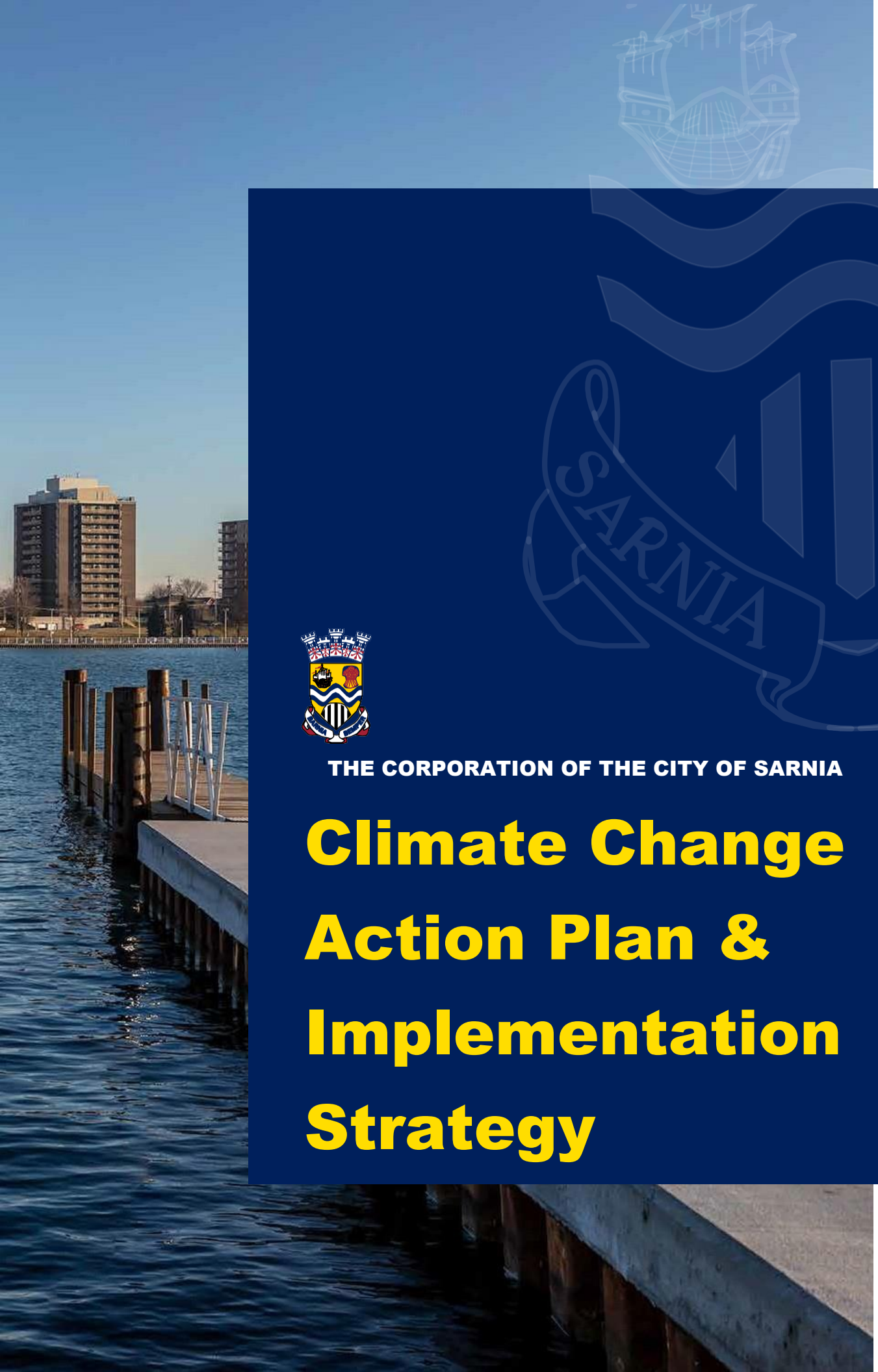


THE CORPORATION OF THE CITY OF SARNIA

Climate Change Action Plan & Implementation Strategy

ACKNOWLEDGEMENTS

Climate change planning requires an integrated team and a multi-stakeholder approach. Here in the City of Sarnia, with leadership from Sarnia City Council, we are delighted to share the first ever Climate Change Action Plan and Implementation Strategy!

The City would like to thank the Environmental Advisory Committee members who played a key role and guiding force as the project Steering Committee. In addition, there were countless residents and community stakeholders who provided input and shared their hopes, directly contributing to this Climate Change Action Plan and Implementation Strategy (CCAPIS) for the City of Sarnia.

What is Climate Change?

Climate change is impacting communities all over the world. It is a particularly complex problem and will require significant changes over-time to the way in which our society and economic systems currently operate, here and all over the world.

Human activities are the main cause of climate change we are experiencing today. We emit Greenhouse Gas (GHG) emissions daily by burning fossil fuels to heat, cool and power our homes and businesses as well as to transport ourselves and the goods we consume. GHG's also come from the clearing of land for agriculture, industrial activity, and decomposition of solid waste from landfills.

An increasing build-up of GHG emissions in the Earth's atmosphere is trapping more heat and is increasing the Earth's temperature to levels that have never been experienced in the history of human civilization and Canada is warming at almost double the global average rate.

Summary

Climate change is happening. Globally, nationally and locally.

The time to act is now.

In Sarnia, climate changes will include weather that is warmer and wetter, and with large and more frequent storms and the effects will increasingly impact Sarnia residents, infrastructure, municipal operations, the economy, and the environment. The scale to which Sarnia is impacted will depend on the actions that the City takes now and into the future.

Strengthening local action on climate change is an important step by the City of Sarnia to enhance the City's resiliency. Delaying action increases the risks posed by climate change and its effects and has the potential to increase the future costs to mitigate and prevent the effects from climate change. By committing to reduce the City's own carbon footprint, the City can set an example and position itself as a leader in municipal policy and action.

Change at a local level can have a positive effect on global climate change.

The primary purpose of the City of Sarnia Climate Change Action Plan and Implementation Strategy (CCAPIS) is to identify achievable and timely objectives and action items that increase community resiliency and capacity to address and adapt to the effect of climate change. The approach is two-pronged:

1. **Adaptation** components of this plan focus on preparing the Municipality for the impacts of climate change. By preparing for future climate conditions, the Municipality will lessen the negative impacts that climate change will have on municipal operations, the provision of services, residents and the local economy.

2. **Mitigation** components of this plan focus on decreasing the severity of future climate change impacts by reducing greenhouse gas (GHG) emissions that are contributing to climate change. By doing its part to reduce GHG emissions, the Municipality can help to slow climate change and limit its negative impacts.

The CCAPIS includes over 100 action items that the City will endeavor to undertake over time to reduce GHG emissions, and adapt corporate assets, operations and services, to limit the negative impacts of climate change. Actions are rooted within 4 Community Pillars which outline high-level objectives that the City will strive towards as it implements the CCAPIS. All actions contained in this plan are achievable and within the control of the municipality.

> *"This CCAPIS is intended to serve as a compass, rather than a map. A map clearly lays out the exact route from A to B with every twist and turn set out, so you know what to anticipate and plan for. But that's not the nature of climate change or this plan. Instead, it is like venturing out into the unknown: you know where you want to get to, but not what lies ahead. So, you want a compass. You can set a bearing based on where you need to get to. You don't know what obstacles or opportunities you will encounter along the way, but you can chart a course and go forward, stopping at regular intervals to see where you are, get the lay of the land before recalibrating and setting out again."*
> *- Environmental Advisory Committee Member*

INTRODUCTION

The City of Sarnia, like other municipalities in Ontario, will be impacted by climate change. The CCAPIS is the product of a collaborative effort to identify and provide practical solutions to the risks and challenges that climate change poses to the City.

By implementing the actions contained in this plan, the City is taking a proactive approach to combat climate change and minimize its impacts on our community. By acting on climate change, the City is working to ensure that Sarnia remains a safe and sustainable place to live, work, and play.

Municipalities are in an ideal position to respond to climate change. According to the Federation of Canadian Municipalities, municipalities have control over 44 percent of Canada's GHG emissions. Municipalities are also responsible for providing affordable and reliable services to residents, which will be impacted by climate change including land-use and development; licensing and regulation; leadership, awareness and education; service delivery; operations and maintenance of assets; and workforce development.

Municipalities can also act as a convener between different sectors and community members to foster collaboration on climate change action.

The plan will build on and provide direction for existing City policies and operational plans that consider environmental sustainability. Plans and initiatives will support sustainability through the means of asset management, energy efficiency, emergency preparedness and land use planning.

- Parks, Recreation, Culture Masterplan
- Transportation Masterplan
- Asset Management Policy and Plan
- Energy Conservation and Demand Management Plan
- Purchasing and Procurement Policy
- City's Strategic Plan
- City's Official Plan and Zoning By-law
- City's Land Development Standards

The purpose of the Interdepartmental Climate Change Working Group (ICCWG) is to collect information on climate change impacts and propose potential solutions for adapting to climate change through the development and implementation of city actions.

The action plan focuses on climate change impacts for which the City has responsibility and outlines coordinated actions that identify and leverage current adaptation measures, while creating and implementing achievable and sustainable action items.

