Climate Action Plan

CITY OF GRAND MARAIS, MINNESOTA

| Approved by the Grand Marais Public Utility Commission: February 13th, 2019 |

| Adopted by the Grand Marais City Council: June 26th, 2019 |

Grand Marais Climate Action Plan
PROJECT SUMMARY

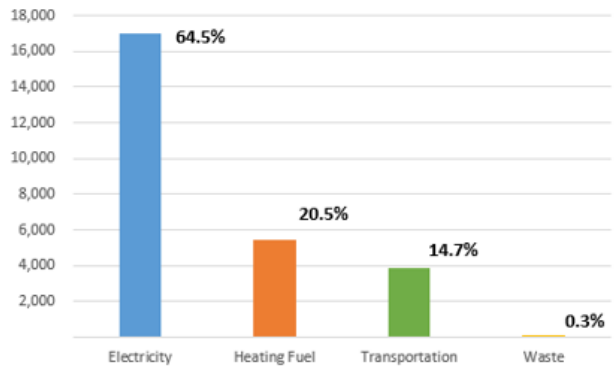
In 2016, a local youth organization identified the City of Grand Marais as lacking action against the threats of climate change. In response, the Grand Marais City Council passed the *Climate Inheritance Resolution* in 2017 and began developing a Climate Action Plan that "significantly reduces Grand Marais' greenhouse gas emissions to levels that would protect our community's children and grandchildren from the risk of climate change." In 2018, a coordinator was hired to develop the plan with the support of a steering committee of community members, business owners, city officials, and local youth. An outline of the plan is summarized below.

❖ GREENHOUSE GAS INVENTORY

What is the carbon footprint of Grand Marais?

- 2016 city-wide greenhouse gas emissions: 26,339 tonnes of CO_2
- Energy use by sector:
  - 55% Commercial
  - 45% Residential
- Emission sources: (Figure 1)
  - *Electricity* produced from coal-fired power plants
  - *Heating Fuels* for buildings and certain appliances
  - *Transportation* for travel only within city limits
  - *Waste* deposited in landfills.

Figure 1: Current Carbon Emissions for Grand Marais (tonnes)



❖ GOALS

What is the expected outcome of the Grand Marais Climate Action Plan?

- The primary goal is a carbon neutral city by 2040.
- A major focus on sustainability that is:
  - Economically viable
  - Improves the quality of life
  - Environmentally effective
- Interim checkpoint goals for 2030 are shown in Table 1.
  - Checkpoints aim for emissions to be 45% below 2010 levels
  - Targets are consistent with the 2018 report from the IPCC

Table 1: Grand Marais Carbon Emissions Goals for 2030 (tonnes)

Goals	Current Emissions	2030 Target
Expand Renewable Energy Generation	16,990	8,238
Improve Existing Building Energy Efficiency Design Zero Net Energy New Buildings	5,414	2,922
Vehicle Emission Reduction	3,878	2,044
Waste Reduction	56	30
Total	26,339	13,234

❖ STRATEGIES AND TACTIC

What is the strategic pathway for achieving carbon neutrality by 2040?

Table 2: Tactic Prioritization	*Immediate Action* ★★★★	*Action within 5 years* ★★★	*Action within 10 years* ★★	*Action within 20 years* ★
Efficiency Tactics	➢ Encourage Commercial Energy Audits ➢ Energy Efficiency Education Programs ➢ Energy Benchmarking and Disclosure ➢ Vehicle Efficiency Education Programs	➢ Retrofit City-Owned Buildings ➢ Replace Streetlights with LEDs ➢ Residential Energy Efficiency Program ➢ Energy Codes for New and Existing Buildings ➢ Outdoor Lighting System Upgrades	➢ Outdoor Lighting Ordinance	➢ New Building Construction to be ZNE
Electrification Tactics	➢ EV Education Programs ➢ Encourage and Incentivize Heating System Electrification Program	➢ Expand EV Infrastructure ➢ Electrify Heating in City-Owned Buildings ➢ Expand EV Incentives	➢ Heating Appliance Electrification Codes ➢ Replace City-Owned Vehicles with EV Alternatives ➢ Explore Policies that Reduce Vehicle Emissions	
Decarbonization Tactics	➢ Solar Advisory Committee ➢ Solar Outreach and Education ➢ Solar Outreach and Marketing ➢ Lobby SMMPA to Expand Renewable Energy Portfolio ➢ Advocate for Climate Friendly State and Federal Policies	➢ Maximize PV on Municipal Sites ➢ Update City Renewable Energy Policies ➢ Organic Waste Collection	➢ Expand City-Owned PV ➢ Contract with Third Party Solar Developer	➢ Explore Potential of Local Wind Energy ➢ Biofuels Pilot Project ➢ Explore Potential for Biomass Plant for Electricity Generation
Land Use and Energy Storage Tactics	➢ Group Bulk Purchasing Program ➢ Preserve Green Space within the City	➢ Explore Options for Energy Storage ➢ Expand Recycling and Composting	➢ Implement Energy Storage Solution ➢ City-Wide Zero-Waste Plan	

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EXECUTIVE SUMMARY

What is a Climate Action Plan?

A Climate Action Plan, *or CAP*, is a roadmap that identifies a city's carbon emission levels and aims to reduce them in a sustainable way. The Grand Marais CAP has four major sections. The first is a Greenhouse Gas Inventory, a study done by Regional Indicators Initiative, an organization that measures performance metrics for Minnesota cities. This study details the sources of Grand Marais' carbon emissions and describes renewable energy resource potential in the city. The second major section of the plan details the goals Grand Marais has set for reducing greenhouse gas emissions over the next two decades. The primary goal of this plan is for Grand Marais to be a carbon neutral city by 2040. The third section outlines broad strategies the city will take to achieve its goals. The final section is a point-by-point list of suggested tactics, which outline exactly how the city could cut carbon emissions to levels that fulfill the *Climate Inheritance Resolution*, which is detailed below.

What is the purpose of the Climate Action Plan?

In February of 2017, the residents of Grand Marais expressed their concern for the growing threat of climate change by encouraging the city council to pass the Climate Inheritance Resolution. This is a policy-based resolution calling for the city to develop a Climate Action Plan that will "significantly reduce Grand Marais' greenhouse gas emissions to levels that would protect our community's children and grandchildren from the risk of climate change". See the full resolution in Appendix 1.

The strategies of this plan follow the principles of sustainability which aim to fight climate change, expand the economy, and improve people's quality of life. The primary goal of the CAP is to reduce carbon emissions in a way that sustainably guides the city away from fossil fuels and toward low carbon energy. Some of the indirect effects of reducing carbon emissions also have positive impacts on day-to-day life. Lower energy bills and operations costs, job creation, more comfortable living spaces, better air quality, and decreased light and noise pollution all serve to make Grand Marais an overall better and more affordable place to live. See Appendix 2 for more on the principles of sustainability.

Why does Grand Marais need a Climate Action Plan?

Scientific consensus has shown that humans are responsible for causing harmful changes to the earth's climate that will endanger the livelihood of future generations on this planet. Through the continued burning of fossil fuels, carbon dioxide (CO_2), a heat trapping gas, has built up to levels not present on Earth in hundreds of millions of years. Excessive CO_2 in the atmosphere is creating a greenhouse effect which is causing global temperatures to increase. Even a 2°C rise in global temperature[1] will have catastrophic effects that will destabilize natural systems on the planet. Some of these effects include polar ice cap melting, sea level rise, ocean acidification, and increased frequency and intensity of severe weather events like storms, floods, forest fires, drought, and heat waves. These events will have devastating impacts for life on Earth including mass extinctions, loss of habitat and biodiversity, decreased crop yields, and food shortages. Additionally, there are significant and adverse human health risks associated with climate change. The Minnesota Department of Health released a report on climate change that details these risks. A link to the full report can be found in Appendix 6.

