	LOSS HABITAT AND SPECIES	83		
Institute bans on non-recyclables and plastic bags	≤64						

Support is high for more food recovery (91%) in the community likely because individuals are connecting it to the need to reduce waste. Support is high for making more local food available because 65% are taking personal action in this area (buying local produce) and because there is much concern about impacts from climate change to land and agriculture (85%) and to the loss of habitat and species (83%).

The third action, to institute bans on certain products/practices, has the least support (≤64). These bans are perceived as affecting business. This action could simultaneously be included with waste actions.

An observation here is that there are fewer individuals reducing meat consumption (44%) or wanting-information about a plant-based diet (40%). This may indicate that individuals are not connecting how these activities contribute to either greenhouse gas emissions or reductions.

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WASTE							
Support future action	%	Taking personal action	%	Concern for MN's climate changes	%	Topics more information is wanted about	%
Institute waste diversion and community composting	89	REDUCE WASTE	91			WASTE DIVERSION	47
Improve disposal practices	87	BUY GREEN PRODUCTS	57			REDUCE CONSUMPTION	46
Prevent the creation of community waste	83	BUY LESS STUFF	54			4 R'S	35
<p>Support is high for the first two possible actions because personal action in this area is moderate to high - buying less stuff (54%) and reducing waste (91%), and there is moderate interest in learning more about waste diversion (47%) and to reduce consumption (46%).</p> <p>The third action, preventing the creation of waste in the community, has good support although there is only moderate personal action to buy less stuff (54%) and there is not much interest in wanting information (35%) about the 4R's (refuse, reduce, repair, and recycle). This third action could easily be tied in with the first two actions when developing an education and outreach plan.</p>							

LAND							
Support future action	%	Taking personal action	%	Concern for MN's climate changes	%	Topics more information is wanted about	%
Plant more trees	87			IMPACTS ON LAND AND AGRICULTURE	85	CARBON SEQUESTRATION	46
More green space around water	85			LOSS HABITAT AND SPECIES	83		
Reduce community sprawl	≤64						
<p>Support is high for planting more trees (87%) and improving green space around water (85%) because there is much concern about the impact from climate change to land and agriculture (85%), to the loss of habitat and species (83%), and relatedly, to the quality of Minnesota lakes and rivers (84%). That there is moderate interest in learning more about carbon sequestration (46%) points to a growing awareness of activities that can reduce local greenhouse gases.</p> <p>Reducing community sprawl, the third action, is least supported. This is likely because reducing community sprawl is socially and economically complex and requires long-term vision.</p>							

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ENERGY							
Support future action	%	Taking personal action	%	Concern for MN's climate changes	%	Topics more information is wanted about	%
Secure renewable energy	86	REDUCE ELECTRIC USE	73			RENEWABLE ENERGY	64
Adopt higher energy efficiency standards	82					RESIDENTIAL ENERGY EFFICIENCY	52
Update existing buildings to reach higher energy efficiency standards	68					COMMERCIAL ENERGY EFFICIENCY	30

Support is high for the first two actions, securing renewable energy (86%) and adopting higher energy efficiency standards (82%), because personal action on reducing energy use is high (73%). Individuals also want more information about renewable energy (64%) and residential energy efficiency (52%). Building on personal action that is already being taken and incorporating what topics individuals want more information about should further secure support.

The third action, to update existing buildings to reach higher energy efficiency standards, likely has less support because it is perceived as costly.

TRANSPORTATION							
Support future action	%	Taking personal action	%	Concern for MN's climate changes	%	Topics more information is wanted about	%
More public transport options	67	REDUCE FUEL USE	53			PUBLIC TRANSPORTATION	37
More pedestrian and bike routes	64					WALKING AND BIKING	32
More electric vehicle capability	≤64						
Transition government fleet to electric	≤64						

Support for more public transportation options (67%) and pedestrian and bike routes (64%) is only moderate because there is only moderate personal action being taken to reduce fuel consumption (53%), and there is even less interest in learning more about public transportation options (37%) and walking and biking (32%).

The third and fourth future actions have less support.

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WATER							
Support future action	%	Taking personal action	%	Concern for MN's climate changes	%	Topics more information is wanted about	%
Decrease water pollution	89	REDUCE WATER USE	53	LAKES AND RIVERS	84	WATER CONSERVATION	52
Update storm water system	87			INCREASED PRECIPITATION	75		
Reduce total community water use	73			INCREASED FLOODING	73		
				CHANGING WINTER RECREATION OPTIONS	47		

Support for reducing water pollution (89%) and updating the storm water system (87%) is high because there is high concern about what is happening to Minnesota's lakes and rivers (84%), and concern for increased precipitation (75%), and flooding (73%). There is moderate interest in learning more about water conservation (52%).

