City of Albert Lea

Climate Action Plan

June 29, 2021

Prepared by:

making change personal
paleBLUEdot LLC

Table of Contents

Albert Lea's Future Climate

By 2050, Albert Lea's climate can be expected to be:

+3-5°F
warmer average annual temperature than now.

+10-15 more days
annually with a high temperature over 95°F.

+25% more
air conditioning demand and energy needed than now.

+5% higher
annual average rainfall than now.

+15% more
Heavy precipitation events annually.

+15-20 days longer
growing, allergy, and mosquito season.

The time is right for Albert Lea's first Climate Action Plan.

Executive Summary

The City has been dedicated sustainability issues for many years, and its focus on these topics has become increasingly strong in recent years. In 2009, Albert Lea became a pilot Blue Zone Project community. The Blue Zone Project supports community transformation programs to increase sustainable healthy living community-wide.

In 2017, Albert Lea achieved "Step 3" in the GreenStep Cities program. Minnesota GreenStep Cities is a voluntary challenge, assistance and recognition program to help cities achieve their sustainability and quality-of-life goals.

In 2017, the City of Albert Lea was selected by the State of Minnesota to receive technical assistance in developing a Climate Vulnerability Assessment. The assessment was completed by paleBLUEdot in January 2018. In 2019, supported through a second grant by the State of Minnesota, the City of Albert Lea engaged paleBLUEdot for the development of a Climate Action Plan outlining strategies and actions to support achieving increased climate resilience as well as reductions in City of Albert Lea City-Wide emissions. This report plan is the result, developed in collaboration with the City's Climate Action Planning Team.

Our Challenge

The complex systems that make up modern civilization result in stressors on the delicate balance of our ecosystems. The combustion of fossil fuels is warming earth's atmosphere and changing our climate. Climate change is already affecting Albert Lea and its impacts are projected to become much more severe in the coming decades. These impacts also contribute to additional strain on vulnerable populations, social systems, and overall community resilience.

Our Opportunity

The impacts of cities represent a major sustainable development opportunity. Transformation of our energy system is essential in order to stop burning fossil fuels. This transition presents an opportunity for Albert Lea. Directing our energy investments into renewable sources will make them more resilient and provide for local job creation. Innovation, technology, and collective social change inherent in climate action can also support greater community abundance and shared equity.

Executive Summary

GHG Emission Reduction Goal in State Context

The State of Minnesota has established state-wide greenhouse gas (GHG) reduction goals through 2050. Using a baseline year of 2005, the State's goals are to reduce total emissions by 80% by 2050 with a benchmark reduction of 30% by 2025. Through 2018, statewide emissions have been reduced by 8%.

Our Climate Goals

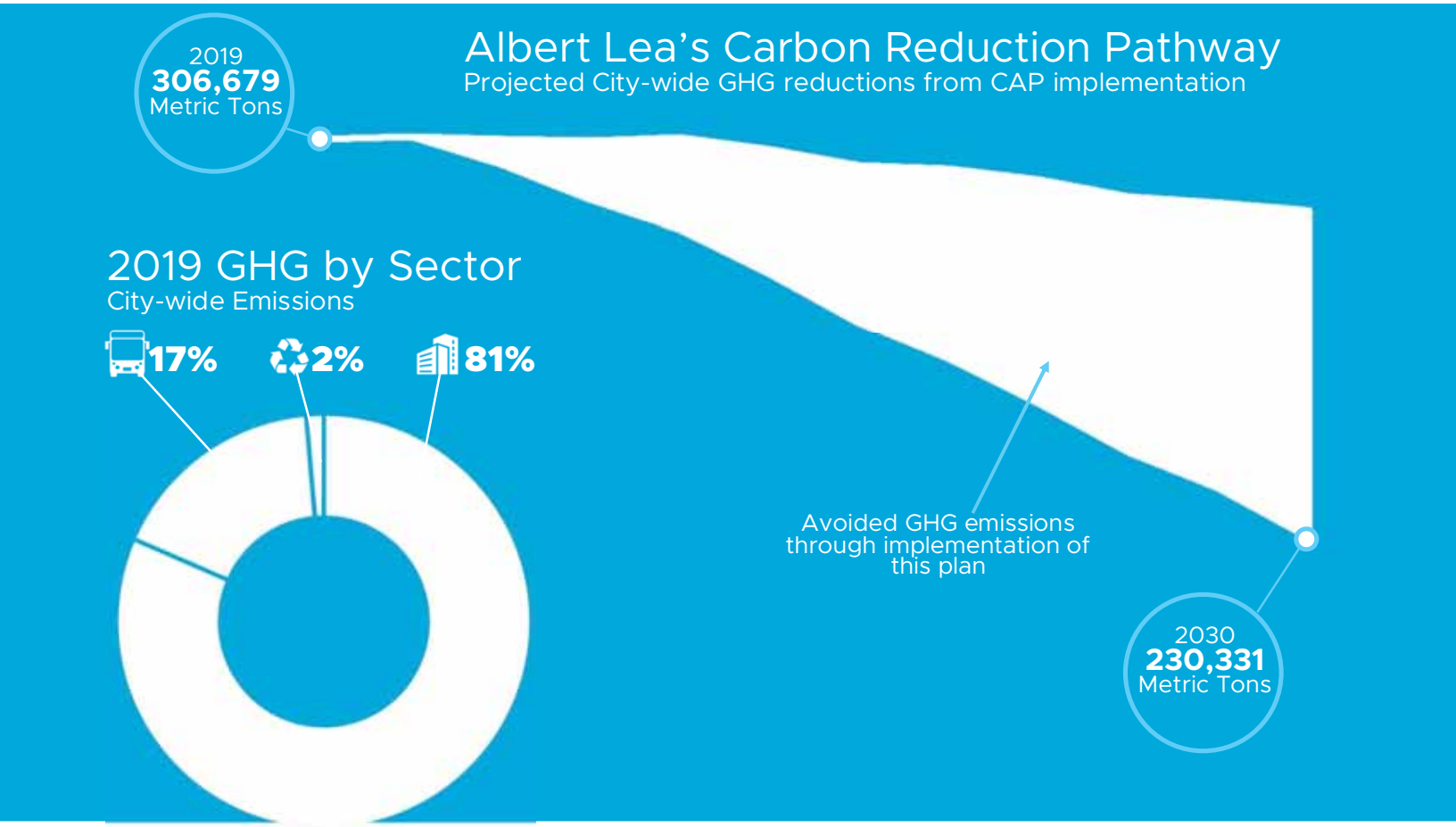
This Climate Action Plan includes a Climate Resilience Vision as well as a GHG reduction goal. These goals are designed to support and relate to the overall State of Minnesota goals and fit with current science based recommendations:

Albert Lea Climate Resilience Vision

To become a climate resilient community, making the social and economic transitions necessary to reduce city-wide greenhouse gas emissions while protecting Albert Lea's natural ecosystems, most vulnerable populations, and economic vitality against the increasing impacts of climate change.

Albert Lea GHG Reduction Goal

The City of Albert Lea's GHG emission reduction goals are to be compatible with the State of Minnesota GHG Emissions goals and shall target a reduction in City operations and community-wide emissions of 25% below 2019 levels by 2030 and 80% below 2019 levels by 2040.



Executive Summary

Climate Action Plan as Living Plan

This Climate Action Plan is intended as a "living plan" rather than a static document. This means that the implementation phase of this plan should be characterized by intermittent measurement of progress and plan adjustments. Plan adjustments should look towards increasing implementation goals for actions which illustrate success, modify goals for actions which may fall short of desired outcomes, and identifying additional action opportunities.

As a "living plan," the 2030 emission reduction goal should be seen as a guiding constant and recognition should be given that initial implementation actions may not yet fully achieve plan goals. Intermittent plan progress measurements and adjustments should identify additional actions, or increases in action implementation targets as needed to meet the ultimate 2030 GHG reduction goal.

Next Steps and Implementation

This Albert Lea Climate Action Plan is only the beginning of an on-going process of evaluating and advancing the City's climate resilience, GHG emissions reductions, and overall sustainability. The plan includes a Climate Action Implementation section providing a framework for launching, guiding, monitoring, and evaluating the execution of this plan. The implementation section outlines specific next steps, and important implementation considerations and recommendations. As details and outcomes are uncovered during the implementation phase, adjustments to quantitative goals, milestones, and detailed actions will be made responsively.

The Plan

The Albert Lea Climate Action Plan:

addresses **9 sectors** of GHG emissions and climate vulnerabilities

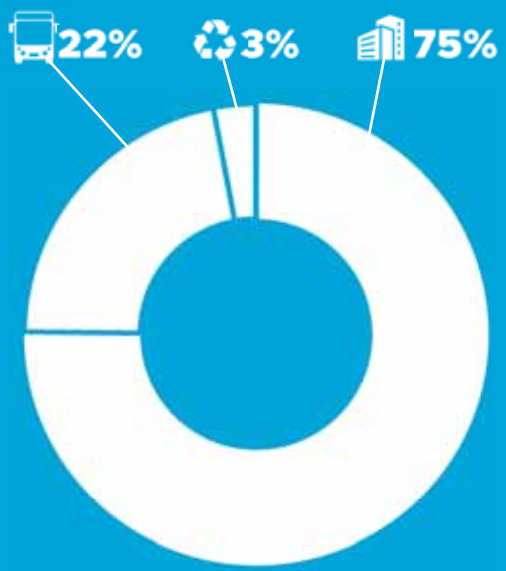
through **37 strategies** addressing climate goals

supported by **176 actions** detailing steps to be taken

during a **9 year** implementation timeframe

Reduction Share by Sector

Share of Total 2030 Reductions of Climate Action Plan actions by Sector:



Acknowledgements

We are deeply grateful for the community collaboration and input that went into this plan. Below are some of the main contributors that made Albert Lea's first CAP possible:

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MINNESOTA POLLUTION CONTROL AGENCY

Partial funding for this project was provided through a 2018 State of Minnesota Pollution Control Agency (MPCA) Environmental Assistance Grant supporting the climate adaptation planning portion of this plan.

Consultant Team

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Top Climate Actions

The following are likely the most impactful 15 actions and initiatives included in the Climate Action Plan. These actions represent a "Quick Start" sub-list of highly impactful actions for community-wide and municipal operations climate action. These actions are recommended for prioritized implementation over the next 1 to 3 years:

Community-Wide Quick Start Climate Actions

	Strategy BE-1: Improve total Community wide residential, commercial, and industrial building energy efficiency by 8% Electricity and 8% Thermal Fuel by 2030.
BE-1-1	Work with Freeborn Mower Cooperative Services, Minnesota Energy Resources, and other partners tto establish commercial energy efficiency audit and upgrade program similar Minnesota Chamber of Commerce's EnergySmart commercial energy savings program. Program could be integrated with the commercial waste audit service identified in Solid Waste action WM-1-1. Target: 24 commercial/industrial businesses per year with 10% electricity savings and 10% natural gas savings each. (https://www.mnchamber.com/your-opportunity/energy-smart)
BE-1-3	Work with Freeborn Mower Cooperative Services, Minnesota Energy Resources, and other partners to establish residential and multi-family energy efficiency audit and upgrade program similar to Xcel Energy's "Home Energy Squad Visits". Target 120 households per year (https://www.homeenergysquad.net/)
	Strategy BE-4: Achieve 7% residential and 7% commercial and industrial building thermal "fuel switching" to reduce on-site fossil fuel use by 2030.
BE 4-1	Promote incentive programs for electrification. Work with Freeborn Mower or other regional partnerships to create financial incentives to electrify new and existing buildings. For example, rebates for panel upgrades, electric appliances, Air Source Heat Pumps, and Ground Source Heat Pumps can encourage the transition to electric energy use in homes and businesses. Goal: Target 10% residential market conversion (75 households annually) and 5% commercial/industrial market conversion (an estimated 10 commercial businesses, 10 industrial businesses annually) by 2030. Resource: https://fmec.coop/rebates
	Strategy BE-5: Increase on-site distributed renewable energy to 5% of Residential and Commercial electric use by 2030.
BE-5-1	Establish a policy which requires all new construction and significant renovation projects for City facilities to be constructed to meet "Solar Ready" requirements and to include a solar feasibility assessment and project option for inclusion of on-site solar, include "Return on Investment" assessment, and incorporate solar where return is favorable.
BE-5-3	Coordinate and promote a commercial Solar Group Purchase Campaign annually to help reduce the costs of solar installation through volume purchasing power (goal, 600KW installed annually). Group purchase campaign could include/focus on properties identified in the "Solar Top 30" assessment effort. Program design to explore strategies to support local small business solar installers and strategies to support local workforce development in coordination with Riverland Community College.
	Strategy TL-1: Decrease community wide VMT by 5% by 2030.
TL-1-2	Conduct a Complete Streets Status and Quality Assessment to provide a comprehensive review of the coverage, quality, and opportunities of complete streets in the community. Study to identify needs to accelerate bike paths, building sidewalks, crosswalks, and other walking infrastructure, particularly in high-need areas and areas serving vulnerable populations. Create an implementation plan establishing annual increases in the total miles of sidewalks, on-road bicycle lanes and multi-use paths.
	Strategy TL-3: Increase battery electric vehicle (BEV) utilization to 20% of community wide rolling stock (from approximately 3,200 vehicles community-wide).
TL-3-1	Create a citywide EV Roadmap. Plan should create citywide and city facility electric vehicle (EV) charging station study and masterplan to map existing infrastructure, determine the current and future demand for EV charging stations, Establish public EV parking regulation, and to identify options for increasing number of electric charging stations in public parking areas and in commercial and high-density residential areas. Plan should include implementation strategies to meet citywide EV charging demand and promote adoption of EVs withing the community.

City Operations Quick Start Climate Actions

	Strategy BE-1: Improve total Community wide residential, commercial, and industrial building energy efficiency by 8% Electricity and 8% Thermal Fuel by 2030.
BE-1-2	Conduct a City Facilities Energy Audit on all buildings within the next 3 years. Use results from City Facilities Energy Audit to prioritize City Facilities Capital Improvement Plans (CIPS) and maintenance improvements. Goal: Reduce City of Albert Lea facility energy consumption by 10%.
BE-1-4	Convert all City streetlights and signals to LED by 2030.
	Strategy BE-3: Achieve 10 ENERGY STAR certified new or renovated commercial buildings within the community by 2030.
BE-3-1	Establish a policy to require all primary City facilities to benchmark (using ENERGY STAR Portfolio Manager or B3 Benchmarking) and disclose annual energy consumption. Invite County, School District, and other public agencies located within the City to participate in City's facilities benchmarking and disclosure effort.
	Strategy BE-4: Achieve 7% residential and 7% commercial and industrial building thermal "fuel switching" to reduce on-site fossil fuel use by 2030.
BE 4-2	Work with regional energy partnerships to develop and implement an Electrification Action Plan for all City facilities. Include new and existing buildings, incorporate strategies to address electricity storage, and focus on highlighting any hurdles or solutions that would be applicable to the broader community

	Strategy TL-3: Increase battery electric vehicle (BEV) utilization to 20% of community wide rolling stock (approximately 3,200 vehicles community-wide).
TL-3-2	Conduct a Fleet and Equipment Use and Operations Assessment to analyze city fleet and equipment use and to provide a guide for the right vehicle/equipment for City functions, with a focus on advancing EV and high fuel efficiency features (like auto-off). Assessment to identify most economical ways of operating which minimize emissions and fuel consumption (i.e. mowing patterns and schedules, street plowing efficiency study, policy patrol efficiency study, etc)
TL-3-3	Update City vehicle purchasing policy/budget process to default to EV and non-fossil fuel alternatives with traditional internal combustion engine (ICE) as optional requiring proof of need. For ICE vehicle options, establish minimum fuel efficiency requirements. Focus on small vehicles as well as large vehicles for alternative fuels. EV replacement to be prioritized for high mileage vehicles. Goal: Achieve 50% EVs within City Fleet by 2030.
	Strategy W-3: Mitigate the projected increased flood hazards and impacts due to climate change.
W-3-1	Establish a Storm Water Infiltration Plan identifying priority areas and strategies for improved infiltration of storm water to minimize storm water volumes requiring handling while increasing water aquifer recharging. Strategies to focus on reduction of impervious surfaces, increase of permeable surfaces, trees, bio swales, rain barrels, rain gardens, compost, mulch, etc. Coordinate and integrate Plan with city's Citywide Heat Island Impact Study (see Buildings and Energy actions)
	Strategy CE-4: Establish sustainable financing for the City's climate action implementation.
CE-4-1	Establish a policy that savings generated by energy efficiency measures and renewable energy installations/agreements for City facilities and operations shall be used as a fund to support future energy efficiency and renewable energy projects in support of the CAP goals.

Section 01
Introduction

Click here to return to TOC

GHG Emissions

generated community-wide in Albert Lea

52,415
Metric tons CO2e in 2019 from vehicle use.

249,542
Metric tons CO2e in 2019 from building energy.

4,201
Metric tons CO2e in 2019 from solid waste

520
Metric tons CO2e in 2019 from water and wastewater

Introduction

Albert Lea, Minnesota, a City of 17,770 people, is located on the crossroads of interstates 35 and 90. The city benefits from a diverse economic base, ranging from health care, education, manufacturing (primarily food related), and financial, to unique design and boutique-type businesses. Its natural beauty, seven lakes and bays, offer a unique environment for its residents and visitors.

Albert Lea's major assets are its lakes. In the center of town is Fountain Lake. This is a recreational lake, known for boating, fishing, water skiing, and paddle boarding. It also has a walking path around its perimeter. In the city and connected by a channel to Fountain Lake is Albert Lea Lake. This large natural lake is primarily used for canoeing, kayaking, and fishing. It is bordered by Myre Big Island State Park which features a natural oak savanna landscape. This State Park is known for its wildlife with 234 different kinds of birds.

The City has been dedicated sustainability issues for many years, and its focus on these topics has become increasingly strong in recent years. In 2017, Albert Lea achieved "Step 3" in the GreenStep Cities program. Minnesota GreenStep Cities is a voluntary challenge, assistance and recognition program to help cities achieve their sustainability and quality-of-life goals.

In 2017, the City of Albert Lea was selected by the State of Minnesota to receive technical assistance in developing a Climate Vulnerability Assessment. The assessment was completed by paleBLUEdot in January 2018. In 2019, supported through a second grant by the State of Minnesota, the City of Albert Lea engaged paleBLUEdot for the development of a Climate Action Plan outlining strategies and actions to support achieving increased climate resilience as well as reductions in City of Albert Lea City-Wide emissions. This report plan is the result, developed in collaboration with the City's Climate Action Planning Team.

Why Create a Climate Action Plan

The creation and dedicated implementation of a Climate Action Plan (CAP) is an organized way for a City to contribute to solving the global climate crisis while helping its resident and business communities create improved resilience to the current and future impacts and risks of climate change. Climate action can also create investment in innovation, jobs and actions that save households and businesses money.

What is a Climate Action Plan (CAP)

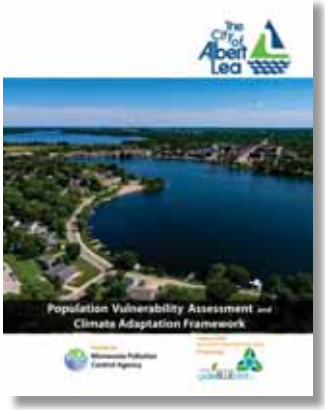
Climate action plans are comprehensive road maps that outline the specific Strategies and Actions that a City will implement to reduce greenhouse gas emissions and build resilience to related climatic impacts. The Albert Lea CAP addresses both climate mitigation and climate adaptation actions.

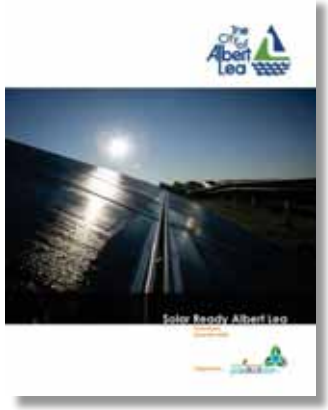
The Role of Communities in Climate Action

With a large majority of Americans living in urban areas, communities play a key role in addressing climate change. While each individual community's impact on global GHG emissions is relatively small, the leadership municipalities provide in motivating change can be extremely significant. According to a survey by the US Conference of Mayors, more than half (53%) had committed to reducing greenhouse gas emissions.

Building on Past Work

This Climate Action Plan builds on past projects and planning efforts of the City of Albert Lea, including the City's Climate Vulnerability Assessment and Renewable Energy Potentials Study





Introduction

Climate Action as a Journey

The Climate Action Plan represents a robust vision of the future with a comprehensive scope of actions befitting the magnitude of our collective climate challenge ahead. This Climate Action Plan establishes a long-term climate resilience vision and mitigation goal for the community. The plan itself, its strategies, and detailed actions, are intended as a 9 year plan. It is anticipated that this plan would be updated by 2030 to outline the next phase of action towards achieving the long-term community-wide goals.

The Albert Lea Climate Action Plan should be seen as a living document. Action progress and effectiveness should be reviewed at regular intervals through the plan's implementation and adjustments should be made to expand or modify the scope of individual actions and to augment the plan with new actions as appropriate to respond to ever-changing market and community conditions.

Benefits of Climate Action

The strategies and actions contained in this plan seek to reduce Albert Lea's dependence on fossil fuels, prioritize sustainable uses of land and water, reduce waste, and support improved equity and livability. The actions outlined in this plan will reduce Albert Lea's GHG emissions. In addition to reducing the community's contribution to climate change this plan strives to identify how climate change will increasingly impact the community. The Climate Action Plan addresses next steps for Albert Lea to adequately respond to climate change. If implemented successfully the plan will enhance Albert Lea's economic vitality, resilience, and viability as a healthy, livable community.

Introduction

Albert Lea's Vulnerability to Climate Risks:

Climate change is a global phenomenon that creates local impacts. It presents one of the most profound challenges of our time. A broad international consensus exists among atmospheric scientists that the Earth's climate system is being destabilized in response to elevated levels of greenhouse gas emissions in the atmosphere.

Two changes to Minnesota's climate are occurring already: shorter winters with fewer cold extremes, and more heavy and extreme precipitation. Increases in the global surface temperature and changes in precipitation levels and patterns are expected to continue and intensify for decades. In turn, these changes in climate have impacts on the economy and health of local communities.

The following highlight the vulnerabilities to climate risks facing Albert Lea, excerpted from the 2018 Albert Lea Climate Vulnerability Assessment:

Heat Stress
(High)

Warmer temperatures and more extreme heat may lead to higher risk of heat-related illness.

Air Quality
(High)

Increased heat may result in more days of poor air quality and exposure to allergens, impacting respiratory illnesses.

Vector-Borne Disease
(Medium—Low)

Longer growing seasons and higher temperatures may increase vector-borne diseases like West Nile Virus and Lyme disease.

Mental Health
(Medium)

Exposure to increased climate impacts and disasters may lead to increased anxiety and other mental health ramifications.

Housing
(High)

Warmer temperatures will increase demand for air conditioning and weatherization needs. Energy costs may be difficult for vulnerable populations to meet. Heavier rains coupled with higher risk of surface drought conditions may cause more local flooding, particularly "flash flooding" which could cause damage to housing and reduce mobility for portions of the community.

Stormwater Management
(High)

Heavier rains coupled with higher risk of surface drought conditions may significantly increase demand on stormwater management. The City's stormwater infrastructure may not be capable of handling the amount of runoff during more frequent heavy down pours, requiring resources to make needed upgrades.

Trees, Greenspace, and Agriculture
(Medium)

Increased temperatures and changes to precipitation will stress trees, greenspace, and agriculture. Conditions may be more favorable for disease, pests, and invasive species. Trees and crop species which formerly thrived in the area's climate may be less suited for future climate conditions.