To avoid these hazards, the Intergovernmental Panel on Climate Change (IPCC) states that substantial emissions reduction over the next few decades can lessen climate risks. Additionally, effective mitigation depends on action *at all scales* and is not only good for reducing climate risk, it is also economically viable[2]. The IPCC's 2018 report states that if humanity is to avoid the worst effects of climate change, the time is now for ambitious and aggressive intervention. This is a call to action on a global scale and has spurred small towns, major cities, and entire nations to address climate change.

How was the Climate Action Plan Developed?

The CAP was developed by a coordinator, steering committee, and a city official. The steering committee consisted of Naomi Tracy-Hegg and Lisa Tracy, and Olya and Jeanne Wright of the Nordic Nature Group; Chris O'Brien of the Cook County Local Energy Project (CCLEP); Rebecca Wiinanen of the Citizen's Climate Lobby; George Wilkes of the Grand Marais PUC; Jay Arrowsmith DeCoux, Mayor of Grand Marais; and community member Don Grant. Additional guidance came from City of Grand Marais Administrator Mike Roth. CAP Coordinator Shane Steele developed and organized the plan. City of Grand Marais Communications Director Patrick Knight developed the public input survey and organized outreach and marketing for the plan. Additional resources were provided by Regional Indicators Initiative, Great Plains Institute, Minnesota GreenSteps Cities, and Clean Energy Resource Teams. Funding for the development of the CAP was provided by the McKnight Foundation.

[1] The Intergovernmental Panel on Climate Change 2018 Report.

[2] IPCC 2014 Report.

GREENHOUSE GAS INVENTORY

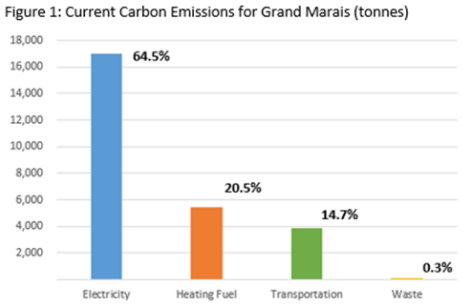
The Greenhouse Gas Inventory, compiled by Regional Indicators Initiative, shows a current snapshot of the carbon footprint for Grand Marais. The report details energy use, sources of carbon emissions, and renewable energy potential in the city. In 2016, Grand Marais had carbon emissions levels of 26,339 tonnes of CO_2. This represents all emissions from buildings, transportation, and waste within city limits. If Grand Marais proceeds with "business as usual" energy use, by 2040 carbon emissions are projected to decrease to 23,715 tonnes annually. However, the two decades between 2020 and 2040 would net between 475,000 and 525,000 tonnes of CO_2 emissions. Regular data collection and reporting can be used to gain a more complete understanding of the true carbon footprint of Grand Marais and how it will respond to implementation of CAP programs. See Appendix 3 for the full Greenhouse Gas Inventory.

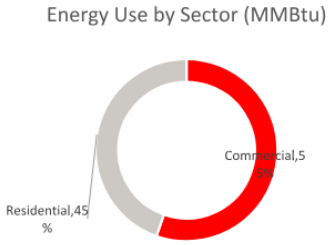
Key Points from the Greenhouse Gas Inventory

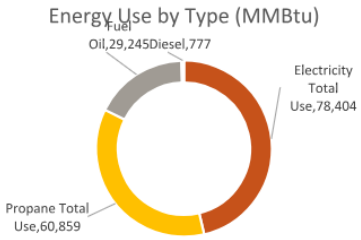
- While there are roughly three times more residential than commercial buildings in town, the commercial sector is responsible for more than half of all energy use in Grand Marais.
- Heating fuel (propane, diesel, fuel oil) and electricity are utilized for energy in similar amounts. However, CO_2 emissions from electricity account for more than two thirds of total emission values.
- Gasoline is the primary fuel source for the transportation sector.
- Transportation emissions are calculated experimentally and factor only miles driven within city limits. If commuting from outside city limits into Grand Marais were calculated, transportation emissions may be drastically higher.
- Waste emissions only factor greenhouse gases from decomposing refuse deposited into a Duluth landfill, and not from emissions to transport waste from Grand Marais to the landfill.

Energy Use Graphs

Figures 1, 2, and 3: The following graphs depict Grand Marais' energy use profile in 2016.

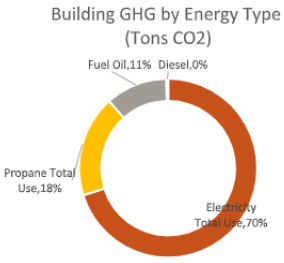


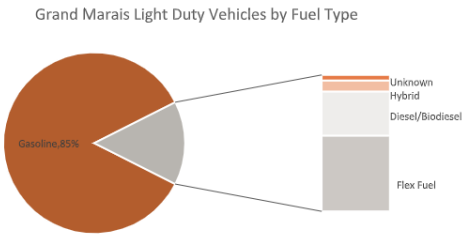




Carbon Emissions Sources

Figure 4, 5, and 6: The primary sources of emissions in Grand Marais come from buildings and transportation.





Carbon Emissions Accounting

Carbon emissions are embedded into all aspects of modern life. Carbon monitoring and accounting distinguishes between three different scopes of emissions[3]. The three scopes allow for categorization of emissions and help focus mitigation projects. The Grand Marais CAP will address some Scope 3 emissions but primarily focus on Scope 1 and 2 emissions.

Scope 1- Direct emissions such as propane usage for space and water heating or gasoline for vehicles.

Scope 2- Emissions from purchased secondary resources such as purchased electricity from a utility supplier-owned power plant.

Scope 3- Complete supply chain emissions including those used in the production of manufactured goods.

[3] Greenhouse Gas Protocol: Scope Emissions FAQ

GOALS

The Greenhouse Gas Inventory on page 7 shows the *before* snapshot of the carbon footprint in Grand Marais. The goals describe the *after* snapshot if full scale carbon mitigation projects were carried out. Apart from the targets listed below, a major goal of the Climate Action Plan is to achieve significant carbon reduction in a sustainable way by focusing on solutions that boost the economy, improving quality of life, and protecting the environment.

Primary Goals

Carbon Neutral 2040

Carbon neutrality, or zero net-emissions, is a high standard that requires accounting for and mitigating all carbon emissions in the city. Some emissions may remain in the system so long as they are offset by a form of carbon capture or sequestration.

The City of Grand Marais and its residents have made it clear that this community strives to be a leader in the fight against climate change. This primary goal of the CAP is based on the grade the city received from the iMatter Climate Report Card, which gives cities that can achieve zero net-emissions by the year 2040 the grade of an A. The grade currently given to Grand Marais is a D+. See Appendix 4 for the full report card.

Energy Resilience

Resilience is the ability to anticipate, prepare for, and adapt to changing conditions and respond to, withstand, and recover from disruptions through planning and technical solutions[4]. As a rural town, Grand Marais will make it a priority to produce more of its own energy while also encouraging its electricity provider to expand their renewable energy portfolio. This approach, if successfully implemented, may result in quantifiable decarbonization, increased grid resilience, economic development, and more local control of the power supply.

Interim Goals

IPCC 2030 Targets

To avoid the most catastrophic effects of climate change, the global community needs to limit temperature rise to within 1.5°C of preindustrial levels. To do this, the IPCC has recommended that emissions be reduced to 45% below 2010 levels by 2030. The CAP will use the IPCC 2030 targets as a major checkpoint on progress. See Table 3 below for Grand Marais' 2030 emission targets. See Table 5 (page 21) for how to track progress on emissions reduction year to year. For raw data on Grand Marais carbon emissions, see Appendix 5.

Table 3: Grand Marais Carbon Emissions Goals for 2030.