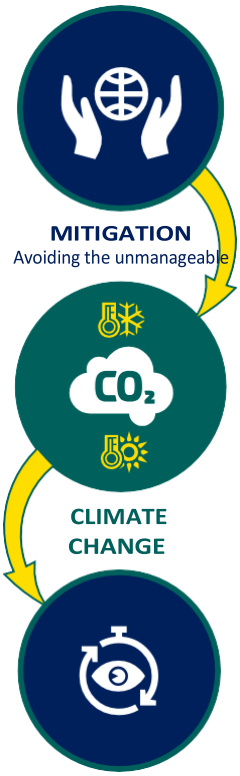
The Environmental Advisory Committee will support implementation by acting as the steering body to assist in the review and certain elements of implementation of the Action Plan.

SCOPE

The Action Plan provides the framework for the City to make informed decisions by prioritizing actions to limit GHG emissions which contribute to climate change and minimize the impacts that climate change will have on the City. Through mitigation, this plan will produce a framework for reducing corporate GHG emissions by building on existing efforts to improve energy efficiency, invest in renewable and alternative forms of energy, divert organic waste from landfills, and incorporate the framework into land use and development planning.

Through adaptation this plan will provide a framework for the City to evaluate and offset risks to properties, amenities and other assets, human health services, and emergency response procedures to ensure readiness.

The CCAPIS applies to all city operations and services and contains a list of action items assigned to specific departments. The plan is intended to evolve over time and as such, current and planned implementation items will be reviewed and reported on annually as many are subject to receiving resources to complete.



By embedding the Action Plan into all facets of the City's operations and services, the City will serve as a leader in climate change action in the community. The City must continue to adapt to climate change by adopting strategies, developing projects, and proposing best practices that will lessen the impact on both residents and community assets.

An intended outcome of the plan is to begin the process of working towards a community-wide Climate Change Action Plan, focusing first with a corporate plan. By increasing our corporate response to climate change the City aims to encourage the greater community to better prepare for and adapt to the impacts of climate change through identifying and determining climate adaptation and mitigation measures.

The CCAPIS is a long-term initiative that will require sustained engagement across all departments to succeed. Ongoing support from Council and the community will be essential to ensure that implementation of this plan maintains momentum.

Sarnia Community Perspective and Impacts

The impacts of climate change are wide-ranging and encompass physical, social, economic and ecological factors. Risks to property, infrastructure damage, service disruptions, human injury and economic losses can each be considered to have potential negative impacts across the community. The most vulnerable populations will likely experience a disproportionate level of the resulting effects. Vulnerable populations may include but are not limited to: children, seniors, the chronically ill, the low-income, the homeless, the disabled, and outside workers.

Climate action planning seeks to identify, understand, and respond to climate change risks that threaten the community and to mitigate risks by reducing greenhouse gas emissions and preserving and enhancing carbon sinks.

Feedback garnered through meaningful public engagement, public surveys and staff workshops and focus groups were a key element in developing this adaptation strategy and achievable implementation plan. Emerging themes and key municipal operations and

service areas were identified, and potential impacts were assessed through the lens of climate change stressors, including the following:

- Increased precipitation
- Increased heavy rainfall events
- Increased temperatures
- Hotter /longer summers
- Summer dry spells
- Increase in extreme weather events
- Damaging winds
- Changing great lakes water level
- Increased potential pests and pathogens

***Temperature* "warmer":** Annual mean temperature is projected to increase. Increases in temperatures are projected to be the most marked throughout the winter and into early summer. Extreme heat days (daily maximum temperature exceeding 30°C) are expected to increase. Extreme cold days (daily minimum temperature lower than -15°C) are expected to decrease.

***Precipitation* "wetter":** Total annual precipitation is projected to increase. Seasonally, the largest precipitation increases are expected in winter, spring, and summer. Rainfall intensities are also projected to increase, with extreme magnitude rainfall events expected to occur more frequently than in the historical record.

***Extreme Weather* "wilder":** In Southern Ontario, the months of December, January, and February are expected to experience more freezing rain events, and more wind gust events, as both large-scale frontal storms and local convective windstorms are projected to occur more frequently. Beach erosion "wavier": The increased frequency of storms generating stronger winds and larger waves, and storm surges, coupled with a delayed onset of protective ice cover will increase the likelihood of shoreline erosion.

GUIDING PRINCIPLES

1. **Leadership** – the City will lead the plan and its implementation and recognizes their role may include that of an educator, facilitator and support innovations and partnerships that encourage climate change considerations into all levels of municipal and community services.
2. **Integration** – develop and maintain a system of cross-departmental policies and programs that will ensure a unified, proactive approach to climate change.
3. **Resilient** – enhance the ability of our community's systems and infrastructure to withstand the effects of climate change related events and impacts and return to normal service functioning in a timely manner.
4. **Education and Awareness** – community promotion and understanding.
5. **Practical, Flexible Action** – building on previous success and progresses to strengthen resiliency while developing a practical and achievable action plan, understanding that new technologies and priorities may emerge that may require attention and may differ from the plan.

4 KEY COMMUNITY PILLARS

The adaptation plan and mitigation actions were placed into 4 key Community Pillars that will outline high level objectives and action Items creating a foundation for a more resilient Sarnia into the future. The plan will include implementation timelines and resources required to enable the completion of the action items.

1. **Natural Environment - Parks, Open Spaces, Natural & Protected Areas**
2. **Flooding - Stormwater Management, Overland & Erosion**
3. **Emergency Preparedness & Response**
4. **GHG Emissions - Buildings, Energy, Transportation & Waste Diversion**

The plan is an important tool that will be used to directly support issues related to the Community Pillars and to ensure the impacts of climate change in our community are addressed proactively.

Building a resilient community is the top priority!

Natural Environment – Parks, Open Spaces, Natural & Protected Areas

OVERVIEW

Parks, open and green spaces, and natural and protected areas are an integral part of the City's green infrastructure that can assist in mitigating the negative impacts of climate change. Climate change can compromise the vitality of urban forests. Increasing tree planting and tree canopy is one way to mitigate the increase in areas susceptible to the Heat Island Effect. Planting plans for naturalized areas should consider pollinators, migratory birds, and other native wildlife, and include supportive species that are tolerant to seasonal variability.

Trees and plants are important to the carbon cycle because they take in carbon dioxide (CO2) and release oxygen (O2) and provide valuable shade, counteracting heat islands. They also aid in storm water management in the absorption and collection of water, improve air quality through carbon filtration from the atmosphere, and provide invaluable habitat for birds and animals we share our community with. The City's Park system must continue to grow and be designed to address climate adaptation and mitigation.

Stormwater storage and the development of wetland habitat to support biodiversity would be most successful and best executed in partnership with Conservation Authorities and other local groups. Integrating green infrastructure considerations into the City's Development Approvals process can encourage the expansion of more naturalized areas as well. In addition, the implementation of sustainability considerations for new development such as Low Impact Development and passive cooling techniques will provide long-term benefits towards a more resilient community.

Biodiversity and the services that it provides are essential for human health and well-being. Climate change seriously threatens biodiversity, yet having healthy ecosystems is a key strategy for enabling ecosystems and species, including humans to be more resilient and adapt. Ecosystems-based approaches that support the sustainable management, conservation, and restoration of biodiversity provide long-term solutions and should be an integral part of the overall adaptation and mitigation effort.

CURRENT STATE

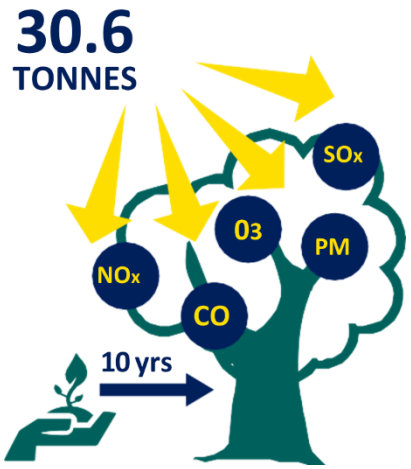
The City's natural systems include municipally owned trees, woodlots, Carolinian forest, wetlands, tall grass prairies, creeks, shorelines, trails, and other natural habitats, and variations of vegetation and natural space. Assets also include outdoor amenities such as beaches, recreational spaces and facilities. The natural environment provides valuable social and physical benefits to residents through both passive and active recreation space.

The City of Sarnia has many assets and active programs that currently contribute to the sustainability of its natural infrastructure:

- **Annual Tree Planting** – planting street trees and naturalizing park spaces to increase the canopy cover across the community.
- Stewarding 20 kilometers of Natural Trails – managing trail hazards and maintaining trees.
- **Eco-Friendly, Non-Selective Vinegar-based Herbicides & Pesticides** – to control invasive non-native weeds.
- **Germain Park Arboretum** – a park with over 200 different species of trees.
- **Community Park Initiatives:**
    - **Adopt-A-Park or Trail** - promoting environmental stewardship and civic pride by encouraging residents to beautify and enhance our public spaces.
    - **Community Park Cleanup Day** – coincides with Earth week, this initiative gets residents outdoors and into their neighbourhoods to keep our parks clean.
    - **Commemorative Tree Program** – allows the community to purchase a commemorative tree as a memorial.
    - **Community Gardens** –provides community residents space in our public parks to grow food, native plants, and/or flowers.
    - **Edible Tree Forest** – located in Mike Weir Park, this area holds a mix of edible trees, shrubs, and plants.
- **Art Teasel Wildlife Refuge** – a restoration project that converted a former gravel pit, construction landfill, and tree nursery to a naturalized area for public use.
- **Suncor Energy Foundation Nature Way** – a 1.5 km long recreation trail that provides linkage between Modeland Road and Wawanosh Wetlands, that has undergone tree-planting, prescribed-burning, and wildflower seeding.
- **Dennis Rupert Prairie Reserve** - eight acres of rare wet prairie ecosystem containing species at risk.
- **Sarnia Bay Point Lands Wetland** – A constructed wetland that provides habitat for many types of wildlife such as birds and fish.
- **Annual Tree Watering Campaign** – a program that monitors and maintains newly planted trees
- **Removal of the Emerald Ash borer** – program to remove hazardous ash trees that succumbed to the invasive Emerald Ash borer pest
- **Canatara Park Natural Habitat** – increasing the percentage of native habitat in the park by re-naturalizing areas
- **Re-introduction of native species** in city open space and parkland

OBJECTIVES

1. Enhance and maintain green infrastructure including Natural Urban Areas, Parks, and Open Spaces to bolster resilience, support biodiversity, and to protect this critical community infrastructure from climate change impacts.
2. Protect, restore, expand and link where possible the natural heritage systems within the City, to support biodiversity and improve resiliency to climate change impacts.
3. Promote and provide opportunities to participate in Environmental Stewardship and Education initiatives across our community.
4. Reduce emissions and consumption by improving and expanding opportunities to reduce, reuse, and recycle.