Surface Water Quality
(Low)

Increases to heavy rain events and flooding/flash flooding risk may negatively impact water quality in the City's lakes, streams, and rivers. Increased pollutants and contamination potential, combined with increased annual water temperatures could increase risk to algal and bacterial growth, harming habitats and limiting recreation.

Introduction

What Are GHG's?

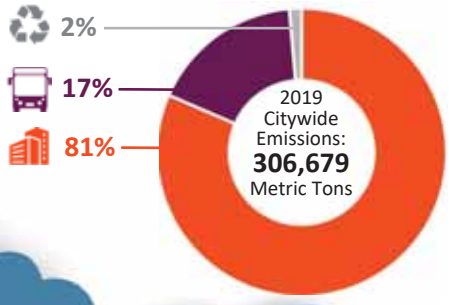
A greenhouse gas is a molecule in the atmosphere which does not react to light energy in the visible range (like sunlight), but does react to light energy in the infrared range -like that which is emitted from the Earth after being warmed by the sun. The most common greenhouse gases include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O).

Why do GHG's Matter?

GHG's let the sun's light shine onto the Earth's surface, but they trap the heat that reflects back up into the atmosphere. In this way, they act like the insulating glass walls of a greenhouse. The more GHGs there are, the more heat that is trapped in our atmosphere and the more we experience the impacts of global warming.

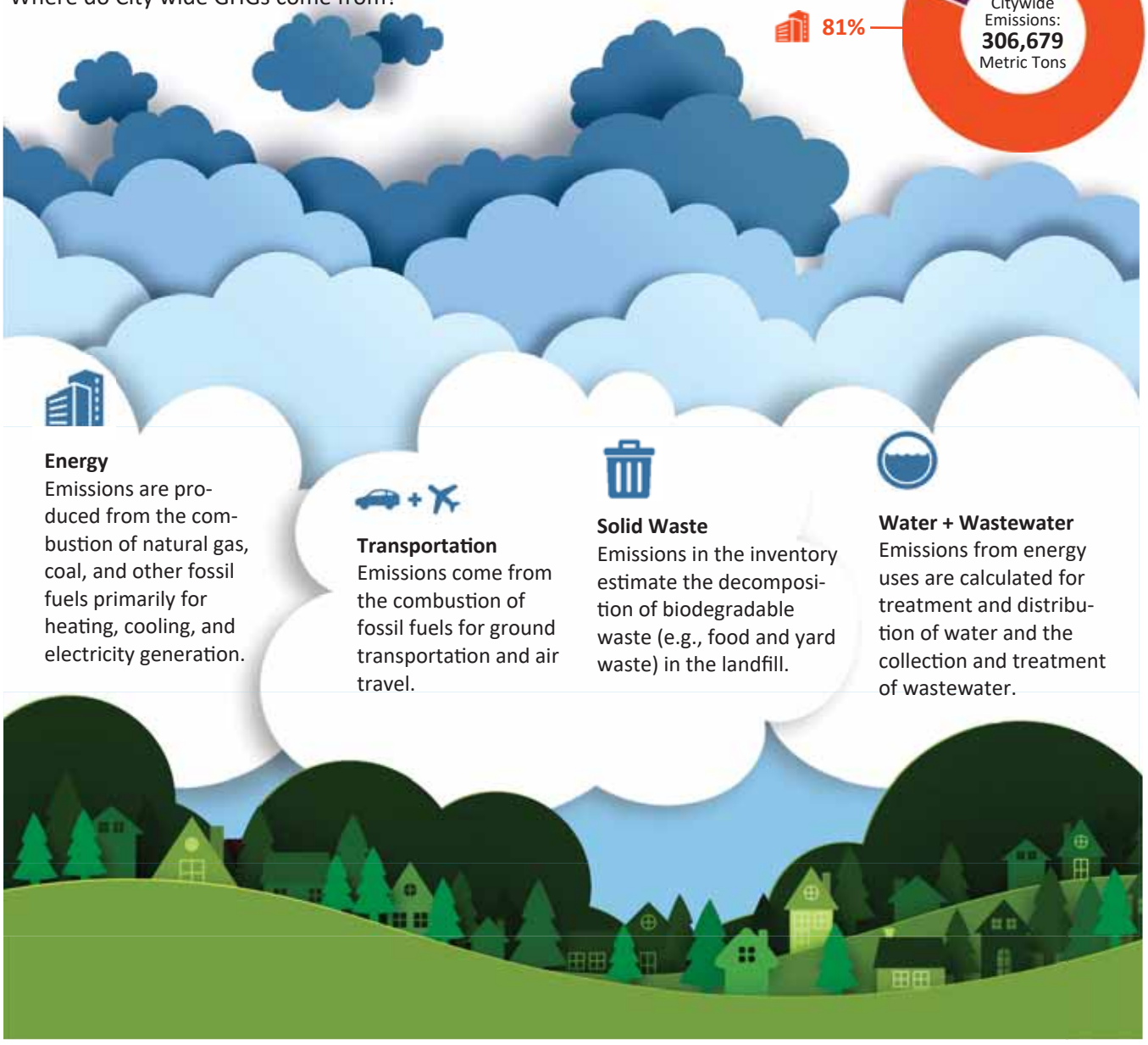
City of Albert Lea GHG Emissions

The City of Albert Lea's community-wide emissions for 2019 totaled 306,679 metric tons. Of that, 249,542 metric tons were from the buildings and energy sector, 52,415 metric tons were from the transportation sector, 4,201 metric tons were generated from solid waste, and 520 metric tons came from water and wastewater generation.



Key Greenhouse Gas Sectors

Where do City wide GHGs come from?



Energy
Emissions are produced from the combustion of natural gas, coal, and other fossil fuels primarily for heating, cooling, and electricity generation.

Transportation
Emissions come from the combustion of fossil fuels for ground transportation and air travel.

Solid Waste
Emissions in the inventory estimate the decomposition of biodegradable waste (e.g., food and yard waste) in the landfill.

Water + Wastewater
Emissions from energy uses are calculated for treatment and distribution of water and the collection and treatment of wastewater.

Introduction

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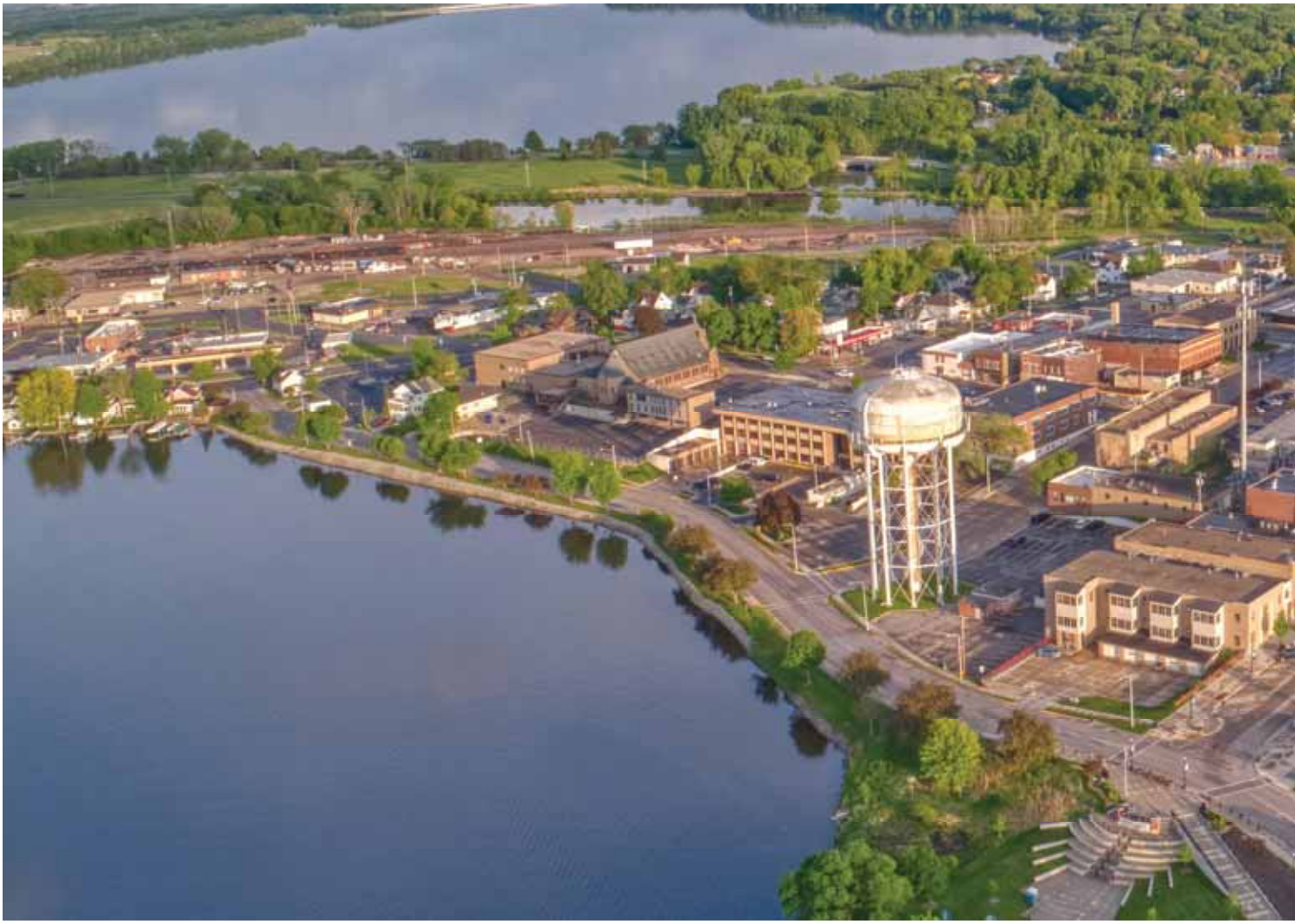
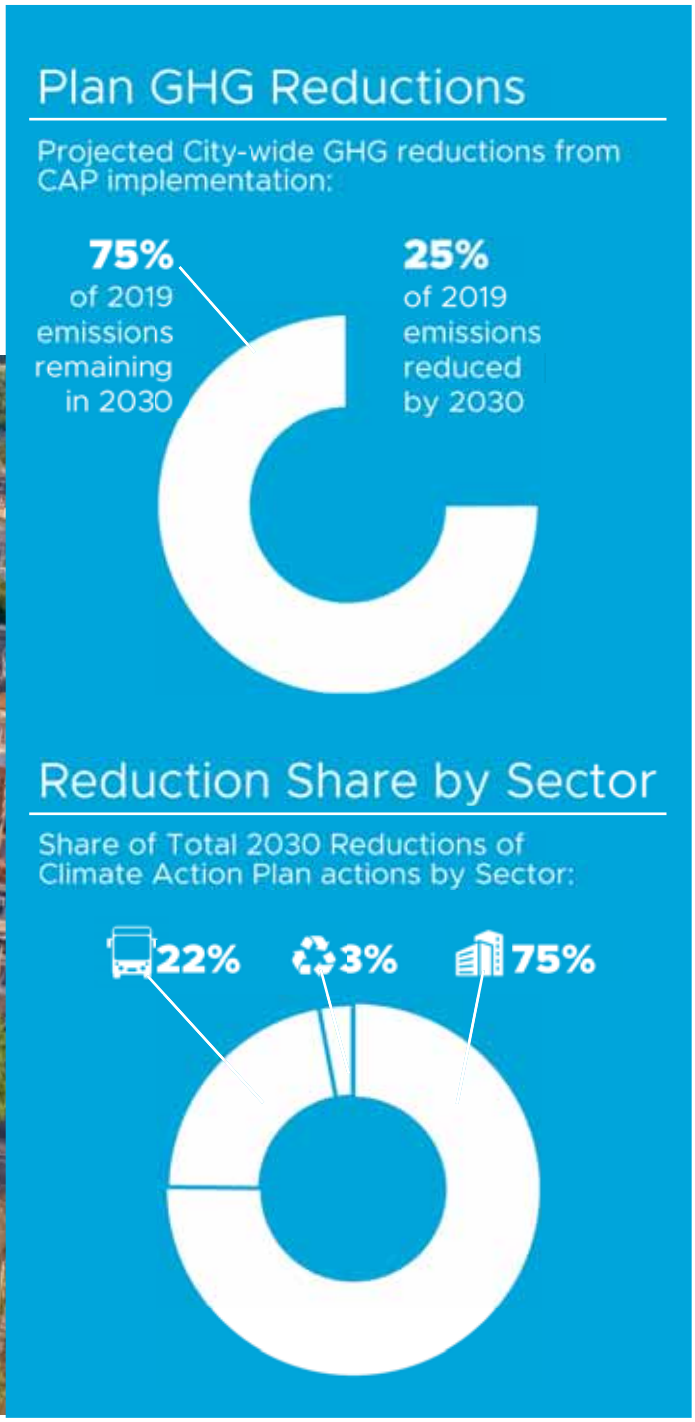


Introduction

Estimated City Wide GHG Reductions Included in This Plan

Long-term emission reduction potentials of the strategies and actions included in this plan have been modeled based on projected energy and fuel reductions and adoption rates of renewable energy and low/no emission transportation modes outlined in the strategies and actions. From this modeling, we know that with the successful implementation of this climate action plan, by 2030 City wide annual GHG emissions are projected to be 76,348 metric tons below 2019 levels. The potential cumulative GHG emissions reductions over the 9 year implementation period are estimated at over 350,000 metric tons - an elimination of over **6.9 billion cubic feet** of man made greenhouse gas atmosphere resulting from this climate action plan.



Introduction

The Process

The plan was developed in collaboration with an 18 person planning team of community members, business community members, non-profit organizations, Freeborn County, and City of Albert Lea staff. The planning team was organized into sub-teams aligned with each of the community-wide climate action sectors included in this plan (see Plan Framework). The plan was developed through a number of planning workshops from January 2021 through May 2021.

Development and implementation of the Albert Lea Climate Action Plan are opportunities for the City of Albert Lea government and partners in the community to research and articulate some of Albert Lea's most pressing resilience challenges; identify specific, multi-benefit actions that contribute to solutions to those challenges; and secure additional resources, technical assistance, and partnerships to accelerate next steps.

The goals and actions identified in the Climate Action Plan are grounded in community input, expert analysis, and best practices from other cities throughout the United States. Strategic goals and detailed actions were developed by the Planning Team through a series of workshop meetings. A preliminary draft of actions were reviewed against action screening criteria which enabled the Planning Team to evaluate, refine, finalize, and prioritize the actions to be incorporated in the final Climate Action Plan.

Albert Lea Action Screening Criteria

Support: How likely is the proposal to be adopted by the City or community-wide? Is it politically feasible? Is there community support? If funding is needed can/will it be made available?

Potential for Success: Do these strategies have a track record for success locally or in other communities?

Co-Benefits: Does the action address multiple goals, or other City or community objectives ? Does the strategy address needs in resilience, public health/quality of life, economic prosperity, triple bottom line, stewardship, and/or innovation?

Climate Action Plan Framework

This Climate Action Plan includes an implementation framework designed to achieve community-wide goals for greenhouse gas reduction and climate adaptation and resilience. The plan is organized around a unifying framework organized by sector as illustrated to on the following page. Each sector has over-arching Strategies established to meet 2030 goals and detailed Actions for implementation. Sector actions include a focus on Climate Mitigation, Climate Adaptation, or both.

Climate Mitigation: addresses the root causes of climate change through the reduction or prevention of greenhouse gas (GHG) emissions. Sectors with this as a significant focus are shown to the right with this symbol:

Climate Adaptation: seeks to lower the risks posed by the impacts of climate change which are now inevitable or likely. Sectors with this as a significant focus are shown to the right with this symbol:

Introduction

Climate Action Plan Framework

Emissions associated with all electricity and natural gas consumption within the City. Approaches to this sector area include improved energy efficiency and resilience.

Emissions from on-road vehicle traffic occurring in the community. Approaches to this sector area include reductions in vehicle miles traveled as well as shifts to public transit and alternative

All solid waste generated by residents and businesses within the community and their associated emissions. Approaches in this sector focus on diversion of food, consumer, and construction waste.

All potable water, wastewater collection and treatment, flood mitigation, and surface water health. Approaches to this sector focus on water conservation, wastewater reduction, flood mitigation, and stormwater management.

Food cultivation and distribution, nutrition insecurity, and food waste. Approaches to this sector include reduction of food waste, food system resilience, strengthening of local food production, and equitable access to healthy food.

Resilience of urban tree canopy, ground cover, greenspace, parks, and ecosystems. Focus includes expansion of tree canopy coverage, improvement of beneficial use of lawn areas, and mitigation of heat island impacts.

Community health impacts and resilience in the face of current and projected climate impacts & risks. approaches in this sector focus on community resilience and connections.

Economic development, jobs, and business creation potential represented by the actions and goals of all sectors in this Climate Action Plan. Approaches include workforce and economic development, and resilience of businesses.

Section 02
Buildings and Energy

Click here to return to TOC

Buildings + Energy
In Albert Lea

187,450,000
kWh of electricity in 2019

32,110,000
Therms of natural gas

+10.5%
Change in residential electricity consumption since 2016

+14.8%
Change in commercial natural gas consumption since 2016

Buildings and Energy

Why Buildings and Energy Is Important

Building construction and operations can have extensive direct and indirect impacts on the environment, society, and economy. Buildings use significant resources (energy, water, raw materials, etc.), generate waste (occupant, construction, and demolition), emit potentially harmful atmospheric emissions, fundamentally change the function of land, and the ability of that land to absorb and manage water.

Building energy use is a major contributor to greenhouse gas (GHG) emissions. The Building Energy sector includes all residential, commercial, and industrial buildings. Greenhouse gas emissions from this sector come from **direct emissions** – from fossil fuels burned *on-site* for heating or cooking needs – as well as **indirect emissions** – from fossil fuels burned *off-site* in order to supply that building with electricity. Building design plays a large role in determining the future efficiency and comfort of facilities. Increasing energy efficiency can help reduce GHG emissions and result in significant cost savings for both homes and businesses. The Albert Lea community can also achieve environmental, social, and economic benefits through enhancements to the built environment.

The Buildings and Energy sector is 81% of Citywide GHG emissions for the City of Albert Lea. Within this sector, the share of residential consumption is 25%, commercial/industrial and government buildings are 75%. In terms of share of building and energy emissions by fuel source, electricity represents 32% and natural gas represents 68% of this sector's emissions. This data indicates significant GHG reduction potential within the buildings and energy sector of Albert Lea, particularly within the commercial and industrial market and natural gas fuel consumption.

Albert Lea Energy Use Profile

Residential:

According to 2019 community wide data, the residential sector in Albert Lea consumes nearly 56.3 million kWh annually. This is equal to 7,478 kWh per household. The sector also consumes over 7 million therms of natural gas annually.

Commercial:

The Albert Lea commercial and industrial sector in 2019 consumed nearly 130.5 million kWh, equal to 13,700 kWh per job. These sectors also consume over 25 million therms of natural gas annually.

Climate Change Considerations

Climate Impacts

This sector impacts climate change through the combustion of fossil fuels (coal, natural gas, heating oil, propane) to generate electricity and heat/cool our buildings.

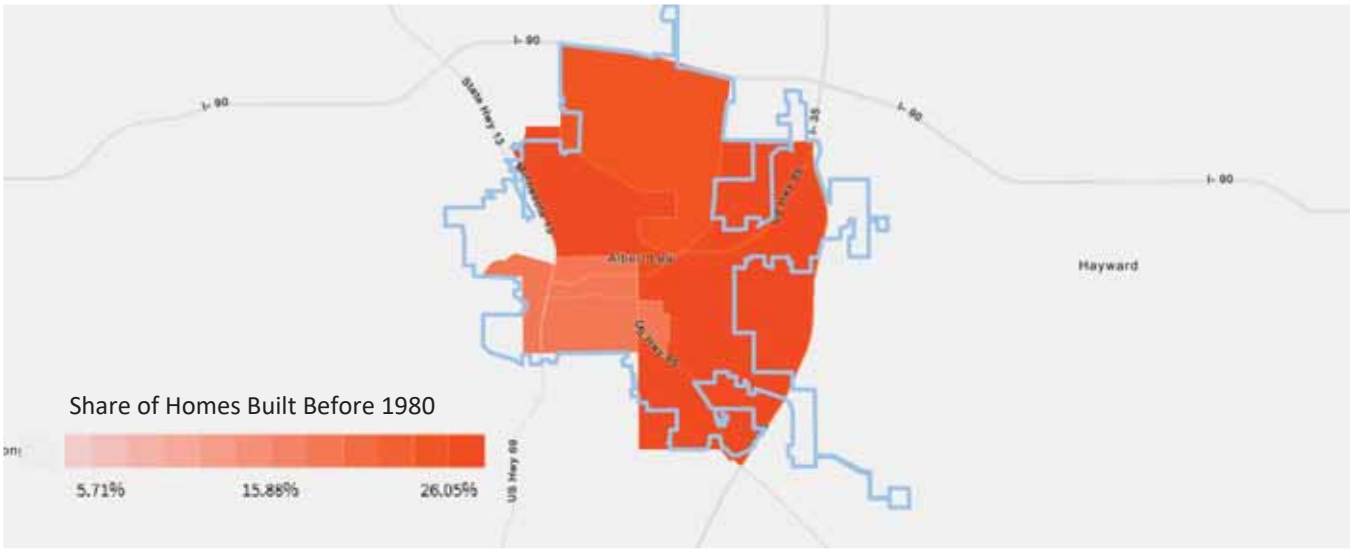
Climate Hazards

Hazards to Buildings and Energy include damage to buildings and energy grid infrastructure from extreme weather and flooding, increased power outages, and increased energy demand and cost expenditure due to rising temperatures and weather variability.

Albert Lea Building Stock Efficiency

The measure of a community's existing building stock, certified high performance buildings, and housing characteristics provides a basis for determining the current and potential energy efficiency gains for the community. Energy and water efficiency upgrades are one of the simplest and most effective ways to conserve resources, save money, and reduce greenhouse gas emissions. New building technology has increased energy efficiency significantly in recent decades. Although newer U.S. homes are 30 percent larger, they consume a similar amount of total energy as older homes - meaning they are more energy efficient per square foot of space. According to the US Energy Information Administration, homes built between 2000 and 2009 used 15% less energy per square foot than homes built in the 1980s, and 40% less energy than homes built before 1950.
This means that retrofitting older homes with some of these technologies provides ample opportunity to improve energy efficiency throughout the community. Below is a map of the distribution of homes and a chart outlining the estimated annual energy savings potential for households built before 1980 in Albert Lea:

Albert Lea Homes Built Before 1980



Energy Savings and Thermal Fuel Switching Potential of Albert Lea Homes Built Before 1980

	Estimated Units		Est Thermal Energy Consumption (million therms)	Targeted Energy Improvement Participation by 2030 (households)	Anticipated Annual Electric Savings by 2030 (MMkWh)	Anticipated Annual Thermal Energy Savings by 2030 (million therms)	Estimated GHG Reduction by 2030
Total Households	**7,523**			**1,500**			
Owner Occupied	**5,131**	**38.40**	**4.77**	**1,023**	**1.15**	**0.14**	**(1,246)**
Built 2010 or Later	8	0.06	0.01				0
Built 2000 to 2009	183	1.37	0.17				0
Built 1980 to 1999	556	4.16	0.52	28	0.03	0.00	(35)
Built 1960 to 1979	1,437	10.75	1.34	287	0.32	0.04	(350)
Built 1940 to 1959	1,768	13.23	1.65	354	0.40	0.05	(431)
Built 1939 or Earlier	1,179	8.82	1.10	354	0.40	0.05	(431)
Renter Occupied	**2,392**	**17.90**	**2.23**	**477**	**0.54**	**0.07**	**(581)**
Built 2000 to 2009	38	0.28	0.04				0
Built 1980 to 1999	450	3.37	0.42	32	0.04	0.00	(39)
Built 1960 to 1979	623	4.66	0.58	125	0.14	0.02	(152)
Built 1940 to 1959	640	4.79	0.60	128	0.14	0.02	(156)
Built 1939 or Earlier	641	4.80	0.60	192	0.22	0.03	(234)
Total Reduction Potential					**1.68**	**0.21**	**(1,827)**

Albert Lea Heating Fuel Switching Potential

According to the US Census, approximately 80% of residential heating is provided by natural gas, 14.6% by electricity, 1.6% by bottled/tank propane, and approximately 0.6% by solar thermal. It is estimated that 94 households, or approximately 1.3%, have no heating fuel. As Minnesota's electric grid decreases in its carbon intensity, building heating fuel will become an increasingly important target for emission reductions. Consequently, a focus on reduction of all fossil fuel heating (oil, propane, natural gas) will be required in order to significantly advance GHG reduction goals. The chart below illustrates the GHG reduction potential of switching 8% of Albert Lea households from fossil fuel heating to electricity.