Goals	Current Emissions	2010 Emissions	2030 Emissions Targets
Increase Renewable Energy Generation	16,990	14,979	8,238
Improve Energy Efficiency of Existing Buildings **Design New Buildings to be Zero Net Energy**	5,414	5,313	2,922
Reduce Vehicle Emissions	3,878	3,716	2,044
Reduce Waste Emissions	56	55	30
Total	26,339	24,062	13,234

Emissions Category Sub-Goals

Emissions category goals can be marketable, energize the community, and create a sense of ownership of the CAP within the community. These goals should be consistent with community values, such as those outlined in the city's comprehensive plan.

Example Electricity Goals

Achieve 100% carbon free electricity city-wide by 2030.

Example Building Goals

Develop housing to meet low-carbon or zero-carbon standards to improve affordability and reduce risk from fuel price increases.

Example Transportation Goals

Make Grand Marais "EV Ready" and fully pedestrian friendly by 2025.

Example Waste Goals

Eliminate single-use plastics city-wide by 2025.

[4] Department of Energy's National Renewable Energy Laboratory- Distributed Energy Planning for Climate Resilience & Resilience Roadmap.

STRATEGIES

This plan aims to account for the needs of today without compromising the livelihood of the future, so the strategies below have been created through the lens of sustainability. An ambitious carbon reduction plan such as this requires a strategic layout to guide mitigation projects. The strategies follow three pathways that can inform tactics the city might use to achieve its climate goals. Also included in this section are methods for prioritizing tactics, engaging the community, and distributing information about CAP programs.

The Carbon Emissions Pathway

Emissions reduction focuses on the methods for carbon reduction. Standard sustainable practice is for cities to improve efficiency, increase electrification, and decarbonize energy use while developing a way to store renewable energy for peak usage.

1. *Efficiency*
   Efficiency is a high priority in reducing carbon emissions. To become carbon neutral, 100% of Grand Marais' energy must be produced from renewable sources. Maximizing efficiency reduces the electrical demand and thus the investment needed in renewable energy infrastructure. Energy efficiency also lowers energy costs for Grand Marais residents and business owners.
2. *Electrification*
   The use of fossil fuels like propane, fuel oil, diesel, and gasoline must be eliminated if the city is to achieve its carbon emissions goals. This can be done by electrifying heating appliances and transportation. Electrification streamlines energy sources and demand which increases efficiency. This consolidation of energy use to the electrical grid provides a simplified path to decarbonization and has the greatest impact on Grand Marais' carbon footprint.
3. *Decarbonization*
   Decarbonizing involves transitioning electricity generation away from coal, propane, and fuel oil and toward renewable sources. To strengthen energy resilience, local renewable energy production must be increased while also advocating for utility scale renewable energy power generation from the city's electricity provider. To avoid unintentionally increasing CO_2 emissions, decarbonization should happen at roughly the same rate as electrification.
4. *Energy Storage*
   Renewable energy generation and peak energy usage do not coincide. Solar and wind potential are strongest during the day, and peak energy use is highest in the early morning and evening hours. Thus, it may be necessary to develop an energy storage system that can provide electricity during peak usage hours.

The Policy Pathway

The policy pathway focuses on how the city can implement efficiency, electrification, and decarbonization tactics from a city-lead standpoint. Policy tactics aim to fit in with the community values listed in the City of Grand Marais Comprehensive Plan which includes sustainable energy use.

1. *Lead by Example*
   The city should lead by example in applying all tactics of the CAP to its own operations to show leadership and streamline energy policies and encourage replication in the private sector. This will also make it easy to gather and share accurate performance data to gain a better understanding of the effectiveness of new technology.
2. *Incentivize*
   Startup capital can be one of the major hurdles to any big project. Incentives can be financial opportunities that are available for the startup of efficiency, electrification, or decarbonization projects. The city will make it a priority to offer business owners and residents sufficient financial opportunities to spur the advancement of various energy efficiency and renewable energy projects throughout the community.
3. *Require*
   To drive incremental energy portfolio improvements, the city can explore policies that like interim ordinances to improve energy use. These policies should be made public well in advance of when they go into effect and be directly connected to incentivization opportunities.
4 *Advocate*
   Advocacy calls for progress to be made towards carbon reduction goals in areas outside of Grand Marais' direct control, such as lobbying SMMPA for aggressive decarbonization of its electricity generation. Elected city officials and other civic leaders can also lobby state and federal legislators for non-partisan, climate-friendly policies.

The Public Involvement Pathway

Public Involvement focuses on community outreach and engagement. These strategies aim to advance low carbon energy use throughout the entire community. The citizens of Grand Marais need to understand, support, and participate in the CAP for the city's goals to be achieved. To involve the public, the city must make resources available for the implementation of all aspects of the plan.

1. *Educate*
   Developing an informed citizenry will be important if the community is to embrace the CAP. Education can be done by reaching out to every Grand Marais citizen and business owner through seminars, marketing campaigns, and outreach programs.
2. *Encourage*
   Encouragement involves removing barriers to energy efficiency and renewable energy projects. This can come in the form of support when selecting a solar installer, adding insulation to a home, or choosing a replacement LED lightbulb. Extra support should be given to those who can benefit the most from CAP programs such as those with low or fixed incomes and those who can contribute the most to achieving the city's goals.
3. *Reward*
   Participation and long-term investment in the development of energy efficiency and renewable energy projects can be rewarded through progressive policies that ensure payoff. Rewards for carbon mitigation projects take a long-term view of the benefits of implementation to spur the impetus for such projects.

Prioritization of Tactics

Tactics have been prioritized into 4 phases of implementation. These phases were assigned based on the level of complexity, amount of capital investment required, potential infrastructure and policy changes, and effectiveness of the tactic.

★★★★ *Immediate Action*
Tactics that are relatively simple and may require minimal to moderate planning and little to no capital investment, infrastructure, or policy changes.

★★★ Action *Within 5 Years*
Tactics that may require significant planning and some capital investment but are feasibly implemented within 5 years.

★★ Action *Within 10 Years*
Tactics that will require long term planning and significant capital investment, infrastructure, or policy changes. With proper planning, these tactics could be implemented within 10 years.

★ Action *Within 20 Years*
Tactics that may be too complex, or are currently not technologically, financially, politically, or otherwise viable at the time this plan was written.

Table 2: Tactic Prioritization

	Immediate Action ★★★★	*Action within 5 years* ★★★	*Action within 10 years* ★★	*Action within 20 years* ★
Efficiency Tactics	➢ Encourage Commercial Energy Audits ➢ Energy Efficiency Education Programs ➢ Energy Benchmarking and Disclosure ➢ Vehicle Efficiency Education Programs	➢ Retrofit City-Owned Buildings ➢ Replace Streetlights with LEDs ➢ Residential Energy Efficiency Program ➢ Energy Codes for New and Existing Buildings ➢ Outdoor Lighting System Upgrades	➢ Outdoor Lighting Ordinance	➢ New Building Construction to be ZNE
Electrification Tactics	➢ EV Education Programs ➢ Encourage and Incentivize Heating System Electrification Program	➢ Expand EV Infrastructure ➢ Electrify Heating in City-Owned Buildings ➢ Expand EV Incentives	➢ Heating Appliance Electrification Codes ➢ Replace City-Owned Vehicles with EV Alternatives ➢ Explore Policies that Reduce Vehicle Emissions	
Decarbonization Tactics	➢ Solar Advisory Committee ➢ Solar Outreach and Education ➢ Lobby SMMPA to Expand Renewable Energy Portfolio ➢ Advocate for Climate Friendly State and Federal Policies	➢ Maximize PV on Municipal Sites ➢ Update City Renewable Energy Policies ➢ Organic Waste Collection	➢ Expand City-Owned PV ➢ Contract with Third Party Solar Developer	➢ Explore Potential of Local Wind Energy ➢ Biofuels Pilot Project ➢ Explore Potential for Biomass Plant for Electricity Generation
Land Use and Energy Storage Tactics	➢ Group Bulk Purchasing Program ➢ Preserve Green Space within the City	➢ Explore Options for Energy Storage ➢ Expand Recycling and Composting	➢ Implement Energy Storage Solution ➢ City-Wide Zero-Waste Plan	

The Implementation of Tactics

The successful implementation of the tactics in this plan require community-wide solutions with city-lead initiatives. The table below shows how the tactics can be distributed between the city, community organizations, home and business owners, and partner organizations.

