CITY OF MUSKEGON

Adopted 2025

Climate Action Plan

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Executive Summary

OVERVIEW

This Municipal Climate Action Plan (CAP) for the City of Muskegon establishes a roadmap for achieving net zero greenhouse gas (GHG) emissions from municipal operations by 2040. This is built upon the City of Muskegon's recognition of an urgent need for climate action and commitment to sustainable and efficient operations. In April 2023, the Muskegon City Commission adopted a resolution declaring this commitment, recognizing that local climate action results in enhanced operational efficiency, reduced costs, and improved resilience.

To support these efforts, a baseline government operations GHG inventory was initiated to provide a basis to inform the development of this CAP. The baseline GHG inventory establishes an understanding of the quantity and sources of GHG emissions generated by city operations.

The development of this CAP was initiated in late 2024, fulfilling action N5.1, "Adopt a Climate Action Plan," from Section C of the city's 2023 Master Land Use Plan. Utilizing baseline GHG inventory data, this CAP outlines a roadmap to reduce GHG emissions from city operations while improving the resiliency of city operations to the impacts of climate change.

OUTCOMES

The intended outcomes of this Climate Action Plan are as follows:

- Position the City of Muskegon to leverage funding opportunities to implement climate action initiatives
- Reduce City of Muskegon operational costs through improved efficiency
- Reach net zero GHG emissions from municipal operations by 2040
- Enhance the resilience of city operations and city-owned land

Each of these outcomes will strengthen city operations while reducing the environmental impact of the City of Muskegon as an organization.

HOW THIS PLAN IS ORGANIZED

This Climate Action Plan's content is organized into:

005
Focus Areas

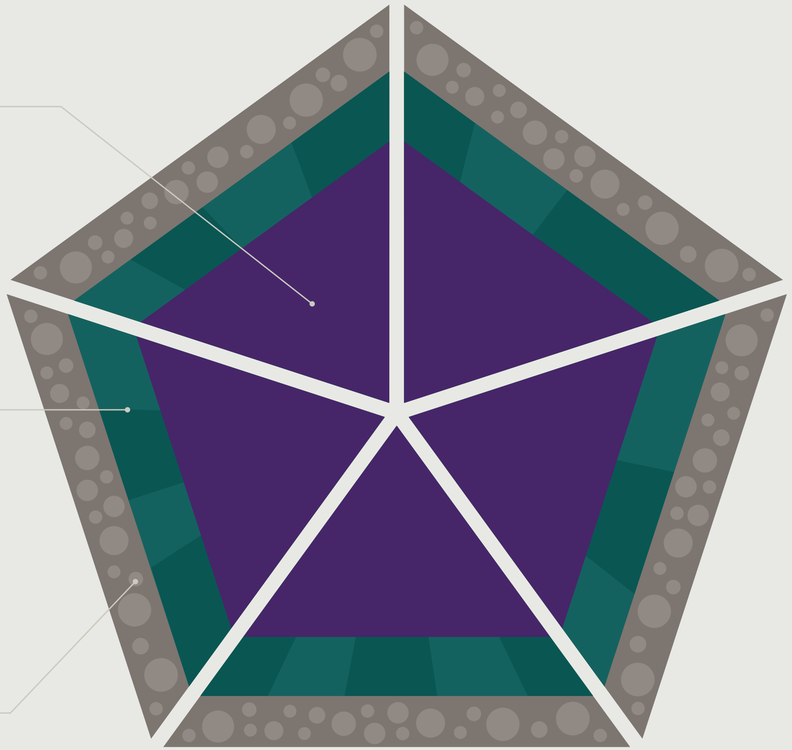
Focus areas are key categories or sectors in which targeted objectives, actions, and/or policies can be developed and implemented to reduce GHG emissions and enhance climate resilience. The focus areas include buildings & facilities, vehicles, waste, land use & resilience, and implementation. Each of these areas are significant to the City of Muskegon's climate action efforts.

018
Objectives

Objectives outline goals within the focus areas and bridge the gap between broad focus areas and the more concrete, specific actions. Objectives serve to organize specific actions within focus areas and represent long-term desired CAP outcomes.

097
Actions

Within each objective are multiple actions. These actions detail specific, tangible steps that can be implemented to contribute to the overarching objective, focus area, and ultimately CAP. Actions are targeted in scope and may need to be adjusted as new opportunities or technologies emerge. This CAP is meant to be a living document, allowing for innovation and adaptation through time.



FOCUS AREAS

01 Buildings & Facilities

The Buildings and Facilities focus area addresses the operational efficiency of all municipal buildings, city-owned facilities, streetlights, park amenities, and other city infrastructure.

02 Vehicles

The Vehicles focus area aims to improve the efficiency and sustainability of vehicles and equipment, such as police cruisers, emergency response vehicles, and lawn maintenance equipment.

03 Waste

The Waste focus area includes initiatives to minimize the amount of waste landfilled as a result of municipal operations and events hosted by the city.

04 Land Use & Resiliency

The Land Use and Resiliency focus area supports the City of Muskegon's efforts to protect natural resources and reduce climate-related risks to municipal operations.

05 Implementation

The Implementation focus area establishes a framework to strengthen the City of Muskegon's internal capacity to carry out all other focus area objectives and actions identified in this plan.

OBJECTIVES

01

Buildings & Facilities

- Assess the energy performance of city facilities
- Reduce energy consumption by city facilities
- Reduce water consumption by city facilities
- Maximize renewable energy utilized to power city facilities

02

Vehicles

- Improve operational efficiency of city vehicle fleet
- Transition fleet vehicles and equipment to most efficient models
- Enhance Muskegon's appeal as a place for city employees to live and thrive

03

Waste

- Reduce landfill waste from city facilities
- Reduce landfill waste from events hosted by the city or at city facilities

04

Land Use & Resiliency

- Increase carbon sequestration potential of city-owned land
- Improve resiliency of city-owned land
- Integrate climate risk considerations into city land use planning and management
- Improve government operations'resilience to the impacts of climate change

05

Implementation

- Leverage funding for CAP actions
- Build city staff capacity for CAP implementation
- Monitor and evaluate progression of CAP implementation
- Integrate CAP priorities into city operations and procurement
- Integrate climate considerations into the development, review, and implementation of all new city plans and policies

ALIGNED CLIMATE ACTION

This CAP builds upon initiatives set forth in City of Muskegon Plans such as the Master Land Use Plan, Stormwater Management Standards, and Recreation Master Plan. Regionally and state-wide, this CAP aligns with the Muskegon County Hazard Mitigation Plan, State of Michigan MI Healthy Climate Plan, and many other Michigan cities' local climate action plans. The establishment of this CAP will enable the City of Muskegon to be eligible for funding opportunities to help implement climate action initiatives and will also contribute to regional and global efforts to reduce the severity of climate change.

CONCLUSION

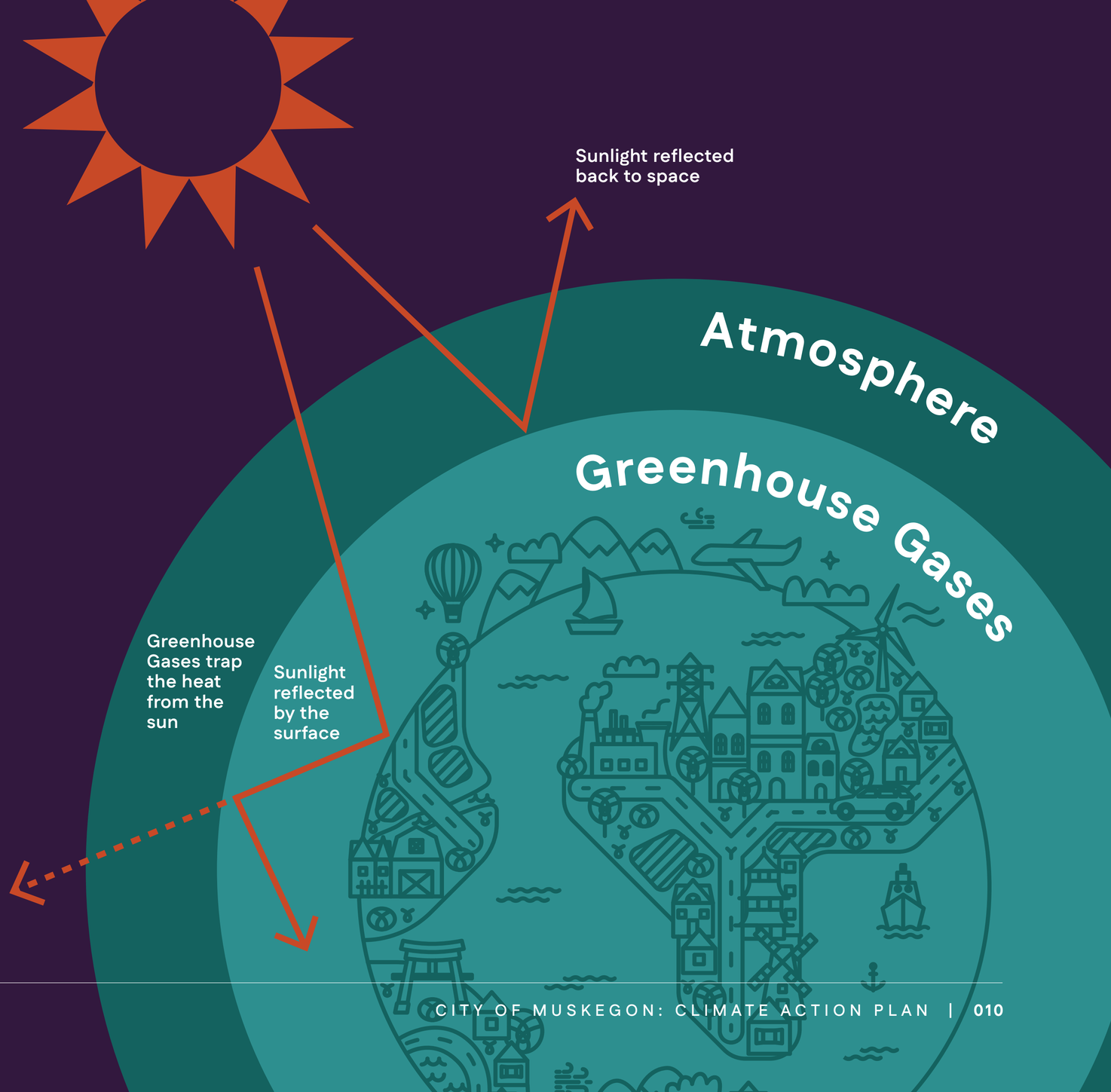
The City of Muskegon's Climate Action Plan provides a path to achieving net-zero municipal emissions by 2040 that will result in improved efficiency and resiliency of municipal operations. By aligning with regional, and state initiatives, this plan positions Muskegon to secure funding and adopt emerging solutions in sustainability. This plan is meant to be a living document, evolving to meet future challenges and opportunities.

Introduction

THE NEED FOR CLIMATE ACTION

The City of Muskegon is joining cities across the world in developing climate action plans to mitigate their contribution to global climate change. Climate change refers to long-term shifts in regional climate resulting from rising global temperatures. These changes in climate have cascading impacts on regional weather conditions, altering historic weather patterns and increasing frequency and severity of extreme weather events. This change is largely driven by human activities like burning fossil fuels, deforestation, and industrial processes that emit heat-trapping greenhouse gases (GHGs). These gases, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), trap heat from the sun and intensify the natural greenhouse effect. The increased concentrations of GHGs have accelerated temperature rises, resulting in novel changes across the Earth's atmosphere, oceans, cryosphere, and biosphere. The disruption of ecosystem health in conjunction with intensified natural disasters and extreme weather events pose significant challenges to infrastructure, public health, and economic stability.

While every city must do its part in reducing contributions to climate change, there are many benefits that climate action brings to cities. For example, improving the efficiency of municipal buildings results in a long-term reduction in taxpayer dollars required to heat and cool buildings, a more comfortable workplace for city employees, and improved indoor air quality, all in addition to reduced greenhouse gas emissions. Many of the actions in this plan also double as reducing contribution to climate change while improving resilience to extreme weather events, meaning that the City of Muskegon will be able to strengthen services provided to the community amidst extreme weather events.