	Estimated Units	Heating Fuel Emissions Remaining Following Energy Efficiency Targets	Targeted Fuel Switching Participation by 2030 by sf	Estimated Fuel Switching GHG Reduction by 2030
Total Households	**7,523**			
Owner Occupied	**5,131**	**24,104**	**410**	**(1,928)**
Built 2010 or Later	8	40	0	0
Built 2000 to 2009	183	904	0	0
Built 1980 to 1999	556	2,726	44	(215)
Built 1960 to 1979	1,437	6,886	72	(344)
Built 1940 to 1959	1,768	8,473	177	(847)
Built 1939 or Earlier	1,179	5,563	118	(556)
Renter Occupied	**2,392**	**11,237**	**191**	**(899)**
Built 2000 to 2009	38	188	0	0
Built 1980 to 1999	450	2,199	32	(157)
Built 1960 to 1979	623	2,986	31	(149)
Built 1940 to 1959	640	3,067	64	(307)
Built 1939 or Earlier	641	3,024	64	(302)
Total Reduction Potential		**35,340**	**602**	**(2,827)**

Albert Lea Renewable Energy Market Potential

As outlined in the Albert Lea Renewable Energy Potentials Study, a number of scenarios for potential future market absorption of on-site solar installations exist. The chart below illustrates the solar potential for Albert Lea based on achieving a share of projected Minnesota solar installation increases based on the City's share of state wide population through 2040.

Albert Lea Solar PV Projection Based on Potential Market Absorption

Year	Cumulative Installed (KW)	Annual Generation (KWH)	% of City Electric Consumption	This is Equivalent to adding (x) Average Residential Arrays Annually:	Or Equivalent to adding (x) Commercial Arrays Annually:	Or Equivalent to adding (x) Arrays Annually with Average Array Size Equal to Current Community Ave:
2025	5,346	5,796,276	**3.05%**	**97**	**18**	**28**
2030	9,009	9,767,063	**5.14%**	**97**	**18**	**28**
2040	16,284	17,654,336	**9.28%**	**97**	**18**	**28**

Buildings and Energy

Equity Considerations

- Often, families that live in properties that are not energy efficient are also those that can least afford high-cost utility bills. These households may lack the ability to pay for energy efficiency improvements or access renewable energy options.
- Renters of both single family homes as well as multi-family housing usually do not have the ability to implement energy efficiency measures to the buildings they live in to gain the benefits of energy efficiency.
- Families with fewer resources must dedicate a disproportionately larger share of their income towards energy costs, which exacerbates other vulnerabilities including exposure to heatwaves and other climate vulnerabilities. These same families are sometimes forced to forego basic access to service altogether - an estimated 66 households in Albert Lea go without heating fuel of any type (US Census heating fuel utilization data).

Community-Wide Buildings and Energy Targets Supporting Sector Goals

Sector goals are established to both support the City's Climate Action Plan in creating a climate resilient community and to reduce community-wide GHG emissions.

	Citywide Renewable Energy (% of total consumption)	Citywide Electricity Consumption	On-Site Natural Gas Consumption	Structures Weatherized	Structures with Electrified Heating
	+	-	-	+	+
Today	0.5%	187.5GHW	32.1MTherms	134	14%
2030 Targets	5%	168.8GWH	26.7MTherms	2,910	22%

Strategies Supporting Sector Goals

Sector goals related to GHG emissions reductions are designed to balance reduction across all sectors and achieve the overall emissions goals set forth for the community. The goals seek to strike a balance between achievability while also reaching -for improvement beyond business-as-usual.

As indicated in the introduction, the Climate Action Plan is intended to be a 9 year plan to be updated at the completion of that time. Consequently, the goals and strategies outlined in this section are intended to be achieved by 2030 (or earlier) unless otherwise noted.

Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy BE 1:** Improve total Community wide residential, commercial, and industrial building energy efficiency by 10% Electricity and 10% Thermal Fuel by 2030.
2. **Strategy BE2:** Encourage Net Zero Energy new construction and renovations within the community, achieve 5 Net Zero Energy buildings by 2030.
3. **Strategy BE 3:** Achieve 10 ENERGY STAR certified new or renovated commercial buildings within the community by 2030.
4. **Strategy BE 4**: Achieve 8% residential and 8% commercial and industrial building thermal "fuel switching" to reduce on-site fossil fuel use by 2030.
5. **Strategy BE 5**: Increase on-site distributed renewable energy to 5% of Residential and Commercial electric use by 2030.

Buildings and Energy

1 Strategy BE 1:

Improve total Community wide residential, commercial, and industrial building energy efficiency by 10% Electricity and 10% Thermal Fuel by 2030

	Actions	Implementation Phase
BE-1-1	Work with Freeborn Mower Cooperative Services, Minnesota Energy Resources, and other partners tto establish commercial energy efficiency audit and upgrade program similar Minnesota Chamber of Commerce's EnergySmart commercial energy savings program. Program could be integrated with the commercial waste audit service identified in Solid Waste action WM-1-1. Target: 24 commercial/industrial businesses per year with 10% electricity savings and 10% natural gas savings each. ((https://www.mnchamber.com/your-opportunity/energy-smart)	1
BE-1-2	Conduct a City Facilities Energy Audit on all buildings within the next 3 years. Use results from City Facilities Energy Audit to prioritize City Facilities Capital Improvement Plans (CIPS) and maintenance improvements. Goal: Reduce City of Albert Lea facility energy consumption by 10%.	1
BE-1-3	Work with Freeborn Mower Cooperative Services, Minnesota Energy Resources, and other partners to establish residential and multi-family energy efficiency audit and upgrade program similar to Xcel Energy's "Home Energy Squad Visits". Target 150 households per year (https://www.homeenergysquad.net/)	1
BE-1-4	Convert all City streetlights and signals to LED by 2030.	2
BE-1-5	Conduct a occupancy and plug load energy efficiency study of primary city owned facilities and establish a "Plug Load and Occupancy Energy Efficiency Guide" outlining operational practices and equipment modifications to advance the City's energy efficiency goals for City facilities. Provide training to all existing city employees and provide on-going training to all new city hires.	2
BE-1-6	Adopt, implement, and promote a Commercial Building Energy Benchmarking and Disclosure ordinance for all public buildings and all commercial buildings 30,000 square feet and larger. https://www.energystar.gov/buildings/program-administrators/state-and-local-governments/see-federal-state-and-local-benchmarking-policies.	2
BE-1-7	Develop and adopt a rental housing energy efficiency policy requiring single family and multi-family rental housing properties to meet minimum energy efficiency level to qualify for rental licensing. Program to include an energy efficiency rating system (ENERGY STAR or HERS). Example program: https://bouldercolorado.gov/plan-develop/smartregs.	3
BE-1-8	Identify homes and multi family building at risk during heat waves due to poor insulation and inadequate air conditioning and scale up resources to insulate them and update their cooling equipment in partnership with local utilities and the SE MN CAP agency.	3

2 Strategy BE 2:

Encourage Net Zero Energy new construction and renovations within the community, achieve 5 Net Zero Energy buildings by 2030.

	Actions	Implementation Phase
BE-2-1	Encourage new construction and remodeling projects to meet Electric Vehicle (EV) ready standards using the EV Readiness section of the City's Net Zero Energy Building Guide. Explore development of a promotional component such as an "EV Ready" plaque.	1
BE-2-2	Create a City of Albert Lea Net Zero Energy Building Guide and Solar Ready Guide providing information and resources on how to achieve net zero, high performance, and solar ready buildings. (examples: https://palebluedot.llc/llbo-nze ; https://palebluedot.llc/solar-ready-guidelines	1
BE-2-3	Provide City's Net Zero Energy Building Guide and Solar Ready Guidelines document to local contractors, realtors, designers, home shows or remodeler showcase events. Provide training on solar ready and net-zero strategies as found in the City's Net Zero Energy Building Guide and Solar Ready Guidelines to area builders with local builders association. Include the City's Net Zero Energy Building Guide and Solar Ready Guideline documents on the City's webpage Explore development of a promotional component such as a "Net Zero" or "Net Zero Ready" plaque.	2
BE-2-4	Utilize incentives, vacant City land, and current programs for pilots of net-zero buildings across different sectors. Explore option of issuing a competitive RFP for effective and innovative Net Zero pilot projects. Explore partnerships and funding sources including Minnesota CERTs Grant, MPCA Environmental Assistance Grants, MN Department of Commerce Grants, or US DOE grants.	2

3 Strategy BE 3:

Achieve 10 ENERGY STAR certified new or renovated commercial buildings within the community by 2030.

	Actions	Implementation Phase
BE-3-1	Establish a policy to require all primary City facilities to benchmark (using ENERGY STAR Portfolio Manager or B3 Benchmarking) and disclose annual energy consumption. Invite County, School District, and other public agencies located within the City to participate in City's facilities benchmarking and disclosure effort.	1
BE-3-2	Incentivize local businesses to participate in ENERGY STAR Portfolio Manager and ENERGY STAR Certification by offering free ENERGY STAR Certification review support. Explore grant opportunities to support program such as Minnesota CERTs Grant, MPCA Environmental Assistance Grants, MN Department of Commerce Grants, or US DOE grants.	2
BE-3-3	Encourage all Planned Unit Developments and Conditional Use Permits, and all projects receiving public financing support to meet LEED or ENERGY STAR Certification requirements.	2

4 Strategy BE 4:

Achieve 8% residential and 8% commercial and industrial building thermal "fuel switching" to reduce on-site fossil fuel use by 2030.

	Actions	Implementation Phase
BE 4-1	Promote incentive programs for electrification. Work with Freeborn Mower or other regional partnerships to create financial incentives to electrify new and existing buildings. For example, rebates for panel upgrades, electric appliances, Air Source Heat Pumps, and Ground Source Heat Pumps can encourage the transition to electric energy use in homes and businesses. Goal: Target 10% residential market conversion (75 households annually) and 5% commercial/industrial market conversion (an estimated 10 commercial businesses, 10 industrial businesses annually) by 2030. Resource: https://fmec.coop/rebates	1
BE 4-2	Work with regional energy partnerships to develop and implement an Electrification Action Plan for all City facilities. Include new and existing buildings,incorporate strategies to address electricity storage, and focus on highlighting any hurdles or solutions that would be applicable to the broader community	2
BE 4-3	Work with Minnesota Energy Resources to establish an option for Renewable Natural Gas for customers and achieve 5% commercial/industrial use by 2030.	2
BE 4-4	Work with Minnesota Energy Resources to establish an option for Renewable Natural Gas for customers and achieve 5% residential use by 2030 (40 households per year).	3

5 Strategy BE 5:

Increase on-site distributed renewable energy to 5% of Residential and Commercial electric use by 2030.

	Actions	Implementation Phase
BE-5-1	Establish a policy which requires all new construction and significant renovation projects for City facilities to be constructed to meet "Solar Ready" requirements and to include a solar feasibility assessment and project option for inclusion of on-site solar, include "Return on Investment" assessment, and incorporate solar where return is favorable.	1
BE-5-2	Identify the "Solar Top 30" commercial/industrial properties within the city and produce detailed solar feasibility assessments for each site. Assessments to include potential solar generation and economic performance and return on investment estimates, information on financing and ownership models, and next step resources. Provide solar assessment reports to properties and conduct an informational workshop to assist building owners and businesses in understanding the assessments and next step potential. "Solar Top 30" assessment effort could be repeated annually, particularly through 2024 in alignment with enhanced federal tax benefits	1
BE-5-3	Coordinate and promote a commercial Solar Group Purchase Campaign annually to help reduce the costs of solar installation through volume purchasing power (goal, 600KW installed annually). Group purchase campaign could include/focus on properties identified in the "Solar Top 30" assessment effort. Program design to explore strategies to support local small business solar installers and strategies to support local workforce development in coordination with Riverland Community College.	1
BE-5-4	Coordinate and promote a residential Solar Group Purchase Campaign annually to help reduce the costs of solar installation through volume purchasing power (goal, 80 households annually). Program design to explore strategies to support local small business solar installers such as being set up to enable small installers to collaborate or having a competitive "marketplace" approach with more than one installer to choose from. Explore partnership with MREA for no-cost to City program management.	1
BE-5-5	Issue a competitive RFP for solar developers for the installation of solar PV on all viable City facilities. RFP to include bid alternates for 3rd party solar array ownership / solar PPA which require no up-front City investment. Invite school district, County, and local businesses to participate in the RFP issue. See City's 2018 solar study: https://palebluedot.llc/carbon-copy/2019/2/28/solar-ready-albert-lea-the-solar-potential-in-the-city-of-albert-lea	2
BE-5-6	Develop and issue an RFP for community solar developers to advance community solar options and subscriptions within City. RFP should focus on projects that benefit all residents, particularly communities of color, low-income populations, and multi-family households. Goal: 50 households subscribed per year.	2

Buildings and Energy

Planned Buildings and Energy GHG Emission Reductions

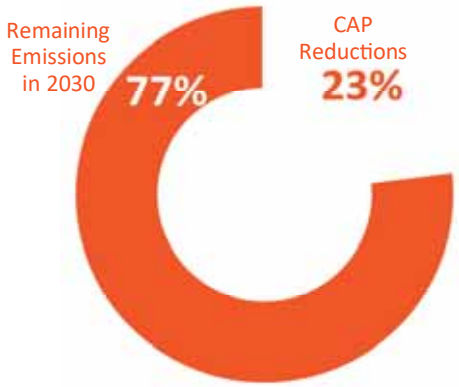
Planned Sector Emission Reductions Through 2030

The strategies and actions included in this section of the Climate Action Plan are projected to reduce the city's annual GHG emissions by 57,403 metric tons (MT) by 2030 - a 23% reduction over 2019 levels.

When compared to 2019 emissions, this is equivalent to eliminating **1.1 billion** cubic feet of man-made greenhouse gas atmosphere annually by 2030.

Sector Emissions Reduction below 2019 by 2030

The total change to sector emissions include CAP Plan reductions are:



Albert Lea's Buildings and Energy Carbon Reduction Pathway

What You Can Do

You can support the goals of the Buildings and Energy section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- Unplug 2 or more electricity "vampires" in your home or apartment. https://www.comed.com/News/Pages/NewsReleases/2019-10-30B.aspx
- Convert 3 or more lights or lamps to LED bulbs.
- Set your thermostat 2 or more degrees higher during cooling season, lower during heating season.
- Turn down your water heater to 120°.
- Replace an older home thermostat with a “smart,” programmable model.
- Replace a major appliance (e.g., refrigerator, air conditioner, furnace) with a newer, energy-efficient model.
- Replace a gas range or clothes dryer with an electric model.
- Schedule a home energy audit with a licensed contractor or Freeborn Mower Electric Cooperative. https://fmec.coop/home-energy-audit
- Install solar panels at your home, working with a licensed contractor. If possible, participate in Albert Lea's residential solar group purchasing program.
- If you don’t own your home but support clean, renewable energy, talk to Green Mountain Power to see if community solar is available. https://cutt.ly/RbC6wa0
- Install — or have a licensed contractor install — more insulation in your home.
- Install energy-efficient windows and doors, working with a licensed contractor.

Section 03
Transportation and Land Use

Click here to return to TOC

Transportation
In Albert Lea

102,424,000
Vehicle Miles Driven (VMT) in 2019

+0.7%
Increase in VMT since 2016

77.1%
Commuters drive alone

25
Electric vehicles currently registered

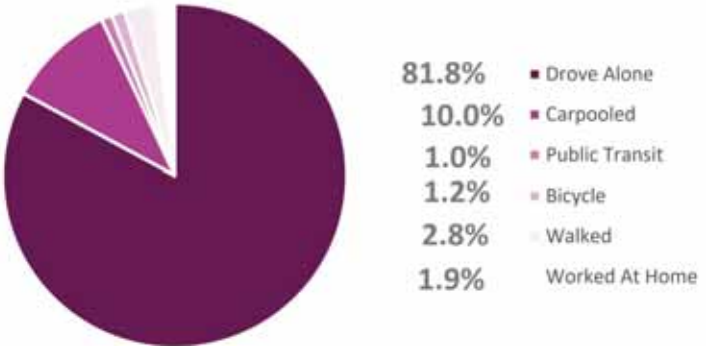
Transportation and Land Use

The design of a City can limit or expand the choices and opportunities available to its residents. Where and how we live, our mobility to and from the places in our community we visit daily, and the related global impact of those decisions are all influenced by how our community is designed. The transportation systems we have access to and choose to use—including private and public vehicles, trains, and planes - can have significant impacts on the environment.

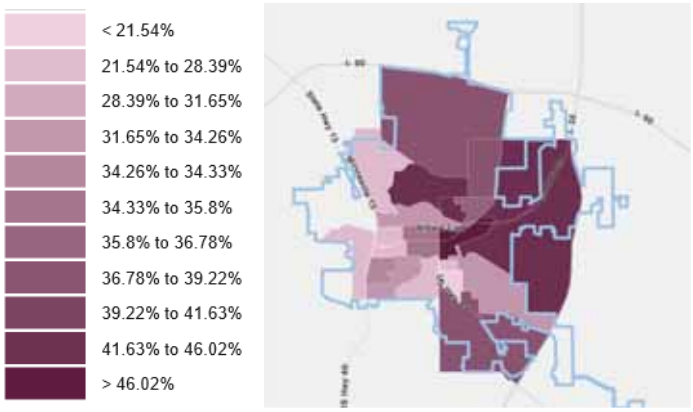
In Albert Lea, the transportation sector accounts for 17% of City wide greenhouse gas emissions (2019 GHG Inventory). As shown in the commuter transportation pie chart to the right, the majority (81.8%) of Albert Lea residents drive to work alone. The remaining carpool (10%), use public transit (1%), walk /bicycle (4%), or telecommute (1.9%).

Of the workforce in Albert Lea, the average commute-to-work time is 16.3. Over 35% of commuters have a commute of less than 10 minutes. This population may represent a significant opportunity for converting commute mode from driving to public transit, biking, or walking.

Commuter Transportation Modes of Workers in Albert Lea



Commuters with <10 Minute Commute in Albert Lea



Continuing to improve the equity and sustainability of Albert Lea's land use and transportation systems requires a focus on developing systems and networks that allow for greater choice in where residents live and work, as well as how they commute. Implementation of Complete Streets and a connected system of transit, bike and pedestrian infrastructure along with emphasis on neighborhood design that supports well designed density and walkability. These strategies are lower cost solutions that will save households money while helping Albert Lea reach its goal to reduce City wide GHG emissions by 2030.

Climate Change Considerations

Climate Impacts

This sector impacts climate change through the combustion of fossil fuels (gasoline, diesel, propane) for on-road cars and trucks and off-road vehicles and equipment.

Climate Hazards

Hazards to transportation and land use include increased damage to roads and transportation infrastructure due to increased freeze and thaw cycles, flooding, and extreme weather and temperatures.

Transportation and Land Use

Equity Considerations

- Increased opportunities for public transit and active transportation can help address health disparities for many at-risk populations.
- Affordable and reliable options for mobility for people with special transportation needs can significantly improve transportation equity. Populations with special transportation needs include older adults, youth, persons with disabilities, and persons with reduced incomes.
- Some portions of Albert Lea have fewer housing and transportation options than others. This can limit people's choices in where they live and how they get to work or other activities. According to the US Census, 3.3% of Albert Lea households have no vehicles. Households that rely on public transit service or who rent their home will be limited in where they may find housing that meets both needs.

Mode Shift Targets Supporting Sector Goals

Sector goals are established to both support the City's Climate Action Plan in creating a climate resilient community and to reduce City-wide GHG emissions.

	Vehicle Miles Traveled (VMT)	Population Density Per Acre*	Electric Vehicles	Biodiesel Replacement of Diesel use
	-	+	+	+
Today	102.4 MVMT	3.35/acre	3	0%
2030 Targets	**97.3** MVMT	**3.45**/acre	**3,200**	**10%**

* calculated based on total population divided by land classified as developed land (open, low, medium, and high densities)

Strategies Supporting Sector Goals

Sector goals related to GHG emissions reductions are designed to balance reduction across all sectors and achieve the overall emissions goals set forth for the community. The goals seek to strike a balance between achievability while also reaching -for improvement beyond business-as-usual.

As indicated in the introduction, the Climate Action Plan is intended to be a 9 year plan to be updated at the completion of that time. Consequently, the goals and strategies outlined in this section are intended to be achieved by 2030 (or earlier) unless otherwise noted.

Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy TL 1:** Decrease community wide VMT by 5% by 2030.
2. **Strategy TL 2**: Increase average population per developed acre by 3% by 2030.
3. **Strategy TL 3:** Increase battery electric vehicle (BEV) utilization to 20% of community wide rolling stock (from approximately 3,200 vehicles community-wide).
4. **Strategy TL 4:** Establish viable biodiesel sources to serve community by 2025. Achieve 10% diesel consumption replacement with biodiesel by 2030.

1 Strategy TL 1:

Decrease community wide VMT by 5% by 2030.

	Actions	Implementation Phase
TL-1-1	Identify locations and partners to facilitate bike/walk commute, carpooling, EV ride share, and telecommuting options for municipal and other employers in the city.	1
TL-1-2	Conduct a Complete Streets Status and Quality Assessment to provide a comprehensive review of the coverage, quality, and opportunities of complete streets in the community. Study to identify needs to accelerate bike paths, building sidewalks, crosswalks, and other walking infrastructure, particularly in high-need areas and areas serving vulnerable populations. Create an implementation plan establishing annual increases in the total miles of sidewalks, on-road bicycle lanes and multi-use paths.	1
TL-1-3	Develop a Bike and Pedestrian Masterplan with recommendations on strategies to maximize the use of the Right of Way (ROW). o Identify areas where on-street bike lanes make sense o Identify where street widths can be reduced—Inclusion of sidewalks, trails, larger boulevards, medians, etc.	1
TL-1-4	Explore shared mobility options for seniors and youth potential ideas include: ○ eBike sharing and/or eBike incentive programs ○ electric golf carts on safe routes for day to day needs and “last mile” transit needs ○ Cart sharing	2
TL-1-5	Establish an incentive or promotion to advance commuter mode-neutral incentives with the goal of 15% of private workforce receiving mode-neutral incentives, parking buyback, or telecommute benefits. Identify locations and partners to facilitate pilot programs for municipal and other employers in the city. Resources: https://www.bestworkplaces.org/pdf/ParkingCashout_07.pdf https://www.boston.gov/transportation/parking-cash-out https://www.vtpi.org/tdm/tdm8.htm https://www.smartgrowthamerica.org/app/legacy/documents/smartgrowthclimatepolicies.pdf http://shoup.bol.ucla.edu/Parking%20Cash%20Out%20Report.pdf	2
TL-1-6	Collaborate with employers in the City to identify potential transit and transportation options capable of reducing overall community VMT while providing benefit to employers and employees. Implement a pilot project based on recommendations.	2

2 Strategy TL 2:

Increase average population per developed acre by 3% by 2030.