Table 4: Tactic Participation	*Immediate Action* ★★★★	*Action within 5 years* ★★★	*Action within 10 years* ★★	*Action within 20 years* ★
City *PUC* *Planning and Zoning*	➢ Energy Benchmarking and Disclosure ➢ Heating Electrification Incentives ➢ Solar Advisory Committee ➢ Lobby SMMPA to Expand Renewable Energy Portfolio ➢ Advocate for Climate Friendly State and Federal Policies ➢ Preserve Green Space within the City.	➢ Retrofit City-Owned Buildings ➢ Replace Streetlights with LEDs ➢ Energy Codes for New and Existing Buildings ➢ Electrify Heating in City-Owned Buildings ➢ EV Incentives ➢ Expand EV Infrastructure ➢ Maximize PV on Municipal Sites ➢ Update City Renewable Energy Policies	➢ Outdoor Lighting Ordinance ➢ Heating Appliance Electrification Codes ➢ Replace City-Owned Vehicles with EV Alternatives ➢ Explore Policies that Reduce Vehicle Emissions ➢ Expand City-Owned EV ➢ Zero-Waste Plan	➢ New Building Construction to be ZNE
Community Groups *Stakeholder Organizations*	➢ Energy Efficiency Education Programs ➢ Vehicle Efficiency and EV Education Programs ➢ Solar Marketing ➢ Group Bulk Purchasing Program ➢ Solar Advisory Committee	➢ Residential Energy Efficiency Program ➢ Expand EV Infrastructure	➢ Zero-Waste Plan	➢ Explore potential for more local renewable energy development such as wind energy, a biofuels project, or a biomass plant.
Businesses and Business Owners *Residents and Homeowners*	➢ Commercial Energy Audits ➢ Heating System Electrification ➢ Group Bulk Purchasing Program	➢ Residential Energy Efficiency Program ➢ Outdoor Lighting Upgrades ➢ Expand EV Infrastructure	➢ Zero-Waste Plan	
Partner Organizations	➢ Solar Outreach and Education ➢ Solar Advisory Committee ➢ EV Education Programs	➢ Expand EV Infrastructure ➢ Expand Recycling and Composting ➢ Explore Options for Energy Storage	➢ 3rd Party Renewable Energy Development ➢ Energy Storage Solution	

The Sustainability Portal

The Sustainability Portal assembles easy-to-find, accurate, and up-to-date information regarding CAP programs in an online database. This database will house all materials and resources related to carbon reduction projects in Grand Marais.

Example Sustainability Portal Contents

- Educational seminar information
- Outreach program details
- Financing options
- Incentive programs
- Cost-benefit analysis for CAP programs
- Reviews and recommendations on renewable energy technology
- Information about changes to city laws
- Timeline for CAP strategy and programs
- City efficiency and renewable energy performance data.

SUGGESTED TACTICS

Tactics are specific actions Grand Marais can take to reduce carbon emissions. There is no generic formula for achieving carbon neutrality as each city has a unique carbon footprint and therefore a unique way to reduce emissions. A city must piece together and test many different tactics while continually revising goals and strategies with advancements in technology and policy. The outline of tactics here take an in-depth look at methods for fully embracing the goal of carbon neutrality by 2040.

Energy Efficiency

1. Improve Energy Efficiency in Existing Buildings

   The Greenhouse Gas Inventory shows that more than 80% of carbon emissions in Grand Marais originate from buildings. These emissions are from two major sources, electricity and heat. Electricity use in buildings is the greatest source of carbon emissions in Grand Marais. Roughly 70% of carbon emissions from buildings are due to electricity use, with the other 30% from heating fuels. To feasibly generate enough electricity from renewable sources to power all Grand Marais' needs, it is vitally important to maximize energy efficiency.

★★★ 1.1. Retrofit City-Owned Buildings to be Zero Net Energy (ZNE)[5].

- 1.1.1. Develop a performance standard for ZNE city-owned buildings.
- 1.1.2. Create a timeline for retrofitting city-owned buildings.
- 1.1.3. Audit all city-owned buildings.
- 1.1.4. Include ZNE into the design process for new city buildings.
- 1.1.5. Monitor operation and track the building performance.

★★★ 1.2. Continue to replace streetlight and other municipal outdoor lighting with LEDs and smart lighting technologies[6].

- 1.2.1. Audit city-operated outdoor lighting and formulate a cost-benefit report for installing more LED streetlights.
- 1.2.2. Use dimming and scheduling technologies to optimize outdoor lighting usage.
- 1.2.3. Use lighting technology that is compliant with the International Dark Sky Association[7].

★★★ 1.3. Implement a residential energy efficiency and weatherization program.

- 1.3.1. Partner with an already established energy efficiency program[8,9] to accomplish significant residential energy efficiency improvements and make the program accessible to all Grand Marais residents.
  - i. The program should offer building envelope tests, infrared thermal scanning, light weatherization projects, LED light bulb replacement. Additionally, offer building operations and behavioral suggestions, as well as track carbon, energy, and financial savings.
- 1.3.2. Organize "Weatherization Blitzes" by procuring sign-ups at outreach events and through cold-calling.
- 1.3.3. Use grant, state, and city funding to implement an income-based payment system to allow low and fixed income residents to participate at little to no cost.

★★★★ 1.4. Encourage commercial energy audits and weatherizations done through SMMPA's energy efficiency program or encourage a local contractor to replicate a model similar to that being done by Clear Result[10].

- 1.4.1. Consider financing options for businesses to implementing energy efficiency projects.
  - i. Financing options may include: AEOA Business Retrofit Program, EDA's Storefront Revitalization Program, commercial PACE financing, or an On-Bill Loan[11] through the Grand Marais Public Utility Commission where repayment of loans is part of the monthly utility bill.

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[5] Zero Net Energy Project Guide for designing ZNE Buildings. Energy Savings Performance Contracting can fund these projects without tapping into capital.

[6] A summary of smart street lighting best practices.

[7] IDA (International Dark Sky Association) Dark Sky Friendly Lighting.

[8] Ecolubrium3, a Duluth non-profit whose mission is to improve energy efficiency and renewable energy.

[9] Green Iowa AmeriCorps is an innovative model program where members are trained as energy auditors and address conservation and sustainable energy usage Iowa communities.

[10] Clear Result's Community-Based Distribution Program makes commercial energy efficiency accessible to all businesses.

[11] On-Bill Financing. U.S. Dept. of Energy.

ii. To emphasize energy efficiency projects that have a direct effect on carbon emissions, lenders should predetermine the types of projects they are willing to fund.

1.4.2. Organize education and outreach programs to promote rebates and tax credits available for energy efficiency projects[12].

1.4.3. Partner with CCLEP to organize education programs about building operations and behavioral changes that increase energy efficiency in the Zero Net Energy model.

2. Accelerate Education and Outreach About Energy Efficiency

To maximize energy efficiency, the city will strive to develop education and outreach materials that will have an impact on every building in Grand Marais. The success of this program relies on the dual benefits of improving energy efficiency by lowering energy costs and providing more comfortable living and workspaces.

★★★★ 2.1. Boost public education and outreach about residential energy efficiency best practices.