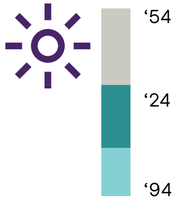
CLIMATE IN Muskegon, Michigan

The City of Muskegon, Michigan is located on the eastern shores of Lake Michigan, where the climate is heavily influenced by the lake. This phenomenon occurs as the lake acts as both a heat source and a heat sink, moderating temperatures and generating localized precipitation along the coast. As a result, Muskegon has historically experienced cold, snowy winters and mild summers.

Due to its near-shore position, the city experiences more significant cooling effects on the regional climate from Lake Michigan than more inland regions of the state. Yet, climate trends indicate that the Great Lakes regional climate is already experiencing significant variations which are disrupting this historic stabilizing effect. Since 1995, average surface water temperatures have risen across all five Great Lakes, while deep water measures of Lake Michigan also indicate significant warming trends over the last 30 years.[1] Other changes include extreme fluctuations in Great Lake water levels, including record-setting highs and periods of low water levels driven by increased evaporation rates.[2, 3] Scientists anticipate that future climate conditions will bring greater year-to-year variability in lake levels, with cycles of extreme precipitation followed by periods of drought, impacting local water supplies, shoreline infrastructure, and ecosystems.[4]

These regional changes have altered expectations for the City of Muskegon's climate and seasonal weather events.

Since 1951, the city's annual average ambient temperature has risen by 3.3°F, with winter temperatures increasing by 4.8°F over the same period.[5]



In 2024, Muskegon recorded 16 days with temperatures above 90°F, more than double the seven 90°F plus days recorded 30 years ago. Projections suggest that by 2054, the city will experience 27 days per year above 90°F.[6]

Total annual precipitation in Muskegon has increased by 20% since 1951, with a growing proportion of precipitation occurring as a heavy downpour.[7]

Over the next 30 years, an estimated 2,922 properties—representing approximately **20% of all properties in the City of Muskegon—will be at risk of flooding.**[8]

Severe storms and extreme precipitation events pose the greatest climate-related risk to the city, leading to increased flooding and infrastructure strain. Additionally, the rising frequency in drought events places added pressure on natural resources.

In summary, the climate is changing in the City of Muskegon, with rising surface temperatures, periods of both increased precipitation and drought, and more extreme weather frequency and intensity, resulting in additional pressure on associated infrastructure and negative impacts on public health. By improving resource management, reducing GHG emissions, and enhancing resiliency of infrastructure, the city is positioning itself to lead by example in protecting its citizens from the worst of extreme weather events while reducing its contribution to climate change.

BASELINE GREENHOUSE GAS EMISSIONS

A baseline GHG emissions inventory is a foundational tool for municipal climate action, enabling informed decision-making, goal setting, and measurement of progress to effectively reduce GHG emissions. To inform the development of this plan, the City of Muskegon embarked on a baseline GHG emissions inventory for fiscal year 2024. The inventory was conducted in alignment with the Local Government Operations Protocol, which provides a rulebook for the accounting of GHG emissions associated with local government operations.[9]

By Sector

The total for fiscal year 2024 local government operations GHG emissions was 8,678 metric tons of carbon dioxide equivalent (mt CO2e). As shown in Figure 1, 37% of these GHG emissions resulted from energy used in municipal buildings and facilities, followed by 36% resulting from water treatment and distribution facilities. Vehicle fleet was the third highest contributing sector at 18%, followed by streetlights at 7%, waste at 2%, and finally fugitive emissions from natural gas distribution at 1%.

By Source

Understanding GHG emissions by fuel source provides a basis from which the effectiveness of potential emissions reduction strategies can be assessed. As seen in Figure 2, electricity is the top source of GHG emissions at 63%. Electricity is primarily consumed by buildings and also by streetlights and electric vehicles. Natural gas used in municipal buildings and facilities is the second highest source of GHG emissions at 18%. The third highest source is gasoline at 12% followed by diesel at 6%, both main sources of vehicle fleet fuel, and finally waste at 2%.

*All percent values in this report are rounded to the nearest whole number.

GHG Emissions | FY 2024
Local Government Operations

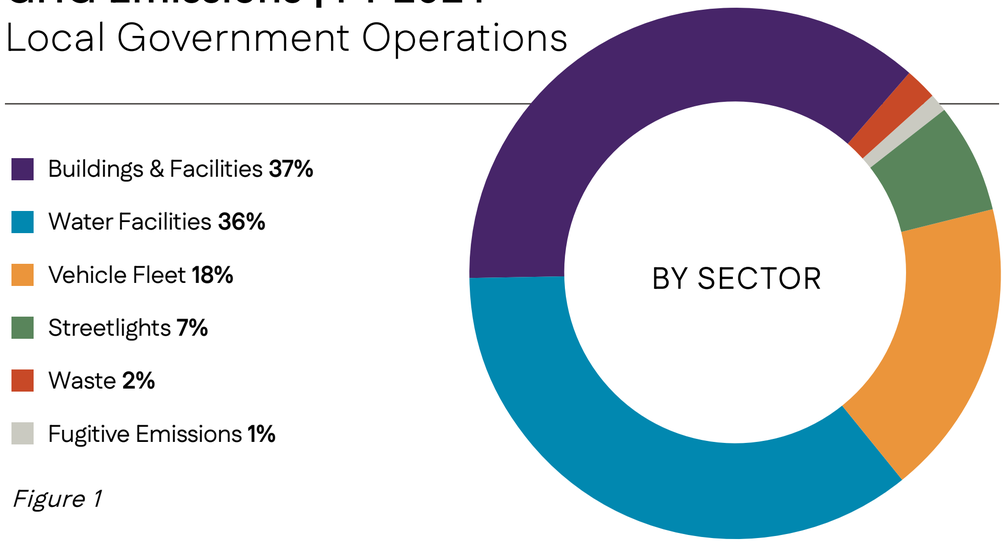


Figure 1

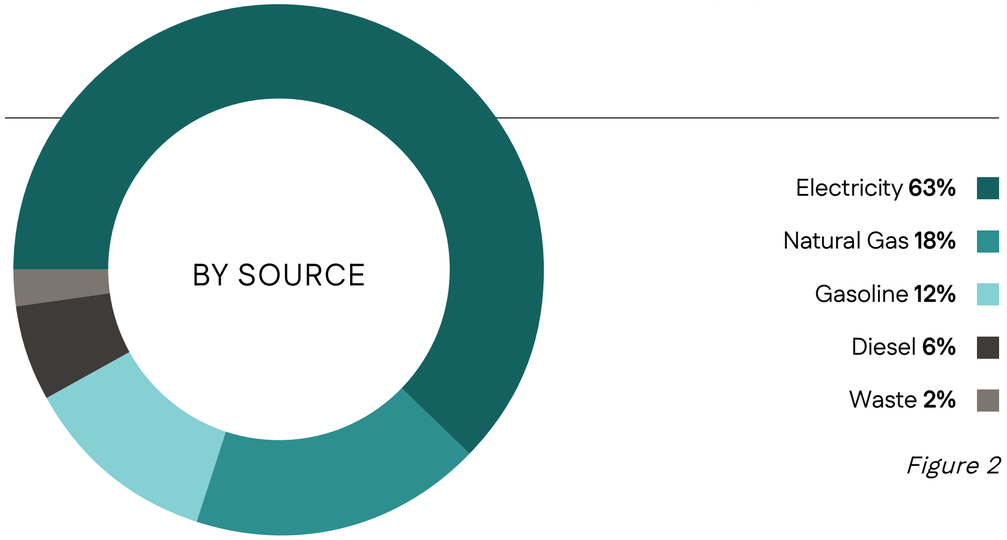


Figure 2

HOW MUCH IS A METRIC TON OF CARBON DIOXIDE EQUIVALENT?

Greenhouse gas emissions are commonly quantified in units of metric tons of carbon dioxide equivalent, which can be difficult to conceptualize, as greenhouse gas emissions are typically unseen by the eye. One metric ton is equal to 2,204.6 pounds. Physically, one metric ton of gaseous CO_2 at standard atmospheric temperature and pressure would occupy a 27ft x 27ft x 27ft cube, as visualized in Figure 3. For reference, a three-story building is approximately 27 ft tall.

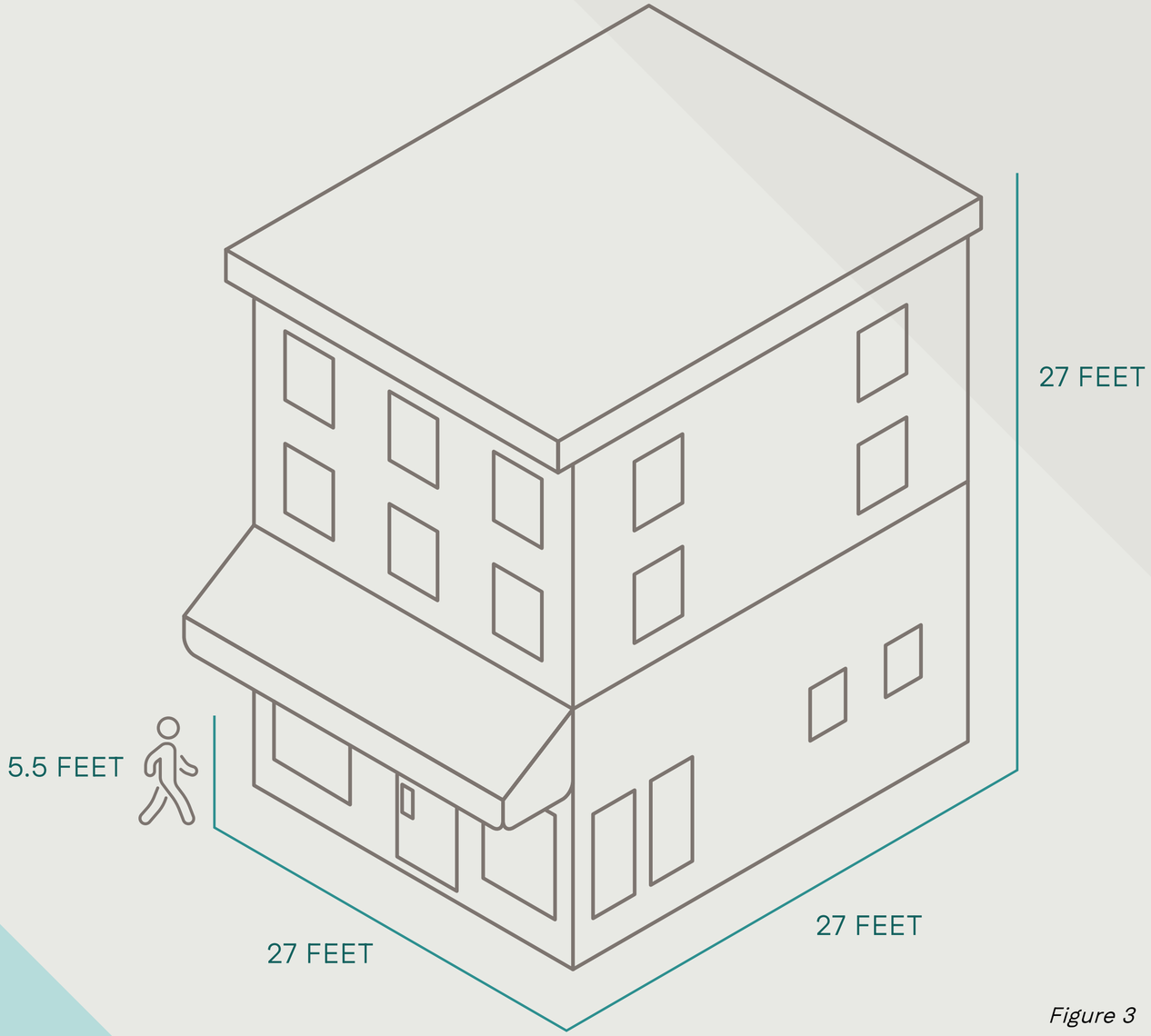


Figure 3

GETTING TO NET ZERO

To understand what the road to achieving net zero GHG emissions by 2040 will likely require, a business-as-usual (BAU) forecast was conducted using baseline GHG emissions data and expected external factors that impact the city's GHG emissions. BAU data represents expected changes in the City of Muskegon's operational GHG emissions without CAP implementation. The main factors incorporated into this forecast are changes in grid electricity carbon intensity and assumed improvements in vehicle efficiency. The assumed change in grid electricity carbon intensity is the most impactful, especially because electricity is the city's top GHG emissions source. This change is driven by Michigan Public Act 235, which mandates 50% renewable energy by 2030 and 60% by 2035.[10] For reference, the grid electricity used in the City of Muskegon contained 12% renewable energy in the baseline year.[11] It is important to note that BAU analyses are based on current knowledge, and changes to forces such as policy, technology and operations within the City of Muskegon are likely.