	Actions	Implementation Phase
TL-2-1	Issue competitive redevelopment Request for Proposals encouraging high quality mixed use redevelopment on infill properties and existing surface parking lots within downtown district. RFP's should focus on equity, affordability, livability, and compliance/support of Climate Action Plan goals.	1
TL-2-2	Conduct a Development Study to identify and prioritize available sites for redevelopment and in-fill development to advance City's walkability, bikeability, and density goals. Study should include a review of under utilized surface parking infrastructure capable of being redeveloped.	1
TL-2-3	Encourage development of accessory dwelling units ("ADU") to create additional legal ADUs compatible with residential neighborhoods. This will add additional housing options for the City's workforce, seniors, families with changing needs, and others for whom ADUs present an affordable housing option.	2
TL-2-4	Establish an ordinance to require developers and landlords to "unbundle" parking from rent structures. Policy should focus on maintaining transit and transportation equity. Resource: https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/preliminary-investigations/final-pricing-parking-management-to-reduce-vehicles-miles-traveled-pi-a11y.pdf	2

3 Strategy TL 3:

Increase battery electric vehicle (BEV) utilization to 20% of community wide rolling stock (from approximately 3,200 vehicles community-wide).

	Actions	Implementation Phase
TL-3-1	Create a citywide EV Roadmap. Plan should create citywide and city facility electric vehicle (EV) charging station study and masterplan to map existing infrastructure, determine the current and future demand for EV charging stations, Establish public EV parking regulation, and to identify options for increasing number of electric charging stations in public parking areas (e.g., schools, parks, libraries, City-owned parking garages, near City Hall) and in commercial and high-density residential areas. Plan should include implementation strategies to meet citywide EV charging demand and promote adoption of EVs withing the community.	1
TL-3-2	Conduct a Fleet and Equipment Use and Operations Assessment to analyze city fleet and equipment use and to provide a guide for the right vehicle/equipment for City functions, with a focus on advancing EV and high fuel efficiency features (like auto-off). Assessment to identify most economical ways of operating which minimize emissions and fuel consumption (i.e. mowing patterns and schedules, street plowing efficiency study, policy patrol efficiency study, etc)	1
TL-3-3	Update City vehicle purchasing policy/budget process to default to EV and non-fossil fuel alternatives with traditional internal combustion engine (ICE) as optional requiring proof of need. For ICE vehicle options, establish minimum fuel efficiency requirements. Focus on small vehicles as well as large vehicles for alternative fuels. EV replacement to be prioritized for high mileage vehicles. Goal: Achieve 50% EVs within City Fleet by 2030.	1
TL-3-4	Create an EV Ready Guide to provide information, resources, and guidance to individuals and businesses on transitioning to electric vehicles. Example: https://palebluedot.llc/llbo-ev	2
TL-3-5	Collaborate with Freeborn Mower Cooperative Services to develop and implement outreach and education campaigns designed to help residents and businesses understand the benefits of transitioning to EVs and to learn how to leverage applicable Freeborn Mower programs or other incentives to facilitate EV charger installation or EV purchase. Explore with Freeborn Mower the development of additional incentives to advance the city's EV goals. Program should focus on increased community equity.	2

4 Strategy TL 4:

Establish viable biodiesel sources to serve community by 2025. Achieve 10% diesel consumption replacement with biodiesel by 2030.

	Actions	Implementation Phase
TL-4-1	Collaborate with Freeborn County, Renewable Energy Group, Freeborn County landfills, local fuel retailers, and the State of Minnesota to conduct a feasibility assessment identifying potential sources for the creation, procurement, distribution, and promotion of advanced biodiesel fuels to serve community needs. Feasibility assessment to provide detailed actionable steps to advance goals.	1
TL-4-2	Establish a Commercial Fleet Task Force comprised of business and public sector fleet owners and operators to explore collaborative potential of increasing alternative fuel utilization to decrease fleet costs while advancing the City's CAP goals.	2

Transportation and Land Use

Planned Transportation and Land Use GHG Emission Reductions

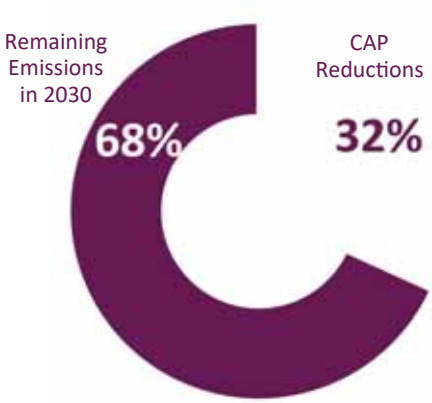
Planned Sector Emission Reductions Through 2030

The strategies and actions included in this section of the Climate Action Plan are projected to reduce the City's annual GHG emissions by 16,671 metric tons (MT) by 2030 - a 31.8% reduction over 2019 levels.

When compared to 2019 emissions, this is equivalent to eliminating **327 million** cubic feet of man-made greenhouse gas atmosphere annually by 2030.

Sector Emissions Reduction below 2019 by 2030

The total change to sector emissions include CAP Plan reductions are:



Albert Lea's Transportation and Land Use Carbon Reduction Pathway

What You Can Do

You can support the goals of the Transportation and Land Use section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- Merge two or more errands into a single driving trip.
- Join a carpool or use ridesharing to get to work, a group activity or event.
- Walk to work, an appointment, a group activity or event.
- Ride a bike, electric bike or scooter to work, an appointment, a group activity or event.
- Take public transit to work, an appointment, a group activity or event. Plan your trip here: http://smartbusmn.org/
- With a family member or friend, take public transit to a group activity or event.
- Buy or tune up a used bike.
- Sell or donate a bike (in good condition) you aren't using.
- Buy or lease a hybrid or electric vehicle.

Click here to return to TOC

Section 04
Waste Management

Solid Waste
In Albert Lea

3,146
tons of recycling in 2019

13,004
tons of landfill waste in 2019

17.7%
increase in total waste collected since 2016

Waste Management

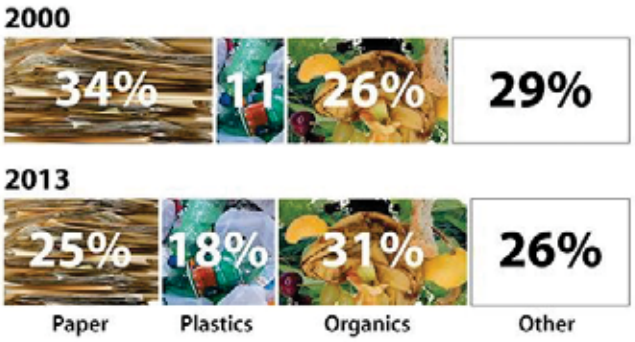
Why Waste Management Is Important

In Albert Lea, solid waste contributed 1.1% of City-wide greenhouse gas emissions in 2019. City-wide municipal solid waste (MSW) handled in 2019 totaled 6,839 tons. Of the MSW handled an estimated 371 tons (5.4% of total) was recycled and the remaining 6,468 tons (94.6%) was landfilled. Municipal solid waste sector has great potential to avoid emissions throughout the economy thanks to waste reduction and waste recovery.

Food discards and residuals that decompose in landfills release methane, a greenhouse gas that is at least 28 times more potent than carbon dioxide. This fact makes food wasting a significant contributor to solid waste greenhouse gas emissions. Habitat destruction, global warming, and resource depletion are some of the effects of our materials consumption.

Minnesota Waste Stream Changing

The Minnesota Pollution Control Agency (MPCA) commissioned a statewide study to determine the characteristics of statewide waste streams. The project studied garbage from six facilities throughout the state and separated it into nine primary categories. The study found that Minnesota waste has changed since the last study was conducted in 2000. Paper, plastics, and organics are still the top three components of our garbage, but the proportions have changed—plastic is up, food is up, but paper is down. This indicates great potential for increased organics recycling opportunities.



Minnesotaʹs Waste Hierarchy

Following the Minnesota Climate Change Advisory Group's initial recommendations on statewide GHG emissions reductions, the MPCA conducted a study to identify the most promising potentials for reduction of solid waste emissions. The report produced the above hierarchy of waste management to achieve the best environmental results.

Climate Change Considerations

Climate Impacts

This sector impacts climate change through combustion of fossil fuels in the collection and processing of materials, as well as the generation of methane from anaerobic decomposition of organic materials in landfills.

Opportunities

As indicated in the Waste Diversion Potential Estimate diagram, a significant portion of Albert Lea's waste stream has the potential for being put to beneficial use while avoiding GHG emissions.

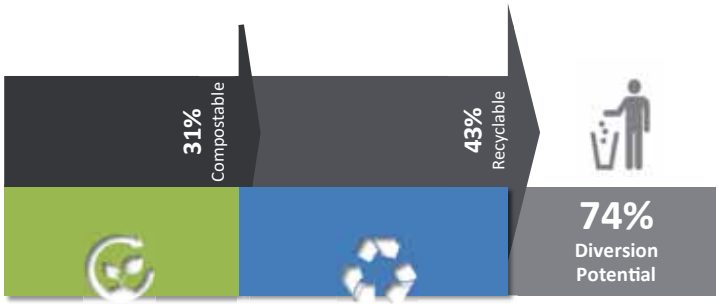
Climate Hazards

Hazards to the waste management system include damage to infrastructure from extreme weather and flooding.

Waste Diversion Potential

Based on the State-wide Waste Characterization Study, there may be waste diversion potential of up to 74% in the current landfilled materials (idealized maximum). Below is the breakdown of the estimated total potential waste diversion:

Organics	**31%**
Potentially Recyclable Materials	**43%**
Other Materials (remaining landfill)	**26%**



Waste Management

Equity Considerations

- Accessibility to recycling and composting programs may not be equally and readily available to all community residents and may also be impacted by other participation-related barriers, including awareness of programs, user fees, accessibility based on housing type, and language barriers.
- Populations that are situated very close to the landfill or composting facility may experience nuisance issues like bad odors and potential health issues unless mitigation actions are implemented.

Community-Wide Solid Waste Targets Supporting Sector Goals

Sector goals are established to both support the City's Climate Action Plan in creating a climate resilient community and to reduce City-wide GHG emissions.

	Organics Diversion	Recycling Diversion	Total MSW Handled
	+	+	-
Today (% of total waste)	9.6%*	17%	17,868 tons
2030 Targets (% of total waste)	**20%**	**25%**	**16,975** tons

*Estimated

Strategies Supporting Sector Goals

Sector goals related to GHG emissions reductions are designed to balance reduction across all sectors and achieve the overall emissions goals set forth for the community. The goals seek to strike a balance between achievability while also reaching -for improvement beyond business-as-usual.

As indicated in the introduction, the Climate Action Plan is intended to be a 9 year plan to be updated at the completion of that time. Consequently, the goals and strategies outlined in this section are intended to be achieved by 2030 (or earlier) unless otherwise noted.

Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy WM-1**: Increase organics landfill diversion from 10% to 20% by 2030
2. **Strategy WM-2**: Increase recycling from 17% to 20% of total MSW handled by 2030.
3. **Strategy WM-3**: Decrease total per capita municipal solid waste handled by 5% by 2030.
4. **Strategy WM-4**: Increase beneficial use of landfill gas by 2030.

1 Strategy WM 1:

Increase organics landfill diversion from 10% to 20% by 2030.

	Actions	Implementation Phase
WM-1-1	Establish a "Towards Zero Waste Certification" program to provide education to food retailers and restaurants on strategies to reduce waste and to promote businesses successfully achieving certification levels. Goal: 12 additional businesses enrolled annually. Resources or models for establishing a program include: https://carbonfreedining.org/ https://true.gbci.org/ https://www.crra.com/certification	**1**
WM-1-2	Close the loop on organics recycling; initiate a Compost Soil Amendment pilot project for use of compost as a soil amendment for public and private construction projects.	**1**
WM-1-3	Identify, partner, or create an organics collection and composting site to support increased food and organics diversion. Example: Transfer station compost site for free public use.	**1**
WM-1-4	Based on results of the Food Scraps Bag pilot project, establish a policy or ordinance expanding or requiring in-trash food scrap composting. https://cutt.ly/tfBf5Dj	**2**
WM-1-5	Establish a Community Garden Composting program supporting the expansion of food waste diversion through at-home composting. Provide backyard composting workshops, tips, and resources. (https://www.bouldercounty.org/environment/composting/)	**2**
WM-1-6	Create a pilot "Food Scraps Bag" pilot program to test food scraps composting collection across restaurant, commercial and residential customer base where food scrap bags are separated at landfill without separate compost bins and collection vehicles. https://cutt.ly/tfBf5Dj	**2**

2 Strategy WM 2:

Increase recycling from 5% to 15% of total MSW handled by 2030 in an energy efficient, low emission manner.

	Actions	Implementation Phase
WM-2-1	Conduct a survey to discover where gaps exist in recycling knowledge for city residents (social media "I don't know" box) and design an educational/communications program to address gaps.	1
WM-2-2	Develop an educational and outreach campaign based on the knowledge gap survey.	1
WM-2-3	Develop and fund a waste audit and diversion assistance program for businesses. Program to support businesses in establishing tracking and reporting waste streams, identify reduction, diversion, beneficial use opportunities, identification of potential financing sources, and connect businesses with energy audit and other resources in support of full CAP goals. Explore funding opportunities through the State of Minnesota MPCA, MN Department of Commerce, and US EPA. Goal: 12 business waste audits completed annually with businesses engaged in measuring and diverting waste. Example programs: https://www.mnchamber.com/your-opportunity/waste-	1
WM-2-4	Create and promote information regarding Zero waste strategies as the cheapest materials management solution. This approach enables organizations to decrease outlay for new materials as well as decreasing waste costs.	2
WM-2-5	Collaborate with the County and increase total recycling and waste reduction education budget	2
WM-2-6	Collaborate with the County and increase total recycling and waste reduction education budget	2

3 Strategy WM 4:
Increase recycling from 17% to 20% of total MSW handled by 2030.

	Actions	Implementation Phase
WM-3-1	Establish a Zero Waste policy for City operations that outlines increasing incremental annual waste reduction goals charting a path to Zero Waste. Policy to require that outside users of City facilities also follow Zero Waste policy and will modify the event permit application to require the inclusion of recycling and composting at events.	1
WM-3-2	Implement a plastic bag, straw, and stirrer-free opt-in program for businesses with appropriate options for people with disabilities.	1
WM-3-3	Coordinate with the Albert Lea chamber of commerce, business, and manufacturing associations to provide seminars, resources, and content to area businesses on waste reduction and Circular Economy concepts. Work with cohort to explore economic potential of Circular Economy business opportunities within the Albert Lea region. Program should include promotion of the Waste Audit and Diversion assis-	1
WM-3-4	Coordinate with the Albert Lea Area Schools to establish paths towards Zero Waste program. Program to include zero waste curricula and family content as well as zero waste strategies for school facilities. (https://www.ecocycle.org/files/Zero%20Waste%20A%20Realistic%20Approach%20Sustainability%20Program%20for%	2

4 Strategy WM 4:
Increase beneficial use of landfill gas by 2030.

	Actions	Implementation Phase
WM-4-1	Conduct a Waste-to-Energy Analysis to identify non-combustion waste-to-energy options and potentials at wastewater treatment, solid waste transfer, landfill facilities, and at private industrial businesses within the community. Analysis should identify pilot project(s) and an implementation schedule.	1

Waste Management

Planned Waste Management GHG Emission Reductions

Planned Sector Emission Reductions Through 2030

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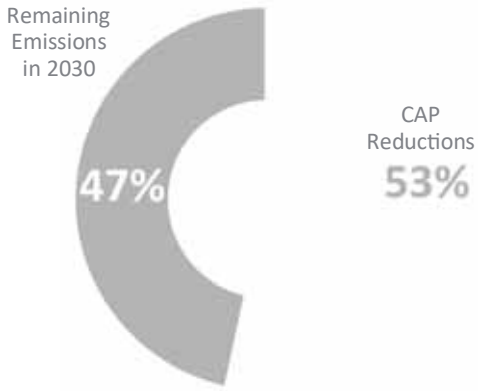
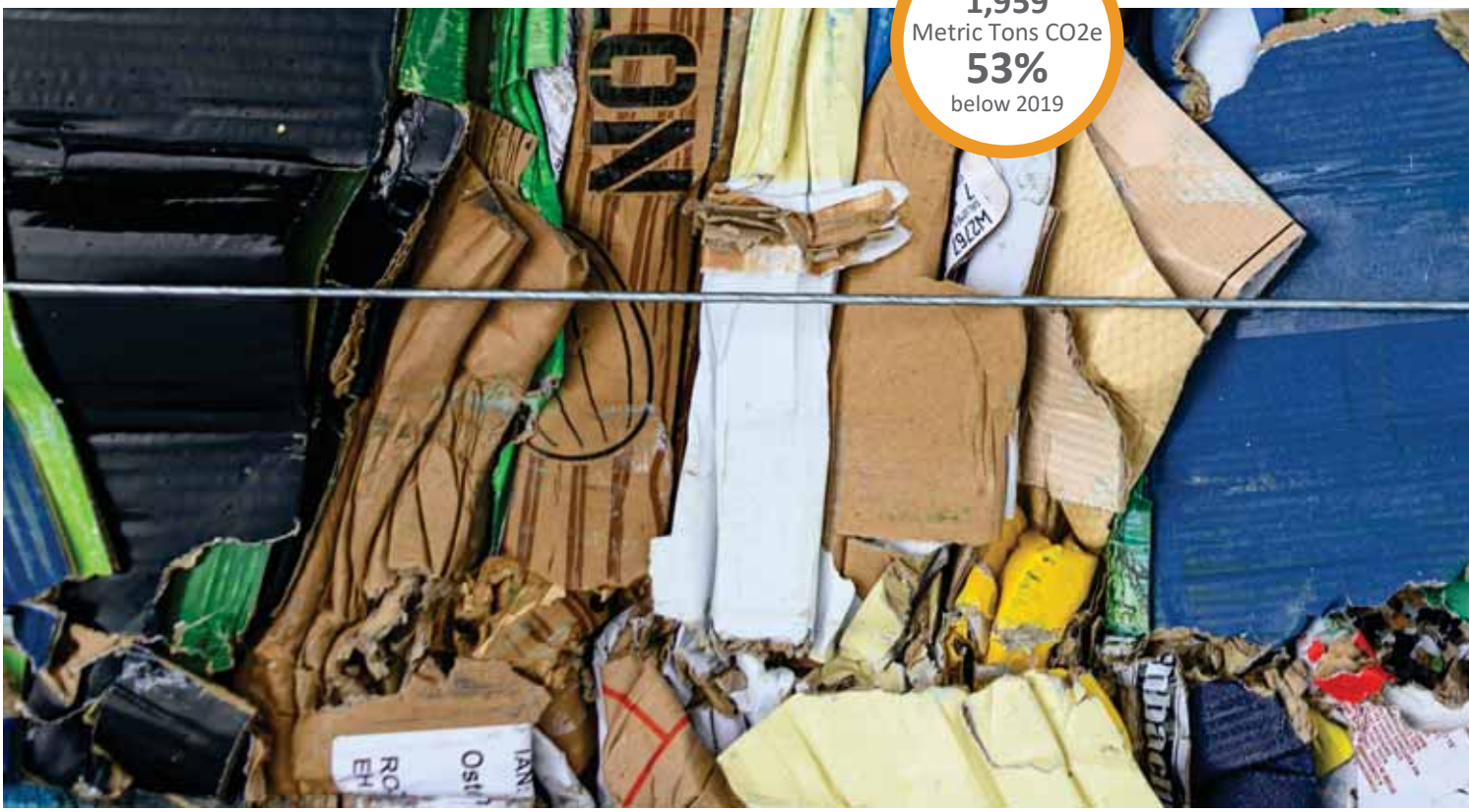


Albert Lea's Waste Management Carbon Reduction Pathway



What You Can Do

You can support the goals of the Waste Management section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- How much of your waste can you divert to recycling? Challenge yourself and your household to increase your recycling. Make sure to rinse and dry your recyclables; dirty materials contaminate the process and have to be landfilled.
- Carry groceries and other purchases in reusable bags. Remember to bring your bags to the grocery store, farmer's market, and when you go retail shopping.
- Give up single-use plastics by switching to sturdy, reusable items like metal/hard plastic water bottles, cutlery, & to-go containers.
- Choose items with no packaging, minimal packaging, or packaging that is compostable or completely recyclable.
- Give unused clothes and household items (in good condition) to a local nonprofit, neighbor or friend.
- Shop local second-hand and vintage stores.
- Create a composting bin and routine.
- Challenge yourself and your household to eliminate your food waste. Minimize your food waste by first eating what you already have in your fridge. Meal planning and making grocery lists can also reduce your food waste. https://www.epa.gov/recycle/reducing-wasted-food-home.

Section 05
Water + Wastewater

Click here to return to TOC

Water + Wastewater

In Albert Lea

551 million

gallons of wastewater generated in 2019

341

Community flooding events reported in Freeborn County since 2001 (NOAA)

Water and Wastewater

Why Water and Wastewater is Important

Water is at the core of climate change and sustainable development. Quality water is vitally important for socio-economic development, maintaining healthy ecosystems, and for human survival. Water is central to the production and preservation of a wide range of services benefiting people. How we process water is also linked to our greenhouse gas emissions. Water related energy use totals 13% of US electricity consumption and has a carbon footprint of at least 290 million metric tons. Meanwhile, wastewater treatment is responsible for 3% of global GHG emissions.

Water is also at the heart of adaptation to climate change. As the IPCC (Intergovernmental Panel on Climate Change) noted in its special report on extremes, it is increasingly clear that climate change "has detectably influenced" several of the water-related variables that contribute to floods, such as rainfall and snowmelt. In the Midwest, climate change exacerbates many of the factors that create significant flood conditions. For Minnesota, climate change has, and is projected to continue to bring heavier precipitation events as well as longer periods of time between rainfall events, creating dryer surfaces for those heavier rains to fall upon.

These climate change impacts significantly increase the threat of flooding in our communities. Flood danger includes over-bank flooding of rivers, ponds, and lakes that are over burdened with heavy precipitation or snowmelt runoff. In addition, the potential for heavier rainfalls on dryer surfaces also increases the risk of flash flooding which is caused by heavy rain events over a short period of time. Flooding in Minnesota can be expected to increase in both regularity and severity. According scientific study issued in 2019 by the University of Notre Dame, the severity of extreme hydrologic events, so-called 100-year floods, hitting watersheds in Minnesota and the Midwest will increase by as much as 30 percent by the end of the century.

Water and Energy Nexus

Water and energy are fundamental components of our 21st century life. Production, distribution, consumption, and treatment of water consumes energy. Production of energy - particularly those generated through fossil fuel use - consumes water. The water-energy nexus is the relationship between how much water is used to generate and transmit energy, and how much energy it takes to collect, clean, move, store, and dispose of water. Both fresh water production and waste water treatment are typically the highest energy and carbon emission sources within a community's operations. Reduction of water demand saves energy not only in the production and distribution of fresh water but also in the collection and treatment of wastewater.

Climate Change Considerations

Climate Impacts

This sector impacts climate change through fossil fuel use to generate the electricity required to process and distribute water.

Climate Hazards

Hazards to the water and wastewater system include damage to infrastructure from extreme weather and flooding. City-wide hazards include increased flooding and flash flooding potential.