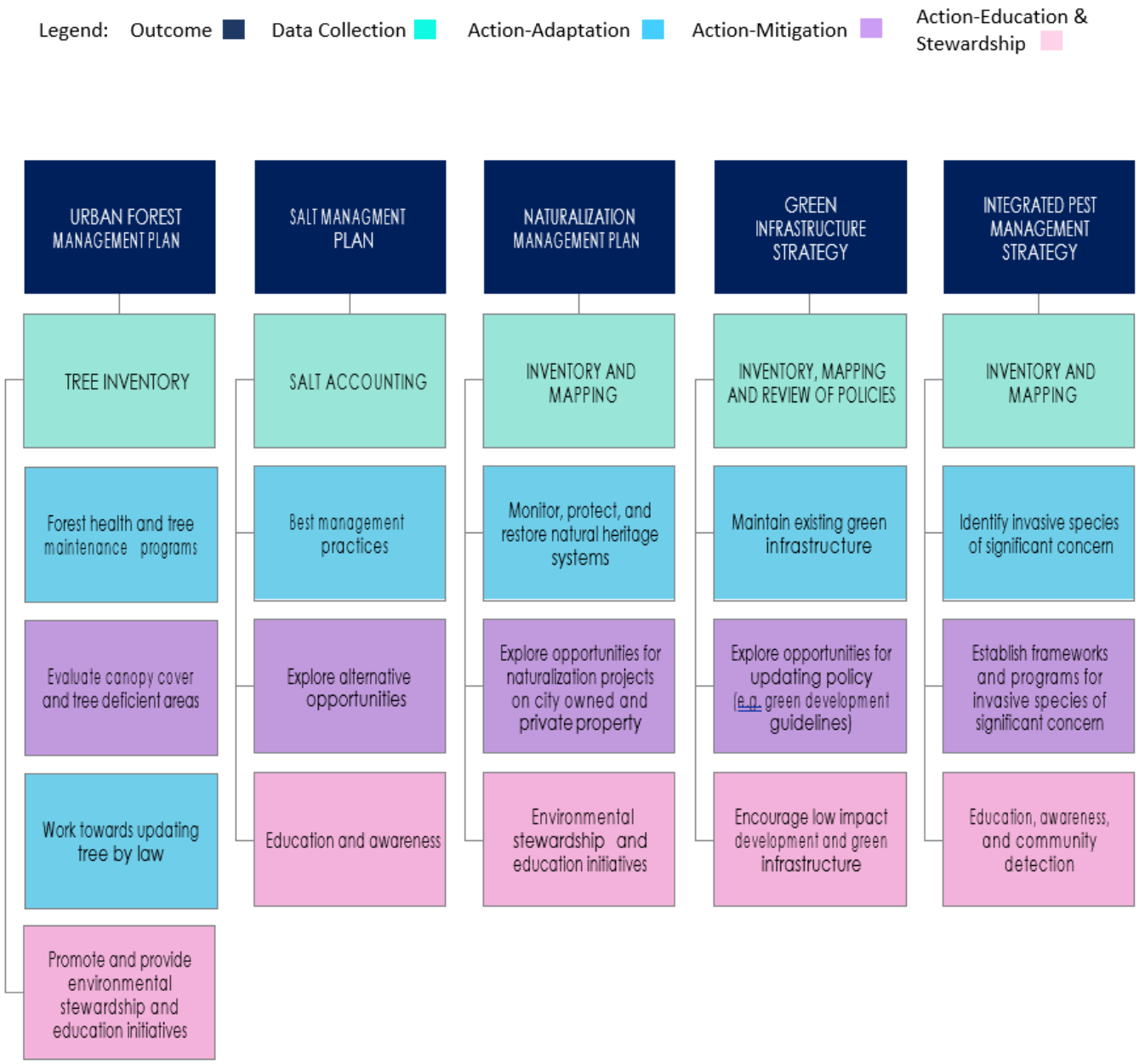


One tree planted in an urban setting, allowed to grow for 10 years sequesters an average of 30.6 tonnes of carbon. Large urban trees are excellent **filters for urban pollutants** and fine particulates.

Visualizing Outcomes

Conceptual flowcharts were created to visualize the high-level outcomes that the City will strive towards as it implements the CCAPIS. These flowcharts serve as a useful tool for reviewing the objectives and associated actions in a simplified and convenient format with action items organized under the outcomes for each pillar. Outcomes are the final product or over-arching policies, plans, or strategies, feeding into the vision for limiting climate risk and improving community resiliency.

NATURAL ENVIRONMENT OUTCOMES



Outcome Summaries

URBAN FOREST MANAGEMENT PLAN

An Urban Forest Management Plan provides strategic guidance for managing Sarnia's urban forest. The purpose of this plan is to increase urban forest management effectiveness and efficiency, improve tree health and diversity, minimize risks to the public and maximize the benefits provided by a healthy and sustainable urban forest. An Urban Forest Management Plan ensures a sustainable urban forest that provides environmental, social, cultural and economic benefits as our community continues to grow. A healthy urban forest can increase our city's resiliency to withstand and recover from increasingly severe weather caused by climate change.

SALT MANAGEMENT PLAN

The role of a salt management plan is to support best practices for road salt handling, storage and application during winter events to reduce negative impacts and ensure environmental protection without compromising road safety on publicly owned roadways and sidewalks.

NATURAL AREAS MANAGEMENT PLAN

Natural Areas Management Plan will serve to unite municipally owned natural areas to the greater county-level Natural Heritage System by monitoring, protecting, restoring, and promoting the potential and existing natural areas and their associated biodiversity of species found within the ecosystems and habitats in the City. This plan will support natural areas as vital community assets that provide a unique and important role to address both climate change mitigation and adaptation by focusing on maintenance and monitoring; planning; protection, enhancement and planting; and education and stewardship.

GREEN INFRASTRUCTURE STRATEGY

A Green Infrastructure Strategy will inventory and map existing green infrastructure, review current policies, maintain existing green infrastructure, and explore opportunities for updating policies such as Green Development Guidelines, and encourage Low Impact Development and Green Infrastructure projects.

INVASIVE SPECIES MANAGEMENT STRATEGY

An Invasive Species Management Strategy aims to collect data for identification and mapping of invasive species, establish frameworks and programs for invasive species of significant concern, develop partnerships and funding strategies, and promote education, awareness, and community detection programs involving the public and strategic partners.

COMMUNITY PILLAR # 2

Flooding – Stormwater Management, Overload & Erosion

OVERVIEW

Increased stormwater, flooding and erosion due to climate change presents critical risks to the wellbeing of the community, and can result in significant economic impacts from property and infrastructure damage.

The City of Sarnia is working towards equipping staff with better decision-making tools to anticipate flooding and erosion risks while trying to maintain and further build infrastructure that is resilient to the natural elements.

Stormwater management, overland flooding, and erosion are three main areas of risk within the City of Sarnia because of climate change.

The development of new standards for managing the risk of urban flooding, ongoing updating of floodplain and erosion risk mapping, and addressing key infrastructure deficiencies are crucial to limiting property and health risks. Additionally, green infrastructure (e.g., rain gardens) which replaces grey infrastructure (e.g., stormwater pipes) can be used to alleviate impacts of heavy rainfall. Effective flood mitigation strategies will require improved modelling using updated data, relying on partnerships with Conservation Authorities and community partners.

Stormwater and Overland

Stormwater management systems are especially important for public works and Conservation Authority infrastructure. Ponds and other slow-release systems help filter urban runoff and slow down the release of flows to lakes and rivers after a major storm event.

To build a stormwater system that is more resilient to intense rainfall events, there is a need to fill in the data gaps in the City's GIS model. This will assist staff in identifying the most at- risk areas. It should include up-to-date details on stormwater infrastructure and modelling to allow for enhanced identification of spatial risks. This can be used to inform future infrastructure improvements and new projects to increase stormwater infiltration and to include stormwater infrastructure maintenance in the long-term maintenance plans.

Rain and snow are typically absorbed by the soil on which they fall. As the water infiltrates the soil several benefits occur. The infiltration process filters contaminants from the water, replenishes soil moisture and recharges groundwater aquifers. However, snow and rain that falls on hard surfaces such as paved streets, parking lots and roof tops forms stormwater run-off and it is not absorbed by the soil. Instead, it generally flows into the nearest drainage system (storm sewers) and is directed into waterways. When the volume of stormwater is too great for the storm sewers to accommodate, streets and other urban areas can quickly flood. As stormwater washes through the streets, it tends to pick up and transport whatever it encounters – spilled oil, detergents, solvents, salt, pet wastes and so forth. This contaminated stormwater is usually not treated before it reaches rivers and lakes. Introduction of these contaminants to water bodies can lower water quality, cause an overabundance of algae, and reduce aquatic life.