This CAP contains strategies that aim to reduce energy and fuel consumption, as well as the emissions intensity of the energy used, making net-zero emissions by 2040 feasible. High-impact action areas include building efficiency, electrification of buildings and fleets, and the use of renewable energy, all of which are detailed throughout this plan.

For residual GHG emissions that are difficult to eliminate by 2040, the city can pursue strategies such as procuring renewable energy credits (RECs) or offsetting emissions through carefully quantified carbon sequestration on city-owned land.

Forecasted Business as Usual GHG Emissions in MT CO_2e

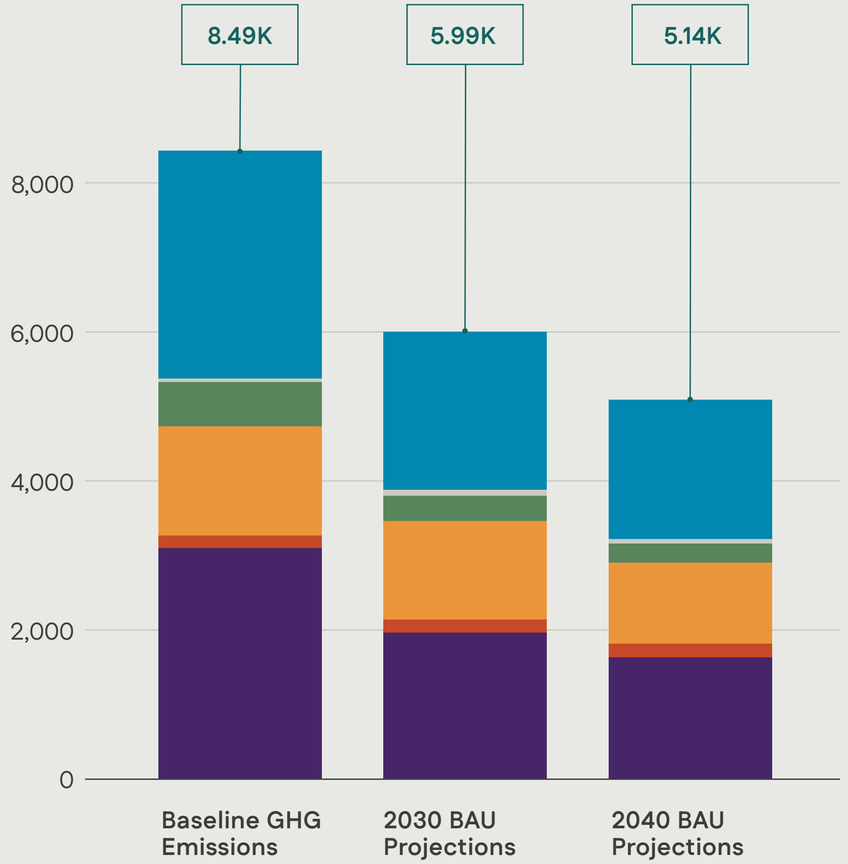


Figure 4

FOCUS AREA:

Buildings & Facilities

The Buildings and Facilities focus area addresses the operational efficiency of all municipal buildings, city-owned facilities, streetlights, park amenities, and other city infrastructure. These assets are the largest source of GHG emissions in the city's government operations inventory, making them a top priority for emissions reductions. Because of the energy demand of municipal buildings and facilities, there is also a significant opportunity for cost savings and efficiency improvements.

Enhancing the efficiency of municipal buildings and facilities has many potential co-benefits. Beyond reducing energy consumption and operational costs, these efforts will lower GHG emissions, improve indoor air quality and employee comfort, and increase the resilience of city operations during extreme weather events.

The content of this focus area also builds upon work that the City of Muskegon has already undertaken and initiated. These efforts include installing solar panels on the Trinity Health Arena, conducting energy audits in two municipal buildings, assessing the water treatment plan, and issuing a request for qualifications for an energy performance contract to evaluate and improve the Department of Public Works' Public Service Building.

01

BASELINE GHG EMISSIONS

This focus area covers all building, lighting, and facility-related GHG emissions sources in the City of Muskegon's GHG inventory, as shown in Figure 5. Water facilities include the Water Filtration Plant, booster stations, and water pumps. Buildings and facilities include all other municipal buildings and facilities, such as main buildings like City Hall, fire stations, and park facilities. The streetlights emissions sector represents electricity meters that are used for lighting only, and fugitive emissions accounts for fugitive emissions from natural gas distribution.

Building, Lighting, and Facility-related GHG Emissions Sources for FY 2024

in MT CO_2e

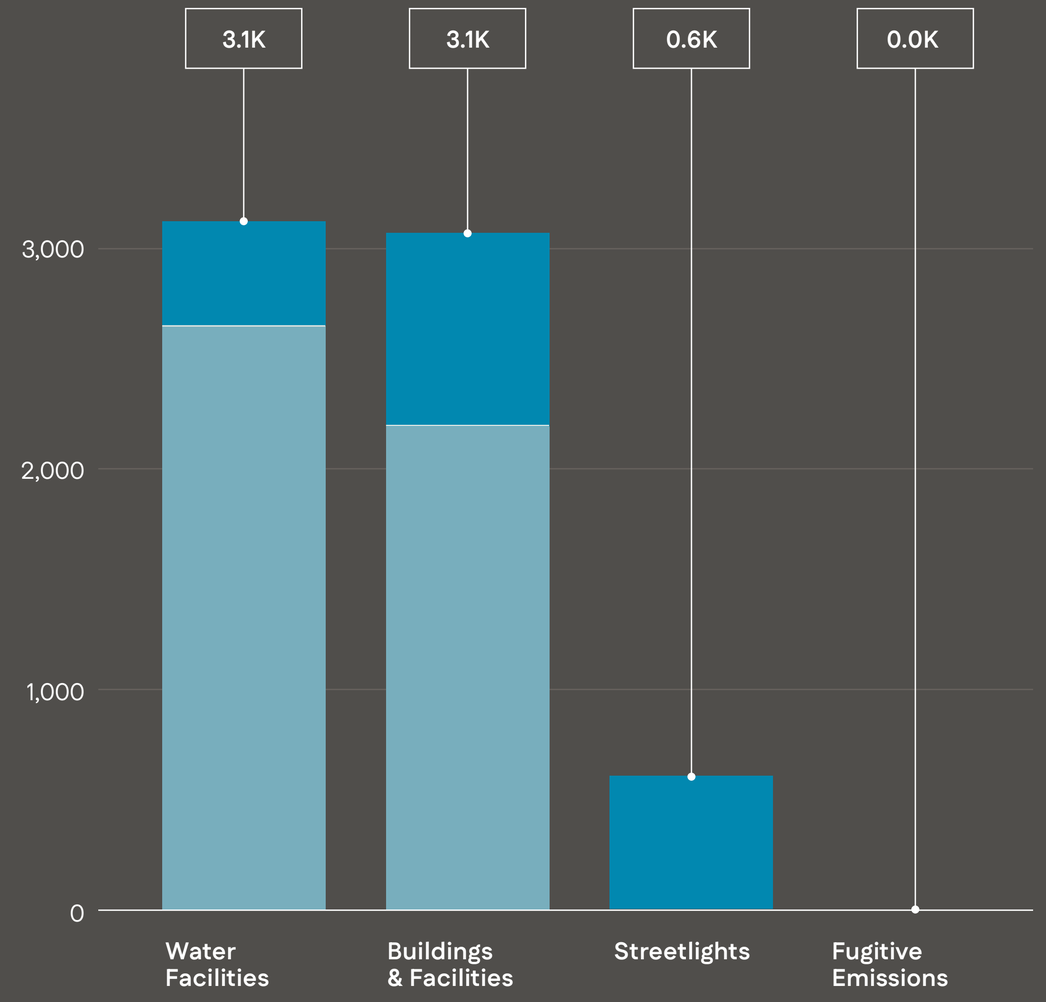


Figure 5

OBJECTIVES

The objectives and actions in this focus area create a clear roadmap toward net-zero municipal buildings. By beginning with energy performance assessments, implementing efficiency upgrades, and ultimately maximizing renewable energy use, the city can achieve quick, cost-effective improvements in the short term while strategically building toward net-zero municipal buildings and facilities by 2040.

This focus area includes four objectives:

B1: **Assess the energy performance of city facilities**

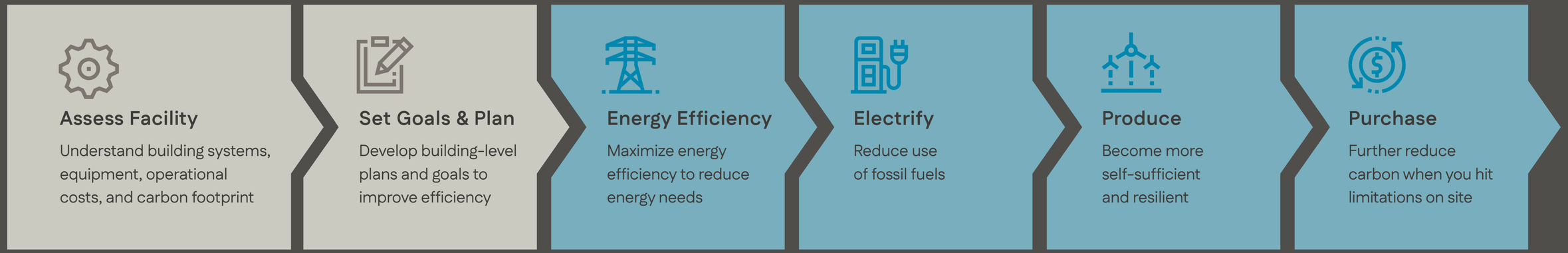
B2: **Reduce energy consumption by city facilities**

B3: **Reduce water consumption by city facilities**

B4: **Maximize renewable energy utilized to power city facilities**

Path to Net Zero Buildings Framework

Figure 6



ACTIONS

B1: Assess the energy performance of city facilities

A baseline assessment of buildings and facilities is essential for effectively and efficiently reducing energy consumption. This objective focuses on establishing systems to consistently monitor and analyze energy use across municipal buildings, as well as conducting comprehensive energy audits that can guide the prioritization of building improvements. These audits typically evaluate equipment performance, building envelopes, and occupant behaviors that impact energy consumption. By leveraging this data, the city can identify low-cost, low-effort opportunities that serve as effective first steps in the building decarbonization process.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
B1.1	Complete energy audits in all city buildings	Short term	
B1.2	Develop a systematic approach to collecting and tracking monthly energy consumption and cost data for all city buildings	Short term	
B1.3	Collect building information necessary to benchmark buildings in Portfolio Manager by ENERGYSTAR such as square footage, age, and occupancy	Short term	
B1.4	Annually benchmark all facilities in ENERGY STAR Portfolio Manager	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