Equity Considerations

- Low-income neighborhoods frequently suffer more damage from flooding, according to studies by the National Academies of Sciences, Engineering and Medicine (*Framing the Challenge of Urban Flooding in the United States*, 2019). The frequency and magnitude of heavy rain events is expected to increase as a result of a changing climate, making the future flooding impacts for at-risk neighborhoods potentially more acute.
- Disadvantaged communities within cities often have denser populations, more impervious surfaces, and less open/green spaces. These areas can also be prone to flooding and sewer overflows. Stormwater management through the creation of open, green spaces serve to revitalize and promote health within these disadvantaged communities.

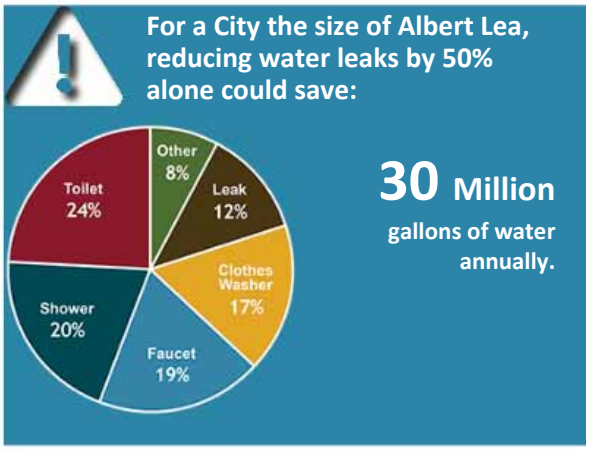
City-Wide Water and Wastewater Targets Supporting Sector Goals

Sector goals are established to both support the City's Climate Action Plan in creating a climate resilient community and to reduce City-wide GHG emissions.

Potable Water Consumption

Today	551 Million Gallons
2030 Targets	**518** Million Gallons

Water Conservation Potential



Source: Water Research Foundation, Residential End Uses of Water, Version 2. 2016

Strategies Supporting Sector Goals

Sector goals related to GHG emissions reductions are designed to balance reduction across all sectors and achieve the overall emissions goals set forth for the community. The goals seek to strike a balance between achievability while also reaching -for improvement beyond business-as-usual.

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Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy W-1:** Promote increased water conservation City Wide with a targeted reduction of 6% by 2030.
2. **Strategy W-2**: Reduce wastewater generation City Wide with a targeted reduction of 6% by 2030.
3. **Strategy W-3**: Mitigate the projected increased flood hazards and impacts due to climate change.
4. **Strategy W-4**: Update design standards and plans to meet projected climate change flood mitigation requirements.
5. **Strategy W-5:** Maintain source and drinking water quality through climate related challenges.

1 Strategy W 1:

Promote increased water conservation City Wide with a targeted reduction of 6% by 2030.

	Actions	Implementation Phase
W-1-1	Conduct a study to identify leaks within water infrastructure and implement an action plan for leak abatement.	1
W-1-2	Accelerate the installation of low-flow water fixtures in residential homes and expand the program to commercial businesses. Goal: achieve 100 households and 10 businesses upgraded annually. Implement pricing preference for households installing water efficient fixtures (such as WaterSense certified fixtures) and water/energy efficient water heaters. Establish incentives/cost reduction programs for qualifying low-income residents to purchase WaterSense certified fixtures.	1
W-1-3	Implement a policy to require installation of rainwater collection systems and WaterSense water efficient fixtures and appliances at all City facility projects and all projects receiving $30,000 or more in City tax abatement, financing or funding. Provide information and technical assistance to projects as needed.	2
W-1-4	Increase the use of Smart Irrigation systems and water conservation fixtures (new or retrofit opportunities). Establish a policy to require use at City facilities. Create rebate programs for replacement of existing irrigation systems with smart irrigation systems at homes and businesses.	2
W-1-5	Implement Advance Meter technology: Water loss detection and repairs, distribution system, By 2025 have a program in place Water audits of top water users – plans for reduction – 50/50 audit reimbursement, goal to do at least 2 per year Customer portal opt-in incentive 50% of customers enrolled by 2030 60-70% by 2040	3
W-1-6	Explore modifying residential water rates that better incentivize water conservation and dis-incentivize water use. An example would be implementing pricing preference for households installing water efficient fixtures (such as WaterSense certified fixtures) and water/energy efficient water heaters.	3

2 Strategy W 2:

Reduce wastewater generation City Wide with a targeted reduction of 6% by 2030.

	Actions	Implementation Phase
W-2-1	Improve/refine waste water and storm water discharge incentives: Implement incentives/pricing preference for businesses and households installing waste/storm water avoidance strategies: - Rain gardens - permeable pavers - energy efficient dishwashers - Greywater reuse Implement new data enhanced outreach and incentives to identify and remedy sources of waste/storm water before management or processing is required. Incentive implementation should focus on improving community equity	1
W-2-2	Evaluate the potential for installation of rainwater collection systems at City facilities for graywater uses, and investigate opportunities for graywater reuse at existing and new City facilities and properties. Implement grey-water systems identified capable of reducing energy/water demand in other areas (for example, watering urban tree	1

3 Strategy W 3:

Mitigate the projected increased flood hazards and impacts due to climate change.

	Actions	Implementation Phase
W-3-1	Establish a Storm Water Infiltration Plan identifying priority areas and strategies for improved infiltration of storm water to minimize storm water volumes requiring handling while increasing water aquifer recharging. Strategies to focus on reduction of impervious surfaces, increase of permeable surfaces, trees, bio swales, rain barrels, rain gardens, compost, mulch, etc. Coordinate and integrate Plan with city's Citywide Heat Island Impact Study (see Buildings and Energy actions)	1
W-3-2	Promote effective Storm Water infiltration in residential sectors by exploring rebates and incentive opportunities including tax incentives, rebates, or other incentives for deceasing driveway, roof, and yard run-off. Implementation of incentive structure to focus on increasing community equity	1
W-3-3	Restructure storm water fee based on impermeable surfaces with tax or other incentives for permeable surfaces and other water retention improvements.	1
W-3-4	Establish incentives to prioritize the development of “green infrastructure” such as parks, wetlands, riparian and wildlife corridors, natural drainage-ways, and low-impact development, particularly in residential districts. Research green infrastructure implementation and long-term viability in local environment	2
W-3-5	Advance improved Storm Water infiltration in new development by creating and enforce codes aimed at zero run-off with a focus on zero run-off parking strategies. Coordinate and integrate Plan with city's Citywide Heat Island Impact Study (see Greenspace and Trees actions)	2

4 Strategy W 4:
Update design standards and plans to meet projected climate change flood mitigation requirements.

	Actions	Implementation Phase
W-4-1	Determine stormwater volume requirements meeting anticipated future storm levels using 20 year precipitation projections based on RCP 8.5 climate models. Identify stormwater management systems and infrastructure not capable of meeting projected needs. Prioritize upgrades required and implement. Integrate upgrades into already scheduled maintenance programs and budgets.	1
W-4-2	Expand inclusion of green infrastructure in City's Stormwater Management Plan to meet increased precipitation projections of climate change as well as in response to the Flood Risk Assessment and Blue Spot mapping. Identify specific types of green infrastructure to implement including: parking lots, alleys, parks, vacant lots, parkways, and grading near sidewalks. In addition, identify property owned by other public entities that have a high potential for improved ecological management to improve stormwater management functions.	1
W-4-3	Build more permeable parking lots and driveways and use more recycled materials with concrete.	2
W-4-4	Modify water utility bills to provide education to residents on what actions they can take to reduce their risk to extreme precipitation events and flash flooding. Develop an information HUB with tools and resources (e.g. https://www.cnt.org/tools/my-rainready-home-assessment-tool)	2

5 Strategy W 5:
Maintain source and drinking water quality through climate related challenges.

	Actions	Implementation Phase
W-5-1	Ensure Wellhead Protection Plan recommended actions have been implemented. Maintain and update Wellhead Protection Plan based on current and projected precipitation and climate data.	1
W-5-2	Develop educational materials covering the link between water resources and climate change.	1
W-5-3	To improve water quality in Albert Lea's lakes Albert Lea public works will increase the frequency of street sweeping with funding provided by the Shell Rock Watershed District. (Related to improving the water quality and reducing summer algal blooms in Albert Lea's Lakes, given bigger rain events, more run off and hotter summers)	1

Planned Water and Wastewater GHG Emission Reductions

Planned Sector Emission Reductions Through 2030

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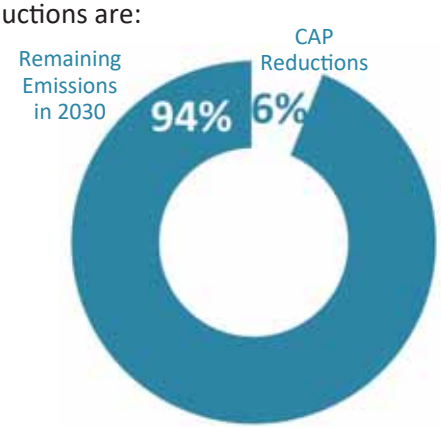


Albert Lea's Water and Wastewater Carbon Reduction Pathway

2019
520
Metric Tons CO2e

2030
489
Metric Tons CO2e
6%
below 2019

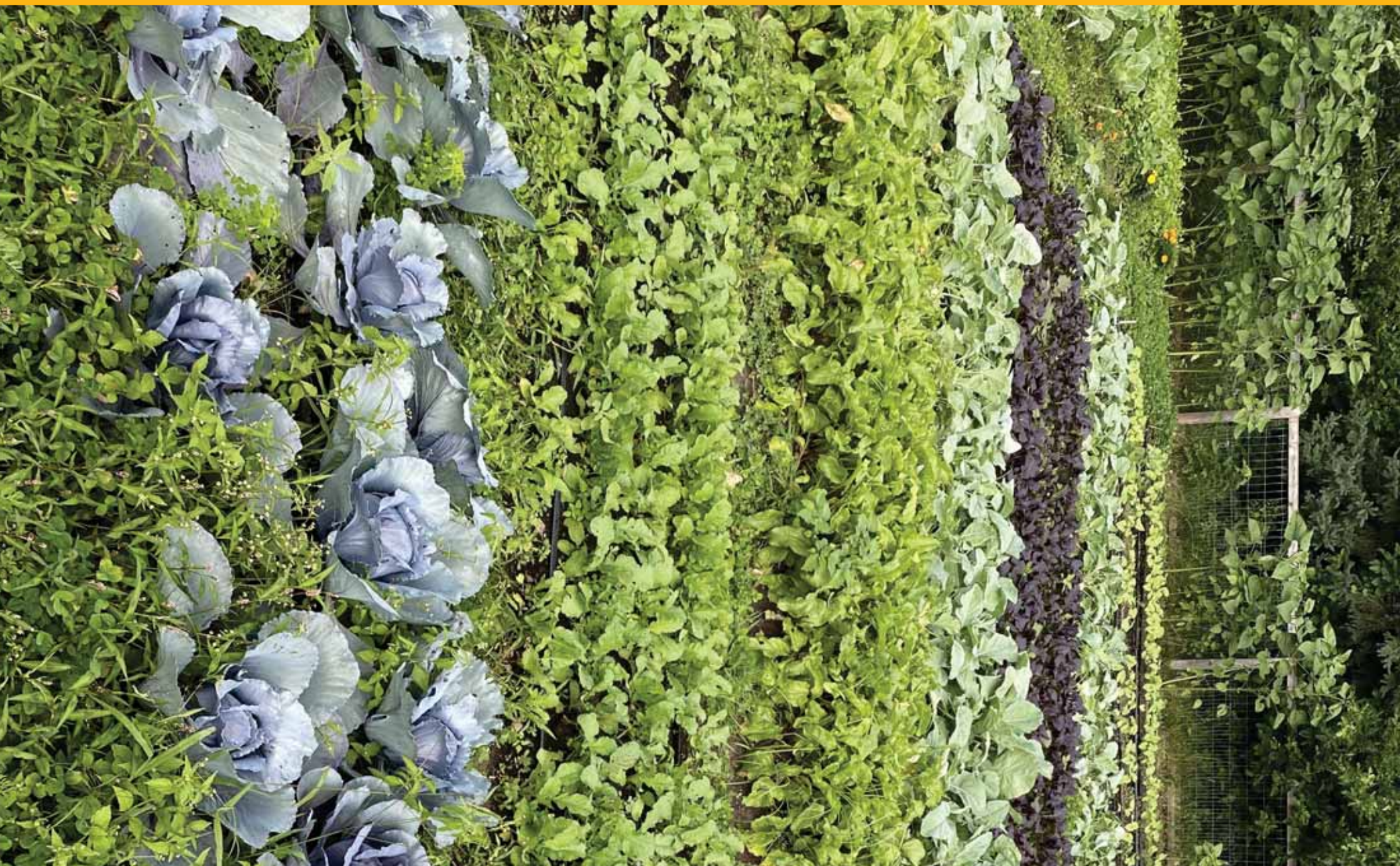
What You Can Do

You can support the goals of the Water and Wastewater section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- Turn off the faucet while brushing your teeth.
- If you have dishwasher, use it. Research shows we use more water washing dishes by hand than running a full or nearly full dishwasher.
- Replace your lawn or portions of your lawn with drought resistant native plantings, prairie grasses, and wild flowers and eliminate or greatly reduce exterior watering.
- If you have a lawn and garden irrigation system, or use hoses and sprinklers, water thoroughly less often, and do so in the early morning or evening.
- Collect rainwater and use it for indoor and outdoor plants.
- Install — or have a licensed plumber install — water-saving aerators on 2 or more showerheads and faucets.
- Install — or have a licensed plumber install — a water-saving low-flow toilet.

Click here to return to TOC

Section 06
Local Food + Agriculture



Local Food
In Albert Lea

2
Community gardens

9%
Food insecurity in Freeborn County

1,511 acres
Crop and pasture land in Albert Lea

Local Food and Agriculture

Why Local Food and Agriculture Are Important

Food and climate change are directly linked. For nutritionally insecure people, climate change is a threat multiplier. Extreme weather events, extreme temperature variations, changes in precipitation, changing soil temperatures and other climate impacts will affect crop yields. Climate impacts can also introduce interruptions in the current food processing and distribution system. Disruptions that occur in the food system are likely to cause food availability or pricing fluctuations.

Our choices about what we eat and where our food comes from also directly impact our personal and community greenhouse gas emissions. Transporting food across long distances burns fossil fuels and emits greenhouse gases. In addition, the extended period of time of long-distance transport increases the need for refrigeration. The less transportation and refrigeration needed to supply us our food, the more sustainable it becomes.

Strengthening local food sources can address both climate change relationships with food and also supports your small business local economy. Studies have indicated that nearly 32 jobs are created for every $1 million in revenue generated by produce farms involved in a local food market, compared to only 10.5 jobs for those involved in wholesale channels exclusively. Increased local food systems also increase community resilience. A robust local food system establishes additional supply chains and resilience to distribution disruptions. Healthy local food systems can also play a critical role in addressing food access vulnerability and food insecurity within neighborhoods of higher vulnerability. Increased local food systems also tend to increase diversity and long-term food system resilience in food crops cultivated.

Community Gardens Per 100,000 Residents

United States: 18,000 Total (est)	**5.5**
Twin Cities Metro: 600 Total	**18.3**
City of Albert Lea: 2 Total	**11**

(Sources: American Community Gardening Association, Star Tribune, Albert Lea Tribune)

Equity Considerations

- People in low-income neighborhoods may have limited access to full-service supermarkets or grocery stores - an area known as a “food desert.”
- Studies have also shown that communities with fewer resources often have more outlets that promote unhealthy dietary behaviors such as fast food restaurants, and little access to affordable nutritious food. This condition is known as a “nutrition desert.”

Climate Change Considerations

Climate Hazards

Hazards to the local food and agriculture system include reduced crop quality and yield, vulnerability to pests and soil moisture as well as fluctuation in availability, food price volatility and change.

Opportunities

Increased capacity of local food and agriculture systems and improved farm-to-table approaches can reduce community food insecurity while creating local jobs and improved community resilience.

Local Food and Agriculture

Strategies Supporting Sector Goals

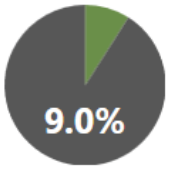
As indicated in the introduction, the Climate Action Plan is intended to be a 9 year plan to be updated at the completion of that time. Consequently, the goals and strategies outlined in this section are intended to be achieved by 2030 (or earlier) unless otherwise noted.

Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy LF-1**: Increase production of local food, particularly serving low income and food insecure individuals.
2. **Strategy LF-2**: Increase access to local food (potentially through the development of local Farmer's Markets, establishment of permaculture "food forests" and
3. **Strategy LF-3:** Reduce food waste and hunger, achieve a 30% reduction in food insecurity community-wide by 2030.
4. **Strategy LF-4:** Increase local agricultural resilience to climate shocks.

FREEBORN COUNTY — **FOOD INSECURE PEOPLE: 2,730**

FOOD INSECURITY RATE



ESTIMATED PROGRAM ELIGIBILITY AMONG FOOD INSECURE PEOPLE

19%	Above Other Nutrition Program threshold of 185% poverty
7%	Between 165%-185% poverty
74%	Below SNAP threshold of 165% poverty

AVERAGE MEAL COST
$ 3.23

ADDITONAL MONEY REQUIRED TO MEET FOOD NEEDS
$ 1,507,000

Local Food and Agriculture

1 Strategy LF 1:
Increase production of local food, particularly serving low income and food insecure individuals.

	Actions	Implementation Phase
LF-1- 1	Establish a policy to allow city facilities to be used as Community Supported Agriculture drop off sites and promote their use among local food producers and consumers.	1
LF-1- 2	Identify opportunities to revise zoning ordinances to increase allowance of urban agriculture and clarify acceptability to remove barriers to front yard and rooftop vegetable gardens, edible landscaping and foraging. Proactively promote and educate the public on urban agriculture ordinances, options and approaches.	1
LF-1- 3	Support farmers to adopt flood and drought resilient agricultural practices - cover crops, forever green, MN soil health coalition. https://www.pca.state.mn.us/air/agriculture-and-climate-change-minnesota	1
LF-1- 4	Explore potential of collaborating with low cost produce providers to establish local food markets serving low income, vulnerable, and food insecure communities while addressing retail and commercial food waste. Example: Daily Table, Boston (https://dailytable.org/)	2
LF-1- 5	Support senior programs that involve both food and community such as volunteering or donating to local charities.	2
LF-1- 6	Collaborate with Freeborn County to develop a comprehensive farmland conservation plan that prioritizes food production serving local communities while taking into consideration other City and County priorities. The plan could also include specific maps or areas prioritized for farmland conservation or identify those areas most at risk from development. Program should focus on exploring increased local food-to-table, local food utilization, and local development of cultural food products in support of Albert Lea area underserved communities.	2
LF 1- 7	Work with community organizations and neighborhood groups to organize a garden-tool lending program and garden bounty exchange program.	2

2 Strategy LF 2:

Increase access to local food.

	Actions	Implementation Phase
LF-2-1	Coordinate with City and County GIS Mapping servcies to identify potential sites for community garden sites or community farm sites (similar to Dubuque Rescue Mission Community Farm http://dbqrescue.org/)	1
LF-2-2	Establish community gardens at under used city owned space and consider identification of additional publicly-owned sites that may be suitable for community gardens and urban farms, work with advocacy groups to make these sites available. Example: City of Burnsville "Grow Burnsville" program. (https://burnsvillemn.gov/2271/Grow-Burnsville)	1
LF-2-3	Encourage multi-family properties developers to establish land for community gardens. Explore potentials for incentives for property owners.	1
LF-2-4	Establish a policy to serve local food at all City events. Encourage Freeborn County and Albert Lea Area Schools to establish similar policies.	1
LF-2-5	Use permaculture (examining and following nature's patterns) in landscaping. Explore opportunities for permaculture and "Food Forest" pilot projects using City land or Right of Way areas, prioritizing locations that can best serve food insecure individuals. Example: City of Burnsville "Grow Burnsville" program. burnsvillemn.gov/2271/Grow-Burnsville)	2
LF-2-6	Expand Farmers Markets, local food hubs and marketing of locally produced and processed foods. Program to focus on increased community equity and food security among at-risk populations	2

3 Strategy LF 3:

Reduce food waste and hunger, achieve a 30% reduction in food insecurity community-wide by 2030.

	Actions	Implementation Phase
LF-3-1	Work with Freeborn County to conduct a detailed Food Security Assessment to determine food insecurity conditions within the City, areas with limited access to full service grocery stores and markets (particularly within areas of higher vulnerable populations), particularly areas which overlap low income and vulnerable populations. Identify areas within the City for improvement, and establish detailed strategies to increase food security within City.	1
LF-3-2	Learn from the increased demand for Ruby's Pantry with long lines during the pandemic, to find out what was causing the increased demand and how to address the economic stability	1
LF-3-3	Collaborate with convenience stores located within food insecure areas identified in the Food Security Assessment to incentivize the purchase and distribution of affordable, fresh, and locally grown foods.	1
LF-3-4	Attract and promote grocery store and food market investment in food desert sections of the City. Explore successful strategies used in other communities to attract grocery stores into food desert locations and implement best practices. Collaborate with neighboring communities to maximize coverage.	2
LF-3-5	Explore development of a mobile food pantry with a focus on local, organic, and whole foods to increase access to high quality nutrition in underserved areas of City. Explore potential partnerships for operation and maintenance of mobile food pantry program.	2

4 Strategy LF 4:
Increase local agricultural resilience to climate shocks.

	Actions	Implementation Phase
LF-4-1	Collaborate with Freeborn County, University of Minnesota Extension, Minnesota Farmer's Association, and local organic farmers associations to encourage adoption of strategies to increase soil health and increased carbon sequestration for Croplands and Grazing Lands. Tools: http://www.comet-farm.com/ GHG and Carbon Sequestration Ranking Tool: https://cutt.ly/Vf04djN	1
LF-4-2	Develop and deliver educational materials for producers that will assist farms in understanding the differences between normal weather fluctuations and long term climate change, as well as provide information on the agricultural crops, varieties, and methods most suitable for our area. (cover crops and soil heath)	1
LF-4-3	Collaborate with regional agencies, universities, and agricultural interests to identify potential impacts of ozone on regional agriculture (both current and projected future impacts based on climate change). Identify strategies to address impacts.	2
LF-4-4	Develop educational materials on the relationship between nitrogen fertilizers, nitrogen monoxide emissions, and ground level ozone formation. Include strategies for minimizing and eliminating ground level ozone creation such as modified fertilizer management strategies and use of slow release fertilizers. Share and promote materials with regional farmers and agriculture associations. https://www.nature.com/articles/news050718-15 https://www.ucdavis.edu/news/smog-forming-soils/	2

What You Can Do

You can support the goals of the Local Food and Agriculture section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- Rent a plot at your local community gardens and grow your own.
- Eat a plant-rich diet. Animal products are extremely GHG-intensive to produce compared to plants. Eating less meat and dairy will reduce emissions associated with food consumption. Eating regionally-grown food that is suitable for the Minnesota climate will also make a difference through reduced transportation-related emissions. A great place to start is with "Meatless Mondays" or one meat-free meal a day. https://ourworldindata.org/food-choice-vs-eating-local
- Buy food directly from a local grower on an ongoing basis by joining a Community Sponsored Agriculture (CSA) group or frequenting the farmer's market.
- Plant fruit or nut bearing trees or shrubs that are well suited for our hardiness zone on your property. Examples include: Trees: Apple, Pear, Plum, Black walnut, Shrub: Serviceberry, Currant.
- Support restaurants and grocery stores that use and sell locally-grown food.
- Buy food that is in season, minimizing the distance food must travel.
- Support your local farmers markets.
- Buy ethically grown and harvested food, like fair-trade coffee and chocolate.