There is less support for the third action because there is only moderate personal action in the area of reducing water consumption (53%) and wanting more information about water conservation (52%). This may signal a lack of understanding between climate change, personal action, and community practices. The third action would have good potential to be tied in with the first two actions when developing an education and outreach plan.

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References

- Barnes, Jessica and Michael Dove, et al. 2013. "Contribution of Anthropology to the Study of Climate Change." *Nature Climate Change* 3: 541-544.
- Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. 2012. *Local Climate Action Planning*. Washington, DC: Island Press.
- U.S. Census Bureau. 2013-2017 American Community Survey 5-Year Estimates. <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>
- US Census Bureau Quick Facts. 2013-2017 Education Estimates. <https://www.census.gov/quickfacts/fact/table/northfieldcityminnesota,US/PST045218>

Thank you to all who took the time to take the survey.

Thank you to all who contributed to this project: the City of Northfield staff and interns, the City of Northfield Climate Action Plan Advisory Board, the student and citizen volunteers who helped to administer the survey, the churches, businesses, and clubs where the survey was administered, and the individuals who volunteered time to help analyze the data and design and edit the report.

Direct any questions about this survey to Carla Hansen at cgmhansen@gmail.com.

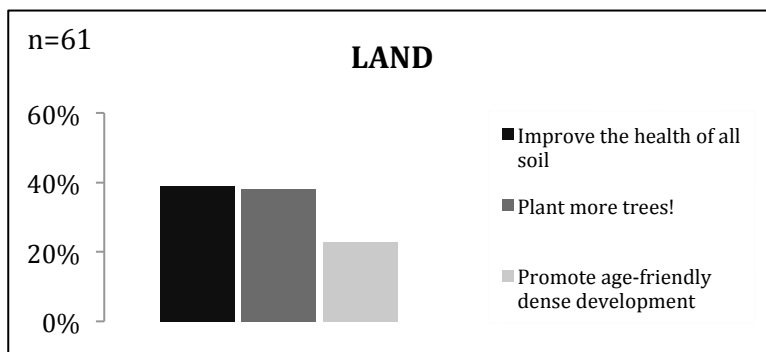
A Summary of the Climate Action Plan Advisory Board (CAPAB) Dot Voting Activity Conducted at the 2019 Northfield Earth Day Celebration

Carla Hansen
May 1, 2019

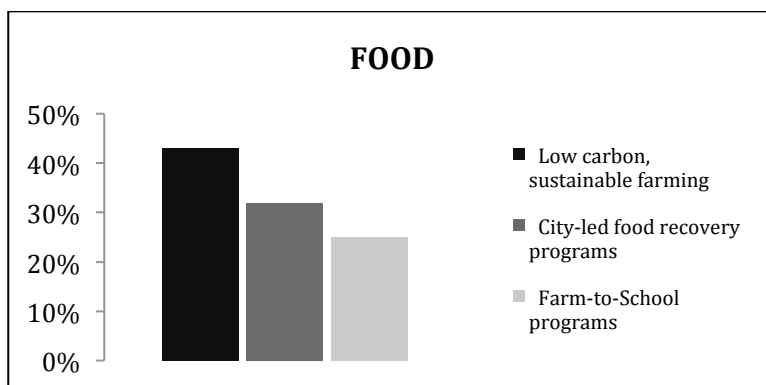
Each of the six CAPAB working groups – land, food, waste, transportation, water, and energy -- participated in Northfield's 2019 Earth Day celebration. In addition to speaking about their group's progress with the climate action plan during the evening program, each of the six working groups exhibited in the afternoon. They provided educational and interactive displays and handouts to inform the community about climate change and the work they are doing to write a climate action plan.

During the exhibiting time, the CAPAB working groups spoke directly with citizens about specific actions they are exploring to reduce greenhouse gas emissions and increase Northfield's resiliency to the effects of climate change. Citizens were encouraged to weigh in on what they thought about these actions by participating in an informal Dot Voting activity answering the question "What do you most want to see in Northfield?" The Dot Voting activity gives a sense of what citizens on that day were thinking.