B2: Reduce energy consumption from city facilities

Building on the assessments completed in objective B1, this objective focuses on implementing actions to reduce energy consumption across municipal facilities. Energy efficiency improvements will be guided by energy audit findings and will include upgrading building equipment and optimizing building envelopes for maximum efficiency. Additionally, this objective establishes a framework to ensure that energy efficiency remains a priority when the city purchases new equipment or constructs new buildings and facilities. Finally, passive design strategies, such as strategic placement of blinds, reflective roof coatings, and landscaping, along with the potential integration of green roofs, will further reduce energy consumption while providing valuable environmental co-benefits.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
B2.1	Upgrade all city lighting to most efficient LEDs	Short term	
B2.2	Utilize smart building controls in all appropriate city buildings	Short term	
B2.3	Ensure the energy efficiency of building equipment through incorporating efficiency-enhancing technologies	Short term	
B2.4	Optimize building envelopes to ensure efficient windows, air sealing, and insulation; as informed by building audits	Medium term	
B2.5	Develop a system for replacing building equipment and components with most efficient available models when repairs or replacements are needed	Medium term	
B2.6	Proceduralize the review of new construction and renovation projects to incorporate measures to ensure alignment with CAP goals	Medium term	
B2.7	Utilize passive design strategies to reduce energy demand	Short term	
B2.8	Explore installation of green roofs on city buildings	Medium term	
B2.9	Improve efficiency of water filtration plant	Long term	
B2.10	Encourage energy-efficiency behaviors from city staff and building occupants	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

B3: Reduce water consumption from city facilities

This objective is an important component of sustainable buildings and facilities. By improving the efficiency of the water that is used, the city can reduce utility costs while improving stewardship of natural resources. This objective includes actions to upgrade equipment to enhance water efficiency, systems to detect leaks and monitor water consumption, optimization of outdoor water use, and finally encouragement of water-saving behaviors among employees and building occupants to foster a culture of conservation.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
B3.1	Upgrade faucets and toilets to low-flow options	Short term	
B3.2	Consider water efficiency in replacements of water-using equipment	Short term	
B3.3	Develop a system for monitoring municipal water consumption and detecting potential leaks	Medium term	
B3.4	Use weather-based smart irrigation controls on irrigated city property	Short term	
B3.5	Utilize passive rainwater management strategies	Medium term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

B4: Maximize renewable energy utilized to power city facilities

Previous objectives in this focus area have aimed to improve energy efficiency in city facilities and transition from fossil fuel-powered equipment to electric alternatives. Achieving net zero GHG emissions will also require sourcing electricity from low-carbon, renewable sources. There are multiple pathways for increasing the share of renewable energy powering city operations, each contributing to greater energy resilience, improved air quality, and long-term cost savings. This objective also includes actions to install back-up energy storage systems, further improving resilience of city facilities, and the exploration of using local organic matter as an energy source at city facilities.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
B4.1	Assess city facilities for solar potential and install solar on appropriate buildings	Medium term	
B4.2	Utilize Power Purchase Agreements (PPAs) or Renewable Energy Credits (RECs) to meet net-zero GHG emissions if necessary	Long term	
B4.3	Showcase use of renewable energy and long-term cost and GHG emissions reductions at city facilities	Short term	
B4.4	Install backup energy storage systems at facilities that produce on-site renewable energy	Medium term	
B4.5	Explore collection of leaves and other organic material for energy use at city facilities	Medium term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

FOCUS AREA:

Vehicles

The Vehicles focus area aims to improve the efficiency and sustainability of vehicles and equipment owned and operated by the City of Muskegon. This includes on-road and off-road vehicles such as police cruisers, emergency response vehicles, lawn maintenance equipment, and service trucks used in day-to-day operations. By prioritizing improvements in vehicle performance and fuel efficiency, the city can reduce greenhouse gas emissions, lower long-term operating costs, and extend the lifespan of its fleet, all while continuing to deliver high-quality services to residents and maintain city infrastructure.

02

BASELINE GHG EMISSIONS

This focus area covers all building, lighting, and facility-related GHG emissions sources in the City of Muskegon's GHG inventory, as shown in Figure 4. Water facilities include the Water Filtration Plant, booster stations, and water pumps. Buildings and facilities include all other municipal buildings and facilities, such as main buildings like City Hall, fire stations, and park facilities. The streetlights emissions sector represents electricity meters that are used for lighting only, and fugitive emissions accounts for fugitive emissions from natural gas distribution.

Vehicle Fleet GHG Emissions by Fuel Type for FY 2024

in MT CO_2e

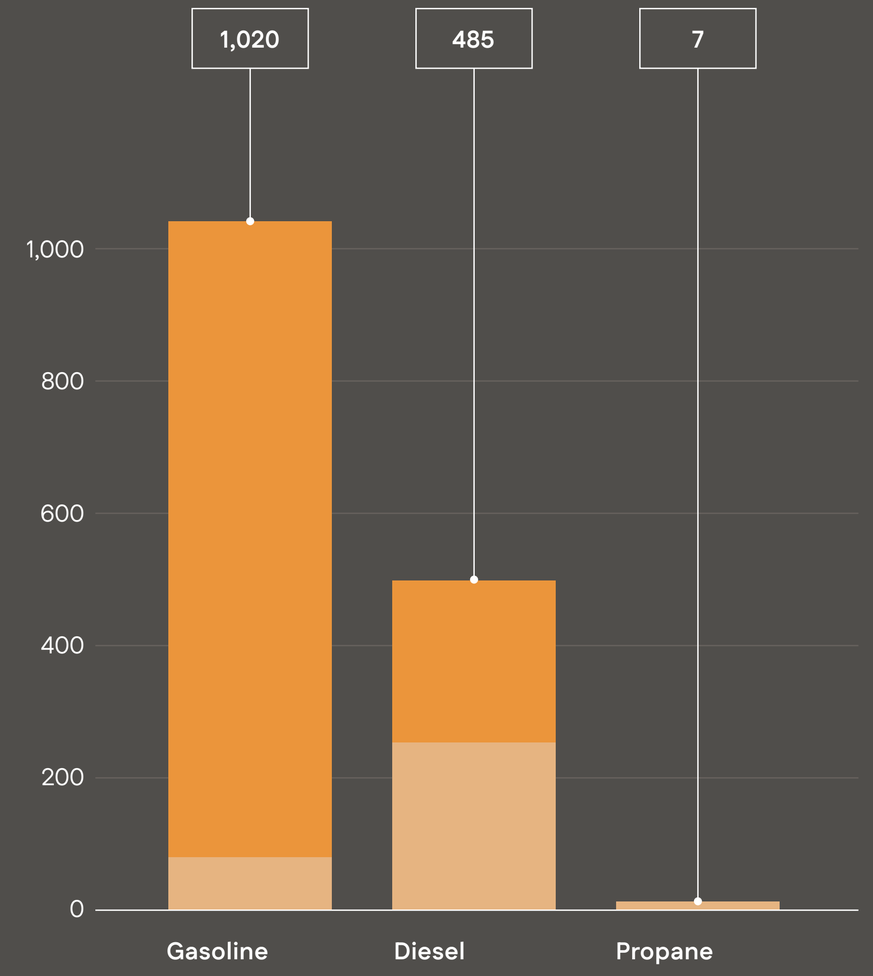


Figure 7

OBJECTIVES

This focus area includes three objectives:

V1: **Improve operational efficiency of city vehicle fleet**

V2: **Transition fleet vehicles and equipment to the most efficient models**

V3: **Enhance Muskegon's appeal as a place for city employees to live and thrive**

Efforts in this focus area will include upgrading to more efficient and cleaner technologies while also improving the way that the city manages and uses its fleet. This includes initiatives such as reducing vehicle idling and right-sizing the fleet. Additionally, investing in low-emission vehicles and equipment demonstrates environmental leadership while taking essential steps toward net zero municipal operations. The City of Muskegon has already begun efforts to improve fleet efficiency and build the infrastructure for electric vehicles. Electric side-by-side vehicles have been purchased utilizing grant funding, and three electrical vehicle charging stations are provided by the city in the Muskegon community. Additionally, the City of Muskegon has continuously improved the bike trail network, allowing both city employees and community members added flexibility in transportation and recreation opportunities.

ACTIONS

V1: Improve operational efficiency of city vehicle fleet

This objective focuses on optimizing the performance of the municipal fleet through data-driven decision-making and improved fleet management systems. Right-sizing of the fleet, which includes ensuring that the city has the appropriate number and type of vehicles and equipment, is often an effective way for municipal vehicle fleets to improve efficiency and reduce fuel and maintenance costs. This focus area also includes an action to prioritize the use of the most efficient vehicles for daily operations, maximizing the efficiency of every mile driven. For high-emissions vehicles that may not be viable to replace in the near term, this objective calls for exploring lower-emissions fuel alternatives such as renewable diesel, which reduce emissions without requiring engine modifications.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
V1.1	Develop a system to accurately track vehicle mileage data	Short term	
V1.2	Systematically monitor and minimize idling in non-emergency vehicles	Medium term	
V1.3	Establish a system to monitor and adjust fleet size for maximum efficiency	Short term	
V1.4	Prioritize the use of the most efficient fleet vehicles for the purpose needed	Short term	
V1.5	Utilize fleet management software to monitor costs and savings of fleet improvements	Medium term	
V1.6	Explore alternative fuel options for high emission diesel-using vehicles that the city does not plan to replace in the near-term	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

V2: Transition fleet vehicles and equipment to the most efficient models

This objective includes upgrading fleet vehicles and equipment to maximize efficiency of the models purchased while minimizing long-term total costs. Though initial costs are often higher for the most efficient vehicle options, in the long-term, differences in maintenance and fuel costs often result in overall savings for the lifetime of the vehicle. Tools such as the U.S. Department of Energy's Vehicle Cost Calculator allow cities to input specific operational data to estimate the full lifetime cost of different vehicle options, helping to guide financially and environmentally sound purchasing decisions.[12] See Figure 1 for an example analysis of total cost of ownership and emissions reductions for select vehicles in the City of Muskegon's fleet.

Across the country, cities are already seeing tangible benefits from transitioning to more efficient fleets. For example, the City of Chula Vista, California, reported a 75% reduction in fuel costs and an 80% decrease in overall cost per mile after converting conventional vehicles to electric models. These upgrades also yielded an 80% reduction in greenhouse gas emissions compared to their gasoline-powered predecessors.[13] Implementation of this objective will require strategic planning for replacing vehicles when they are at their end of life and phasing in efficient replacements in alignment with the 2040 goals set forth in this plan.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
V2.1	Conduct a Total Cost of Ownership analysis for fleet vehicles to determine highest cost savings opportunities in city vehicle purchases	Short term	
V2.2	Transition lawn care equipment and off-road vehicles to non-fossil fuel options	Short term	
V2.3	Purchase electric bicycles for employees to use for short-distance trips during work shifts	Short term / Medium term	
V2.4	Increase availability of EV chargers to meet necessary demand for powering vehicle fleet	Short term	
V2.5	Develop a system to identify electric, hybrid, or other renewable-using market ready vehicles options that may serve as a replacement for current fleet vehicles	Medium term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

V3: Enhance Muskegon's appeal as a place for city employees to live and thrive

The City of Muskegon values supporting city employees in living within city limits. Employees who live in Muskegon will have shorter commutes than employees who commute from outside of city limits, resulting in lower emissions from vehicle travel. Additionally, over time, options for commuting such as biking, walking, and riding transit will be increasingly available, and especially accessible for those who live in the City of Muskegon. This objective also explores options such as teleworking, carpooling, and functional bike storage for cities.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
V3.1	Collaborate with the County to expand public transit options with incentives for use by city employees	Long term	
V3.2	Provide incentives to employees who walk, bike, carpool, or utilize public transit for commuting	Medium term	
V3.3	Provide secure, functional, and shaded bike storage options	Short term	
V3.4	Offer incentives to employees who live in the City of Muskegon	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

CASE STUDY

Cost and emissions reductions for electrification of vehicles

GHG emissions reductions from potential vehicle replacements in the City of Muskegon's fleet were modeled using the U.S. Department of Energy's Total Cost of Ownership Vehicle Calculator. As shown in Figure 8, replacing the city's Chevrolet Impalas with Chevrolet Bolts could result in an estimated 60% reduction in emissions, equivalent to approximately 3.6 metric tons of CO_2e per vehicle annually, based on current fuel usage of 550 gallons of gasoline per year. Figure 9 illustrates that replacing the city's Ford pick-up trucks with the Ford F-150 Lightning could reduce GHG emissions by 60%, or about 6 metric tons of CO_2e per vehicle annually, based on a current fuel consumption of 907 gallons per year.

These modeled emissions reductions do not account for any additional renewable energy the City of Muskegon may add to its electricity supply.