2.1.1. Partner with local organizations to organize seminars about DIY home energy weatherization and building operation and behavioral changes.

2.1.2. Using the Sustainability Portal, compile a list of DIY home energy projects, resource materials, and contractors who specialize in various energy efficiency projects.

★★★★ 2.2. Boost public education and outreach about commercial energy efficiency.

2.2.1. Partner with organizations like SMMPA's Energy Efficiency Program, Clear Result, etc. and a local contractor to establish "Best Practices for Commercial Businesses" resources in the Zero Net Energy Model. Publish this document in the Sustainability Portal.

2.2.2. Use a focused outreach program to contact local businesses to encourage participation in energy efficiency programs.

3. Expand Energy benchmarking and Disclosure

Energy data measure a building's energy use performance. Comparing a building to itself over time, or comparing a building to like-buildings, can provide a method to pinpoint inefficiencies and address them. A better understanding of building performance can be gained through the continual gathering and sharing of energy data. The city can facilitate the collecting and sharing of data to make the process as easy as possible and ensure maximum participation.

★★★★ 3.1. Explore incentives and requirements for energy benchmarking and disclosure for all public and commercial buildings[13].

3.1.1. Start with public buildings to lead by example. Then, establish parameters for engaging buildings in the private sector[14].

3.1.2. Contribute energy data to EnergyStar's® online database called Portfolio Manager to get an annual rating.

i. Annual rating should include EnergyStar® rating, energy use/square foot/year, annual CO_2 emissions, and basic descriptive data.

3.1.3. Optimize benchmarking through a variety of approaches[15]. For example, comparing a building's performance against itself over time or against similar buildings over time, etc.

3.1.4. Use this program as a feed-in for commercial energy audits and weatherizations mentioned in section *1.4*.

3.1.5. To maximize participation, reach out to commercial building stakeholders about the benefits of benchmarking and offer manpower to facilitate data compilation.

★★★★ 3.2. Promote energy benchmarking and disclosure for residential buildings.

3.2.1. Using the Building Performance Database (BPD) or EnergyStar's® Portfolio Manager, encourage residents to contribute their home energy data.

3.2.2. Establish a rating system and benchmarking approach to residential buildings.

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[12] DSIRE, an online database to energy efficiency and renewable energy project rebate and tax information.

[13] State and Local Energy Efficiency Action Network (SEE Action) Energy Performance Benchmarking and Disclosure Policies for Public and Commercial Buildings (begins on p14)- facilitated by the US DOE.

[14] SEE Action Policy Design Guide for State and Local Governments.

[15] See page 2 of SEE Action's Energy Benchmarking, Rating, and Disclosure for Local Governments for more information on the benefits of energy benchmarking.

3.2.3. To encourage maximum participation, reach out to residents about the benefits of benchmarking and offer to facilitate data compilation.

3.2.4. Use this program as a feed-in for residential audit and weatherizations mentioned in section *1.3*.

4. Explore Progressive Building Energy Codes

Energy codes are seen a long-range tactic for moving the building stock and community towards a higher efficiency status quo. Energy codes can be mandatory or voluntary depending on the code. Energy codes range in complexity from putting limits on the amount of energy certain appliances and fixtures would be allowed to consume, to a comprehensive look at building materials, performance, and total carbon emissions.

★★★ 4.1. Assess the cost-benefit of establishing an energy code for existing buildings[16].

4.1.1. Use the energy efficiency of two prototype residential buildings to analyze the viability of energy codes.

i. Use one building that meets Minnesota Residential Energy Efficiency Standards[17], and another that is performing at a ZNE level as models to determine the likely outcome of enforcing an energy code.

4.1.2. If an energy code is favorable, consider the process to implementing it.

i. To prevent market disruptions: focus on tiered incremental phase-in of these energy codes; develop a financing method that helps residents and business owners with upfront capital; and work with real estate markets, contractors, residents, and building owners upfront to avoid resistance.

4.1.3. Establish a code that moves the building stock towards ZNE on a timescale consistent with the goals of this plan.

★★★ 4.2. Assess the cost-benefit of an energy code for new buildings.

4.2.1. Use the same analysis methods as in part *4.1.1*.

4.2.2. Establish the optimal efficiency standard above the current Minnesota Energy Efficiency Code based on the cost benefit analysis for both commercial and residential buildings.

4.2.3. Establish an incremental timeline for phasing in of optimal stretch energy codes for both commercial and residential buildings.

4.2.4. Establish a timeline for new building construction to be ZNE.

★★★ 4.3. Implement an outdoor lighting code[18, 19] for commercial and residential buildings.

4.3.1. Define parameters such that all lights used daily for extended periods are required to be within a specified efficiency and lumens range.

4.3.2. Establish a deadline for required upgrades. (e.g. by 2025, all building lights not exempt from the requirement must be improved to the determined efficiency standard.)

4.3.3. Offer a rebate on upgraded products to those who complete the upgrade in advance of the deadline.

i. Ensure that all recommended upgrades are approved by the International Dark Sky Association.

4.3.4. Create a systematic and effective enforcement policy for the new lighting system code.

[16] The city of Santa Monica conducted a Cost Effectiveness Study to establish the benefit of stretching their city energy code above the standard set by the California Energy Code.

[17] Commercial and Residential Energy Efficiency from the 2015 Minnesota Energy Code.

[18] New York City lighting upgrade law.

[19] IDA Lighting for Policy Makers & Lighting Ordinances.

Electrification

5. Electrify hot water and space heating appliances

Propane, fuel oil, and diesel account for roughly 20% of Grand Marais' total carbon emissions and 30% when only considering building emissions. Eliminating the use of fossil fuels in buildings could reduce greenhouse gas emissions by almost 5,000 tonnes per year, or 100,000 tonnes over the next two decades. Replacing outdated combustion heating appliances with highly efficient electric versions is a direct path to carbon neutrality as the electrical grid becomes decarbonized.

★★ 5.1. Incrementally electrify hot water and space heating in all city buildings[21].

5.1.1. Based on the assessment from *1.1.3*, determine a schedule by which hot water and space heating appliances will be replaced.

5.1.2. As appliances reach the end of their usable life, use highly efficient replacements that keep the building on track with the *1.1* tactic of converting all city buildings to ZNE.

★★★★ 5.2. Implement a program to encourage and incentivize the electrification of hot water and space heating systems in residential and commercial buildings.

5.2.1. Provide information to business owners and residents about options for highly efficient replacement appliances with data from the city's own replacements.

i. Include many options for different sizes and types of buildings and meeting their hot water and space heating needs, as well as projected 1, 5, and 10 year payoff scenarios.

5.2.2. Through the Grand Marais PUC, establish a heating appliance replacement low or no-interest loan program.

5.2.3. Consider the cost benefit of a group purchase of heating appliances to reduce the cost of delivery and installation.

★★ 5.3. Explore heating appliance electrification efficiency codes.

5.3.1. Through the Grand Marais Public Utility, provide off-peak and interruptible rate options for electric hot water heaters and thermal storage units[22].

5.3.2. Incentivize, then require, high efficiency electrified heating appliances upon previous fixture burnout/replacement.

6. Reduce Reliance on Fossil-Fuel Vehicles

Vehicle emissions within city limits account for 15% of Grand Marais' total emissions. There are two major ways to reduce vehicle emissions: driving less and increasing the use of carbon free transportation. Driving less means using non-motorized transportation more and thus developing pedestrian and bicycle-friendly streets. The 2019 City of Grand Marais Pedestrian Plan aims to increase the number of pedestrian-friendly corridors in the city. Currently, the most viable option for carbon-free transportation are electric vehicles (EV) that are charged using renewable energy.

★★ 6.1. Incrementally replace city-owned fossil-fuel vehicles with full or partial electric and alternative fuel vehicles[23].