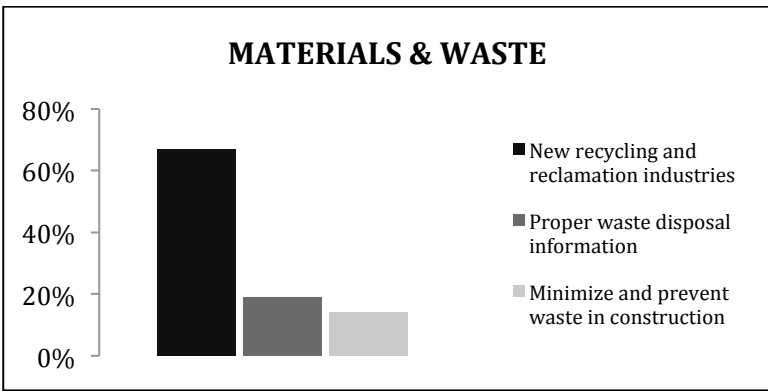
Below is a simple summary of each working group's Dot Voting results. This information is useful to each working group to let them know 1) what a subsection of citizens want to see for Northfield and 2) where more education is needed. From the results, more education is needed to understand why increasing community density, minimizing and preventing construction waste, managing potable and flood water, disclosing energy data to potential buyers, and instituting Farm-to-School programs would contribute to future sustainable practices.



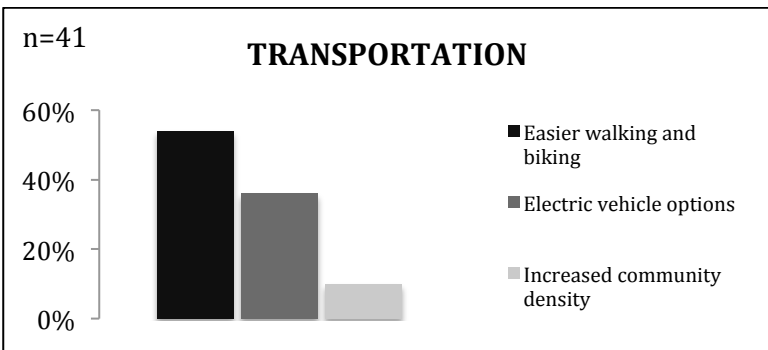
Respondents see the value in all of the Land actions but voted most to improve soil health (39%) and plant trees (38%).



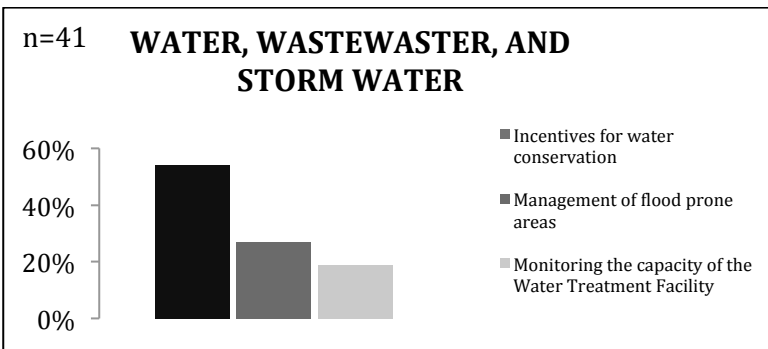
The respondents are interested in all of the Food actions. Most (43%) emphasize low carbon, sustainable farming. One-third (32%) of the respondents want to see city-led food recovery programs.



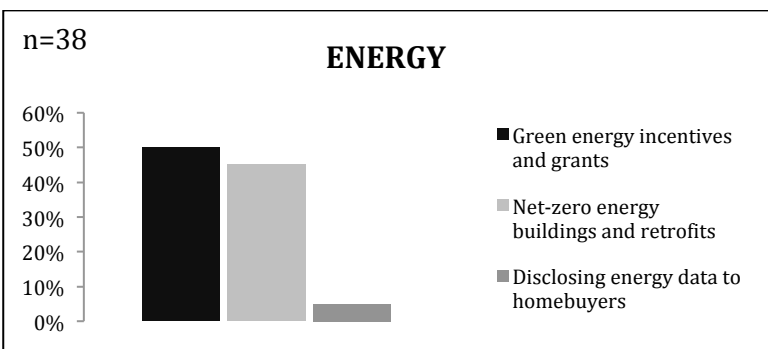
Notice how the respondents (67%) have prioritized that we should take responsibility for our waste.