It is anticipated that levels of precipitation and intensity of storms will increase in Sarnia which means more water is expected to fall in shorter periods of time, which can overwhelm our stormwater management infrastructure. This will lead to greater amounts of contamination being discharged directly into waterways as well as increasing the potential for property damage. For these reasons, it is important that the City address stormwater management to reduce the impacts to raw water quality and protect the natural environment.

Storm water management will be more effectively managed and integrated into other initiatives such as land use planning, environmental protection and capital planning for required infrastructure. Stormwater management will become part of a greater environmental protection and enhancement strategy.

Erosion

Erosion, particularly along the north shore of the City along Lake Huron, is an area of concern. Alongside Conservation Authorities and the federal government, City staff are working to ensure infrastructure at the waterfront is resilient to the effects of high-water levels and wave action and that staff are equipped with the proper decision-making tools to evaluate risks and providing suitable solutions.

The City needs to develop a detailed shoreline and erosion potential analysis to inform relocation and/or ongoing rehabilitation of critical infrastructure and improve infiltration on private property (i.e., retrofitting existing properties and new builds). Continued communication and partnerships with Conservation Authorities, utility stakeholders, owners and operators on erosion mapping and flood risk information is critical to fostering community-wide resilience.

CURRENT STATE

Existing undersized infrastructure, which does not comply with today's standards, can put public and private properties at risk of flooding due to heavy rainfall. Building-out the spatial analysis of stormwater, flooding, and erosion vulnerable areas, and applying this to inform new policies, by-laws, and projects to manage risk.

Proper planning will ensure the economic, social, and environmental costs of storm damage are reduced in the long-term by leveraging the best available information to predict where the greatest risks lie and taking proactive steps to invest in infrastructure improvements such as expanding naturalized areas to improve capacity to absorb stormwater runoff overland flows.

Programs and initiatives currently in practice:

- **Coronation Park** – Smoke Testing is used to determine if inflow and infiltration is a factor in basement flooding and sewer backups (ongoing)
- **Brights Grove Beach Erosion** - Use of armour stone as an effective and protective measure along shoreline (ongoing)
- **Ferry Dock Hill** - Check valves preventing water back up into municipal sewers
- **Standpipe installation** to prevent surface flooding during large rainfall events by providing extra storage
- **Planning** - Development of a 10-year plan for the water pollution control centre
- **Integration** of City's Asset Management Plan including shoreline protection plan

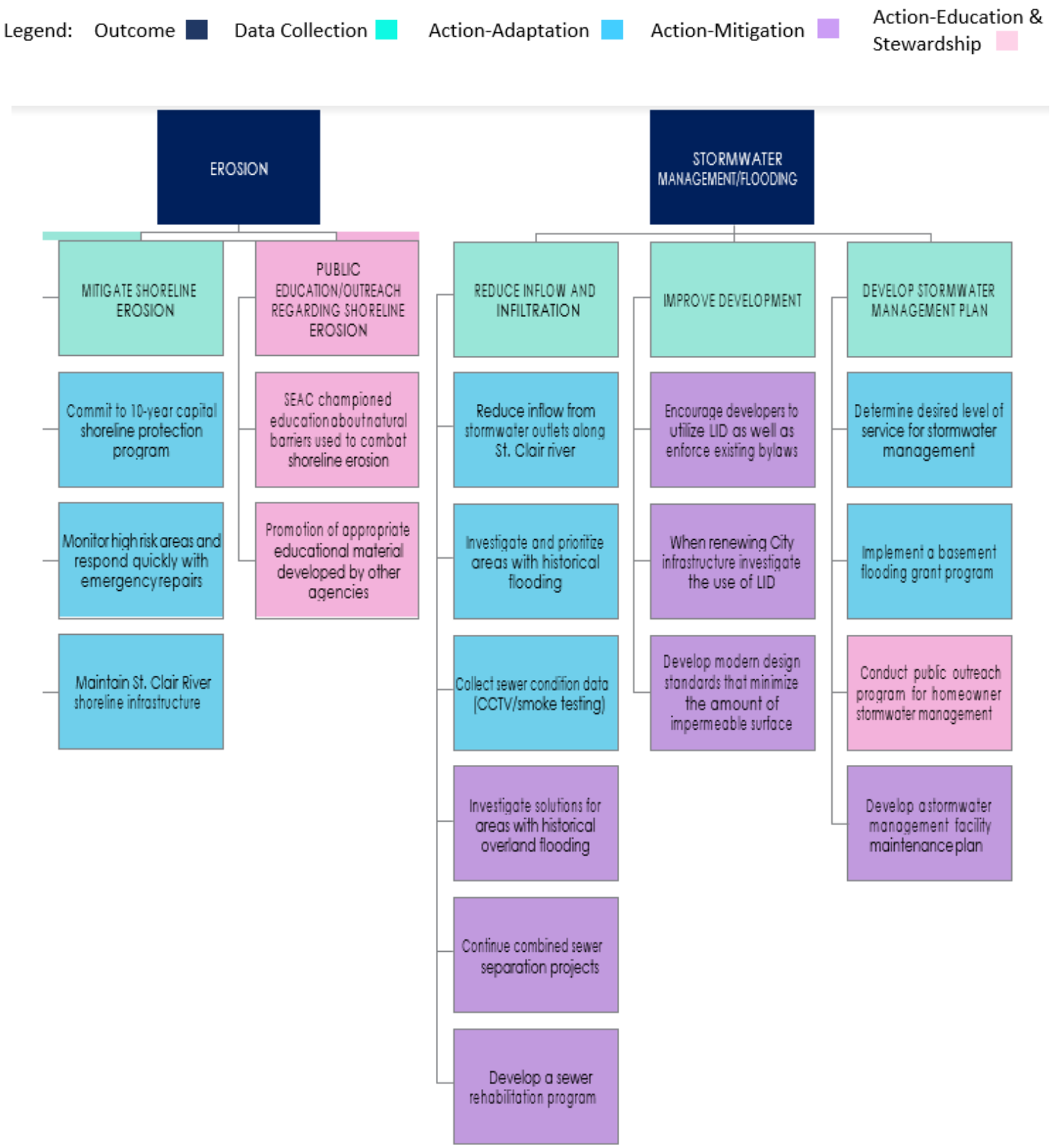
OBJECTIVES

Key objectives in the management of stormwater, flooding, and erosion risk include improving the proactive planning and decision-making tools at the disposal of City staff and investing in critical and social infrastructure resilience.

1. Reduce the inflow and infiltration in the municipal sewer system
2. Protect the municipal shoreline from rising water levels
3. Provide staff with decision making tools to identify areas of high vulnerability and risk of flooding and erosion
4. Enhance the resiliency of stormwater management and infrastructure across areas of known high flooding risk

Visualizing Outcomes

FLOODING & EROSION OUTCOMES



SHORELINE EROSION

With high water levels and a heavily developed shoreline it is important that Sarnia remains diligent in mitigating the effects of erosion. Development of a ten-year capital shoreline protection plan will encourage a more proactive approach to be adopted. In addition to the capital plan, continued monitoring of high-risk areas will allow for a quick response to any emergency repairs that are required. Existing infrastructure along the St. Clair River must also be maintained to ensure that costly unforeseen repairs are avoided. Education efforts, championed by the Environmental Advisory Committee (EAC), will focus on informing the public about natural barriers that can be utilized to combat shoreline erosion.

STORMWATER MANAGEMENT PLAN

The purpose of this plan is to assist the City in setting the desired level of service and outline the multiple areas of stormwater management. The City currently operates multiple stormwater management facilities that either require or will require maintenance in the short-term. A facility management plan will allow for the needs of these locations to be appropriately budgeted for. In addition to City owned infrastructure, there are measures that can be implemented to protect individual homes from significant rainfall events. Conducting public outreach / education and implementing a basement flooding grant program will assist homeowners with protecting their property from the negative effects of large storm events.

Inflow and Infiltration

Inflow and infiltration (I&I) place a major load on the City's existing infrastructure. Submerged outlets along the St. Clair river, aging sanitary and storm sewers, unidentified cross connections, and illegal connections to the City's infrastructure are all sources of I&I. Investigative projects such as CCTV, smoke testing, and flow monitoring are currently underway to assist in identifying these locations / sources of I&I. A focus for these investigations is in areas of the City that have historically experienced flooding. The continued elimination of combined sewers is also recognized as a way to significantly reduce I&I. Investigating sewer rehabilitation solutions will provide the City with options other than asset replacement in areas that are experiencing high I&I.

Improve Development

Development is an important aspect of stormwater management. Reducing the impact of development on new and existing infrastructure will help the City with adjusting to the reality of climate change. Low-impact development (LID) are measures that reduce the load placed on municipal grey infrastructure. Encouraging developers to utilize LID as well as modernizing existing by-laws will assist the City in managing the increasing frequency of significant rain events. This goal can be furthered through leading by example by investigating the use of LID when renewing City infrastructure.

COMMUNITY PILLAR #3

Emergency Preparedness & Response

OVERVIEW

The safety of a community, or even the perception of safety, can be an important component of sustainability as it impacts community livability as most people want to feel assured that their families and properties are generally safe. If safety issues are properly addressed on an on-going basis, residents will generally experience a higher quality of life. Key elements of community safety include protection from natural disaster, fire prevention and mitigation, and safety of the built environment.