Hybrid and electric vehicles are also projected to have lower lifetime costs than internal combustion engine vehicles, due to reduced fuel and maintenance expenses. The extent of potential cost savings for the City of Muskegon will depend on the specific pricing available to the city for each vehicle model.

Figure 8

	Gasoline	Hybrid	Electric
			
Current 2008 Chevrolet Impala Replacements: **Estimated Annual GHG Addition / Reduction** assuming 550 gallons gasoline per year or equivalent	2023 Chevrolet Malibu	2025 Toyota Camry HEV AWD LE	2023 Chevrolet Bolt EUV
	6.0 MT CO_2e	(2.6 MT CO_2e)	(3.6 MT CO_2e)
	0%	44% GHG Reduction	**60% GHG Reduction**

Figure 9

Current Ford Pickup Replacements: **Estimated Annual GHG Addition / Reduction** assuming 907 gallons gasoline per year or equivalent	2024 Ford F-150 Pickup 2WD	2024 Ford F-150 Pickup 4WD HEV	2024 Ford F-150 Lightning 4WD
	9.9 MT CO_2e	(3.6 MT CO_2e)	(6.0 MT CO_2e)
	0%	24% GHG Reduction	**60% GHG Reduction**

FOCUS AREA:

Waste

The waste focus area includes initiatives to minimize the amount of waste landfilled as a result of municipal operations and events hosted by the city. Though waste generated from municipal facilities only makes up around 2% of municipal GHG emissions, it is an important component of resource stewardship of the city. Actions in this focus area have the potential to both reduce the amount of waste sent to landfills and to reduce the quantity of supplies purchased by the city, resulting in cost savings.

03

OBJECTIVES

This focus area includes the following objectives:

W1: **Reduce landfill waste from city facilities**

W2: **Reduce landfill waste from events hosted by the city or at city facilities**

A waste audit conducted as a part of the city's GHG inventory identified opportunity for diverting recyclable waste from the landfill. The City of Muskegon already collects recycling at municipal facilities, so this focus area includes initiatives to ensure that recyclable materials are properly placed in recycling bins and that the systems in place to collect recyclable materials are being utilized.

For events hosted by the city, this focus area includes actions to reduce waste through increased recycling and eventually compost collection, along with collaboration with event vendors to reduce the quantity of waste landfilled from events long-term.

Along with recycling collection, the City of Muskegon has already taken steps to reduce waste by providing water bottle fill stations for city employees and through the development of a Surplus Properties Policy, which provides guidance for reusing, recycling, selling, or otherwise disposing of unwanted property. This policy promotes the thoughtful transfer of property and encourages reuse or recycling when possible.

ACTIONS

W1: Reduce landfill waste from city facilities

This objective includes actions that encourage waste diversion from the landfill, such as providing individual recycling bins for employees, employee education, and clear signage to encourage recycling. The piloting of a municipal compost program is also included as an action under this objective and would provide an opportunity for the conversion of food waste from municipal facilities into nutrient dense compost that can be used in city gardens. Finally, this objective includes long-term actions to replace disposable dishes with reusables at city staff and commission events, and to consider waste generation when making purchasing decisions.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
W1.1	Periodically audit the quantity and composition of waste generated by municipal facilities	Short term	
W1.2	Include waste diversion options and standards in new employee orientation	Short term	
W1.3	Develop waste diversion training materials for existing city employees	Short term	
W1.4	Provide recycling bins at each employee's workstation	Short term	
W1.5	Pair placement of trashcans with clearly labeled recycling bins	Short term	
W1.6	Collect compost at city facilities	Medium term	
W1.7	Establish a process to use reusable dishes and utensils at city staff and commission/council events	Long term	
W1.8	Consider waste generation in city purchasing choices; for example, prioritize use of reusable products, and ensure recyclability/compostability of disposables	Long term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

W2: Reduce landfill waste from events hosted by the city or at city facilities

The City of Muskegon is well positioned to expand their waste reduction efforts to community events that are hosted by the city or at city facilities, such as the Arena. Currently, aluminum cans are separated from waste at events. This objective includes actions to provide ample opportunities for waste diversion and educate and promote the opportunities provided to event attendees. Event-scale waste diversion efforts can require additional staff capacity and planning but have a high potential for landfill waste diversion.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
W2.1	Develop a model for event waste minimization	Medium term	
W2.2	Provide ample recycling bins throughout event spaces	Short term	
W2.3	Build capacity to collect and manage compost at events	Long term	
W2.4	Develop standards and incentives for recycling and waste minimization at Farmers Market	Long term	
W2.5	Work with event vendors to minimize unnecessary consumption and waste	Long term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

FOCUS AREA:

Land Use & Resiliency

The Land Use and Resiliency focus area supports the City of Muskegon's efforts to protect natural resources and reduce climate-related risks to municipal operations. This approach utilizes nature-based solutions, which are actions that restore, protect, and manage natural systems while also addressing multiple community needs. In cities, these solutions often include green infrastructure to manage stormwater, planting vegetation to reduce building energy use, and installing native gardens that support ecosystems and improve air quality.

The City of Muskegon currently manages a large portfolio of public land, including approximately 1,200 acres of parks and green space comprised of 40 parks, which include 28 neighborhood parks and 12 community parks. This substantial land base provides a strong foundation for contributing meaningfully to GHG emissions reduction goals, advancing local ecosystem health, and strengthening resilience to climate-related risks. City-owned land sequesters an estimated 1,028 metric tons of carbon dioxide per year, which is equivalent to 12% of the City of Muskegon's baseline GHG emissions. This focus area includes strategies to enhance the potential of city-owned land to sequester carbon, while strategically using landscaping strategies to reduce energy needs of municipal buildings.
Co-benefits of the initiatives in this focus area also include reduction in infrastructure maintenance costs, stabilization of long-term budgets, increase in property values and tax revenues, and green job development in alignment with state public health and environmental priorities.

04

OBJECTIVES

This focus area is structured around four key objectives:

LR1: **Increase the carbon sequestration potential of city-owned lands**

LR2: **Strengthen the climate resilience of city-owned landscapes**

LR3: **Integrate climate risk into city land use planning and development decisions**

LR4: **Improve operational resilience across government functions in response to climate change**

Early actions will focus on land care practices that support biodiversity and identify vulnerabilities, such as flood-prone areas. Matching these areas with nature-based solutions - for example, planting native vegetation to absorb stormwater or adding green roofs to reduce heat - will enable the city to manage long-term climate challenges more effectively.

This work builds on several existing city-led initiatives, including the development of a citywide stormwater infrastructure standard, a wildlife corridor study, efforts to expand the urban tree canopy, a tree inventory and the 2023 Master Land Use Plan, which provides forward-looking guidance for natural resource protection and climate adaptation.

As communities across the U.S. advance their climate resiliency efforts, strategies such as native species landscaping, reconnecting natural habitats, expanding green infrastructure, and improving equitable access to nature are becoming increasingly important priorities. The City of Muskegon is well-positioned to lead by example. Through thoughtful, ecologically informed land management, the city can realize long-term cost savings, advance environmental outcomes aligned with its resiliency goals and contribute meaningfully to Michigan's broader carbon reduction targets.

ACTIONS

LR1: Increase carbon sequestration potential of city-owned lands

Enhancing the carbon sequestration potential – the amount of carbon captured and stored by vegetation– of city-owned land presents an opportunity to align land management practices with broader state climate goals. This objective provides actions to build upon the city's land management techniques to improve species diversity and benefit the local ecosystem and overall resiliency of the city's natural resources, all while increasing the quantity of carbon sequestered by public lands. Actionable steps include expanding native tree and shrub planting efforts, adapting no-mow landscaping strategies, and prioritizing land management approaches that build healthy soils. These efforts help the city meet state-level climate targets while also improving biodiversity and neighborhood livability.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
LR1.1	Consider species diversity and carbon sequestration potential in tree replacement and planting	Short term	
LR1.2	Explore opportunities to allocate land for ecological conservation and easements	Long term	
LR1.3	Consider opportunities to transition mowed spaces to natural landscapes	Medium term	
LR1.4	Review city-owned parks for opportunities to prioritize the integration of nature-based solutions	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

LR2: Strengthen the climate resilience of city-owned landscapes

Improving the resiliency of city-owned land enhances the ability of cities to manage flooding, heat, and other climate and extreme weather-related impacts. This objective supports actions such as updating park and garden landscapes to use stormwater-absorbing vegetation, identifying areas where habitat restoration would improve ecosystem function and improve stormwater management, and aligning publicly owned land with climate and natural resource goals. These initiatives also offer many co-benefits, such as creating more inviting and accessible public spaces for residents to enjoy.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
LR2.1	Expand the integration of native and adapted plant/shrub species in landscaping of city owned parks and gardens	Short term	
LR2.2	Review city landscaping for alignment with the Stormwater Management Standards	Long term	
LR2.3	Incorporate habitat restoration and protection strategies into land-management projects	Medium term	
LR2.4	Review city green spaces and vacant land to align with 2023 Master Land Use Plan, Section C: Natural Features & Climate Resiliency	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

LR3: Integrate climate risk into city land use planning and development decisions

Integrating climate risk into everyday decision-making is essential to ensuring the long-term sustainability of public investments. This objective establishes a framework for the city to embed climate risk assessments into planning and development processes, while also training staff in resilient landscape management practices such as green infrastructure and watershed-scale strategies in collaboration with local experts. Pilot projects, like alternative de-icing methods or integrated pest management, can serve as testing grounds for innovative solutions. By sharing lessons learned across departments, the City of Muskegon can strengthen organizational capacity and foster more sustainable practices in the community.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
LR3.1	Incorporate climate risk assessments into development decisions	Medium term	
LR3.2	Host staff training program for relevant city staff on resilient land management practices	Medium term	
LR3.3	Promote and share the techniques used by the city to enhance landscape resiliency	Medium term	
LR3.4	Explore alternative de-icing solutions	Medium term	
LR3.5	Adopt cost effective integrated pest management (IPM) protocols to effectively reduce pesticide use in city-owned property	Medium term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

LR4: Improve operational resilience across government functions in response to climate change