Respondents (54%) want easier walking and biking. Just over one-third (36%) of the respondents would like to see more electric vehicle options in Northfield.



It is clear that the majority of respondents (54%) would like more incentives made available to participate in water conservation activities.



Respondents see value in both of these actions: green energy incentives and grants (50%) and net-zero energy buildings and retrofits (45%).

What do you most want to see in Northfield?

	Number of Respondents	Percentage
Land:		
Improve the health of all soil	24	39%
Planting more trees!	23	38%
Promote age-friendly dense development	14	23%
Total	61	
Food:		
Low carbon, sustainable farming	23	43%
City-led food recovery programs	17	32%
Farm-to-school programs	13	25%
Total	53	
Waste:		
New recycling and reclamation industries	29	67%
Proper waste disposal information	8	19%
Minimized and prevent waste in construction	6	14%
Total	43	
Transportation:		
Easier walking and biking	22	54%
Electric vehicle options	15	36%
Increased community density	4	10%
Total	41	
Water:		
Incentives for water conservation	22	54%
Management of flood prone areas	11	27%
Monitoring the capacity of the Water Treatment Facility	8	19%
Total	41	
Energy:		
Green energy incentives and grants	19	50%
Net-zero energy buildings and retrofits	17	45%
Disclosing energy data to homebuyers	2	5%
Total	38	

Additional comments that respondents wrote in at the bottom of the Dot Voting sheet:

Land - Planted correctly (trees). Watered the 1st and 2nd years. Please water the trees on 4th St. hill.

Waste - Local solar company wants to educate all their employees about new recycling rules. Pulverize plastic make bricks and roads with them.

Northfield Climate Action Plan

Community Engagement Memo

Prepared by: Jenna Greene, May 22, 2019

The City of Northfield is completing a climate action plan that will include strategies to reduce greenhouse gas emissions in the community and increase resilience among its residents, built and natural infrastructure. As part of the development of the plan, the city seeks to broaden community engagement efforts to ensure that the plan addresses barriers to the quality of life and physical, economic, and environmental health of residents, particularly the most vulnerable.

In alignment with the mission outlined above, Great Plains Institute conducted four community engagement focus group discussion sessions in May 2019 to gather input on priorities, strategies, and implementation involvement from different community groups throughout the city. The focus groups included:

- Latinx community organization leaders
- St. Olaf and Carleton College students
- Business leaders
- Northfield High School students

The feedback gathered from this process will be incorporated into the Climate Action Plan. The following provides a description of each session, along with outcomes and further actions.

LATINX COMMUNITY ORGANIZATION LEADERS

Participants: The session was facilitated by Great Plains Institute. Staff from the City of Northfield, Healthy Communities Initiative (Growing Up Healthy, Link Center), Neighbors United, Greenvale Park Community School, and the CAPAB co-chairs all attended as participants.

Description: GPI convened and facilitated a focus group of community leaders who work closely with Northfield's Latinx and Immigrant communities. The purpose of this focus group discussion was to better understand barriers residents face on issues related to housing, economics, transportation, and health and to incorporate strategies into the Northfield CAP that improve residents' quality of life.

Process:

- **Context Setting and Overview:** GPI presented on the process of the CAP development, the stakeholders involved in its development, the timeline, and a snapshot of what will be included in the plan in terms of greenhouse gas emissions and community resilience.
- **Discussion of Concerns:** Each participant was asked to write concerns related to the following four topics and share their concerns with the groups. Similar concerns were grouped to identify themes among each area.

Housing

Economics

Transportation

Health

- **Successes, Targets, and Strategies:** GPI facilitated a discussion around prioritized themes to better understand target successes and strategies for success.

Outcomes: The group identified concerns related to each of the four topic areas (housing, economics, transportation, and health). Housing and transportation concerns were identified as the most pressing for the Latinx community in Northfield.

Participants identified living wage jobs and access to funding for energy improvements as the primary economic concerns. Many of the other economic concerns were embedded in the transportation and housing issues and are summarized in those sections.

Health concerns were primarily centered on access to affordable health care. Many are concerned with the rising cost of prescription drugs, access to affordable health insurance, as well as addressing language barriers. Additional considerations include food security, especially access to affordable, healthy options. Some of the concerns related to climate impacts were related to air quality and how that might affect health, especially asthma and allergies.