The complexity of any emergency depends on a combination of factors such as the severity, intensity or duration of an event and the nature of the assets, services or demographics impacted. The City of Sarnia is responsible for developing, managing, and implementing its own emergency management programs through emergency planning, annual exercises, training, and public education.

Emergencies within the community (e.g., fire, police, medical, public works, power outages, flood control) are addressed through the response capabilities of local agencies or by activating predetermined emergency response plans and procedures. With a changing climate that is characterized by more severe, intense and frequent temperature, precipitation, and extreme weather events, it is likely that the demand for emergency services will increase, presenting new challenges to key preparedness and response agencies that are tasked with delivering emergency services to the community.

As climate-related events become more prevalent, so too will the demand for these emergency services and the need for timely and effective responses. A further concern for emergency personnel are the unique challenges and risks that climate change poses to priority populations who may be disproportionately affected by a disaster or are unable to evacuate or secure their own safety in a crisis.

Through a commitment to proactive planning, the City of Sarnia can build its resiliency and enhance its adaptive capacity to manage the growing trend of extreme weather and climate- based events.

Strong communication and accessible education materials are central to the timely awareness of imminent risks, especially for priority populations such as seniors, homeless, and those below the poverty-line. An individual's vulnerability to climate variability can be influenced by their exposure to a hazard or stressor, their level of sensitivity to the effect of that hazard, or their capacity to adapt. All these factors can have lasting and consequential effects on the health, life, safety, and overall well-being of certain demographic groups.

CURRENT STATE

As climate change persists, emergency preparedness and response efforts will need to assess the existing emergency management framework and incorporate the unique needs and circumstances of the community's diverse residents and the state of its infrastructure into future planning efforts.

Alongside our municipal/County partners, the City will further implement its emergency notification system MyCNN. Through this system, municipalities, emergency management, and rescue services will be able to notify residents and businesses of public safety messages in the event of a large-scale emergency such as a flood, severe weather, tornado, or significant power outages.

The City will carry out business continuity planning using an all-hazards approach to address daily operations, roles and responsibilities, critical activities such as emergency shelters and emergency staffing. The City will reengage its critical support groups, non-governmental agencies, and non-municipal infrastructure/facilities.

Through additional analysis and mapping, the City can determine the areas and demographic groups that are most at-risk within the community, and implement measures that plan, prepare, and mitigate the impacts of climate change to those populations.

Programs and initiatives currently in practice:

- Lambton Public Health currently utilizes a shared notification tool called My Community Notification Network (MyCNN) that notifies its citizens of heat and cold temperature alerts and road closures. Seniors are signed up for the notification program through local senior outreach initiatives.
- The City media representatives (City, Fire, Police) engages the community on social media during the Emergency Preparedness Week (which occurs in the first week of May). The Emergency Manager encourages Emergency Preparedness through social media and speaking appearances throughout the year.
- Externally, extreme weather announcements and updates are communicated through Lambton Public Health and the City shares their communications. The County of Lambton, utilizing a shared notification platform, contacts citizens of heat/cold alerts.
- Internally, the Emergency Response Plan sets out communication protocols and response procedures for when an emergency is declared.
- Updates to the City's website/social media are only made during regular business hours.
- The Emergency Management Program Committee has identified realistic hazards that may occur in the City and assessed them in terms of probability, frequency of occurrence, and magnitude of consequence or impact. The HIRA tool is utilized and reviewed annually. Results of the HIRA assist with the development of training and exercise scenarios and may initiate the development of hazard-specific plans or procedures in the event of an emergency.
- The City's Emergency Response Plan includes the governance structure for emergency response, roles and responsibilities, response goals for emergency operations and a HIRA of realistic hazards that may occur in Sarnia.
- City facilities with onsite generators include City Hall for identified Emergency Devices such as servers and supporting Information Technology equipment.
- The City maintains three fuel storage locations at Public Works, Police and Fire.
- The pandemic in 2020 aided the City to implement work from home strategies. The long-term offering of this ability is being reviewed.

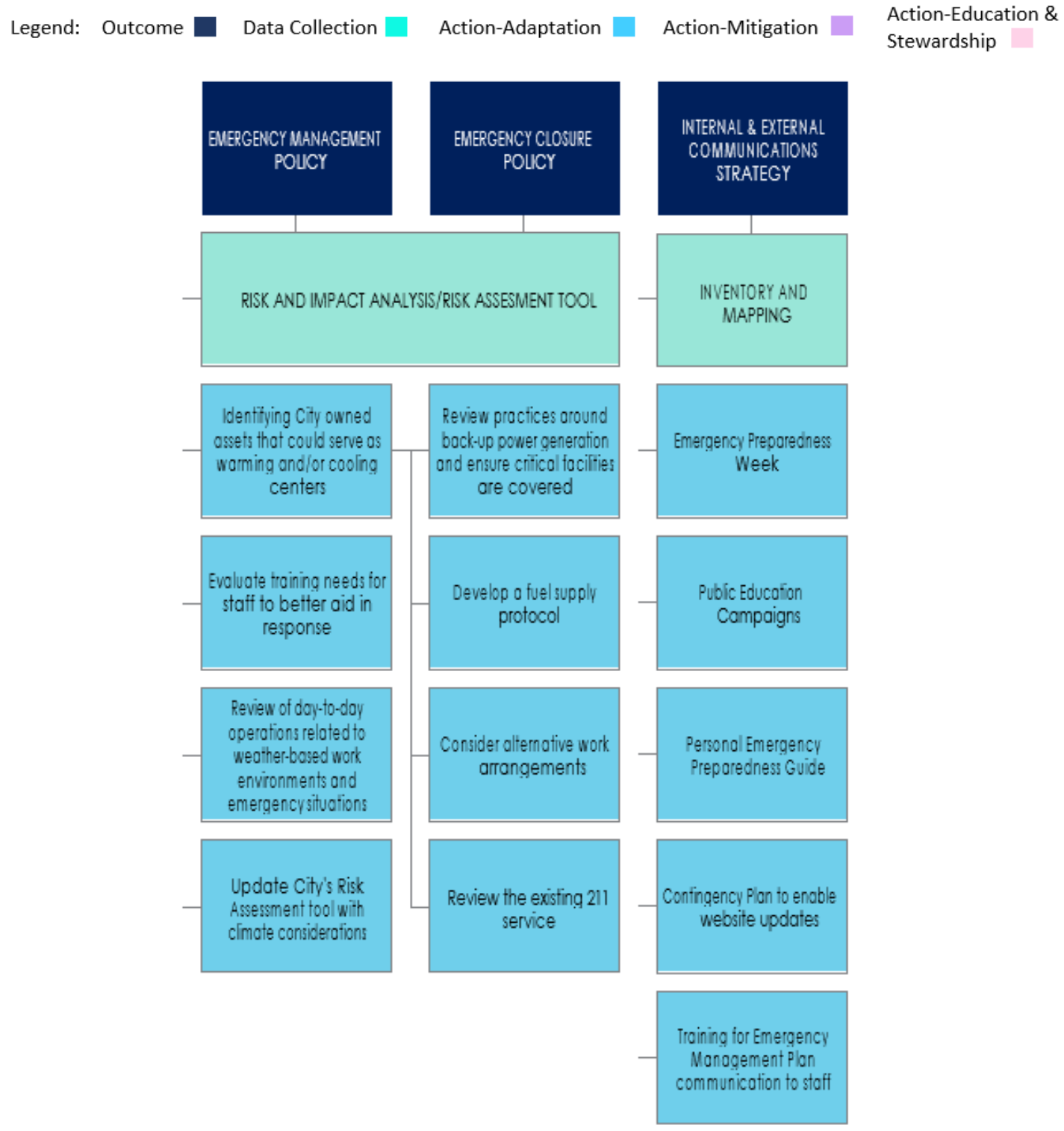
OBJECTIVES

Key objectives to better prepare Sarnia for climate related disruptions to emergency services and response include a focus on vulnerable populations, improving infrastructure resiliency, increasing awareness and preparedness, offering supporting programs and policies to manage human health impacts, and having emergency plans in place.

1. Minimize safety risks to outdoor workers and community members and ensure priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information.
2. Generate awareness of changing climate conditions with staff and the public and ensure priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information.
3. Support a coordinated response to, and recovery from, extreme weather events.
4. Minimize disruption to City services.

Visualizing Outcomes

EMERGENCY PREPARDNESS & RESPONSE OUTCOMES



Outcome Summaries

The objective of the Emergency Management Response Plan is to safeguard the property, health, safety and welfare of citizens faced with an emergency. This allows for the protection of people, property and the environment with a controlled and coordinated response by a number of agencies.

Focusing on climate change, the flowchart provides a straightforward visualization that illustrates the important role of both response procedures as well as communication strategies for the City's Emergency Preparedness and Response. Response procedures and communication strategies are integral aspects interwoven into the City's Emergency Management Response Plan.

EMERGENCY MANAGEMENT POLICY

The Emergency Management Response Plan provides Police, Fire, Emergency Medical Services, City Engineering, Sarnia Transit, Community Services, and various other organizations a framework to operate within a unified command structure. The City will review and update the Plan to ensure climate change considerations are appropriately addressed, ensuring that policies and procedures cover climate factors such as extreme cold and heat, high winds, freezing rain, intense rainfall, and heavy snowfall.

Hazard Identification and Risk Assessment (HIRA) will serve as a tool to assess which hazards pose the greatest risk in terms of how likely they are to occur and how great their potential impact may be. Based on the HIRA, actions related to emergency response and preparedness procedures will be considered. For the purposes of the flowchart, the response plan focuses on response processes, protocols, training, and determining locations for ad-hoc warming and cooling centers Response procedures are outlined in The Emergency Management Response Plan.