Section 07
Greenspace and Trees

Click here to
return to TOC

Greenspace
In Albert Lea

65%
Forest coverage

10%
Estimated Impervious surface coverage

136 acres
Estimated maintained lawn coverage

Greenspace and Trees

Why Greenspace and Trees Are Important

Human activities coupled with natural variations in the carbon cycle, have resulted in a significant increase in the concentration of carbon dioxide (CO_2) and other "greenhouse gases" in the atmosphere, thus causing measurable global warming. Controlling atmospheric CO_2 requires deliberate action that combines reducing emissions and increasing storage, while planning for adaptation to the changes that result. Part of this Climate Action Plan addresses ways that greenspace protection and enhancement is one of Albert Lea's most important avenues for lowering our environmental footprint.

Greenspace, plays a central role in supporting community health, improving air, soil, and water quality, reducing energy use in buildings, and supporting climate -change mitigation. An urban greenspace includes any permeable vegetated surface, public or private, set apart for recreational, aesthetic, or ecosystem services in an otherwise urban environment. It is space set aside for providing life-essential benefits people and other living things obtain from properly-functioning ecosystems. The key benefits and services greenspaces provide include:

- Carbon sequestration: Plants on land convert carbon dioxide into biomass (leaves, stems, etc.) through photosynthesis. If more plants grow in more places, they will remove more CO_2 from the atmosphere.
- Stormwater infiltration and flood mitigation: Greenspace helps protect from flash flooding by absorbing water through roots and slowing down rainwater running off.
- Reduce the urban heat island effect: The more vegetated greenspace we have in Albert Lea, the better the cooling effects. High levels of impervious surfaces (a surface that does not allow water to infiltrate such as pavement and buildings) results in an increased urban heat island effect, which raises the temperature of the near-surface air, buildings, and pavement higher than the surrounding areas.
- Purify and humidify the air: Plants purify the air when they absorb light, carbon dioxide, and water to manufacture sugar.
- Support pollinators: Animal species that pollinate plants, termed pollinators, carry pollen, either accidentally or intentionally, from the male part of a flower to the female part of the same or another flower.

Climate Change Considerations

Climate Hazards

Projected climate change impacts may cause forests and urban trees to experience increased mortality and reduced productivity, more prevalent invasive species and disease all resulting in forest and tree loss, reduction in crop yield. Loss of greenspace, in turn, reduces carbon capture potential of green infrastructure.

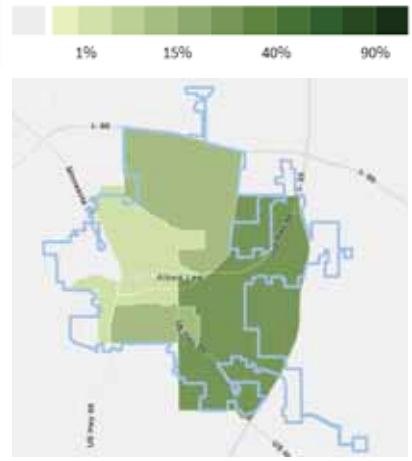
Opportunities

Many strategies within the Greenspace sector can advance community resilience and quality of life. Increased tree canopy, decreased impervious surfaces, and increased utilization of native grasses and plantings can reduce heat island experiences, energy consumption, stormwater runoff, and flood impacts.

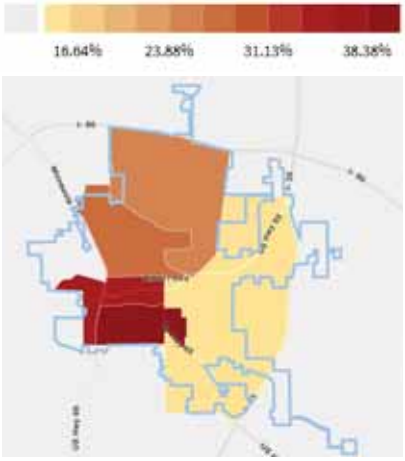
Albert Lea's Micro-Heat Island Contribution

Higher levels of impervious surfaces (pavement and buildings) within a community will increase the micro-heat island impacts of the community. Micro-heat island refers to the phenomenon of higher atmospheric and surface temperatures occurring in developed areas than those experienced in the surrounding areas due to human activities and infrastructure. Increased heat indicies during summer months due to heat island effects effectively raise human discomfort and health risk levels in developed areas, especially during heat waves. Based on a 2006 study done by Minnesota State University and the University of Minnesota, the relationship between impervious surface percentage of a City and the corresponding degree of heat island temperature increase can be understood as a ratio.

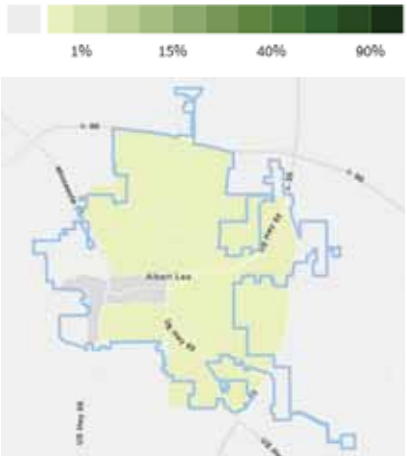
Croplands and Grasslands
City-wide by Census Tract



Developed land
City-wide by Census Tract



Forest Coverage
City-wide by Census Tract



Equity Considerations

- Lower income neighborhoods and neighborhoods with higher proportions of people of color regularly have lower tree canopy coverage, and the environmental, economic, and quality of life benefits trees support than more affluent neighborhoods.
- "Heat islands" and "micro heat islands" are built up areas that are hotter than other nearby areas. This is caused by lack of adequate greenspace and healthy tree canopy coverage combined with too many hard surfaces like roads, parking lots, and hard building surfaces. Frequently neighborhoods with higher vulnerable populations have the highest heat island impacts.

Strategies Supporting Sector Goals

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Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy GT-1**: Increase Tree Cover and Diversity, achieve a city-wide Tree Canopy coverage increase of 10% by 2030.
2. **Strategy GT-2**: Increase beneficial uses of lawn spaces including use of native species and pollinator restorations, rain gardens, and vegetable garden areas with a targeted conversion of 5% of city-wide lawn coverage to pollinator restoration coverage.
3. **Strategy GT-3**: Reduce Micro-Heat Island Effect through City-Wide impervious surface reduction of 5% by 2030.
4. **Strategy GT-4:** Protect and sustain greenspaces, urban tree canopy, and wildland ecosystems, enhancing their resilience to climate change impacts.

1 Strategy GT 1:

Increase Tree Cover and Diversity, achieve a city-wide Tree Canopy coverage increase of 10% by 2030.

	Actions	Implementation Phase
GT-1-1	Conduct a Citywide Ground Cover and Heat Island Assessment. Assessment should include tree canopy, light-colored impervious surface, dark-colored impervious surface, grassland, and water coverage by census tract. Study should include heat island impact study to identify areas of high heat island contribution and impact. Findings of tree coverage, benefits, heat island impacts, and opportunities should be overlapped with vulnerable population mapping from the City's Climate Vulnerability Assessment. Assessment to establish tree canopy and heat island mitigation goals by census tract. See https://palebluedot.llc/tree-canopy-assessments	1
GT-1-2	Plant shade trees to limit the need for indoor cooling and reduce temperatures at parks, playgrounds, and other outdoor spaces. Collaborate with School District to include school properties.	1
GT-1-3	Explore a partnership with the County, Chamber of Commerce, and others to establish a program to plant trees at targeted locations such as businesses, low income residential districts, or streets with significant street tree needs. Program can include a mechanism for tree donations, volunteer tree planting, tree plant awards, and tree banking opportunities. Looking into Arbor Day Foundation, Tree City USA	1
GT-1-4	Establish an implementation master plan with schedule, budget, and prioritized actions following the completion and recommendations of the City's Citywide Ground Cover and Heat Island Assessment	2
GT-1-5	Replanting tree loss, and Ash tree replacement for EAB management, at 150% or more of replacement with improved diversity.	2
GT-1-6	The City will explore a program to give away trees on an annual basis for residents to plant on their property. Potential program concept: grow seedlings and give to homeowners once per year, or sell at a discount 200+ per year.	2
GT-1-7	Create a tree preservation ordinance with reasonable exceptions that support the CAP tree canopy coverage and heat island mitigation goals. Ordinance should reflect projected climate changes and impacts on tree species.	2
GT-1-8	Create additional incentives for tree planting, particularly in prioritized areas within the City as established by the Citywide Ground Cover and Heat Island Assessment.	2

2 Strategy GT 2:

Increase beneficial uses of lawn spaces including use of native species and pollinator restorations, rain gardens, and vegetable garden areas with a targeted conversion of 5% of city-wide lawn coverage to pollinator restoration coverage.

	Actions	Implementation Phase
GT-2-1	Create a policy requiring the use of native plants in landscaping at City-owned properties unless a data-driven case can be made that such use is not appropriate.	1
GT-2-2	Establish a policy and incentives to assist homeowners by covering some of the cost of converting traditional lawns by planting pollinator friendly food gardens, permaculture, wildflowers, clover or native grasses in an effort to slow the collapse of the state's bee population. (http://m.startribune.com/program-pays-minnesota-homeowners-to-let-their-lawn-go-to-the-bees/510593382/)	1
GT-2-3	Complete a Land Conversion Opportunity Study. Analyze public and private property for unused turf and impervious areas, and create a Ground Cover Conversion Implementation plan by census tract to convert identified areas to native grasslands, wetlands, shrub, and forested areas. Identify incentive opportunities and establish an outreach campaign.	1
GT-2-4	Install roadside climate-adaptive native vegetation that creates effective barriers to prevent drifting of air pollutants to adjacent schools, residences, and parks. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6060415/	2
GT-2-5	Conduct a greenspace and preservation equity assessment to evaluate greenspace citywide and determine potential needs for expansion, purchase and preservation of greenspace based on quantified equity, environmental, economic benefits, and Return on Investment based on life cycle costs of greenspace property ownership. Coordinate assessment with findings of the Citywide Ground Cover and Heat Island Assessment and Urban Forest Management Plan.	2
GT-2-6	Review city ordinances on lawns, explore opportunities to encourage lawn alternatives, consider set-backs and signage areas for native installations.	2
GT-2-7	Increase use and promotion of "no mow areas" with plantings of appropriate heights to ensure safety and visibility along roads and parking lots.	3
GT 2-8	Develop a list of invasive non-native plants commonly used in landscaping and proven to seriously reduce diversity of native plants and wildlife. Adjunct to this list, provide native alternatives to each non-native species. Publicize this list widely and encourage plant nurseries and landscapers to provide the native alternatives	2

3 Strategy GT 3:

Reduce Micro-Heat Island Effect through City-Wide impervious surface reduction of 5% by 2030.

	Actions	Implementation Phase
GT-3-1	Research, evaluate and pilot porous paving, de-paving, vegetation and/or more reflective surfaces in parking areas to reduce and cool impervious surfaces, particularly in urban heat island areas with populations most vulnerable to heat. Explore partnership opportunities with local multi-family property owners (particularly low income communities), local businesses or institutions for pilot projects as well as research and development	1
GT-3-2	Develop a performance based ordinance requiring tree planting within parking lots. Ordinance should establish a specific goal of percentage of pavement to be shaded by trees. Explore partnering with local business to create a pilot project to illustrate new ordinance requirements and benefits.	1
GT-3-3	Conduct an Impervious Surface Conversion plan. Plan to provide particular focus on reduction of impervious surface coverage within neighborhoods with the highest existing coverages based on Citywide Ground Cover and Heat Island Assessment.	1
GT-3-4	Develop a policy that requires all housing and commercial development projects receiving City funding, PUD approval, and/or Conditional Use Permitting to implement commercial scale heat island mitigation strategies including cool surfaces, solar-friendly landscape shading strategies, impervious surface reduction, and breeze capture.	2
GT-3-5	Create a "Living Streets" policy (Living Streets combines the concepts of complete streets and green streets, and also puts additional focus on quality of life aspects for City residents) to guide current and future street construction, reconstruction, and maintenance projects within the City.	2
GT-3-6	Create pilot project to demonstrate Greenroof technology and benefits	2
GT-3-7	Partner with utilities to develop an education and rebate program to encourage green/ cool roofs	2

4 Strategy GT 4:

Protect and sustain greenspaces, urban tree canopy, and wildland ecosystems, enhancing their resilience to climate change impacts.

	Actions	Implementation Phase
GT-4-1	Establish and effectively manage native-habitat corridors along trails (Parks) and utility easement areas to restore and maintain landscape connectivity.	1
GT-4-2	Assemble a Climate Adaptive Tree Species list for City tree planting and replacement guidance ensuring species diversity and climate adaptive capacities. Distribute and promote list for public use as well.	1
GT-4-3	Manage publicly-owned natural areas to enhance and maintain diverse native landscape communities. Implementation should prioritize areas of high impact and vulnerability.	1
GT-4-4	Require soil profile rebuilding at all building project sites or compacted soil conditions to reduce erosion and runoff contaminated with fertilizers, increase soil carbon stores and support long-term soil building (https://www.urbanforestry.frec.vt.edu/SRES/)	2
GT-4-5	Preserve existing forested areas through practices that re-purpose already developed areas, such as establishing codes that retain minimum canopy cover on new developments and minimize removal of native soil, ground cover, and shrubs.	2

What You Can Do

You can support the goals of the Greenspace and Trees section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- Plant a rain garden with native plantings to absorb storm water and replenish our aquifers.
- Plant trees in your yard to provide shade and cooling in summer heat. Select trees suited for the changing climate of Albert Lea.
- Replace your lawn and landscape with drought-resistant, native or well-adapted, non-invasive plants.
- Make your backyard a Certified Wildlife Habitat with the National Wildlife Federation. www.nwf.org/garden-for-wildlife/certify
- Remove pavement and increase permeable surfaces. De-pave areas wherever possible to encourage stormwater infiltration onsite.
- Install bioswales/rain gardens or rainwater diversion systems to reduce impact on the stormwater system.
- Install a Green Roof (living roof) to reduce your energy consumption. Decrease heat island impacts, and reduce stormwater runoff.

Click here to return to TOC

Section 08
Health and Safety

Climate Health + Safety

In Albert Lea

+3-5°F

Increase in temperature by 2050

+25% more

Air conditioning demand by 2050

+12-15 days

Longer allergy season by 2050

Health and Safety

Why Health and Safety Are Important

There is a strong relationship between human health and environmental health. From the air we breathe to the water we drink and use, life here on Earth depends on the natural resources and the environment around us. This link between the environment and human health is a critical consideration of the impacts of climate change. As outlined in the City's Climate Risk and Vulnerability Assessment, changes in climate, such as higher average temperatures and increased storm frequency and intensity, can intensify public health stressors. These climate change impacts endanger public health and safety by affecting the air we breathe, the weather we experience, our food and water sources, and our interactions with the built and natural environments. As the climate continues to change, the risks to human health continue to grow.

The health of our environment affects our public health, and agencies should promote it as such. There is a direct relationship between climate action and community health because the health of our environment affects public health.

Equity Considerations—Vulnerable Populations

Climate change impacts the health of all community members, however, people within our communities are differently exposed to hazards and some are disproportionately affected by the risks of climate change. According to the National Climate Assessment, greater health risks related to climate impacts can be experienced by some populations in our communities including children, older adults, low-income communities, and some communities of color. Others, like children, older adults, low-income communities, some communities of color, and those experiencing discrimination are disproportionately affected by extreme heat and weather events, and many have increased health and social vulnerability which decreases their access to resources that can help them avoid the risks of climate change.

According to the National Climate Assessment (https://nca2018.globalchange.gov/chapter/14/):

> Additional populations with increased health and social vulnerability typically have less access to information, resources, institutions, and other factors to prepare for and avoid the health risks of climate change. Some of these communities include poor people in high-income regions, minority groups, women, pregnant women, those experiencing discrimination, children under five, persons with physical and mental illness, persons with physical and cognitive disabilities, the homeless, those living alone, Indigenous people, people displaced because of weather and climate, the socially isolated, poorly planned communities, the disenfranchised, those with less access to healthcare, the uninsured and underinsured, those living in inadequate housing, and those with limited financial resources to rebound from disasters.

Climate Change Considerations

Climate Hazards

Climate stressors include increases in the frequency and intensity of poor air quality days, extreme high temperature events, heavy rainfalls, extended pollen seasons, changed distribution of disease carrying pests.

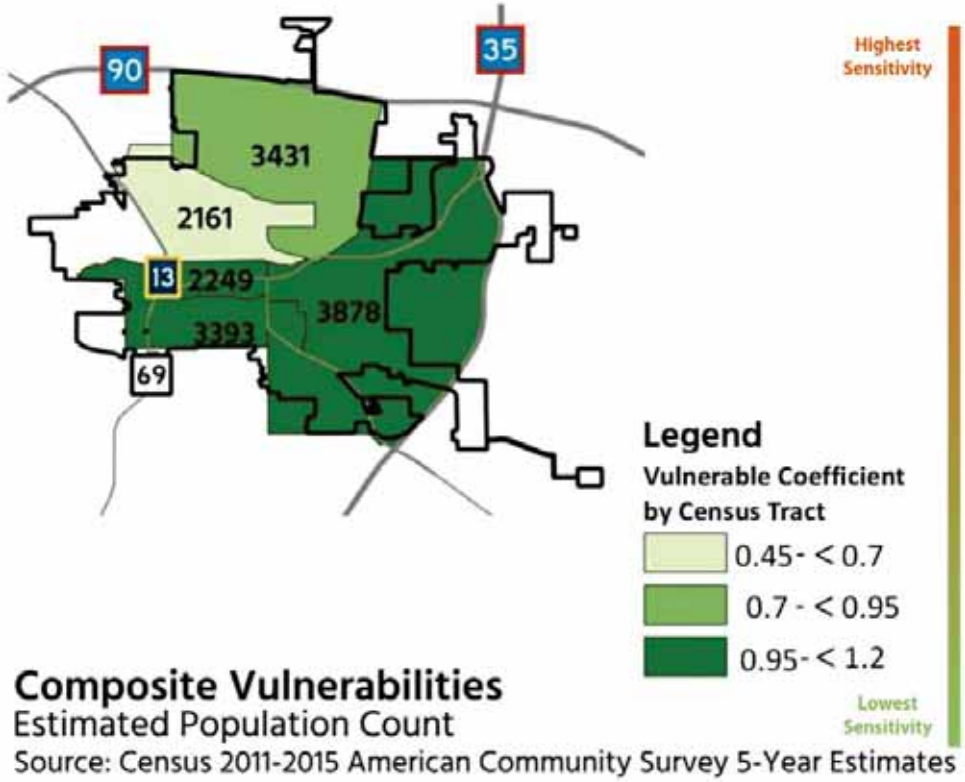
Opportunities

Strategies which improve community connectedness, mobility, community resilience through healthy lifestyles frequently coincide with climate mitigation measures such as improved pedestrian safety and low income home weatherization.

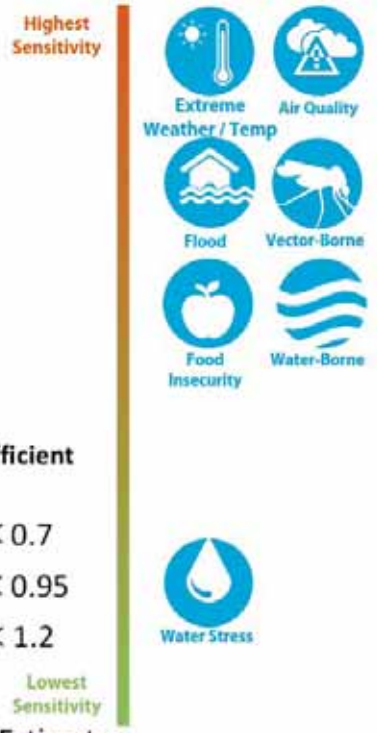
Albert Lea Vulnerable Populations Risk Sensitivity Chart

The map below provides a composite mapping of all vulnerable populations identified in the City's Climate Vulnerability Assessment. It should be noted that it is possible for individuals to be members of more than one vulnerable population. For example, an individual may be both an adult over age 65 as well as an individual living below 200% of poverty level. This composite view of vulnerable populations is also useful in identifying those climate risks which may be most impactful to the most vulnerable individuals. As indicated in the map below, the census tracts can be ordered from fewest instances of population vulnerability to most instances of population vulnerability (Total Population Vulnerability). The Vulnerability Coefficient represents the ratio of total instances of population vulnerabilities to the total population within the census tract where higher numbers represent a higher prevalence of vulnerabilities within the census tract population.

Vulnerable Population Distribution Within Community



Albert Lea Climate Risk Sensitivity Summary



Prioritizing Risk and Vulnerable

Climate change impacts will affect everyone and City policies and actions should consider climate adaptive needs of the entire community. As with all planning efforts climate adaptation benefits from analysis in order to assist in establishing priorities for initial efforts. An effort to structure a prioritization should not be seen as an attempt to discard the need to address climate impacts for any population within the City - whether or not it is defined as one of the "vulnerable" populations . Prioritization, however, may be necessary to ensure the greatest impact and effectiveness of limited City resources.

Based on the above review the City's adaptive efforts may be most effective by prioritizing strategies which address the climate risks of Extreme Temp/Weather, Air Quality Impacts, Flood risks, Vector-Borne Diseases, and Food Insecurity. Particular attention should be paid to strategies which are most effective for those in Economic Stress, Older Adults, Disabled individuals, and At-Risk Workers.

Strategies Supporting Sector Goals

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1. **Strategy HS-1:** Educate, engage, and empower the public on health and safety risks of climate change impacts.
2. **Strategy HS-2:** Assist the City's extreme heat, flooding, storm, and vector borne disease vulnerable population in preparing for and mitigating climate change impacts.
3. **Strategy HS-3:** Establish and update plans to address climate risks and impacts.
4. **Strategy HS-4:** Strengthen community response capacity and support networks.

1 Strategy HS 1:

Educate, engage, and empower the public on health and safety risks of climate change impacts.

	Actions	Implementation Phase
HS-1-1	Identify current efforts and programs in place to engage the business and health care community in developing emergency response plans and business continuity plans. Review and expand efforts and programs to assure climate change impacts and risks are incorporated.	1
HS-1-2	Increase outreach to diverse populations about climate change and health, natural hazards, and emergency preparedness via broadcast, print, bus ads, social media, and other forms of communication in multiple languages and accessible to individuals with disabilities to ensure that emergency preparedness planning reaches all City residents	1
HS-1-3	Give city and county elected officials and staff tools (e.g. webinar trainings on emergency preparedness, facilitation guides, and other materials in multiple languages) to have dialogues about emergency preparedness within neighborhoods and to create local resilience strategies such as an Adopt-A-Neighbor campaign or hosting an OEM CERT-like training session in their community.	1
HS-1-4	Deploy point-in-time alert systems (e.g., RAVE, Nixle) to notify people of extreme weather events, periods of dangerous cold, and heat waves and refer them to resources on symptoms and prevention of climate-related illness.	2
HS-1-5	Coordinate with Freeborn Public Health to educate public, healthcare, and public health professionals about health risks posed by climate change, including potential changes in air quality and impacts on mental health.	2

2 Strategy HS 2:

Assist the City's extreme heat, flooding, storm, and vector borne disease vulnerable population in preparing for and mitigating climate change impacts.