TRANSPORTATION		
Goal: All residents have access to reliable, safe transportation options for mobility in-town and regionally		
Theme Area	Concerns	Strategies
Public Transportation	<ul style="list-style-type: none"> • Not enough routes within and outside of Northfield • Lack of use – doesn't meet the needs of the community • Barriers to use: inconvenient hours; unreliable; operators only speak English; no guarantee Dial-a-Ride will give you a spot; bus routes take a long time • Renting busses for programming is cost prohibitive 	<ul style="list-style-type: none"> • Coordinate with colleges on piloting rideshare, public transit options, etc. • Bring Uber/Lyft to Northfield <ul style="list-style-type: none"> ◦ Voucher access • Ensure city is plugged into regional transportation system • Coordinate volunteer drivers • Rethink layout/design of city for increased mobility options
Mobility Options	<ul style="list-style-type: none"> • Lack of pedestrian and bike lanes in many areas and neighborhoods 	<ul style="list-style-type: none"> • Ensure safe, accessible routes to school

HOUSING		
Goal: All housing in Northfield is safe, efficient, affordable, accessible		
Theme Area	Concerns	Strategies and Targets
Housing Stock Quality	Conditions of mobile homes are unsafe, especially in the face of climate hazards – unanchored, antiquated furnaces, outdated HVAC	<ul style="list-style-type: none"> • Council considering ADU ordinance • Combine healthy home opportunities with efficiency
Energy and Efficiency	<ul style="list-style-type: none"> • Energy efficiency upgrades not affordable • Need weatherization and efficiency upgrades in low income housing • Pipe freezing concerns, many residents run water to avoid freezing • Lack of access to weatherization programs <ul style="list-style-type: none"> ○ Contractors need specialized HVAC equipment to work on mobile homes ○ Immigration status is a barrier to apply for programs ○ Housing title needed for programs, not how mobile homes are generally transferred 	<ul style="list-style-type: none"> • Home Energy Squad visits in the Energy Action Plan – partnering with Growing Up Healthy • Strategize funding options to pay for equipment upgrades • Ensure any EE program does not jeopardize peoples’ housing
Homeownership Access	<ul style="list-style-type: none"> • Barriers for undocumented residents (access to capital) • Need programs to help folks buy homes for first-time buyers 	<ul style="list-style-type: none"> • Northfield could pilot a credit union specifically to serve the Latinx Community
Affordable Housing	<ul style="list-style-type: none"> • Limited affordable housing – less than 1% housing vacancy in Rice County, with no vacancy of affordable housing • No emergency/transition housing, workforce housing • Rental prices are too high 	<ul style="list-style-type: none"> • Maintain naturally occurring affordable housing
Isolation of Housing	<ul style="list-style-type: none"> • Affordable housing is not walking distance or easily accessible to necessities • Problems of communities in Northfield are invisible to much of the community 	<ul style="list-style-type: none"> • Consider community connections in community planning and housing programming

Participants emphasized the importance of the City to act on the plan and work on implementing a tangible program soon. Further, they stressed the importance of following through on announced programs to ensure they will happen – which will help to build trust between residents and the City.

ST. OLAF AND CARLETON COLLEGE STUDENTS

Participants: The session was facilitated by the Great Plains Institute. Participants included City of Northfield staff, Carleton College Students, and St. Olaf Students.

Description: The two colleges in Northfield impact the community's emissions, resilience, and strategies for addressing climate change. GPI facilitated a conversation with students to brainstorm their role in implementing the plan and to gather input on strategies.

Process:

- **Context Setting and Overview:** GPI presented on the process of the CAP development, the stakeholders involved in its development, the timeline, and a snapshot of what will be included in the plan in terms of greenhouse gas emissions and community resilience.
- **Discussion of Student Involvement:** Participants discussed the ways in which they may be involved with plan implementation and their input on CAP strategies.

Outcomes: Overall, students emphasized the need for collaboration between the schools and among the Colleges and the City for climate action.

CAP Strategy Feedback

Students identified transportation as a priority issue both for their own needs and for the Northfield community more broadly. Ideas included: more reliable and extensive bus routes, scooters/bikes available to students and city residents, and collaboration between Colleges and City for community-wide bike/scooter share. Further ideas and priorities are below.