6.1.1. Improve the efficiency of the city fleet. Establish baseline fuel use data and use data tracking software[24] to set goals for improving operational efficiency and vehicle utilization of the city fleet.

6.1.2. Build EV infrastructure for city vehicles. Develop and build a pilot project[25] to better understand the costs and logistics of EV charging for city fleet use. Identify potential problems, such as electrical upgrades, maintenance, and repair of new infrastructure.

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[21] Heating appliance replacement information from MN Dept. of Commerce. Fuel switching will add demand on the electrical load, the following paper: *Implications of electrified residential space heating in California* addresses this issue as a model how much additional load there will be in California.

[22] Arrowhead Electric Cooperative's incentives for heating appliance electrification: Electric Thermal Storage, Interruptible HWS.

[23] US Dept. of Energy's Plug In Electric Vehicle Handbook outlines how cities can transition their fleets over to lower carbon alternatives. The City of Seattle Washington has a Green Fleet Action Plan which shows their ongoing transition from internal combustion engines to electric and biofuel vehicles.

[24] An example of fleet management software that tracks metrics to improve efficiency.

[25] A guide developed by Fleetcarma to launching an electric vehicle pilot program.

6.1.3. Select an ideal default carbon free vehicle equivalent for each type of city vehicle based on its use. As current vehicles reach the end of their useable life replace them with equivalent EV or alternative fuel models.

★★★ 6.2. Expand EV charging infrastructure[26].

6.2.1. Survey city residents to estimate how many EV users are in the city and how many new users are projected in the next decade.

6.2.2. Use the results and Table 3 (page 21) to establish a target for the number of EV charging stations to add to Grand Marais.

★★★ 6.3. Consider incentives that aid in the expansion of electric vehicles.

6.3.1. Offer incentives to EV users. (e.g. allowing access to prime parking space, free daytime charging, etc.)

6.3.2. Partner with local businesses to install EV charging stations outside their storefronts for patron use.

6.3.3. Offer incentives to local businesses to promote the use of EV by their employees.

★★★★ 6.4. Education Programs on vehicle efficiency and EV.

6.4.1. Partner with CCLEP and local organizations to offer informational sessions regarding the costs and benefits of transitioning to electric vehicles in Grand Marais.

★★ 6.5. Explore policies that reduce emissions from internal combustion engines.

6.5.1. Explore the cost and emissions savings that result from a no-idling policy for city vehicles[27].

Decarbonization

7. Expand Locally-Generated Solar Electricity

Electricity accounts for 65% of Grand Marais' total emissions. Decarbonizing the electrical grid is a major priority to reaching carbon neutral. The Greenhouse Gas Inventory details the solar potential of Grand Marais by using a high-resolution map developed by the University of Minnesota. The upper limit of rooftop solar potential in Grand Marais would meet 25% of its demand. To meet the rest of the demand, the city can choose to split electricity generation between local and nonlocal utility-scale projects. Development of both local and non-local solar sites are important for maintaining a resilient energy source. A diverse energy portfolio will make Grand Marais less susceptible to price fluctuation while maintaining the stability provided by the electrical grid.

★★★ 7.1. Install solar photovoltaics on municipal sites with solar potential.

7.1.1. Assess all policies and contracts concerning local renewable energy generation.

7.1.2. Conduct solar site assessments on all municipal buildings and sites to determine the optimal locations for solar projects.

7.1.3. Use a solar-specific RFP to solicit bids from solar developers.

7.1.4. Use the Guaranteed Energy Savings Program[28] (or another option such as a tax-exempt bond or performance contracting) to finance all possible municipal solar projects.

7.1.5. Monitor the system's power generation and compare with expected results. Make this information public in the Sustainability Portal.

★★ 7.2. Contract with a third party solar developer to establish a large-scale solar array[29].

7.2.1. Publicize an RFP for third party solar developers to establish a project in or around Grand Marais.

7.2.2. Enter into a Power Purchase Agreement (PPA) with the third party developer to establish large-scale solar array to produce municipal energy.

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[26] The City of Oslo, Norway is aiming to be the EV capital of Europe.

[27] An example of a Public Vehicle Idling Policy.

[28] Guaranteed Energy Savings Program (GESP)

[29] CERTs Information on Third Party Solar Development.

★★★★ 7.3. Establish a Solar Advisory Committee to build a sustainable solar market in Grand Marais[30].

7.3.1. Invite local advocacy groups and other stakeholders to a planning process meeting.

7.3.2. Survey residents and business owners to identify barriers to installing solar.

7.3.3. Conduct an installation baseline survey of all solar projects that exist in the area to ascertain an average cost of installing solar.

7.3.4. Conduct a study to determine the viability of a PUC or SMMPA owned community solar garden[31] for renters and those unable to install solar on their homes or businesses.

★★★★ 7.4. Publicize information about the benefits of going solar.

7.4.1. Using the Sustainability Portal, compile financial information regarding solar installations.

i. Include Minnesota Solar Map and information regarding rebates, property and sales tax incentives, feed-in tariffs, Property Assessed Clean Energy Financing (PACE), low-interest solar loans, group purchasing, and information from 8.4.3. regarding installation baseline data.

7.4.2. Organize educational seminars, public forums, targeted outreach events, and utilize the Sustainability Portal to include information about going solar.

i. Use mapping tools[32], demonstration projects, advertising campaigns, etc. to publicize information about solar installation.

ii. Include information regarding solar site assessments, financing, installation, payback, maintenance, lifespan, output, etc.

iii. Find "ready to go" sites and actively recruit them to partake in solar installation projects.

iv. Operate a customer assistance program to help home and business owners learn the ins and outs of solar purchasing and installation.

★★★ 7.5. Update Local Renewable Energy Policies.

7.5.1. Establish solar access rights laws by creating solar access permits and solar easements to protect access to sunlight on a property[33].

7.5.2. Encourage, then after a determined date, require homebuilders and developers to design and build solar-ready homes.

i. Create Solar-Ready guidelines[34] and make them available through the Sustainability Portal.

7.5.3. Structure utility rates such that solar is the highest valued form of electricity.

i. Implement a rate structure that highly values solar electricity to decrease the payback time for solar projects.

ii. In 2030 and beyond, have the PUC explore rate tiers that favor renewable energy for high energy use customers.

iii. Reward EV-PV charging scenarios[35] by offering a premium rate to those who pair the two technologies.

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[30] A guide for local government to establish a solar market in their community including links to other communities as case studies: Solar Powering Your Community.

[31] CERTs resources on community solar gardens.

[32] University of Minnesota/CERTs Solar Map.

[33] Minnesota Statute 500.30 Subdivision 1. Solar Easements.

[34] Solar Ready Building Design Guidelines. from The Minneapolis Saint Paul Solar in the Cities Initiative.

[35] Strategic Charging EV-PV summary.

8. Advocate to Expand Non-Local Utility-Scale Renewable Energy

The Grand Marais PUC's electricity provider is the Southern Minnesota Municipal Power Agency (SMMPA), which also provides electricity to 17 other communities. Grand Marais is the smallest member of the Co-op, representing 0.67% of SMMPA's load. Lobbying this organization to develop more renewable energy can be a definitive way to reduce carbon emissions and rapidly expand renewable energy supplied to the electrical grid.

★★★★ 8.1. As a member within SMMPA, lobby and negotiate with the organization to aggressively expand their renewable energy portfolio.

- 8.1.1. Partner with SMMPA to explore the possibility of developing a large-scale solar PV array at a local site.
  - i. Establish a team of PUC and SMMPA members to explore options for the project.
- 8.1.2. Request SMMPA supply Grand Marais with 100% renewably generated electricity through the Green Power Purchasing program with renewable energy credits.
- 8.1.3. Partner with other SMMPA member cities to request they demand 100% renewable energy through Green Power Purchasing.