	Actions	Implementation Phase
HS-2-1	Seek to reduce exposure to extreme heat and improve stormwater damage by promoting, distributing, or providing installation assistance of shade trees focused on community areas identified as having high heat island impact. Assistance should prioritize vulnerable populations.	1
HS-2-2	Collaborate with Freeborn County and Shell Rock River Watershed District to offer on-site and on-line flood assessments and readiness improvements to residents within flood and flash flood prone areas. (e.g. https://www.cnt.org/tools/my-rainready-home-assessment-tool)	1
HS-2-3	Ensure public safety staff are properly trained to recognize and respond to physical and behavioral signs of heat-related illness	2
HS-2-4	Seek to reduce exposure to extreme heat through distribution of energy-efficient, air conditioning in vulnerable populations with a prioritization in areas of high micro heat island impacts.	2
HS-2-5	Improve the energy efficiency of homes, apartments and commercial buildings to keep interiors cool, improving the comfort and safety of occupants and reducing the need for summer air conditioning. Encourage the planting of trees and vegetation on the south and west sides of homes and buildings to reduce summer heat gain.	2
HS-2-6	Collaborate with community partners to provide flood insurance education to home owners, particularly new home buyers and at-risk home owners. Education should include when insurance is recommended, purposes for flood insurance, and what is typically covered and not covered by insurance.	2

3 Strategy HS 3:

Establish and update plans to address climate risks and impacts.

	Actions	Implementation Phase
HS-3-1	Coordinate with County to incorporate climate change and CAP goals into the County's Community Health Needs Assessment Health Improvement Plan	1
HS-3-2	Coordinate with County, State of Minnesota, Red Cross, and utilities to develop a debris management plan to support response to severe storm events and flooding.	1
HS-3-3	Include a Health and Climate Change Impact Assessment component in all City plans. Develop metrics for reporting on climate related risks and health events	1
HS-3-4	Collaborate with County to ensure Emergency Management Plans include current and projected climate change risks and hazards and prioritize and prepare for responses in the event of climate hazards and extreme weather events.	2
HS-3-5	In collaboration with County, develop a comprehensive heat and flood response plan that incorporates most current climate change impact projections and combines individual strategies into an integrated approach.	2
HS-3-6	Establish guidelines and appropriate requirements for adequate community-safe space within the City's special event permitting process. Community-safe space guidelines and requirements to address climate change impacts such as extreme heat, cold, extreme weather, and poor air quality. Guidelines to ensure that these spaces are accessible and adequate for vulnerable populations.	2

4 Strategy HS 4:
Strengthen community response capacity and support networks.

	Actions	Implementation Phase
HS-4-1	Enhance community networks and connections for those who require special attention during extreme heat and weather events, such as the elderly, homebound, disabled, isolated, or those likely to be in need of financial assistance during or after extreme weather events (heat, cold and heavy precipitation)	1
HS-4-2	Strengthen social connectedness through relationship-building among community members across age, ethnicity, income, and other demographic differences	1
HS-4-3	Support and encourage the expansion of public events that bring communities together in public and private spaces. Explore developing events in collaboration with other regional public agencies and private sponsors	1
HS-4-4	Organize a transportation-assistance program for individuals without access to vehicles. Explore partners such as the County, Cedar Valley Service, and local hospitals.	2
HS-4-5	Expand activity and participatory arts programs for older adults, extracurricular activities for youth social engagement, youth peer mentoring and intergenerational mentoring. Programs should focus on expanding social connectedness within and between demographic cohorts (age and ethnicity)	2
HS-4-6	Expand the use of social media to share information and encourage collaboration and civic engagement. Identify responsible party within city to establish and maintain a social media campaign to include organized and regular climate action plan implementation and/or climate change preparedness communications	2
HS 3-7	After weather-related emergency events, assess response to identify effectiveness, deficiencies and resources needed to build future resilience	2

What You Can Do

You can support the goals of the Health and Safety section of the Albert Lea Climate Action Plan as an individual, household, or a business. Here are just a few things you can do:

- Put together an emergency preparedness kit for your household by visiting https://www.ready.gov/
- Get involved with the Albert Lea Community Emergency Response Team (CERT). Join your neighbors and receive training to prepare for potential disasters.
- Prepare your home for the extremes. Understand the risk of extreme weather, extreme temperatures, flooding or wildfire to your home, and take action to safeguard your home.
- Keep yourself and your family current with physicals, vaccinations and prescribed medications and therapies.
- Plan and rehearse a fire evacuation plan with everyone who lives in your home or apartment.
- Have breathing-protection masks available for you and your family for when air quality alerts are declared.
- Take first-aid and CPR certification training.
- Notice a person who lives alone. Offer to check on them periodically, especially during extreme weather or a natural disaster.
- Notice a person who sometimes lacks transportation to their doctor, shopping or other services. Offer to drive them.
- Notice a person or family who lacks air conditioning in their home or apartment. Offer to have them visit or stay with you during extreme heat events.

Click here to return to TOC

Section 09
Climate Economy

Climate Economy

Why Climate Economy Is Important

Climate change and the economy are inexorably linked. Left unabated, the impacts of man-made climate change through the end of this century will cost the United States billions of dollars. According to a 2019 study by two EPA scientists, the difference in economic impact between the mid-range climate model and the high range climate model may account for as much as $224 billion in economic impact annually by 2090. According to a 2019 World Bank report on trends in carbon pricing, a carbon price range of $40-$80 per ton is necessary by 2020 to reach the goals set by the 2015 Paris Agreement, while other studies have placed the full cost of carbon at $200-$400 per ton.

Climate Action and Economic Development

Rather than weakening the economy, climate action can support economic development. Transitioning away from fossil fuel use, improvements to public transit systems, and growth of local food industries are all, in part, a transition to local energy and labor sources. These transitions represent opportunities for communities to reduce the community wealth that is being exported and increase the percentage of community wealth that remains in the community in the form of local jobs. Additionally, many of the jobs potentials in Climate Action redirect funds away from less labor intensive (but more material resource intensive) sectors of the economy to support greater overall employment combined with less resource utilization. In general, economic opportunities include:

Energy Efficiency Jobs

Public Transit Jobs

Renewable Energy Jobs

Economic Savings

Climate Change Considerations

Climate Hazards

In many sectors, climate change will impact water and energy consumption and costs. Extreme weather and increasing variability in temperatures and precipitation may stress transportation systems and fleets. Increasing extreme weather hazards may threaten supply material and product supply chains.

Opportunities

Climate mitigation strategies like transformation of Albert Lea's energy system, improvements to the energy efficiency of the City's building stock, enhancement of transportation alternatives, and the implementation of goals like tree canopy increases and reduction to impervious surfaces represent opportunities for the development of new businesses and job creation.

Climate Economy

Equity Considerations

- Low income individuals in our communities are especially prone to the impacts of climate change and bear a greatly disproportionate share of the costs—including vulnerability to job instability that can be brought about by extreme weather events and other climate change impacts.
- Income inequality is rising in the US, with September 2019 levels being the highest in 50 years—and the impacts of the COVID-19 pandemic have only increased these inequities. High inequality leads to lower life spans, increased instances of mental health issues, and increased obesity rates among other social impacts. Because the impacts and the costs of climate change are disproportionately felt by vulnerable populations and low-income individuals, climate change impacts will exacerbate income inequality in our communities.

Strategies Supporting Sector Goals

As indicated in the introduction, the Climate Action Plan is intended to be a 9 year plan to be updated at the completion of that time. Consequently, the goals and strategies outlined in this section are intended to be achieved by 2030 (or earlier) unless otherwise noted.

Implementation of actions are anticipated to be initiated over 3 phases: phase 1 within 1-2 years, phase 2 within 2-7 years, and phase 3 within 4-8 years of CAP approval.

1. **Strategy CE-1:** Capture local economic potential of climate action.
2. **Strategy CE-2:** Increase workforce development for the climate economy.
3. **Strategy CE-3**: Build marketplace climate resilience.
4. **Strategy CE-4:** Establish sustainable financing for the City's climate action implementation.

1 Strategy CE 1:
Capture local economic potential of climate action

	Actions	Implementation Phase
CE-1-1	Conduct a Climate Economy Economic Development Assessment to identify economic development potential of climate adaptation, climate mitigation, and energy action planning.	1
CE-1-2	Establish a Clean Energy business incubator to support the establishment of innovative energy efficiency and renewable energy business models within the community.	1
CE-1-3	Leverage Community Development Block Grants from the Department of Housing and Urban Development, or HUD, to invest in resilient and equitable communities	2
CE-1-4	Focus the City's business development efforts on businesses that have lower impacts on natural resources, that are non-polluting, offer or support environmentally sustainable goods or services, and/or actively promote telecommuting, alternative work schedules, and alternative transportation modes.	2
CE-1-5	With community stakeholders and partners, conduct a study and host a community conversation to identify threats to current industries, opportunities for new businesses and industries, and areas that need support.	3

2 Strategy CE 2:
Increase workforce development for the climate economy.

	Actions	Implementation Phase
CE-2-1	Develop job training programs focused on building resiliency, solar construction, weatherization, etc. Potential example program: Colorado solar training program.	1
CE-2-2	Work with local union hall and Riverland College to ensure that apprenticeship program includes solar and energy efficiency training.	1
CE-2-3	Explore the development of a job training and entrepreneurial development program similar to Operation Fresh Start. Program to focus on developing green jobs skills within vulnerable and underserved populations in local sustainable agriculture, energy efficiency audits and upgrades, renewable energy, and other skills that support the goals of the CAP. (http://www.operationfreshstart.org/)	2
CE-2-4	Promote alternatives to traditional building demolition such as relocation, deconstruction and salvage. Establish a jobs training program focused on building workforce with deconstruction skills and capacities. Job training program should focus on establishing job skills and placement for low income individuals. See Better Futures Program (https://betterfuturesminnesota.com/services/building-deconstruction/)	2
CE-2-5	Create an intern program similar to the Minnesota GreenCorps internship. Task interns with finding resiliency solutions and cost savings. Intern development should focus on increasing community equity (https://www.pca.state.mn.us/waste/minnesota-greencorps)	2

3 Strategy CE 3:
Build marketplace climate resilience.

	Actions	Implementation Phase
CE-3-1	Conduct a planning effort focused on identifying economic vulnerabilities and opportunities, especially those affecting the city's vulnerable populations. Identify economic resilience strategies and strengthen public-private economic communications, especially with targeted group businesses (minority-owned, veteran owned, economically disadvantaged, etc.). Planning effort could be implemented in conjunction with Climate Economy Economic Development Assessment. Possible example process: https://www.eda.gov/ceds/	1
CE-3-2	Make sure key business infrastructure is recognized in the City and County's general hazard mitigation plan and emergency response plan	1
CE-3-3	Create an online assessment of business' vulnerability/resiliency, including the following topics and content: Potential Climate Impacts and Risks— Climate Resiliency—Energy: efficiency and renewables—Emergency Response—Zero Waste improvements—Potential Incentives or Tax breaks available.	2

Strategy CE 4:
Establish sustainable financing for the City's climate action implementation.

	Actions	Implementation Phase
CE-4-1	Establish a policy that savings generated by energy efficiency measures and renewable energy installations/agreements for City facilities and operations shall be used as a fund to support future energy efficiency and renewable energy projects in support of the CAP goals.	1
CE-4-2	Explore opportunities to utilize Tax increment Financing (TIF) to incentivize Mitigation and Adaptation actions. Options include the establishment of a Renewable Energy TIF district incentivizing on-site renewable energy utilization or a Net Zero TIF funding mechanism incentivizing high energy efficiency and Net Zero buildings.	1
CE-4-3	Explore the "green marketplace" utilization potential of the city's urban forest with all revenue being invested in Climate Action Plan strategies. Strategies may include sale of downed and select removed trees through marketplaces such as the Urban Wood Network (http://urbanwoodnetwork.org/members), as well as exploring lease of benefits of select city owned tree stock such as "sugaring" rights of maple trees. Utilization should be prioritized to maintain quality of the city's urban forest and quality of life benefits.	1
CE-4-4	Establish a policy that designates City Electric and Natural Gas Franchise Fee Income as funding source for Climate Initiatives. https://ilsr.org/energy/utility-franchise-fees/	2
CE-4-5	Explore Issuing "resilience bonds" that generate risk-reduction rebates from a city's catastrophe insurance premiums to pay for resilience projects, prioritizing projects with high resilience, GHG mitigation, and climate adaptation potential.	2
CE-4-6	Explore the potential of developing a "Carbon Impact Fee" similar to the City of Watsonville CA. Additional funds raised to be used for Climate Mitigation and Adaptation implementation. Increased revenue to be used to fund Climate Mitigation and Adaptation implementation with a focus on the actions and strategies which increase the community's equity. https://www.cityofwatsonville.org/DocumentCenter/View/198/Frequently-Asked-Questions-About-the-Carbon-Fund-Ordinance-PDF https://www.cityofwatsonville.org/DocumentCenter/View/3944/Carbon-Fund-Voluntary-Compliance-Worksheet?bidId=	2

Section 10
Climate Action Implementation

Click here to
return to TOC

Climate Action Implementation

The first few years after plan adoption are critical to its success. Establishing roles, both internal and external, and identifying funding will help establish the implementation phase of the plan and ensure the community is on track to achieve its goals. This plan includes robust goals for significant GHG emission reductions and addressing climate resilience. This vision require commitment and integration of the CAP into City operations, functions, and services.

Implementation is For Everyone

Implementation actions are detailed items that should be completed in order to carry out the vision and strategies identified in the plan. Some actions will need to be led by City Council, City departments, and/or the business community; and there are some things that households and individuals can do to make an impact. While many actions will require City Council to amend a policy there will be opportunities for businesses, organizations, households, and individuals to support the City Council policy changes and provide input on and feedback on those policies. Ultimately, achieving the visionary energy efficiency, renewable energy, alternative transportation, and climate resilience goals outlined in this plan will require engagement and a sense of responsibility not only by the City of Albert Lea leadership and government, but by the community itself as well. It is critical for all to remain engaged and active, advancing and advocating for actions you feel are important.

General Implementation Recommendations

Foundational recommendations to support the long-range implementation of the CAP include Building Internal Capacity, External Support, and Funding:

Building Internal Capacity

Continuing to build internal capacity will be important to help establish the CAP as a priority integral to internal operations as well as fostering connections to community partners, businesses, and individuals through outreach, education, special projects, and service delivery.

1. Establish clear guidance and direction for the participation in and support of the CAP implementation actions by all City of Albert Lea departments.
2. Fund and support Climate Action / Sustainability staffing required to:
    - Facilitate discussion among large users to reduce emissions through business and industrial strategies.
    - Participate in technical resource programs as they are available through County, Regional, State, Federal, and non-profit provider partners.
    - Support City of Albert Lea department managers and staff as they implement CAP actions within their service area or area of expertise.
    - Convene an internal City of Albert Lea Climate Working Group that meets regularly and provides updates on progress and success, identifies additional support or resources needed to advance actions of the CAP, and collaboratively discusses strategies for more complex challenges.
    - Ensure the establishment and maintenance of a City of Albert Lea Climate Action webpage supporting CAP resources for the community.
    - Coordinate and organize volunteer groups and events.
    - Engage City boards and commissions to ensure the CAP is integrated into their work plans.
3. Review Climate Action Plan implementation progress and impacts on a regular basis (1-2 year cycle). Review should include development of an updated community wide and municipal operations GHG inventory. Strategies and actions should be reviewed for implementation progress and for continued appropriateness. Based on the review, adjust, add, and remove detailed CAP actions as appropriate.

Climate Action Implementation

External Support

City staff and elected officials will not be able to implement this plan without robust support from community members and coordination with jurisdictional, institutional, and organizational partners.

1. Establish an existing commission, or create a new commission to function as the main citizen-body to support the implementation of the CAP. Committee's mission and scope of work should include support of the implementation of the Climate Action Plan, coordination with City staff in all relevant departments, receiving updates on City CAP projects and progress, and providing input on plan adjustments as needed.
2. Establish a designated City Council representative and commission representative participant in the City's internal Climate Working Group in support of CAP implementation.
3. Establish a coordinated communication and education campaign supporting the educational and informational actions included in each of the CAP sections. The campaign should also look to help community members:
    - Understand why change at the individual, community, City, and business level needs to occur,
    - How to make those changes correctly, and
    - What the benefit/incentive to them might be, for example, articulating that switching to solar energy and or an electric bus fleet might help reduce bills
4. Establish jurisdictional partnerships that advance CAP strategies to advance and accelerate action. This can include government entities like Freeborn County, Shell Rock River Watershed District, the State of Minnesota, utilities like Freeborn Mower Cooperative Electric and Minnesota Energy Resources; institutions like Albert Lea School District and Riverland Community College; Albert Lea businesses, and community groups.

Funding

Funding the implementation of the CAP will require reallocation/reconsideration of existing City funds, raising new City funds, and identifying outside resources and funding opportunities. Some funds will need to be dedicated toward long-term support like staffing, while other funding will be on a project-by-project basis.

1. Establish and maintain funding for staff supporting the implementation of the CAP.
2. Establish and maintain a Climate Action Reserve Fund to support projects on an annual basis
3. Explore additional sustainable funding sources as per the detailed actions outlined in the Climate Economy section of the plan.
3. Utilize no-cost technical assistance offerings as available.

Climate Action Implementation Support Tools

To support the City in its initial implementation phase, the paleBLUEdot team has created a number of tools including:

- Implementation and Monitoring Matrix
- Example Climate Action Policies and Ordinances
  The paleBLUEdot team has assembled example policies and ordinances supporting some of the strategies and actions included in the Albert Lea Climate Action Plan.
  The examples can be found on the following webpage:
  https://palebluedot.llc/albert-lea-cap-policy-examples

Click here to return to TOC

Section A1
Glossary of Terms

A

Activity Data
Data on the magnitude of a human activity resulting in emissions or removals taking place during a given period of time. Data on energy use, metal production, land areas, management systems, lime and fertilizer use and waste arisings are examples of activity data. (IPCC)

Adaptive Capacity
The social, technical skills, and financial capacities of individuals and groups to implement and maintain climate actions.

Aerosols
A collection of airborne solid or liquid particles, with a typical size between 0.01 and 10 micrometer that reside in the atmosphere for at least several hours. Aerosols may be of either natural or anthropogenic origin. Aerosols may influence climate in several ways: directly through scattering and absorbing radiation, and indirectly by acting as cloud condensation nuclei or modifying the optical properties and lifetime of clouds. (IPCC2)

Afforestation
Planting of new forests on lands that historically have not contained forests. (IPCC2)

Air Pollutant
Any man-made and/or natural substance occurring in the atmosphere that may result in adverse effects to humans, animals, vegetation, and/or materials. (CARB)

Anthropogenic
The term "anthropogenic", in the context of greenhouse gas inventories, refers to greenhouse gas emissions and removals that are a direct result of human activities or are the result of natural processes that have been affected by human activities. (USEPA2)

Atmosphere
The gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a number of trace gases, such as argon (0.93% volume mixing ratio), helium and radiatively active greenhouse gases such as carbon dioxide (0.035% volume mixing ratio) and ozone. In addition, the atmosphere contains the greenhouse gas water vapor, whose amounts are highly variable but typically around 1% volume mixing ratio. The atmosphere also contains clouds and aerosols. (IPCC2)

B

Baseline Emissions
A baseline is a measurement, calculation, or time used as a basis for comparison. Baseline emissions are the level of emissions that would occur without policy intervention or without implementation of a project. Baseline estimates are needed to determine the effectiveness of emission reduction programs (also called mitigation strategies).

Base Year
The starting year for the inventory. Targets for reducing GHG emissions are often defined in relation to the base year.

Biogenic
Produced by the biological processes of living organisms. Note that we use the term "biogenic" to refer only to recently produced (that is non-fossil) material of biological origin. IPCC guidelines recommend that peat be treated as a fossil carbon because it takes a long time to replace harvested peat.

Biogeochemical Cycle
Movements through the Earth system of key chemical constituents essential to life, such as carbon, nitrogen, oxygen, and phosphorus. (NASA)

Biomass
Either (1) the total mass of living organisms in a given area or of a given species usually expressed as dry weight; or (2) Organic matter consisting of or recently derived from living organisms (especially regarded as fuel) excluding peat. Includes products, by-products and waste derived from such material. (IPCC1)

Biomass Waste
Organic non-fossil material of biological origin that is a byproduct or a discarded product. "Biomass waste" includes municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural crop byproducts, straw, and other biomass solids, liquids, and gases; but excludes wood and wood-derived fuels (including black liquor), biofuels feedstock, biodiesel, and fuel ethanol. Note: EIA "biomass waste" data also include energy crops grown specifically for energy production, which would not normally constitute waste. (EIA)

Black Carbon
Operationally defined aerosol species based on measurement of light absorption and chemical reactivity and/or thermal stability; consists of soot, charcoal and/or possible light absorbing refractory organic matter (Charlson and Heintzenberg, 1995, p. 401). (IPCC2)

C
Carbon Cycle
All parts (reservoirs) and fluxes of carbon. The cycle is usually thought of as four main reservoirs of carbon interconnected by pathways of exchange. The reservoirs are the atmosphere, terrestrial biosphere (usually includes freshwater systems), oceans, and sediments (includes fossil fuels). The annual movements of carbon, the carbon exchanges between reservoirs, occur because of various chemical, physical, geological, and biological processes. The ocean contains the largest pool of carbon near the surface of the Earth, but most of that pool is not involved with rapid exchange with the atmosphere. (NASA)

Carbon Dioxide (CO_2)
A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1. (IPCC2)\

Carbon Dioxide Equivalent (CO_2e)
A metric used to compare emissions of various greenhouse gases. It is the mass of carbon dioxide that would produce the same estimated radiative forcing as a given mass of another greenhouse gas. Carbon dioxide equivalents are computed by multiplying the mass of the gas emitted by its global warming potential.

Carbon Disclosure Project (CDP)
An international organization that administers a platform for organizations and cities to publicly disclose their environmental impacts, such as climate risk. CDP is one of the approved disclosure platforms utilized by GCoM.

Carbon Emissions
The release of carbon dioxide into the atmosphere. Primary human sources of the release of carbon dioxide occur from burning oil, coal, and gas for energy use.

Carbon Equivalent (CE)
A metric measure used to compare the emissions of the different greenhouse gases based upon their global warming potential. Carbon equivalents can be calculated from to carbon dioxide equivalents by multiplying the carbon dioxide equivalents by 12/44 (the ratio of the molecular weight of carbon to that of carbon dioxide). The use of carbon equivalent is declining in GHG inventories.

Carbon Intensity
The amount of carbon by weight emitted per unit of energy consumed. A common measure of carbon intensity is weight of carbon per British thermal unit (Btu) of energy. When there is only one fossil fuel under consideration, the carbon intensity and the emissions coefficient are identical. When there are several fuels, carbon intensity is based on their combined emissions coefficients weighted by their energy consumption levels. (EIA)

Carbon Neutrality
"Carbon neutrality" means annual zero net anthropogenic (human caused or influenced) CO2 emissions by a certain date. By definition, carbon neutrality means every ton of anthropogenic CO2 emitted is compensated with an equivalent amount of CO2 removed (e.g. via carbon sequestration).

Carbon Sinks
A forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.

Carbon Sequestration
This refers to the capture of CO_2 from the atmosphere and its long term storage in oceans (oceanic carbon sequestration), in biomass and soils (terrestrial carbon sequestration) or in underground reservoirs (geologic carbon sequestration).

Chlorofluorocarbons (CFCs)
Greenhouse gases covered under the 1987 Montreal Protocol and used for refrigeration, air conditioning, packaging, insulation, solvents, or aerosol propellants. Because they are not destroyed in the lower atmosphere, CFCs drift into the upper atmosphere where, given suitable conditions, they break down ozone. These gases are being replaced by other compounds, including hydrochlorofluorocarbons and hydrofluorocarbons, which are greenhouse gases covered under the Kyoto Protocol. (IPCC3)

Circular Economy
An alternative to a traditional linear economy (make, use, dispose) in which an economy is a regenerative system where resource input and waste are minimized. This is achieved through long-lasting product design, repair, reuse, remanufacturing, and recycling. Circular economy strategies are often cited as systems level approaches to reducing waste generation through product and system design.