- Events: Students shared their excitement about a climate expo and about students helping with climate-related events
- Colleges should divest from fossil fuels
- All housing in Northfield should be efficient
- Harness student energy and activism in Northfield to (1) mandate climate action as a component of every class; (2) communicate about environmental issues
- Incorporate recycling and compost in every business in Northfield

Implementation Ideas

Methods for Student Involvement in Implementation

- Education and Outreach: Create email list to communicate volunteer opportunities; work with College students to engage elementary, middle, and high school students
- Innovation and Demonstration: Engage student naturalists and student volunteers on tree planting initiatives
- Supporting the Plan: Encourage St. Olaf to start a sustainability office, CAP
- Planning and Policy: Students can help with research for best practices

Vectors for Involvement

- Academic Civic Engagement Courses – semester or quarter-long projects
- Student clubs – opportunity for volunteering and engagement
- Student Employment – opportunity for student work study or internship with the City

BUSINESS LEADERS

Participants: The session was facilitated by Great Plains Institute. Participants included representatives from Sheldahl Flexible Technologies, The Hideaway, Northfield Chamber of Commerce, Hotspot Music, Just Food Coop, a retired employee of Malt O Meal, and a CAPAB Co-chair

Description: Commercial and industrial buildings make up a large portion of Northfield’s emissions, and thus can lead on emission reductions.

Process:

- **Context Setting and Overview:** GPI presented on the process of the CAP development, the stakeholders involved, the timeline, and an overview of what will be included in the plan
- **Discussion Business Actions and Strategies:** Participants discussed what businesses in Northfield are already doing with regards to climate action, and input on CAP strategies

Outcomes: Many business leaders in attendance have been involved in the CAP process thus far on subcommittees. The discussion focused on climate adaptation and climate resilience as they relate to business owners, including actions to date, desires moving forward, barriers, and opportunities.

Climate Mitigation	
Actions to date	Lighting replacement, adding recycling/compost options
Desires moving forward	Mass compost program, increase bike parking, making it easier for businesses to implement efficiency and renewable energy upgrades, bulk procurement of alternatives to single use plastic, teracycle programs, combined heat and power systems, behavior change campaigns for consumers
Barriers to implementation	Raising cost of sustainable products, lack of time, barriers to knowledge and information, coordinating initiatives (like bulk purchasing programs) takes time
Opportunities	Peer exchange and information sharing

Climate Resilience	
Actions to date	More reactive strategies: cleaning up from flooding, sandbagging
Desires moving forward	Guidance on planning for resilience, ensuring back-up generation availability
Barriers to implementation	Money, space for back-up systems
Opportunities	City can educate on rain gardens, coverage, lead on park management and turf management, more collaboration on stormwater issues, battery storage, procurement of renewable energy

NORTHFIELD HIGH SCHOOL STUDENTS

Participants: GPI facilitated the conversation. Participants included Northfield High School Students , TORCH staff, and City of Northfield staff.

Description: Youth have been an integral voice in the movement for climate action. The City of Northfield identified high school students as being an important community for CAP implementation.

Process:

- **Context Setting and Overview:** GPI provided an overview of the CAP development process
- **Discussion of Student Involvement:** Participants discussed the ways in which they may be involved with plan implementation and their input on CAP strategies

Outcomes:

- Students shared how they know about climate and environmental topics: classes, the news, Instagram are most influential places for learning about these topics
- Students shared what they're already doing on climate action: diet, waste management
- Students shared their perception about how other youth get involved/how they feel about environmental issues: (1) in denial/pessimistic, (2) don't care, or (3) involved

Background Provided: The Northfield CAP includes actions to address greenhouse gas emissions in the community that come from travel, residential energy use, commercial energy use, and waste. The CAP organizes actions under four umbrella strategies:

- **Education and Engagement** - Outreach, campaigns
- **Policy and Planning** - Keeping pressure; be involved in commissions, committees
- **Innovation and Demonstration** - Big idea/pilot project
- **Supporting the Plan** - Youth involvement on resident body/commission

Vectors for Implementation

- Class – May not have the capacity to do implementation projects. Seniors have capstone projects.
- Clubs - Could help to educate other students, collaborate with city, colleges, other school clubs

Other Ideas

Students shared ideas for implementing climate action plan policies in the following ways.

- Have a dedicated teacher/staff member with the Environmental Club to help ensure that these things happen
- Locally focused projects – students always looking for volunteer opportunities, can share these opportunities online and through Northfield Shares/Northfield Promise website
- Want to provide framework and steps for action for young activists in Northfield
- Students are interested in both (1) physical volunteering and (2) education and engagement opportunities
- Prioritized Issues: Students expressed an interest mostly in pedestrian accessibility and decreasing mowing and turf