★★★★ 8.2. Advocate for climate-friendly state and federal policies.

- 8.2.1. Encourage federal lawmakers to officially support H.R.763, the Energy Innovation and Carbon Dividend Act[36].

9. Expand Other Forms of Locally-Generated Renewable Energy

Other forms of renewable energy include biofuels and wind energy. The Greenhouse Gas Inventory shows that a large wind turbine would not be an ideal solution for Grand Marais or the North Shore region. Investing in nonlocal wind energy through green power purchasing programs via SMMPA is a more economical method of harnessing wind energy. There is potential for biofuels processing in Grand Marais given the availability of locally sourced and reliable biofuels resources.

★ 9.1. Aid in the establishment of a biofuels pilot project that refines forest slash and wood mill leftovers into diesel fuel[37].

- 9.1.1. Conduct a study to determine the performance of biodiesel in cold climates.
- 9.1.2. Partner with a green technologies firm to invest in a local business that is willing to house and operate the pilot project. Additionally, partner with logging and wood mill businesses that are willing to sell or donate slash to the pilot project.
- 9.1.3. Partner with government entities, businesses, organizations, and private citizens to sell the refined biodiesel at a price competitive with regular diesel fuel.
- 9.1.4. Use the findings from the pilot project to determine if a larger biofuels operation would be feasible in Grand Marais.
- 9.1.5. Expand the use and infrastructure of sustainable, locally sourced biofuels in certain vehicles.

★ 9.2. Explore the potential efficacy of a biomass plant for electricity generation.

★ 9.3. Consider creative renewable energy solutions such as solar roads, micro-hydro plants, etc.

★ 9.4. Explore the possibilities of wind energy within reasonable proximity to the city.

- 9.4.1. Continue to assess the wind resource in and around Grand Marais.
- 9.4.2. Hold a stakeholder meeting to hear concerns about the possibility of wind turbines near a major bird migration corridor.
- 9.4.3. Find and negotiate with SMMPA, or a third party developer, regarding the potential of financing, installing, and maintaining the turbine.

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[36] H.R763-116th Congress: The Energy Innovation and Carbon Dividend Act.

[37] A company like Advanced Biorefinery sells products that help turn forest slash and wood mill leftovers into biofuels.

10. Tactics for Energy Storage

Peak renewable energy production, and peak energy demand do not coincide. During the early mornings before the workday, and during the evenings before most people go to sleep are the times of day when there is high demand for electricity. Unfortunately, these are typically time when solar and wind are not generating enough energy to supply that demand. Thus, a storage system to capture the excess energy generated during the day and release it to the distribution system when demand is highest will be required to achieve a sustainable carbon-free electrical supply.

★★ 10.1. Develop a plan for an energy storage system to capture excess renewable energy generated during off-peak hours.

10.1.1. Explore the viability of all commercially available options for energy storage[38].

11. Tactics for Reducing Waste and Optimizing Land and Water Use

Waste and land use are small, but important, aspects of Grand Marais' carbon footprint. Optimization of waste disposal, while not a major contributor to carbon emissions, is an important issue for many residents. The garbage generated in Grand Marais is shipped by truck to Duluth to be deposited in a landfill. The emissions from the trucks are not figured into the overall carbon footprint of the city but if calculated would make waste responsible for more carbon emissions. Secondly, trees are an important natural repository of CO_2 via the carbon cycle. It should be a priority for the city to protect its trees and green spaces to maintain this natural cycle.

★★★ 11.1. Partner with Cook County to expand community composting capability.

11.1.1. Consider a facility that would accept kitchen/food scraps and produce garden quality compost.

11.1.2. Through stakeholder organizations, create an education and outreach program to help the community embrace an expanded composting program.

★★★ 11.2. Expand recycling capabilities available to the community to include more plastics and obscure items where there is a market to do so (e.g. dental hygiene products recycling program).

11.2.1. Consult with Cook County and the Nordic Nature Group for further action.

★★★★ 11.3. Aid in the development of group/bulk purchasing of commonly used commercial products.

11.3.1. Survey local businesses to ascertain interest for group purchasing plan.

11.3.2. Gather stakeholders and facilitate a meeting for group purchasing plan.

11.3.3. Designate a community champion to coordinate the expansion of a group/bulk purchase program.

★★ 11.4. Develop a city wide Zero-Waste Plan[39].

11.4.1. Zero-Waste City Operations.

11.4.2. Incentives for zero-waste businesses and organizations.

11.4.3. Consider banning certain single-use plastics items such as plastic bags, food service plastic wear, etc.[40].

11.4.4. Conduct a cost-benefit analysis of the carbon savings from trash incineration in a biomass plant vs transporting garbage and allowing it to decompose in a landfill.

★★★★ 11.5. Continue to plant trees and conserve green space within city limits to promote natural carbon sequestration.

11.5.1. Conduct a tree inventory to determine current carbon sequestration levels[41].

11.5.2. Track and account for tree gain and loss within city limits.

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[38] *Energy Storage Technologies and the Value to the Grid* from GPI.

[39] An example of a Zero-Waste Plan for the Island of Guam.

[40] City of Hilton Head Island City ordinance banning the use of single-use plastic bags.

[41] United Kingdom Forestry Commission: Mitigation- Planting More Trees. & University of New Mexico study on How to Calculate the Amount of Carbon Sequestered in a Tree per Year.

SUSTAINABILITY

The Benefits of Investing in Sustainability

Some of the tactics in this plan come with upfront costs that could be prohibitive for some residents and business owners. This plan calls for replacing hot water heaters, furnaces, vehicles, lightbulbs, and investing in building efficiency and renewable energy. To ask the community to make all of these changes in a short window of time would be unrealistic. However, given the 20 year timeline of this plan, it is realistic to assume that *most* hot water heaters, furnaces, lightbulbs, and even vehicles that are operating today will need to be replaced before the year 2040. As these replacements happen, the benefits of investing in energy efficiency will be sound economic opportunities for home and business owners to save money and reduce their energy bills and cost of living expenses.

The strategies and tactics on the previous pages make it possible for the city to use education, outreach, and examples set by its own operations; as well as creative building and energy codes, plus incentives, to help Grand Marais residents and business owners make sustainable decisions *when they need to* replace their appliances.

The Sustainability Coordinator

Within Grand Marais there is a desire, and now a plan, to strive for a zero net-emissions community. For progress to be made on this plan, the City of Grand Marais will have to dedicate staff resources to implement it. The best practice for CAP implementation nationwide is to hire a coordinator who can dedicate time and expertise to the planning and execution of the principles of sustainability.

Benefits of a Sustainability Coordinator-

A designated Sustainability Coordinator will work for the efficient and timely implementation of the Climate Action Plan. The city's goal of carbon neutrality by 2040 is ambitious and to be in position to achieve this goal, planning and action must begin immediately. A designated coordinator will ensure progress by filling a niche without impeding day to day operations within the existing roles at the city.

Apart from the logistical benefits of a Sustainability Coordinator, there are financial incentives for both the city and the community to invest in the success of the CAP. The tactics in the plan strive to reduce energy consumption which will translate in a reduction in energy costs within city operations and community-wide.

The Role of the Coordinator

The primary role of the Sustainability Coordinator would be to act as a liaison between the City of Grand Marais, the community, and the Climate Action Plan. The coordinator will creatively incorporate sustainable practices into the government, infrastructure, and community in accordance with the goals of the CAP.

<u>Internal Roles</u>

The Sustainability Coordinator will develop sustainable policies and programs within city operations per the suggested tactics of the CAP. The coordinator will assist departments with the implementation of tactics by acting as a resource for conservation and sustainability. The coordinator will develop potential energy saving and carbon emissions reduction projects outlined in the CAP.