INTERNAL AND EXTERNAL COMMUNICATIONS STRATEGIES

Strong and effective communication strategies and systems are essential to Emergency Management Response Plans to help ensure public safety, protect property, facilitate response efforts, elicit cooperation, instill public confidence, and aid in community resiliency. Internal and external communication strategies are necessary to ensure informed response to extreme weather events of emergency by staff and to ensure citizens, priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information. A gap analysis will serve as a method of data collection to identify current practices (what is communicated, to who and how) and identify gaps and opportunities to improve existing communication strategies and systems climate change and extreme weather.

GHG Emissions – Buildings, Energy, Transportation & Waste Diversion

OVERVIEW

Greenhouse Gas (GHG) emissions are contributing to the acceleration of climate change. While there are many natural sources of GHG emissions, human activities have contributed to increasing concentrations of GHG emissions into the atmosphere. The majority of human caused GHG emissions are from energy production and consumption for buildings and transportation and solid waste decomposition.

There is opportunity corporately to achieve emission reductions by focusing on fleet and equipment as well as the corporate buildings and facilities. When it comes to corporate actions a focus on energy efficiency projects, promotion of active transportation and waste diversion initiatives will be at the forefront.

GHG emissions from the industrial sector are regulated by the Provincial and Federal governments and corporations have their own specific plans and targets. The city will support opportunities to work with the private sector to cooperatively reduce GHG emissions, or implement other climate adaptation initiatives, as opportunities are identified.

CURRENT STATE

Buildings and Energy

Developing strategies to address energy demand and supply is critical to community sustainability and emergency preparedness for several reasons. Producing and consuming energy results in environmental consequences such as greenhouse gas emissions, ecological impacts, and air quality concerns.

The city strives to achieve continual reductions in per-capita energy consumption and promote a sustainable energy-use lifestyle through building / facility energy audits / assessments, and the increased use of renewable energy sources and new technologies such as LED lighting, window replacements, the use of new high efficiency Air Conditioning units and refrigeration equipment that use low GHG refrigerants.

Transportation and Transit

A well-functioning transportation network is pivotal to our local economy in terms of moving goods and allowing business to thrive as well as maintaining community social connections. How we move around the community can have significant environmental consequences including the dedication and consumption of land used for roads and release of greenhouse gas emissions. A sustainable transportation system for Sarnia results in significantly reduced automobile usage, particularly single-occupant vehicles.

On-road transportation is the highest CO2 emitting sector in Ontario due to the heavy reliance on personal and commercial vehicles utilizing fossil fuel burning combustion engines. Ample opportunities exist to evaluate the availability of zero emission vehicles, lower carbon and renewable fuels to reduce the emissions of the city's fleet. Further, for some years, the city has prioritized improvements in active transportation through a connecting trail and pathway network and an increase in bike lane infrastructure and safe street initiatives.

OBJECTIVES

1. Implement the Transportation Masterplan and promote Active Transportation
2. Explore and research opportunities to develop a Fleet Management strategy that will consider and support the purchase of electrified vehicles and or other more efficient Eco-vehicles
3. Introduce measures to increase transit ridership
4. Introduce measures to reduce the usage/storage of hazardous chemicals and or designated substances including refrigeration systems and lighting
5. Reduce electrical consumption and optimize energy efficiency by creating implementation plan specifically for infrastructure retrofits of existing facilities
6. Explore and investigate opportunities that assist with Waste Diversion and promote and encourage corporate and community use of the City's Compost site

Solid Waste Diversion

It is important for the City to continue to increase efforts to divert waste from the landfill and to reduce community emissions associated with solid waste. Production and consumption of goods results in waste generated throughout the whole product life cycle as well as substantial amounts of energy to produce, distribute, and use goods. Solid waste decomposition results in production of greenhouse gas emissions (CO2 and methane).

Organic curbside collection is another initiative that is encouraged and aligns with the shift of the Province of Ontario to a circular economy, as outlined in their 2017 Strategy for a Waste-Free Ontario: Building the Circular Economy. The Government of Ontario has also proposed a new Blue Box regulation which will see recycling responsibilities handed off to producers and increase the list of materials accepted, including "paper and plastic cups, wraps, foils, trays, and bags and other single use items such as stir sticks, straws, cutlery and plates" (Government of Ontario, 2020).

From a GHG emission reduction perspective, the focus is on the diversion of organic waste from the landfill. Once organic waste (i.e., food waste, brush, lawn clippings, cardboard) is buried in a landfill in an oxygen depleted environment, the organic waste generates methane (CH4) which is at greenhouse gas that is at least 25 times more potent than CO2. When the same organic materials decompose in an oxygenated environment, such as a backyard composter or the municipal organics digester, methane gas is not produced.

The Green Bin program is a waste diversion program that decreases the amount of organics being dumped at the landfill. The organic matter collected with Green Bins is composted into a reusable soil resource for farmers. Backyard composter is another alternative to make use of your organic waste to nourish your garden.

DID YOU KNOW?

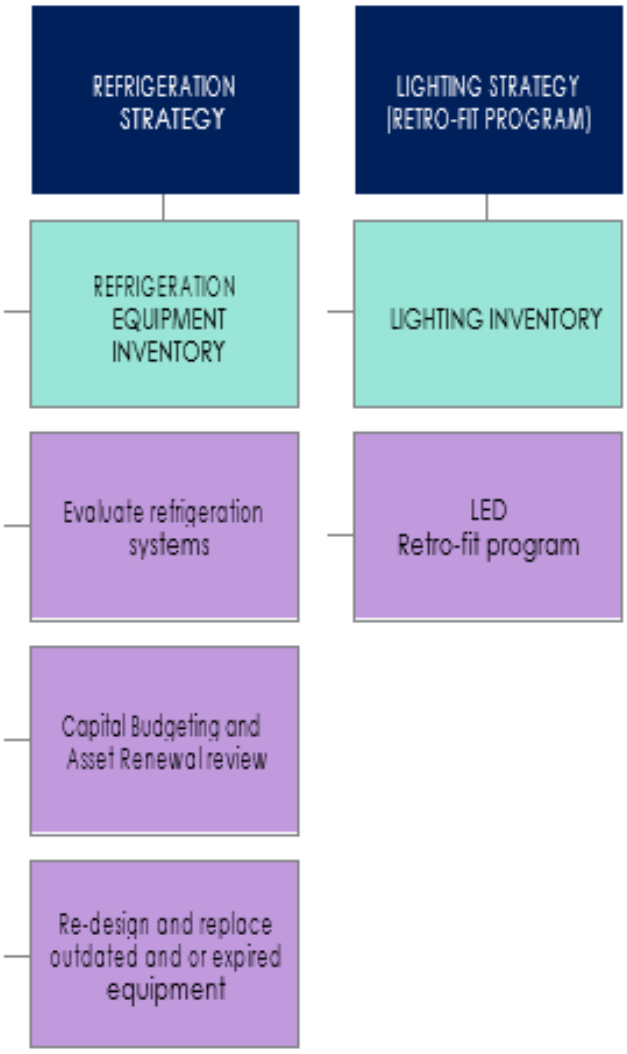
It would take a forest five times the land area of Sarnia-Lambton to capture the community's annual emissions.