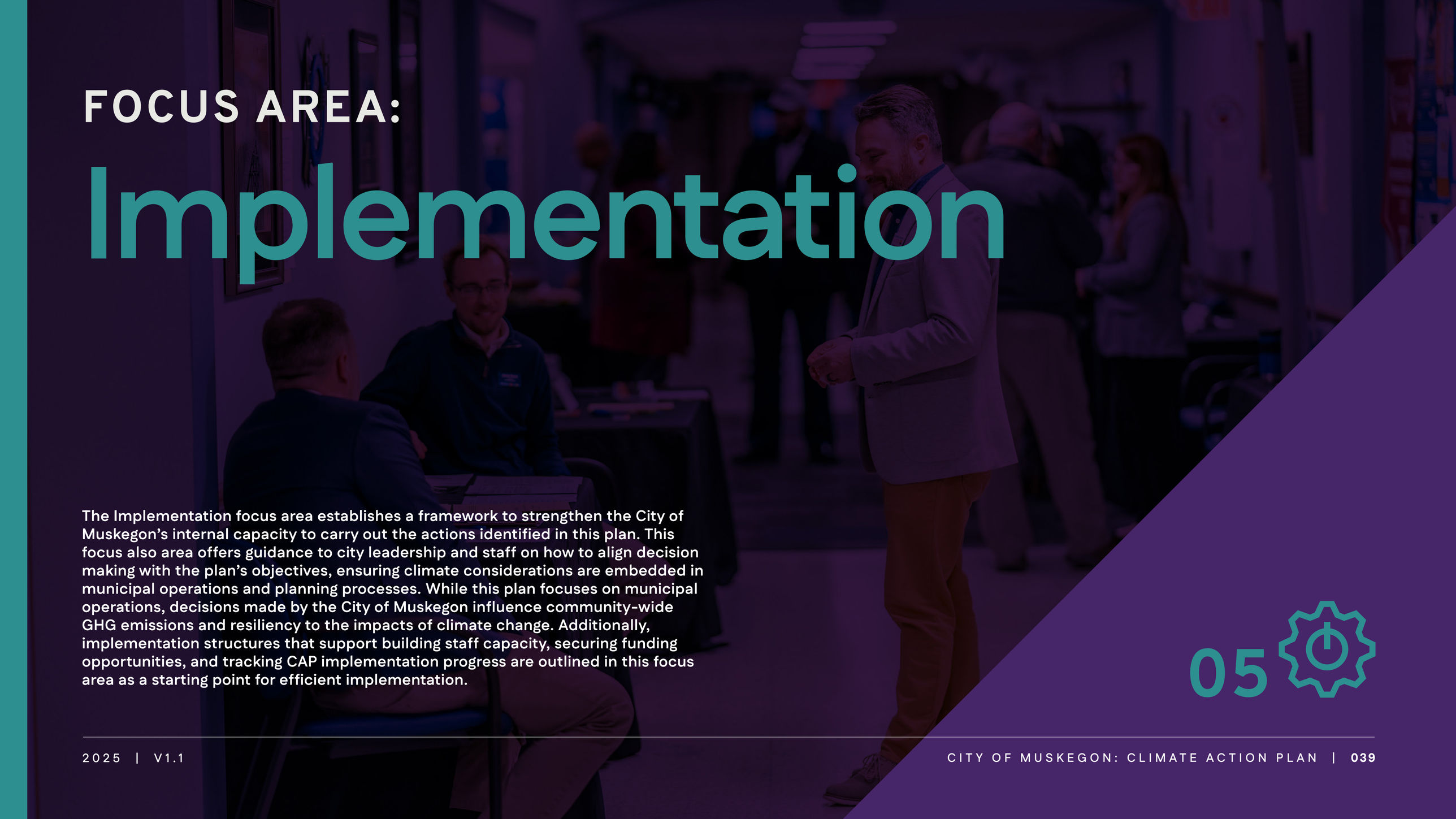
Improving the resilience of government operations is important for maintaining essential services and protecting community well-being in the face of climate change. This objective promotes identifying vulnerable infrastructure and operations, such as low-lying roads or energy-dependent facilities, and preparing hazard mitigation and emergency response plans accordingly. Additional actions include development of community response centers that provide shelter during extreme weather events, incorporating resiliency into decisions regarding municipal buildings and capital improvement projects, and working with neighboring jurisdictions to share resources during emergencies.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
LR4.1	Identify locations and processes within city operations that are most vulnerable to extreme weather events	Short term	
LR4.2	Develop building and site-specific hazard mitigation plans	Medium term	
LR4.3	Develop emergency response plans for all relevant extreme weather	Medium term	
LR4.4	Offer emergency response training to city employees	Medium term	
LR4.5	Ensure that community resilience centers meet community need, are physically accessible, and are stocked with essential materials	Short term	
LR4.6	Consider resilience opportunities in building renovations, new buildings, and other capital improvement projects	Short term	
LR4.7	Partner with local organizations and jurisdictions to share resources and increase capacity to respond to events	Short term	
LR4.8	Explore the integration of climate change impact modeling into water source security assessment protocols	Medium term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

FOCUS AREA:

Implementation



The Implementation focus area establishes a framework to strengthen the City of Muskegon's internal capacity to carry out the actions identified in this plan. This focus also area offers guidance to city leadership and staff on how to align decision making with the plan's objectives, ensuring climate considerations are embedded in municipal operations and planning processes. While this plan focuses on municipal operations, decisions made by the City of Muskegon influence community-wide GHG emissions and resiliency to the impacts of climate change. Additionally, implementation structures that support building staff capacity, securing funding opportunities, and tracking CAP implementation progress are outlined in this focus area as a starting point for efficient implementation.

05

OBJECTIVES

This focus area contains five objectives:

I1: **Leverage funding for CAP actions**

I2: **Build city staff capacity for CAP implementation**

I3: **Monitor and evaluate progression of CAP implementation**

I4: **Integrate CAP priorities into city operations and procurement**

I5: **Integrate climate considerations into the development, review, and implementation of new city plans, policies, and decisions**

Each of these objectives provide structure for implementing the CAP and capturing opportunities to advance climate action in the City of Muskegon.

ACTIONS

I1: Leverage funding for CAP actions

While low and no cost CAP actions are detailed throughout this plan, many high-impact actions that require infrastructure or equipment upgrades can be costly. Staying informed about current funding opportunities and building the capacity to successfully apply for and manage them is essential for effective CAP implementation, especially given the ever-evolving funding landscape. This objective also establishes a framework for identifying funding needs for priority actions, aligning the city's budget process with CAP goals, and creating systems to track implementation progress and cost savings over time.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
I1.1	Develop a system to review incoming funding opportunities, including incentives, for CAP actions	Short term	
I1.2	Incorporate alignment with/contribution to the CAP's implementation in the city budget process	Medium term	
I1.3	Identify funding opportunities and needs for priority CAP actions	Short term	
I1.4	Develop a system to track operational expenses that have been reduced through CAP actions to promote further action	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

I2: Build city staff capacity for CAP implementation

Staff capacity limitations are often a main obstacle for cities in CAP implementation. This objective includes actions to strategically leverage and build staff's ability to implement this plan. This includes participation in free technical assistance programs and hiring interns through funded programs. This objective also calls for the addition of a dedicated sustainability staff person, the formal organization of interdepartmental teams of staff to implement CAP actions, and the expansion of staff knowledge through professional development.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
I2.1	Seek opportunities to take advantage of free technical assistance programs	Short term	
I2.2	Utilize programs that fund interns to build capacity for appropriate CAP implementation projects	Short term	
I2.3	Hire a dedicated sustainability staff person with a focus on improving efficiency of operations	Short term	
I2.4	Develop interdepartmental city staff CAP teams to collaborate in implementation of CAP actions	Short term	
I2.5	Encourage and support sustainability-related professional development for city staff	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

I3: Monitor and evaluate progression of CAP implementation

This objective provides a framework for tracking progress of CAP implementation, including annual GHG inventories, CAP reports, and resources for staff and the community to understand progress made. The tracking of Key Performance Indicators (KPIs) over time provides insights into where progress is being made and where efforts are needed to stay on track to reach long-term goals. Consistent evaluation of progress also provides insights into energy and cost savings, emissions avoided, and other co-benefits of CAP implementation, establishing a clear understanding of the financial and environmental benefits of this work and the opportunity to celebrate wins.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
I3.1	Determine key performance indicators that will be tracked annually	Short term	
I3.2	Conduct an annual municipal greenhouse gas emissions inventory	Short term	
I3.3	Produce an annual report detailing CAP implementation progress and GHG emissions changes	Short term	
I3.4	Designate a webpage and/or website for residents to access the CAP, reports, and related resources	Short term	
I3.5	Develop an annual review of CAP strategies and actions to determine progress from the previous year and identify priorities for the upcoming year	Short term	
I3.6	Recommend CAP activities and achievements to the larger community	Medium term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

I4: Integrate CAP priorities into city operations and procurement

This objective includes opportunities for embedding climate action into the city's day-to-day operations and procurement practices. By considering contractor sustainability, the city can further incorporate climate action into projects that are contracted out. Additionally, city staff have many opportunities to contribute to the initiatives in this plan, so this objective calls for the formal organization of staff communication. Finally, by providing GHG emissions data and CAP KPI's to department leaders, the city can further integrate CAP priorities across departments.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
I4.1	Include consideration of contractor sustainability efforts in bidding process	Medium term	
I4.2	Compile opportunities and expectations for city staff to contribute to CAP implementation into one document or webpage	Medium term	
I4.3	Provide department-level GHG emissions data and other relevant KPIs to department leaders on an annual basis	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

ACTIONS

I5: Integrate climate considerations into the development, review, and implementation of new city plans, policies, and decisions

This objective focuses on the City of Muskegon's decision-making processes that shape community sustainability. Land use, development, and zoning decisions play an important role in influencing community-wide GHG emissions and overall resilience. For example, encouraging mixed-use development can reduce transportation-related GHG emissions and enhance access to low-carbon transportation options such as walking, biking, and use of transit. City decisions also affect urban heat. Through intentional design, increased vegetation, and the use of reflective materials, some of this heat can be mitigated. In conclusion, by applying the principles outlined in this plan, the City of Muskegon's leaders can help ensure that the benefits of climate action are shared across the community.

I.D.	ACTION DESCRIPTION	TIMELINE	ATTRIBUTES
I5.1	Consider community energy, transportation, and ecosystem needs and impacts when making zoning and development decisions	Short term	
I5.2	Ensure diverse engagement in decisions that impact the community, prioritizing those most adversely impacted by climate change	Short term	
I5.3	Seek opportunities to encourage renewable energy development, electric vehicle infrastructure, and electrification for new development in the community	Short term	
I5.4	Seek opportunities to improve low-carbon transportation options in the community (i.e. during street renovation or other development projects)	Short term	
I5.5	Establish a process for reviewing new city plans and policies to consider climate impact	Short term	

= Low or no cost | = Savings potential | = Funding opportunities available | = Priority | = High GHG reduction potential

Appendices

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DESCRIPTION & DETAILS

Buildings Objective 1 | Assess the energy performance of city facilities

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
B1.1	Complete energy audits in all city buildings	Audits have been done at City Hall and at the Arena through Consumers Energy. Audits should be done at all other city facilities that consume energy.
B1.2	Develop a systematic approach to collecting and tracking monthly energy consumption and cost data for all city buildings	This may require designating a staff person to organize utility bills, and/or a system to automate the conversion of PDF bills into Excel workbooks for easy data tracking. Explore collaborating with Consumers + DTE to obtain utility bill data in workbook format for all accounts each month.
B1.3	Collect building information necessary to benchmark buildings in Portfolio Manager by ENERGYSTAR such as square footage, age, and occupancy	This data is required to provide comparative energy performance data to other similar buildings. City staff has this data for some buildings.
B1.4	Annually benchmark all facilities in ENERGY STAR Portfolio Manager	ENERGY STAR Portfolio Manager is a free tool that compares building energy performance to other buildings with similar use types, fuel mixes, and sizes. As improvements are made, annual benchmarking enables easy tracking and communication to the public about energy savings and progress made. A weather normalized performance analysis is also available, which provides information about changes in energy consumption based on weather versus performance.

Buildings Objective 2 | Reduce energy consumption from city facilities

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
B2.1	Upgrade all city lighting to most efficient LEDs	This action pertains to all building, streetlight, and parking garage lighting.
B2.2	Utilize smart building controls in all appropriate city buildings	Smart building controls may include occupation sensors, smart thermostats, smart plugs, smart power strips, etc. These may be controlled systematically from an energy management platform.
B2.3	Ensure the energy efficiency of building equipment through incorporating efficiency-enhancing technologies	Examples of appropriate technologies include adding Variable Frequency Drives (VFDs) to HVAC systems, and adding evaporator fan speed controllers to refrigerators.
B2.4	Optimize building envelopes to ensure efficient windows, air sealing, and insulation; as informed by building audits	This action requires the implementation of building audit findings regarding building envelope aspects such improvements in insulation and air sealing and upgrading to more efficient windows.
B2.5	Develop a system for replacing building equipment and components with most efficient available models when repairs or replacements are needed	This action may have overlap with the electrification policy but would further include efficient replacements of building components such as windows, doors, electronics, etc., that can strongly influence overall building energy consumption.
B2.6	Proceduralize the review of new construction and renovation projects to incorporate measures to ensure alignment with CAP goals	This action ensures that alignment with the CAP is considered throughout new projects. Staff or other stakeholders with knowledge of building sustainability should be included in the established review process.

B2.7	Utilize passive design strategies to reduce energy demand	Passive design strategies are building design approaches that harness natural elements like sunlight, wind, and thermal mass to reduce the need for mechanical heating, cooling, and lighting. This may include the application of a reflective roof coating to lower cooling loads, the strategic use of blinds to optimize natural light while minimizing solar heat gain, and landscaping techniques to provide building shade in the summer.
B2.8	Explore installation of green roofs on city buildings	Rooftop gardens reduce the urban heat island effect and are shown to save both heating and cooling costs. Green roofs have a wide range of design strategies, from a planting of low-maintenance lightweight vegetation to full gardens that may be enjoyed by staff or residents. The city should work with a professional to understand design options and related structural and maintenance needs for each option.
B2.9	Improve efficiency of water filtration plant	The water filtration plant has had careful review of efficiency opportunities already, but this action calls for the continued monitoring and evaluation of efficiency. Tactile recommendations include: 1) Measure the energy intensity of booster pumps in kilowatt-hour per million gallons and prioritize the use of the more efficient pumps; 2) Consider installing VFDs on pumps where the discharge has been throttled
B2.10	Encourage energy-efficiency behaviors from city staff and building occupants	This may include utilizing signs with reminders to close doors or turn off lights where appropriate, enabling automatic sleep timers on electronics, providing guidance on temperature settings for staff that have permissions to adjust building temperatures, working with stakeholders who host events in city buildings to follow energy-saving protocols, and other initiatives based on staff knowledge/recommendations.