<u>External Roles</u>

The coordinator will oversee the implementation of CAP programs and tactics and ensure they are carried out in the best interest of the community. They will develop education and outreach programs to maximize knowledge and participation in CAP programs. The coordinator will create and strengthen partnerships with community organizations.

<u>Essential Functions</u>

The coordinator will research and apply for grants and other funding to be used for sustainability projects. They will be responsible for conducting research, tracking progress, and reporting results of all CAP programs. The coordinator will be expected to maintain a current knowledge of the trends and initiatives in the field of sustainability.

Engagement Level

The city may choose to hire a full time, part time, or contracted Sustainability Coordinator. The city may also choose to phase in the coordinator over time based on current and future needs. Below are brief position overviews for a new Sustainability Coordinator at different engagement levels depending on the city's needs.

A. Contracted Hourly Sustainability Coordinator 10-15hrs/wk
This level of employment allows the city to test the new position with a minimal investment of resources. A contractor can work on projects as they arise as well as handle minor day-to-day aspects of the position. The city can pursue grant funding that would likely cover all of this position's salary. However, this engagement level lacks the continuity of a regularly scheduled employee.

B. Part-Time Sustainability Coordinator 20-30hrs/wk
A part-time position offers all the benefits of the contractor in addition to the consistency of a regularly scheduled employee. This allows the coordinator to establish the role and value of the position by producing consistent results. However, the city may be required to contribute some funding to this position's salary.

C. Full-Time Sustainability Coordinator
As a full-time position, the role of the coordinator would be maximized to show the community that the city is serious about its climate action goals. However, this would require funding a full time salary as well as committing to providing the workload of a full time position.

D. Shared Position between Other City Responsibilities
Sharing the roles and responsibilities of a Sustainability Coordinator between the existing staff can be a way to achieve the results of the position without committing to funding it. However, this may put a massive strain on the existing city staff and lack the benefits of a designated Sustainability Coordinator as outlined above.

Funding the Position

Options for funding the Sustainability Coordinator include pursuing grant funding alone for contracted hourly engagement levels, asking the city to match a certain percentage of grant funding up to a predetermined amount, or funding the position entirely with city funds. Grant opportunities are available for cities seeking to reduce their carbon footprint[42]. It is advised that a city seeking to hire its first Sustainability Coordinator fund the position with grant funding until the level of engagement the city needs to achieve its sustainability goals can be determined.

[42] The McKnight Foundation Midwest Energy and Climate Program aims to "foster and support climate and energy leadership in the Midwest, making the region a model for the world by reducing energy-related greenhouse gas emissions".

PROGRESS REPORTING

The best way to gain a quantitative understanding of the impact that tactics are having on carbon emission levels is to report current carbon emissions and completed and ongoing carbon mitigation projects as an annual occurrence. Over the years, new reports will be supported by a database of past reports that show the effectiveness of certain tactics over time. As the database grows, carbon calculating will improve, and the city will be able to accurately assess the effectiveness of its carbon mitigation efforts.

Annual Climate Action Plan Progress Report

An annual report, presented to the city council by the Sustainability Coordinator, will be created using up-to-date carbon emissions data. The report will summarize ongoing tactics and their impact on carbon emissions as well as detail tactics that are still in the development phase. The coordinator will broadly assess the progress the city is making on its goals as well as make recommendations for future action.

Benefits of Annual Reporting

Highlight accomplishments and identify areas to improve on.
Maintain transparency with respect to how tactics are affecting carbon emission levels.
Engage the public regarding ongoing and upcoming tactics.

Assessment Checkpoints

Assessment of Tactics

Below, Table 5 shows an estimation of the yearly actions needed to progress emissions reduction linearly towards carbon neutrality by 2040. These data are broken into two categories. The first is emissions source reduction. To reduce total emissions to zero by 2040 the city needs to generate, or advocate for the generation of, 24,400 MWh of renewable energy, improve the efficiency of 500 buildings by 30%, convert 500 gas powered heating appliances to electric, and replace 250 vehicles with EV. The second category shows new power plants producing renewable energy that need to be installed to meet the total energy demand of the city. The data show in megawatts (MW) the size an all solar, all wind, or a 50-50 PV/wind mix power plant. These data account for increased electrical use due to heating appliance and vehicle electrification.

Assessment of Goals

Carbon emission data and the effectiveness of tactics will become more accurate the longer they are in place. As more data are gathered and more tactics are enacted, the path towards carbon neutrality will become clearer. Based on the findings of the annual report, adjustments to goals, strategies, and tactics can be made to most effectively achieve the city's carbon reduction goals (Figure 7).

Table 5: Yearly Actions to Achieve Carbon Neutrality by 2040.

Emissions Source Tactics	*Total Actions*	*Actions Per Year*
Renewable Energy Generated (MWh)	**24,400**	**1,162**
Buildings Improved by 30%	**500**	**24**
Heating Systems Converted to Electric	**500**	**24**
Vehicles Replaced with EVs	**250**	**12**
New Renewable Energy Plants Installed		
ALL PV (MW)	**19.5**	**0.95**
ALL Wind (MW)	**7**	**0.33**
50% PV (MW)	**9.87**	**0.47**
50% Wind (MW)	**3.57**	**0.17**

Figure 7: Reporting Flow Chart

GLOSSARY

AEOA Arrowhead Economic Opportunity Agency

Building Code A set of rules and standards for building construction.

CAP Climate Action Plan

Carbon Capture/Sequestration The process of capturing CO_2 from the atmosphere and storing it, this is done naturally or artificially.

Carbon Fee and Dividend A policy that taxes fossil fuels at the source and redistributes the funds as a dividend for all US citizens.

Carbon Neutral A no-net release of carbon emissions into the atmosphere, accomplished by mitigation and offsets.

Carbon Tax Fee on the carbon content of fossil fuels.

CCLEP Cook County Local Energy Project

CERTs Clean Energy Resource Teams

EDA Economic Development Association

Energy Code A set of rules and standards for energy use.

EV Electric Vehicle

EV Ready Infrastructure to support increased EV use is prevalent within the community.

Heating Fuels Fossil fuels commonly used for heating: propane, fuel oil, diesel, and natural gas.

Interim Ordinance A temporary city ordinance that expires at a predetermined date.

International Dark Sky Association A non-profit that works to help stop light pollution.

IPCC Intergovernmental Panel on Climate Change. A panel of the United Nations.

LED Light Emitting Diode

MWh Megawatt hours, 1 MWh is equal to 1,000KWh.

NZE Net Zero Emissions. Same as *Carbon Neutral.*

Payoff Date How long it takes for the savings from the efficiency of an appliance or the energy from a renewable source to eclipse the initial investment.

PUC Public Utility Commissions (Grand Marais).

PV Photovoltaic. Producing electricity from sunlight- usually referring to solar panels.

RECs Renewable Energy Certificates. Non-tangible, tradeable, renewable energy commodities.

Regional Indicators Initiative An organization that measures annual performance metrics for Minnesota Cities and is committed to increasing their efficiency and sustainability.

Revolving Loan Fund A self-replenishing pool of money used for development projects.

RFP request for proposals

SMMPA Southern Minnesota Municipal Power Agency. A cooperative organization from which Grand Marais purchases its electricity.

Strategies The concept-scale actions that inform which tactics will be implemented to reduce greenhouse gas emissions.

Tactics The project-scale actions that can be taken to reduce energy use, renewable energy, and lower greenhouse gas emissions.

Tonnes Another term for metric ton, equal to 1000kg or 2,205lbs.

Utility Scale Projects Large-scale energy projects usually measured in megawatts as opposed to kilowatts.

Weatherization Simple modifications to a building that reduce energy consumption and optimize energy efficiency.

ZNE Zero Net Energy. Meaning the total amount of energy used by the building on an annual basis is equivalent to amount of renewable energy created on site.