164.6 km² x 5

Visualizing Outcomes

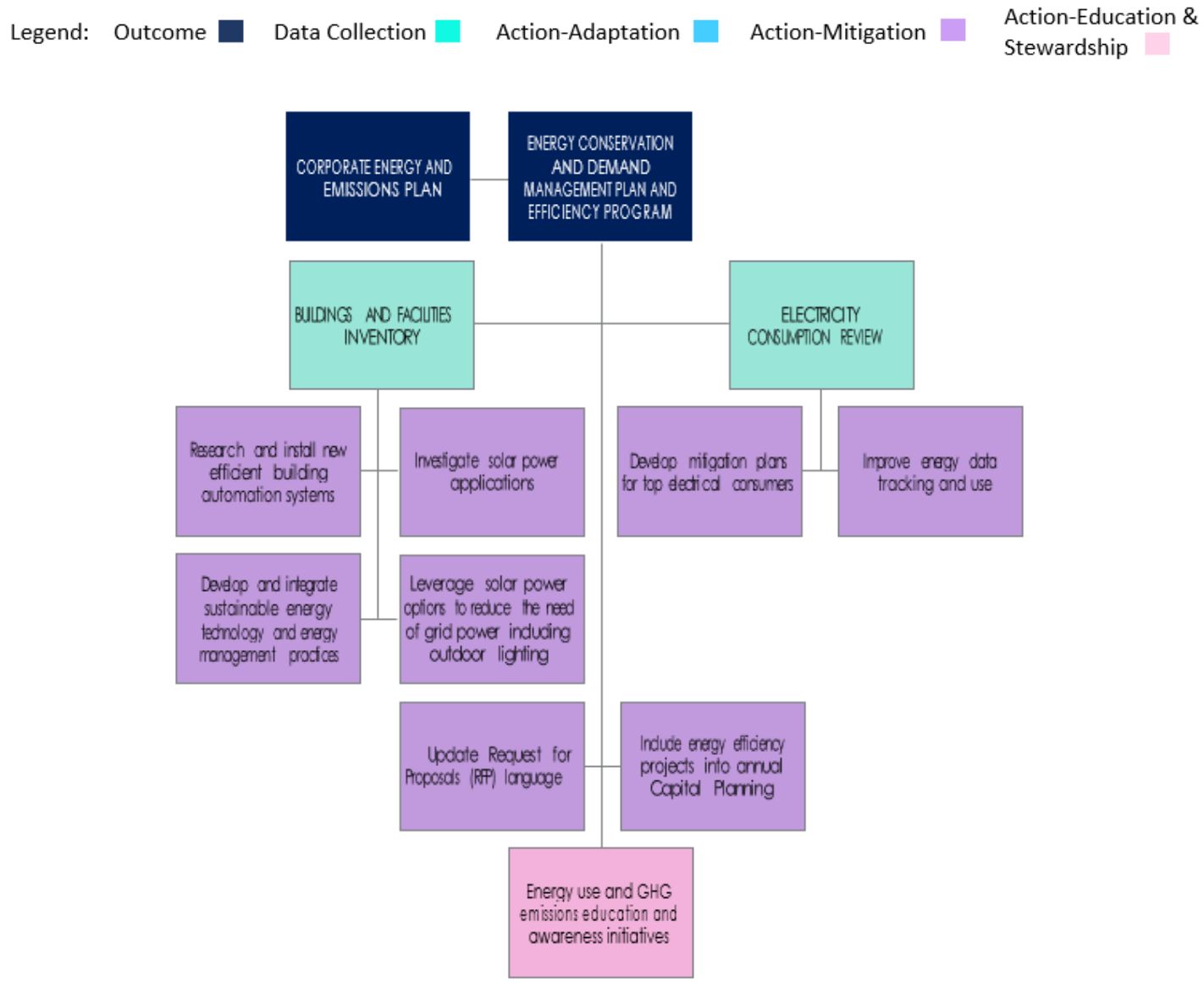
GHG EMISSIONS - BUILDING OUTCOMES – A

Legend: Outcome Data Collection Action-Adaptation Action-Mitigation Action-Education & Stewardship



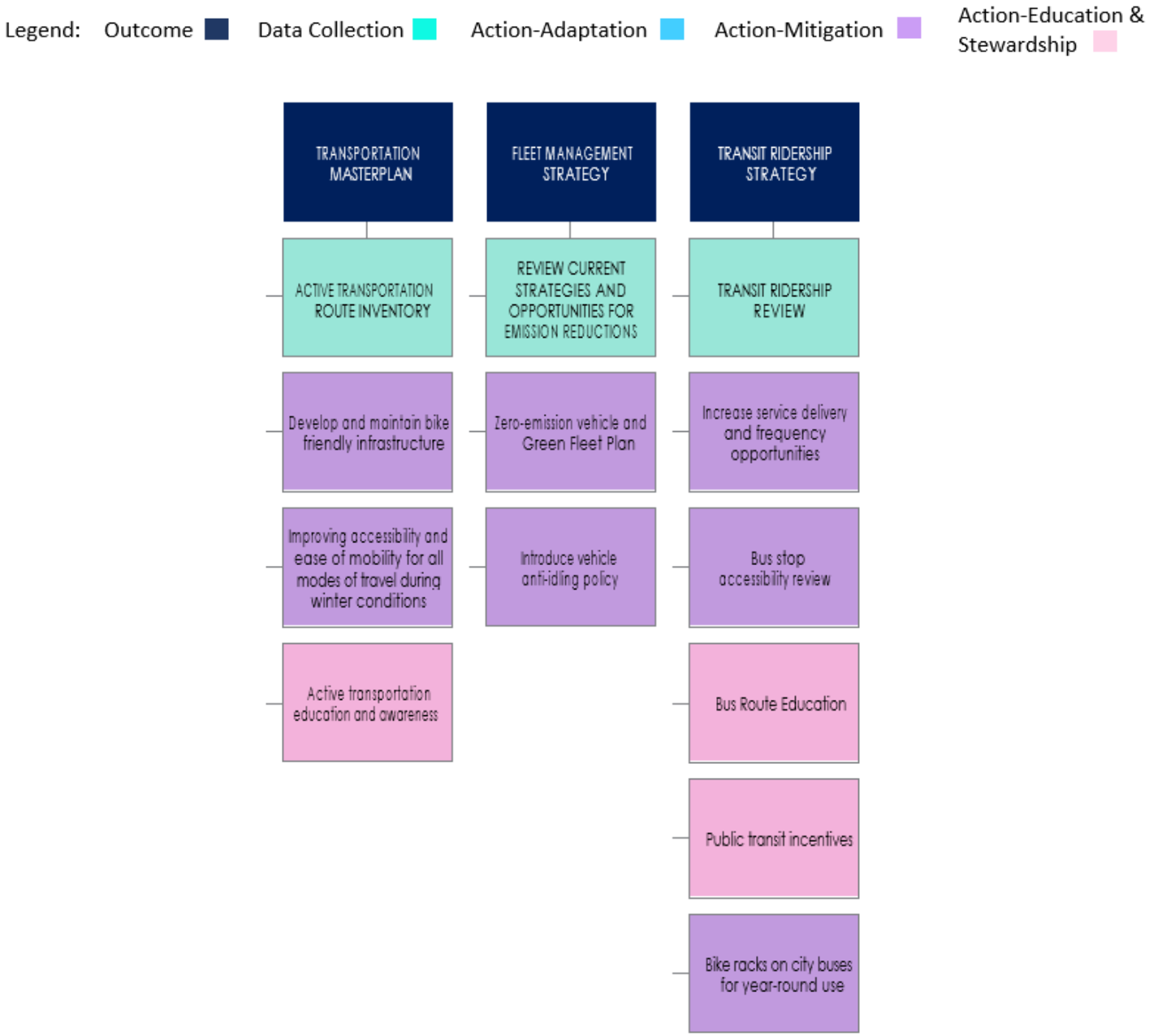
Visualizing Outcomes

GHG EMISSIONS - BUILDING OUTCOMES – B



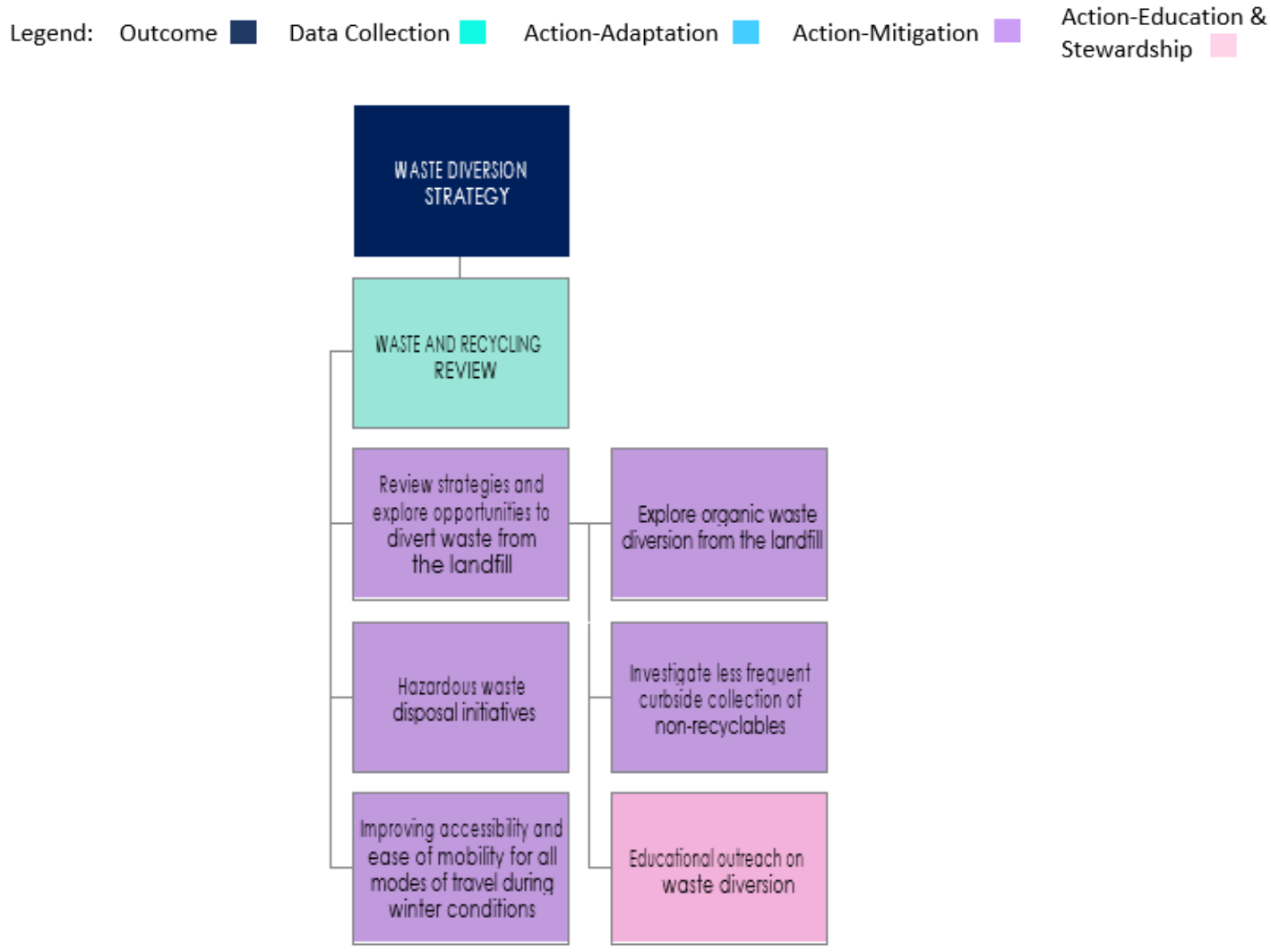
Visualizing Outcomes

GHG EMISSIONS - TRANSPORTATION OUTCOMES



Visualizing Outcomes

GHG EMISSIONS - WASTE DIVERSION OUTCOMES



Outcome Summaries

BUILDINGS AND ENERGY

Reducing energy demand will reduce the production of greenhouse gas emissions and result in cost savings. Many of the largest energy saving opportunities have been implemented over the past few years with conversion of streetlights to LED and implementation of more energy efficient equipment at the City's large-scale facilities. Moving forward the plan will need to be more strategic on identifying the cost/benefit of the next level of opportunities to mitigate energy demand.