Buildings Objective 3 | Reduce water consumption from city facilities

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
B3.1	Upgrade faucets and toilets to low-flow options	This may be done on a prioritized replacement schedule, or if current toilets are highly inefficient, consider near-term replacement.
B3.2	Consider water efficiency in replacements of water-using equipment	This includes equipment such as refrigerators, dishwashers, plumbing fixtures, irrigation systems, etc. The EPA's WaterSense label can be used to identify equipment that is the most water efficient.
B3.3	Develop a system for monitoring municipal water consumption and detecting potential leaks	Water consumption data can be benchmarked in Portfolio Manager along with energy. Through this system, anomalies and sudden increases in water consumption may be more easily spotted. Audits should also be completed on a regular basis. Leak detection technology may also be considered.
B3.4	Use weather-based smart irrigation controls on irrigated city property	By using local weather data and landscape conditions to tailor watering schedules, weather-based irrigation controllers determine when and how much to water.
B3.5	Utilize passive rainwater management strategies	This action involves landscaping strategies that maximize water conservation

Buildings Objective 4 | Maximize renewable energy utilized to power city facilities

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
B4.1	Assess city facilities for solar potential and install solar on appropriate buildings	As a first step, online resources such as sunroof with google can be used to estimate solar potential of city-owned buildings. For buildings where solar seems feasible, professional quotes should be done to understand specific cost and energy production information.
B4.2	Utilize Power Purchase Agreements (PPAs) or Renewable Energy Credits (RECs) to meet net-zero GHG emissions if necessary	This action includes the evaluation and implementation of options that would help the city reach net zero GHG emissions targets. These options may be pursued while the city is making long-term changes to operations to reduce GHG emissions. Quotes should be obtained by the city to understand costs of these options.
B4.3	Showcase use of renewable energy and long-term cost and GHG emissions reductions at city facilities	This action includes promoting the benefits of solar panels, (such as the reduction in GHG emissions or payback period) to encourage residents and business owners to consider solar.
B4.4	Install backup energy storage systems at facilities that produce on-site renewable energy	Backup energy storage installation should be prioritized at the most critical facilities, such as those that are most essential to providing services to the community, and those that are utilized as community shelters during extreme weather events. The city should consider working with a consultant or contractor to design and install storage systems to meet operational needs.
B4.5	Explore collection of leaves and other organic material for energy use at city facilities	This may include evaluating technologies such as anaerobic digestion or biomass energy systems, identifying potential pilot sites, and conducting a cost/benefit analysis. The city should consider partnering with local organizations and peer cities to assess feasibility of this action.

Vehicles Objective 1 | Improve operational efficiency of city vehicle fleet

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
V1.1	Develop a system to accurately track vehicle mileage data	This data would ideally be tracked on a per trip basis, but the purpose of this action is to enable annual miles traveled per vehicle in conjunction with the fuel consumption data that is already tracked.
V1.2	Systematically monitor and minimize idling in non-emergency vehicles	This may include installing telematic monitoring systems that can monitor vehicle idling in real time and provide data on when and where vehicles are idling. This can help reduce unnecessary consumption of fuel.
V1.3	Establish a system to monitor and adjust fleet size for maximum efficiency	This action will ensure that the city has an appropriate number of vehicles for the priorities needed as time goes by. Fleet right sizing efforts have the potential to reduce the number of vehicles that the city owns and maintains.
V1.4	Prioritize the use of the most efficient fleet vehicles for the purpose needed	This action ensures highest use of the most efficient and low-emission vehicles, which results in a reduction of fuel costs.
V1.5	Utilize fleet management software to monitor costs and savings of fleet improvements	Fleet management software platforms provide data that can be used to inform route optimization, fuel consumption, and driver behaviors to maximize efficiency. This data can also be used to monitor the cost savings associated with fleet improvements.
V1.6	Explore alternative fuel options for high emission diesel-using vehicles that the city does not plan to replace in the near term	Alternatives to diesel include options such as renewable diesel and biodiesel. Renewable diesel is generally more suitable for cold weather climates, but may have limitations in availability.

Vehicles Objective 2 | Improve operational efficiency of city vehicle fleet

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
V2.1	Conduct a Total Cost of Ownership analysis for fleet vehicles to determine highest cost savings opportunities in city vehicle purchases	When making new vehicle purchases, the city should consider total cost of ownership to understand long-term financial investment of vehicle options.
V2.2	Transition lawn care equipment and off-road vehicles to non-fossil fuel using options	This may be included in a fleet electrification policy if the city decides to take that route. This transition has benefits of reducing noise and air pollution from lawn care equipment and off-road vehicles used by the city and has the potential to reduce long-term fuel and maintenance costs. For heavy-duty off-road vehicles, renewable diesel may be considered until readily available options for electric or other alternative options become available.
V2.3	Purchase electric bicycles for employees to use for short-distance trips during work shifts	This action may be preceded by an employee survey assessing interest in use of electric bicycles as an alternative for driving for short distance trips.
V2.4	Increase availability of EV chargers to meet necessary demand for powering vehicle fleet	This action will include planning EV charging infrastructure to meet long-term plans for adding EVs to the city's vehicle fleet. The location of chargers should be strategically planned to meet the city's travel needs.
V2.5	Develop a system to identify electric, hybrid, or other renewable-using market ready vehicles options that may serve as a replacement for current fleet vehicles	This policy or system should be developed strategically to meet the needs of the City of Muskegon's municipal vehicle fleet while maximizing efficiency, with an emphasis on minimizing long-term costs.

Vehicles Objective 3 | Enhance Muskegon's appeal as a place for city employees to live and thrive

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
V3.1	Collaborate with the County to expand public transit options with incentives for use by city employees	This action would include ensuring public transit options between main residential areas in the City of Muskegon and the main locations where city staff work at. Incentives may be the same as the below action.
V3.2	Provide incentives to employees who walk, bike, carpool, or utilize public transit for commuting	Incentives may include providing free transit ridership, or a certain number of days utilizing alternative transportation options correlating with a certain number of PTO hours.
V3.3	Provide secure, functional, and shaded bike storage options	This action may promote ridership by ensuring that bikes are safe, and weather protected while employees are at work.
V3.4	Offer incentives to employees who live in the City of Muskegon	This builds upon the work that the city has initiated to make living in the City of Muskegon more attractive. This action requires understanding specific obstacles faced by employees and the incentives that may be most valued.

Waste Objective 1 | Reduce landfill waste from city facilities

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
W1.1	Periodically audit the quantity and composition of waste generated by municipal facilities	The implementation of this action will include assessing how much waste facilities are producing, and how much of the waste being sent to the landfill can be diverted. Many guides are available for conducting waste audits.
W1.2	Include waste diversion options and standards in new employee orientation	This action will include ensuring that all new employees are thoroughly informed of options for waste diversion while at work, and expectations for utilizing recycling or other landfill-diversion systems that the city has in place. The city may provide a magnet, flier, or other signage to help new employees integrate.
W1.3	Develop waste diversion training materials for existing city employees	This training material may be provided as part of a larger municipal sustainability training for city staff. The training should include waste diversion opportunities and expectations for city staff, as well as context on how staff participation contributes to overall CAP goals. Materials may also include magnets or signage with waste diversion guidelines.
W1.4	Provide recycling bins at each employee's work station	This will ensure consistent access to recycling for city employees. Janitorial training may be needed in conjunction with this.
W1.5	Pair placement of trashcans with clearly labeled recycling bins	This pairing will promote recycling whenever possible, especially in conjunction with clearly labeled signs on bins detailing appropriate materials for recycle vs trash.
W1.6	Collect compost at city facilities	Facilities may be prioritized based on findings from the waste audit. Where significant organic waste is landfilled, the city will need to create a sanitary and consistent system to collect compost and to process it. The processing of compost may be done at city garden facilities so that the final compost product can support local gardens.

W1.7	Establish a process to use reusable dishes and utensils at city staff and commission/council events	An established inventory of reusable dishes and utensils will need to be organized through facilities or another relevant department. The city will need to establish a system for reserving, cleaning, and storing these dishes.
W1.8	Consider waste generation in city purchasing choices; for example, prioritize use of reusable products, and ensure recyclability/compostability of disposables	This action includes developing a protocol that ensures a systematic way for the city's purchases to support waste reduction and minimization from city operations.

Waste Objective 2 | Reduce landfill waste from events hosted by the city or at city facilities

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
W2.1	Develop a model for event waste minimization	This action may include the development of a framework specific to the types of events hosted by the city and the locations in which the events take place. This model may include standards for recyclable or compostable material, the placement of recycling and eventually composting bins, reusable water fill containers, and event staff requirements for managing waste to minimize the amount of waste that is landfilled.
W2.2	Provide ample recycling bins throughout event spaces	This may entail developing a standard for required number of bins per community event. Bins should have signage informing residents of recycling protocols. Consider providing more recycling bins than trash bins, or recycling bins that are larger than trash bins to increase attention to recycling.
W2.3	Build capacity to collect and manage compost at events	This may include partnering with a local composting organization or facility or leveraging systems developed to collect and process compost at city facilities. Educational signage should be used for compost collection, and event staff/vendors should also be trained to facilitate and communicate this system.
W2.4	Develop standards and incentives for recycling and waste minimization at Farmers Market	Implementing this action may include inviting ideas from Farmers Market vendors and attendees. Potential standards may include requiring all packaging be compostable, recyclable, or reusable; or prohibiting certain types of single use materials. Incentives may include providing reusable bags and containers, providing recognition for vendors who implement waste-reduction strategies, and hosting raffles for prizes for customers who bring their own bags, cups, or containers.
W2.5	Work with event vendors to minimize unnecessary consumption and waste	This would be best implemented through having conversations with vendors to understand their perceived barriers to waste reduction, and collectively formulating strategies to remove barriers.

Land Use & Resilience Objective 1 | Increase carbon sequestration potential of city-owned land

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
LR1.1	Consider species diversity and carbon sequestration potential in tree replacement and planting	This action should be informed by the findings of the urban tree canopy inventory study that is expected to be completed. Species diversity of the city's tree canopy will help improve over all resilience towards pests, diseases, natural disasters, etc.
LR1.2	Explore opportunities to allocate land for ecological conservation and easements	This action could contribute to habitat connectivity, total carbon sequestration, and reduction in urban heat effect.
LR1.3	Consider opportunities to transition mowed spaces to natural landscapes	As the City of Muskegon has a large quantity of park land, there may be opportunities over time to transition land that is currently mowed to maintained prairies/grasses, native plants, or gardens. As an example, the city may transition roadside easements to native plants to contribute to habitat connectivity.
LR1.4	Review city-owned parks for opportunities to prioritize the integration of nature-based solutions	Through site assessments, GIS mapping, and collaboration with ecologists, the city can identify opportunities for nature-based solutions such as reforestation, wetland restoration and management, native plant landscaping, and green stormwater infrastructure.

Land Use & Resilience Objective 2 | Improve resiliency of city-owned land

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
LR2.1	Expand the integration of native and adapted plant/shrub species in landscaping of city-owned parks and gardens	This may include developing a native plant landscaping framework that provides clear, tangible standards and outlines species-appropriate native plant choices for common types of gardens/landscapes, levels of sun, and availability of maintenance.
LR2.2	Review city landscaping for alignment with the Stormwater Management Standards	The city's Stormwater Management Standards provides thorough and clear best practices for the city to use. This action entails reviewing applicability and use of the standards in city-owned land.
LR2.3	Incorporate habitat restoration and protection strategies into land-management projects	This action should begin with the identification of areas in need of restoration/protection within city-owned land. Priority projects may be based on the opportunities for contribution to restoration, protection of ecosystem health, presence of invasive species, or the selection of habitats that are well-suited to strategically promote ecosystem health and landscape resiliency to climate change.
LR2.4	Review city green spaces and vacant land to align with 2023 Master Land Use Plan, Section C: Natural Features & Climate Resiliency	The City Master Land Use Plan, Section C provides strategies, projects and best practices that enhance landscape resiliency that the city is key in facilitating. The action entails reviewing applicability of best practices in city-owned lands.