Climate
Climate in a narrow sense is usually defined as the "average weather" or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. (IPCC2)

Climate Adaptation or Resilience
The capacity of a natural environment to prevent, withstand, respond to, and recover from a disruption. The process of adjusting to new climate conditions in order to reduce risks to valued assets.

Climate Change
Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. (IPCC2)

Climate Hazard
An extreme climate event or condition that can harm human health, livelihoods, or natural resources. It can include abrupt changes to the climate system such as extreme precipitation, storms, droughts, and heat waves.

Climate Risk
The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability and hazard. (IPCC):

Climate Vulnerability
Is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its capacity to adapt. Vulnerability = potential impact (sensitivity x exposure) – adaptive capacity (IPCC):

Climate Vulnerability Assessment
A report used to identify and define the risks posed by climate change and inform adaptation measures needed to combat climate change. Reports can be about a wide range of fields including food security, poverty analysis, and extreme weather events.

Cogeneration
Cogeneration is an industrial structure, installation, plant, building, or self-generating facility that has sequential or simultaneous generation of multiple forms of useful energy (usually mechanical and thermal) in a single, integrated system. (CARB)

Combined Heat and Power (CHP)
Combined heat and power is the simultaneous production of both electricity and useful heat for application by the producer or to be sold to other users with the aim of better utilisation of the energy used. Public utilities may utilise part of the heat produced in power plants and sell it for public heating purposes. Industries as auto-producers may sell part of the excess electricity produced to other industries or to electric utilities. (IPCC)

Community Solar
Solar facilities shared by multiple community subscribers who receive credit on their electricity bills for their share of the power produced. Community solar allows members of a community to share the benefits of solar power on their property without installing it on their own property. Electricity generated by the community solar farm typically costs less than the price from utility companies.

Complete Streets
A "complete street" is a design approach that requires streets to be designed to support safe, convenient and comfortable travel and access for users of all ages and abilities regardless of their mode of transportation.

Consistency
Consistency means that an inventory should be internally consistent in all its elements over a period of years. An inventory is consistent if the same methodologies are used for the base and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. (IPCC)

Continuous Emission Monitor (CEM)
A type of air emission monitoring system installed to operate continuously inside of a smokestack or other emission source. (CARB)

Criteria Air Pollutant
An air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set. Examples include: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and PM10 and PM2.5. The term "criteria air pollutants" derives from the requirement that the U.S. EPA must describe the characteristics and potential health and welfare effects of these pollutants. The U.S. EPA and CARB periodically review new scientific data and may propose revisions to the standards as a result. (CARB)

D
Deforestation
Those practices or processes that result in the change of forested lands to non-forest uses. This is often cited as one of the major causes of the enhanced greenhouse effect for two reasons: 1) the burning or decomposition of the wood releases carbon dioxide; and 2) trees that once removed carbon dioxide from the atmosphere in the process of photosynthesis are no longer present and contributing to carbon storage. (UNFCC)

Distillate Fuel Oil
A general classification for one of the petroleum fractions produced in conventional distillation operations. It includes diesel fuels and fuel oils. Products known as No. 1, No. 2, and No. 4 diesel fuel are used in on-highway diesel engines, such as those in trucks and automobiles, as well as off-highway engines, such as those in railroad locomotives and agricultural machinery. Products known as No. 1, No. 2, and No. 4 fuel oils are used primarily for space heating and electric power generation. (EIA)

E
Emissions
The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere. (USEPA1)

Emission Factor
A coefficient that quantifies the emissions or removals of a gas per unit activity. Emission factors are often based on a sample of measurement data, averaged to develop a representative rate of emission for a given activity level under a given set of operating conditions. (IPCC)

Emission Inventory
An estimate of the amount of pollutants emitted into the atmosphere from major mobile, stationary, area-wide, and natural source categories over a specific period of time such as a day or a year. (CARB)

Emission Rate
The weight of a pollutant emitted per unit of time (e.g., tons / year). (CARB)

Environmental Justice
The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies

Estimation
Estimation is the assessment of the value of an unmeasurable quantity using available data and knowledge within stated computational formulas or mathematical models.

F
Fluorocarbons
Carbon-fluorine compounds that often contain other elements such as hydrogen, chlorine, or bromine. Common fluorocarbons include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). (UNFCC)

Flux
Either (1) Raw materials, such as limestone, dolomite, lime, and silica sand, which are used to reduce the heat or other energy requirements of thermal processing of minerals (such as the smelting of metals). Fluxes also may serve a dual function as a slagging agent. (2) The rate of flow of any liquid or gas, across a given area; the amount of this crossing a given area in a given time. (e.g., "Flux of CO2 absorbed by forests"). (IPCC)

Fossil Fuel
Geologic deposits of hydrocarbons from ancient biological origin, such as coal, petroleum and natural gas.

Fuel Combustion
Fuel combustion is the intentional oxidation of materials within an apparatus that is designed to provide heat or mechanical work to a process, or for use away from the apparatus. (IPCC)

Fugitive Emissions
Emissions that are not emitted through an intentional release through stack or vent. This can include leaks from industrial plant and pipelines. (IPCC)

G
Geologic Carbon Sequestration
It is the process of injecting CO_2 from a source, such as coal-fired electric generating power plant, through a well into the deep subsurface. With proper site selection and management, geologic sequestration could play a major role in reducing emissions of CO_2. Research efforts to evaluate the technical aspects of CO_2 geologic sequestration are underway. (USEPA4)

Global Warming
Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities. Also see Climate Change (USEPA1)

Global Warming Potential (GWP)
An index, based upon radiative properties of well-mixed greenhouse gases, measuring the radiative forcing of a unit mass of a given well-mixed greenhouse gas in the present-day atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide. The GWP represents the combined effect of the differing times these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing thermal infrared radiation. The Kyoto Protocol is based on GWPs from pulse emissions over a 100-year time frame. (IPCC2)

GCOM Global Covenant of Mayors:
GCoM is the largest global alliance for city climate leadership, built upon the commitment of over 10,000 cities and

local governments. The alliance's mission is to mobilize and support climate and energy action in communities across the world.

Green Streets
A "green street" is a stormwater management approach that incorporates vegetation, soil, and engineered systems to slow, filter, and cleanse stormwater runoff from impervious surfaces.

Greenhouse Effect
Trapping and build-up of heat in the atmosphere (troposphere) near the earth's surface. Some of the heat flowing back toward space from the earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases in the atmosphere and then reradiated back toward the earth's surface. If the atmospheric concentrations of these greenhouse gases rise, the average temperature of the lower atmosphere will gradually increase. (UNFCC)

Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories:
A robust, transparent and globally-accepted framework that cities and local governments can use to consistently identify, calculate and report on city greenhouse gas emissions.

Greenhouse Gas
Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrochlorofluorocarbons (HCFCs), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). (UNFCC)

Green Infrastructure
An approach to managing precipitation by reducing and treating stormwater at its source while delivering environmental, social, and economic benefits. Stormwater runoff can carry trash, bacteria, and other pollutants and is a major cause of water pollution in urban areas.

Gross Domestic Product (GDP)
The sum of gross value added, at purchasers' prices, by all resident and non-resident producers in the economy, plus any taxes and minus any subsidies not included in the value of the products in a country or a geographic region for a given period, normally one year. It is calculated without deducting for depreciation of fabricated assets or depletion and degradation of natural resources. (IPCC3)

H

Halocarbons
A collective term for the group of partially halogenated organic species, including the chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), halons, methyl chloride, methyl bromide, etc. Many of the halocarbons have large Global Warming Potentials. The chlorine and bromine-containing halocarbons are also involved in the depletion of the ozone layer. (IPCC2)

Hydrocarbons
Strictly defined as molecules containing only hydrogen and carbon. The term is often used more broadly to include any molecules in petroleum which also contains molecules with S, N, or O An unsaturated hydrocarbon is any hydrocarbon containing olefinic or aromatic structures. (IPCC)

Hydrofluorocarbons (HFCs)
Compounds containing only hydrogen, fluorine, and carbon atoms. They were introduced as alternatives to ozone depleting substances in serving many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are also used in manufacturing. They do not significantly deplete the stratospheric ozone layer, but they are powerful greenhouse gases with global warming potentials ranging from 140 (HFC-152a) to 11,700 (HFC-23). (USEPA1)

I

ICLEI Local Governments for Sustainability:
A membership organization for local governments to pursue reductions in carbon pollution and improvements in advancing sustainable urban development. ICLEI's members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

Intergovernmental Panel on Climate Change
The IPCC was established jointly by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world's expert scientists as authors and thousands as expert reviewers. Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences. With its capacity for reporting on climate change, its consequences, and the viability of adaptation and mitigation measures, the IPCC is also looked to as the official advisory body to the world's governments on the state of the science of the climate change issue. For example, the IPCC organized the development of internationally accepted methods for conducting national greenhouse gas emission inventories. (USEPA1)

K

Kilowatt Hour (kWh):
A measure of electrical energy equivalent to a power consumption of 1,000 watts for one hour.

Kyoto Protocol
The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1997 in Kyoto, Japan, at the Third Session of the Conference of the Parties (COP) to the UNFCCC. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in Annex B of the Protocol (most Organisation for Economic Cooperation and Development countries and countries with economies in transition) agreed to reduce their anthropogenic greenhouse gas emissions (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) by at least 5% below 1990 levels in the commitment period 2008 to 2012. The Kyoto Protocol entered into force on 16 February 2005. (IPCC2)

L

Land Use and Land Use Change
Land use refers to the total of arrangements, activities and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for which land is managed (e.g., grazing, timber extraction and conservation). Land use change refers to a change in the use or management of land by humans, which may lead to a change in land cover. Land cover and land use change may have an impact on the surface albedo, evapotranspiration, sources and sinks of greenhouse gases, or other properties of the climate system and may thus have a radiative forcing and/or other impacts on climate, locally or globally. (IPCC2)

Living Streets
A "living street" combines the concepts of complete streets and green streets while putting additional focus on quality of life aspects for City residents.

LULUCF
Acronym for "Land Use, Land Use Change and Forestry", a category of activities in GHG inventories.

M

Megawatt Hour (MWH):
A measure of electrical energy equivalent to a power consumption of 1,000,000 watts for one hour.

Methane (CH_4)
A hydrocarbon that is a greenhouse gas with a global warming potential most recently estimated at 25 times that of carbon dioxide (CO_2). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, flooded rice fields, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion. The GWP is from the IPCC's Fourth Assessment Report (AR4).

Metric Ton
The tonne (t) or metric ton, sometimes referred to as a metric tonne, is an international unit of mass. A metric ton is equal to a Megagram (Mg), 1000 kilograms, 2204.6 pounds, or 1.1023 short tons.

Million Metric Tons (MMT)
Common measurement used in GHG inventories. It is equal to a Teragram (Tg).

Mitigation:
Actions taken to limit the magnitude or rate of long-term global warming and its related effects. Climate change mitigation generally involves reductions in human emissions of greenhouse gases.

Mobile Sources
Sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats, and airplanes. (CARB)

Mode Share
The percentage of travelers using a particular type of transportation. Modal share is an important component in developing sustainable transport within a city or region because it reveals the level of utilization of various transportation methods. The percentage reflects how well infrastructure, policies, investments, and land-use patterns support different types of travel.

Model
A model is a quantitatively-based abstraction of a real-world situation which may simplify or neglect certain features to better focus on its more important elements. (IPCC)

Municipal Solid Waste (MSW)
Residential solid waste and some non-hazardous commercial, institutional, and industrial wastes. This material is generally sent to municipal landfills for disposal. (USEPA1)

N
Natural Sources
Non-manmade emission sources, including biological and geological sources, wildfires, and windblown dust. (CARB)

Net-zero Emissions (NZE)
Building A building or property that generates or offsets all energy consumed. If the City develops a NZE building code, this definition will have to be refined to provide additional guidance on calculating emissions and offsets to achieve net-zero emissions.

Nitrogen Fixation
Conversion of atmospheric nitrogen gas into forms useful to plants and other organisms by lightning, bacteria, and blue-green algae; it is part of the nitrogen cycle. (UNFCC)

Nitrogen Oxides (NO_x)
Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. Nitrogen oxides are produced in the emissions of vehicle exhausts and from power stations. In the atmosphere, nitrogen oxides can contribute to formation of photochemical ozone (smog), can impair visibility, and have health consequences; they are thus considered pollutants. (NASA)

Nitrous Oxide (N_2O)
A powerful greenhouse gas with a global warming potential of 298 times that of carbon dioxide (CO_2). Major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, manure management, fossil fuel combustion, nitric acid production, and biomass burning. The GWP is from the IPCC's Fourth Assessment Report (AR4).

O
Ozone (O_3)
Ozone, the triatomic form of oxygen (O_3), is a gaseous atmospheric constituent. In the troposphere, it is created both naturally and by photochemical reactions involving gases resulting from human activities (smog). Tropospheric ozone acts as a greenhouse gas. In the stratosphere, it is created by the interaction between solar ultraviolet radiation and molecular oxygen (O_2). Stratospheric ozone plays a dominant role in the stratospheric radiative balance. Its concentration is highest in the ozone layer. (IPCC2)

Ozone Depleting Substances (ODS)
A compound that contributes to stratospheric ozone depletion. Ozone-depleting substances (ODS) include CFCs, HCFCs, halons, methyl bromide, carbon tetrachloride, and methyl chloroform. ODS are generally very stable in the troposphere and only degrade under intense ultraviolet light in the stratosphere. When they break down, they release chlorine or bromine atoms, which then deplete ozone. (IPCC)

P
Perfluorocarbons (PFCs)
A group of human-made chemicals composed of carbon and fluorine only. These chemicals (predominantly CF_4 and C_2F_6) were introduced as alternatives, along with hydrofluorocarbons, to the ozone depleting substances. In addition, PFCs are emitted as by-products of industrial processes and are also used in manufacturing. PFCs do not harm the stratospheric ozone layer, but they are powerful greenhouse gases: CF_4 has a global warming potential (GWP) of 7,390 and C_2F_6 has a GWP of 12,200. The GWP is from the IPCC's Fourth Assessment Report (AR4).

Photosynthesis
The process by which plants take carbon dioxide from the air (or bicarbonate in water) to build carbohydrates, releasing oxygen in the process. There are several pathways of photosynthesis with different responses to atmospheric carbon dioxide concentrations. (IPCC2)

Point Sources
Specific points of origin where pollutants are emitted into the atmosphere such as factory smokestacks. (CARB)

Power Purchase Agreement (PPA)
A power purchase agreement (PPA), or electricity power agreement, is a contract between two parties; one party generates electricity (the seller) and the other party looks to purchase electricity (the buyer). Individual customers and organizations may enter into PPAs with individual developers or may join together to seek better prices as a group. PPAs can allow longer term commitments to renewable energy as well as a form of “direct” investing in new renewable energy generation.

Property-Assessed Clean Energy (PACE)

A program created for financing energy efficiency and renewable improvements on private property. Private property can include residential, commercial or industrial properties. Improvements can include energy efficiency, renewable energy and water conservation upgrades to a building.

Process Emissions
Emissions from industrial processes involving chemical transformations other than combustion. (IPCC)

R
Radiative Forcing
A change in the balance between incoming solar radiation and outgoing infrared (i.e., thermal) radiation. Without any radiative forcing, solar radiation coming to the Earth would continue to be approximately equal to the infrared radiation emitted from the Earth. The addition of greenhouse gases to the atmosphere traps an increased fraction of the infrared radiation, reradiating it back toward the surface of the Earth and thereby creates a warming influence. (UNFCC)

Reforestation
Planting of forests on lands that have previously contained forests but that have been converted to some other use. (IPCC2)

Regeneration
The act of renewing tree cover by establishing young trees, naturally or artificially - note regeneration usually maintains the same forest type and is done promptly after the previous stand or forest was removed. (CSU)

Renewable Energy
Energy resources that are naturally replenishing such as solar, wind, hydro and geothermal energy.

Renewable Energy Credits (RECs)
A market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource. The single largest category of reductions in Evanston's emissions has been through the purchase of RECs.

Residence Time
Average time spent in a reservoir by an individual atom or molecule. Also, this term is used to define the age of a molecule when it leaves the reservoir. With respect to greenhouse gases, residence time usually refers to how long a particular molecule remains in the atmosphere. (UNFCC)

Reservoir
Either (1) a component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored; or (2) Water bodies regulated for human activities (energy production, irrigation, navigation, recreation etc.) where substantial changes in water area due to water level regulation may occur. (IPCC)

Respiration
The process whereby living organisms convert organic matter to carbon dioxide, releasing energy and consuming molecular oxygen. (IPCC2)

Retro-commissioning
The systematic process to improve an existing building's performance ensuring the building controls are running efficiently and balancing the designed use and the actual use of the building.

Ride-share
The practice of sharing transportation in the form of carpooling or vanpooling. It is typically an arrangement made through a ride-matching service that connects drivers with riders.

S

Scope 1:
Scope 1 includes emissions being released within the city limits resulting from combustion of fossil fuels and from waste decomposition in the landfill and wastewater treatment plant.

Scope 2:
Scope 2 includes emissions produced outside the city that are induced by consumption of electrical energy within the city limits.

Scope 3:
Scope 3 includes emissions of potential policy relevance to local government operations that can be measured and reported but do not qualify as Scope 1 or 2. This includes, but is not limited to, outsourced operations and employee commute.

Short Ton
Common measurement for a ton in the United States. A short ton is equal to 2,000 lbs or 0.907 metric tons. (USEPA1)

Sink
Any process, activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere. (IPCC2)

Social Cost of Carbon
The social cost of carbon is a measure of the economic harm from climate change impacts, expressed as the dollar value of the total damages from emitting one ton of carbon dioxide into the atmosphere.

Solar Radiation
Electromagnetic radiation emitted by the Sun. It is also referred to as shortwave radiation. Solar radiation has a distinctive range of wavelengths (spectrum) determined by the temperature of the Sun, peaking in visible wavelengths. (IPCC2)

Source
Any process, activity or mechanism that releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol into the atmosphere. (IPCC2)

Stationary Sources
Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants. (CARB)

Sulfur Dioxide (SO_2)
A compound composed of one sulfur and two oxygen molecules. Sulfur dioxide emitted into the atmosphere through natural and anthropogenic processes is changed in a complex series of chemical reactions in the atmosphere to sulfate aerosols. These aerosols are believed to result in negative radiative forcing (i.e., tending to cool the Earth's surface) and do result in acid deposition (e.g., acid rain). (UNFCC)

Sulfur Hexafluoride (SF_6)
A colorless gas soluble in alcohol and ether, slightly soluble in water. A very powerful greenhouse gas with a global warming potential most recently estimated at 22,800 times that of carbon dioxide (CO_2). SF_6 is used primarily in

electrical transmission and distribution systems and as a dielectric in electronics. This GWP is from the IPCC's Fourth Assessment Report (AR4).

T

Terrestrial Carbon Sequestration
It is the process through which carbon dioxide (CO_2) from the atmosphere is absorbed by trees, plants and crops through photosynthesis, and stored as carbon in biomass (tree trunks, branches, foliage and roots) and soils. The term "sinks" is also used to refer to forests, croplands, and grazing lands, and their ability to sequester carbon. Agriculture and forestry activities can also release CO_2 to the atmosphere. Therefore, a carbon sink occurs when carbon sequestration is greater than carbon releases over some time period. (USEPA3)

Therm:
A unit of measure for energy that is equivalent to 100,000 British Thermal units, or roughly the energy in 100 cubic feet of natural gas. Often used for measuring natural gas usage for billing purposes.

Total Organic Gases (TOG)
Gaseous organic compounds, including reactive organic gases and the relatively unreactive organic gases such as methane. (CARB)

Transparency
Transparency means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of information. (IPCC)

Trend
The trend of a quantity measures its change over a time period, with a positive trend value indicating growth in the quantity, and a negative value indicating a decrease. It is defined as the ratio of the change in the quantity over the time period, divided by the initial value of the quantity, and is usually expressed either as a percentage or a fraction. (IPCC)

U

Urban Tree Canopy
Describes the makeup and characteristics of trees within the urban environment.

V

VMT Vehicle Miles Traveled:
A unit used to measure vehicle travel made by private vehicles, including passenger vehicles, truck, vans and motorcycles. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle.

Vision Zero:
Vision Zero is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all. https://visionzeronetwork.org/

W

Water Vapor
The most abundant greenhouse gas; it is the water present in the atmosphere in gaseous form. Water vapor is an important part of the natural greenhouse effect. While humans are not significantly increasing its concentration, it contributes to the enhanced greenhouse effect because the warming influence of greenhouse gases leads to a positive water vapor feedback. In addition to its role as a natural greenhouse gas, water vapor plays an important

role in regulating the temperature of the planet because clouds form when excess water vapor in the atmosphere condenses to form ice and water droplets and precipitation. (UNFCC)

Weather
Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season. Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. A simple way of remembering the difference is that climate is what you expect (e.g. cold winters) and 'weather' is what you get (e.g. a blizzard). (USEPA1)

Z

Zero Emission Vehicles (ZEV)
A vehicle that does not emit harmful emissions during operation. Harmful emissions can have a negative impact on human health and the environment. Electric (battery-powered) cars, electric trains, hydrogen-fueled vehicles, bicycles, and carriages are considered to produce zero emissions.

Zero Waste
A cyclical system in which products are designed for reuse, which creates no waste. A zero waste system eliminates the volume and toxicity of waste and materials and conserves current resources through reuse.

Click here to return to TOC

Section A2
Supporting Research

Supporting Research

Climate Vulnerability Assessment

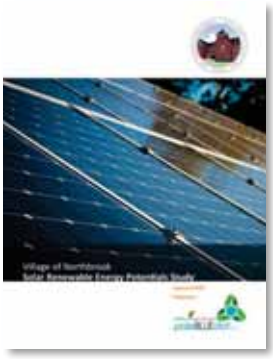
paleBLUEdot completed a Climate Vulnerability Assessment for the City of Albert Lea in 2018. The assessment included the identification of vulnerable populations within the community and possible impacts and risks associated with projected climate change for the region. paleBLUEdot mapped the vulnerable populations within the Town as well as existing town infrastructure and resources which may be capable of supporting climate adaptation strategies. These assessments provided a basis for understanding vulnerabilities and resources which supported the decision making process needed for identifying and prioritizing climate adaptation measures to be included in the final Climate Action Plan. The Assessment focused on City-Wide vulnerabilities with a particular focus on climate vulnerable populations to ensure all populations benefit from proposed implementation measures.

Click on the link below or scan the QR code to access the document:
https://view.publitas.com/palebluedot/albert-lea-vulnerable-populations-final-draft-report-012418/

Supporting Research

Community Wide Solar Energy Potentials Study

In support of development of effective renewable energy goalsetting and to establish strategies addressing renewable energy development, paleBLUEdot conducted a Community-Wide solar pv potentials study including economic and environmental benefits. This effort included:



1) Collect City-wide satellite data (NREL, NOAA, and NASA data).
2) Determine building roof stock characteristics and solar suitable buildings, calculate total suitable areas by roof configuration/orientation.
3) Calculate total rooftop solar capacity and annual energy generation by roof configuration/orientation.
4) Identify cost efficient annual energy generation potential.
5) Research solar market at national, State and regional levels. Identify low, medium, and high solar market absorption rates and City-wide solar pv goals.
6) Identify environmental and economic benefit of solar including economic development and job creation potential. (NREL JEDI model)
7) Develop City-Wide Renewable Solar Energy Potentials report.

Click on the link below or scan the QR code to access the document:
https://view.publitas.com/palebluedot/albert-lea-solar-potentials-study/

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