Land Use & Resilience Objective 3 | Integrate climate risk considerations into city land use planning and management

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
LR3.1	Incorporate climate risk assessments into development decisions	This action may be implemented through the development of a formal procedure or framework to assess climate change-related risks associated with potential city developments.
LR3.2	Host staff training program for relevant city staff on resilient land management practices	This training may be done in partnership with local conservation groups, or led by staff members familiar with current resiliency land management practices such as urban rewilding and green infrastructure topics, traditional land stewardship, and watershed scale management practices.
LR3.3	Promote and share the techniques used by the city to enhance landscape resiliency	This action will promote the geographic-specific work and success stories from the city's techniques in managing city-owned land. QR code signs may be used in city landscaping that take residents to a webpage. This could be done through local partnerships or in collaboration with an educational institution.
LR3.4	Explore alternative de-icing solutions	Alternatives to salt include the use of liquids, utilizing a sodium chloride brine with beet juice, removing ice mechanically, using an anti-icing brine before storms, and the addition of wing blades to plows.
LR3.5	Adopt cost effective integrated pest management (IPM) protocols to effectively reduce pesticide use in city-owned property	The implementation of this action would entail prioritization of pests under most impactful management practices, research into associated integrated pest management strategies and tools (such as pest pheromone traps, nematode, insect, bacterial, fungal or viral application, light management, low-toxicity to organic pesticides, timing strategies etc.) and the development of a road map to effectively integrate the IPM strategies into current pest management practices.

Land Use & Resilience Objective 4 | Improve government operations resilience to the impacts of climate change

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
LR4.1	Identify locations and processes within city operations that are most vulnerable to extreme weather events	This may be done through a vulnerability and risk assessment of all city buildings and facilities that takes into consideration the type of services offered and the importance of the services offered.
LR4.2	Develop building and site-specific hazard mitigation plans	The development of the plans will include incorporating principles from the County-wide hazard mitigation plan and climate scenario planning to prepare for a range in severity of events that could take place.
LR4.3	Develop emergency response plans for all relevant extreme weather	This includes a high-level risk assessment to understand the most relevant weather-related events in Muskegon, such as flooding, blizzards, and extreme heat and wind events. This action would build upon the efforts in the County-wide hazard mitigation plan to develop a refined, City of Muskegon-specific protocol for each relevant weather event. This action may be achieved through the completion of the city-specific Emergency Operations Plan.
LR4.4	Offer emergency response training to city employees	This action may follow the development of site-specific hazard mitigation plans and emergency response plans. In addition, city employees should be trained on ways to protect themselves during emergencies and ways to contribute assisting other employees and city operations during events.
LR4.5	Ensure that community resilience centers meet community need, are physically accessible, and are stocked with essential materials	The city currently uses the McGraft Park Community Building and Smith-Ryerson Community Building. This action should include a periodic analysis of how these facilities meet community need and should consider needs of mobility-limited residents.

LR4.6	Consider resilience opportunities in building renovations, new buildings, and other capital improvement projects	This includes choosing the most weather-resistant materials, efficient models for new equipment, and setting buildings up to be electrified.
LR4.7	Partner with local organizations and jurisdictions to share resources and increase capacity to respond to events	Building upon the use of the County's Hazard Mitigation Plan, this action may include the shared use of communication tactics/materials, coordination of emergency supplies, and joint trainings for city staff or other relevant stakeholders.
LR4.8	Explore the integration of climate change impact modeling into water source security assessment protocols	Building on the existing Source Water Intake Protection Plan (SWIPP), the integration of climate changing modeling to expand understanding of potential contaminant risks to water source security. Nutrient loading, AOC legacy impacts contaminants and algal blooms may be exacerbated by increasing extreme weather events and climate change.

Implementation Objective 1 | Leverage funding for CAP actions

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
I1.1	Develop a system to review incoming funding opportunities, including incentives, for CAP actions	This may include assigning a staff person to monitoring funding opportunities or partnering with another city or organization to ensure awareness of incoming opportunities.
I1.2	Incorporate alignment with/contribution to the CAP's implementation in the city budget process	This action can include a field in city budget requests for alignment with CAP objectives or the development of a subsection of the city's budget dedicated to implementing priority CAP actions.
I1.3	Identify funding opportunities and needs for priority CAP actions	The city should plan yearly implementation of priority CAP actions and ensure funding opportunities are being pursued for the implementation of these actions or that funding is included in the city's budget for these actions.
I1.4	Develop a system to track operational expenses that have been reduced through CAP actions to promote further action	This effort would tie into other actions such as benchmarking of municipal buildings and fleet tracking that provide insights into cost savings resulting from CAP implementation.

Implementation Objective 2 | Build city staff capacity for CAP implementation

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
I2.1	Seek opportunities to take advantage of free technical assistance programs	Free technical assistance opportunities are offered by state and federal agencies, nonprofits, and academic institutions and can be leveraged to boost staff capacity and knowledge. The city may designate a staff person to monitor and apply for these opportunities.
I2.2	Utilize programs that fund interns to build capacity for appropriate CAP implementation projects	Interns may be available through academic institutions or programs such as the State of Michigan program for STEAM Ahead.
I2.3	Hire a dedicated sustainability staff person with a focus on improving efficiency of operations	Hiring a dedicated staff person is highly recommended to manage CAP implementation and reporting to ensure that the city reaches its 2040 GHG emissions reduction goals.
I2.4	Develop interdepartmental city staff CAP teams to collaborate in implementation of CAP actions	As many CAP actions span across operational departments, interdepartmental teams may help streamline and appropriately disperse responsibility of CAP implementation.
I2.5	Encourage and support sustainability-related professional development for city staff	The city may designate CAP-related professional development opportunities, or may consider allowing staff to propose professional development that they need to implement CAP initiatives.

Implementation Objective 3 | Monitor and evaluate progression of CAP implementation

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
I3.1	Determine key performance indicators that will be tracked annually	The city should first determine readily available data that can be used to track KPIs. As the actions in the Plan are implemented, more detailed data will become available that can feed into KPIs.
I3.2	Conduct an annual municipal greenhouse gas emissions inventory	This may be done by a consultant or eventually by city staff. The GHG inventory should include an analysis that ties CAP implementation to changes in GHG emissions.
I3.3	Produce an annual report detailing CAP implementation progress and GHG emissions changes	This report should include data and analysis from the GHG inventory report, along with progress made by the city that may not be reflected yet in the GHG inventory, such as capacity building, program development, or improvements in resiliency.
I3.4	Designate a webpage and/or website for residents to access the CAP, reports, and related resources	This page should be advertised and accessible. The city may consider providing interactive data dashboards and should focus on financial savings and operational improvements that result from CAP implementation.
I3.5	Develop an annual review of CAP strategies and actions to determine progress from the previous year and identify priorities for the upcoming year	This action should ensure the implementation of priority actions and should detail resources needed to stay on track for GHG emissions reductions.
I3.6	Recommend CAP activities and achievements to the larger community	These recommendations may be included on the city's CAP/sustainability webpage. The purpose of this action is to share success stories from the city's CAP efforts that may be used by community entities and residents.

Implementation Objective 4 | Integrate CAP priorities into city operations and procurement

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
I4.1	Include consideration of contractor sustainability efforts in bidding process	This may include an open question in RFPs for bidders to share their sustainability practices or specific questions that are relevant to the specific bid. Additionally, incentives could be developed to offer to bidders who meet certain criteria or standards.
I4.2	Compile opportunities and expectations for city staff to contribute to CAP implementation into one document or webpage	This document or webpage can outline roles, responsibilities, and actions that city staff can take within their departments, along with opportunities for trainings and other resources to take advantage of.
I4.3	Provide department-level GHG emissions data and other relevant KPIs to department leaders on an annual basis	This could be done as a part of the annual reporting process, where any department-specific data is shared with leaders to understand progress towards CAP goals, potential cost savings, and needs moving forward.

Implementation Objective 5 | Integrate climate considerations into the development, review, and implementation of new city plans, policies, and decisions

I.D.	ACTION	DESCRIPTION / ADDITIONAL DETAILS
I5.1	Consider community energy, transportation, and ecosystem needs and impacts when making zoning and development decisions	This action calls for careful consideration of the impacts of zoning and development decisions on community sustainability. This includes considering how land use decisions affect community access to clean/affordable energy, low-carbon transportation options, and local ecosystem health.
I5.2	Ensure diverse engagement in decisions that impact the community, prioritizing those most adversely impacted by climate change	Integrating CAP priorities into community decisions requires an understanding of how different groups are affected by climate impacts. This action calls on decision-makers to prioritize inclusive engagement, especially of those most adversely impacted, and to ensure diverse voices are meaningfully considered in the planning and decision-making process.
I5.3	Seek opportunities to encourage renewable energy development, electric vehicle infrastructure, and electrification for new development in the community	This action builds upon this plan's initiatives to promote renewable energy and electrification within municipal operations and calls for the city to pursue these opportunities within the community.
I5.4	Seek opportunities to improve low-carbon transportation options in the community (i.e during street renovation or other development projects)	This action includes considering opportunities to improve infrastructure that supports low-carbon transportation infrastructure, such as sidewalks, bike lanes, and pedestrian signals during the planning phase of projects.
I5.5	Establish a process for reviewing new city plans and policies to consider climate impact	This action aims to formalize the process of reviewing city plans and policies for opportunities to progress and align with this CAP. Often, consideration in the planning phase leads to long-term cost savings and helps to phase in changes that promote sustainability.

ABBREVIATIONS

CAP ..... Climate Action Plan

BAU ..... Business as Usual

CCF ..... Hundred Cubic Feet

CO_2 ..... Carbon dioxide

CH_4 ..... Methane

Gal ..... Gallon

GHG ..... Greenhouse Gas

Kg ..... Kilogram

kWh ..... Kilowatt-hour

LGOP ..... Local Government Operations Protocol

MT CO_2e ..... Metric Tons of Carbon Dioxide Equivalent

N_2O ..... Nitrous Oxide

PPA ..... Power Purchase Agreement

REC ..... Renewable Energy Credit

GLOSSARY

Action

A specific, tangible step designed to advance a broader objective or focus area within the Climate Action Plan; actions are targeted in scope and may evolve over time in response to emerging opportunities or technologies.

Carbon Dioxide Equivalent (CO_2e)

A standard unit used to quantify the global warming potential of greenhouse gases. It expresses the impact of different gases in terms of the amount of CO_2 that would have the same global warming effect over 100 years using the IPCC Sixth Assessment Report global warming potential values.

Fugitive emissions

Greenhouse gas emissions that result from unintentional leakage in the distribution of natural gas.

Focus area

A key category or sector in which targeted objectives, actions, and/or policies can be developed and implemented to reduce greenhouse gas emissions and enhance climate resilience.

Greenhouse gas (GHG)

Atmospheric gases that trap heat and contribute to the greenhouse effect, including carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons.

Greenhouse gas emissions inventory

A quantification of the GHG emissions produced by multiple sources during a set time period and within a specified boundary.

Objective

A goal within a focus area that bridges the gap between broad priorities and specific actions, helping to organize efforts and represent long-term desired outcomes of the Climate Action Plan.

Scope 1 emissions

Direct GHG emissions resulting from owned or controlled sources, such as stationary natural gas combustion or fuel used in city-owned vehicles.

Scope 2 emissions

Indirect GHG emissions resulting from purchased electricity.

Scope 3 emissions

Indirect GHG emissions resulting from indirect activities in the organization’s value chain that are not directly controlled by the organization.

Sector

A specific category or industry that contributes to the release of pollutants or greenhouse gases into the environment.

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