TRANSPORTATION AND TRANSIT

Vehicles are one of the largest contributors to municipal greenhouse gas emissions. A green fleet plan will provide a strategy for converting the municipal fleet to zero-emission vehicles and equipment. The transit fleet will be a priority based on the large impact it will have on reducing greenhouse gas emissions and to take advantage of federal and provincial grants available to support the conversion. Enhancing the City's active transportation network and transit system will make them more attractive choices to encourage the broader community to take less single passenger vehicle trips.

WASTE MANAGEMENT

Sending organic waste to the landfill is a major contributor to greenhouse gas emissions and is a poor utilization of limited landfill capacity. The City will start planning for the provincially mandated development of an organic waste program to be implemented by 2025.

GREENHOUSE GAS REDUCTION STRATEGY

The Greenhouse Gas Reduction Strategy has 3 major components that are contingent on the success of reducing the GHGs. Each of the 3 components in its own way is equally important and ultimately aligns with the end goals of reduction in GHG emissions. Through the reduction in the usage and storage of hazardous chemicals and or designated substances we will be able to lower the risk and impact of a potential leak of the dangerous gases into the atmosphere. The goal would be to reduce our usage of these dangerous refrigerants by a minimum or 25% in the next 5 years.

The next component to the reductions strategy would be to reduce electrical consumption in all our facilities, which in turn will reduce our demand and dependency on the electrical grid. The last component is to reduce the use and dependency on fossil fuels in our operations by purchasing new equipment that is far more efficient using electricity/ solar as its fuel source.

Reduce usage/ storage of hazardous chemicals and or designated substances by:

1. Replacement of all outdated and or expired refrigeration equipment not highly efficient
2. Replacement of all florescent light fixtures, metal halide, compact florescent lights with LED lighting
3. All new equipment that usage various refrigerants must be high efficiency and use less refrigerant to operate

Reduce electrical consumption in all city facilities by:

1. Replacing all facility lighting with high efficient LED lights which will reduce the electrical demand/generation
2. Research/invest in new Building Automation systems to increase facilities' efficiency, in turn, reducing the electrical demand and hydro generation
3. Research /invest in solar power options to reduce the need for electricity from the grid for all city facilities

Reduce usage of Fossil fuels for general operations

1. Purchase of electric powered vehicles/equipment
2. Research/invest in new Building Automation systems to operate more efficient, in turn will reduce the usage of the various building systems that currently use natural gas and electricity
3. Research /invest in solar power options to power various equipment, which will decrease the need of electricity from the grid and decrease our dependency on the grid

GREENHOUSE GAS EMISSION PREVENTION STRATEGY

With GHG emissions, it is not only important to think about today and our current facilities, but to have a plan in place for the future that takes into consideration future needs of the community/ facility/ properties. The city will look to commission a study for all new proposed facilities that will provide a forecasted GHG impact. The goal would be for all new facilities to have a low impact on GHG emissions.

CCAPIS Monitoring and Review

CONCLUSION

The CCAPIS identifies a path forward for the City to proactively prepare for climate change which will require continuous monitoring and review of the objectives and adaptation actions outlined therein.

The key objectives presented in this plan will assist the City in further developing its emergency management, natural systems, stormwater, flooding and erosion and Green House Gas Emissions – Buildings, Energy, Transportation and Solid Waste programs. Overall, the CCAPIS is designed to improve the City's adaptive capacity to achieve each objective presented.

Monitoring and review are important pieces of the adaptation plan and process as the objectives, action items are flexible and subject to periodic reviews. Lessons learned through monitoring can be integrated into future adaptation actions.

To be successful, emission reduction efforts must become part of the operational culture of the City and both human and financial capital investment will be required. The plan acknowledges that there are municipal constraints and recommends funding (both governmental and private sector) that can further help with implementation. The breakdown of actions in short, medium and long term helps with a more phased implementation approach.

It is important to note that this plan should be viewed as a living document and as such it is expected to evolve over time as technologies, funding and regulation regarding climate change mitigation change.

For the City's identified Community Pillars, it is important that departments work together to facilitate and monitor programs that mitigate the impacts of climate change and to lay the groundwork for increased green infrastructure on public lands.

Communication and an increased community education and awareness is an integral part of the strategy and implementation plan that is included across all 4 Community Pillars and objective there within.

MONITOR, EVALUATE, REPORT AND REVIEW

Monitoring, evaluating, reporting and reviewing the implementation of climate actions on an ongoing basis will enable staff to adjust and optimize climate action implementation and ensure the highest level of success. Progress on implementation of climate adaptation actions will be monitored using key performance indicators (KPIs) that are tailored to each climate action. Mitigation actions will be monitored by tracking customized KPIs and corporate GHG emissions. The City acknowledges that specific KPIs for each action still needs to be completed. Evaluation will measure the effectiveness of the action based on the KPIs and the intended objective.

Reporting on climate change actions, outcomes, and objectives, transparency will be promoted internally and externally. This builds accountability, trust, and civic engagement, which are important to influence climate action within the community. It also enables the City to lead by building knowledge on the initiatives with the greatest impact and awareness of those initiatives where the City should pivot and adapt. Monitoring, evaluating and reporting will be accomplished through three main avenues: regular ICCWG meetings, annual report cards, and bi-annual plan reviews.

REGULAR INTERDEPARTMENTAL CLIMATE CHANGE WORKING GROUP MEETINGS

Implementing and overseeing the action plan will require staff time from several of the City's departments. The departments who have participated in the creation of the plan will continue to play an active role in the monitoring and implementation of the plan. In addition, monitoring and reporting of relevant data will be necessary to produce annual reports and plan updates.

These departments and specifically the ICCWP will work to identify opportunities to implement the plan and include this in their annual work programs and budgets as appropriate.

Lead and supporting divisions will be responsible for providing updates on the status of action item implementation, timelines, costs and other reporting details as required. At this time, the corporate GHG emissions inventory still needs to be completed. Although this is crucial data necessary to set targets, actions, and measure reductions, the city will strive to continue to move forward with meaningful climate actions as this initiative progresses.

ANNUAL REPORT CARD

An Annual Report Card will be developed as a way to ensure that actions are being pursued efficiently and effectively. City staff will complete an Annual Report Card that will be submitted to Council and made available to the public. The annual report will summarize KPIs and GHG emissions, highlight successes and lessons learned throughout the action implementation process, and provide an overview of the work that will be undertaken in the following year.

PLAN REVIEW

The CCAPIS is a living document that will be adapted throughout the implementation process. With input and support from the ICCWG, EAC will review the plan every two years and update it every five years. Updates to the plan will incorporate lessons learned from implementing the plan and will be updated based on the current context, Council priorities and new opportunities.

IMPLEMENTATION STRATEGY

OBJECTIVES AND GUIDING ACTIONS

The plan is a progressive step and encourages a commitment to become more sustainable on an environmental, social and economic level. It builds on the City's participation in previous environmental initiatives, energy efficiency projects and efforts to lower GHG emissions.

For the plan to move forward, the City must follow through on implementation, and monitor GHG reduction results.

The objectives and associated actions outline high-level intentions that the City will strive towards in implementing the CCAP.

An implementation schedule was developed for the actions to inform who, when, and how they will be implemented. For each action, the schedule outlines scope, division leads, timelines, and estimated resource needs at a high level. The schedule will also be an important tool for reporting on the City's progress related to climate change adaptation objectives. The CCCAP is intended to be a living document that will be updated as opportunities arise, and new information becomes available. It will serve as a guide for the City as it continues to adapt its assets, operations, and services to the impacts of a changing climate.

The recommended actions under each section of the plan integrate both initiatives that may already be underway and new recommendations to reduce climate change related risks from corporate operations and the greater community.

The action items represent the measurable steps the City of Sarnia will need to take to achieve the vision for limiting climate risk and improving community resiliency.

The plan contains over 100 suggested actions that are recommended to be implemented over time. The implementation of actions will be championed by the City as well as the Environmental Advisory Committee.

Timelines for Action:

Actions within the plan have been broken down into separate timeframes, due to resource constraints and other barriers to implementation. The timing and length of actions can be adapted to respond to changes in policy, technology and funding. This plan is intended to be a living document.

Short (1-2 Years)
Medium 3-5 Years)
Long (5+ Years)

Cost:

$ - Minimal
$$ - Medium
$$$ - Significant

Categories:

Plans & Studies
Guidelines & Standards
Policies
Capital Asset Renewal
Community Initiative
Data Technology

COMMUNITY PILLAR # 1

NATURAL ENVIRONMENT – PARKS, OPEN SPACES, NATURAL & PROTECTED AREAS

OBJECTIVE 1-Urban Forest Management Plan: Enhance, Plan and maintain the green infrastructure including Natural urban Areas, Parks, and Open Spaces within the urban boundary of the City to be resilient and supportive of biodiversity and to help protect the critical and social infrastructures from climate change impacts.

OBJECTIVE 2: Protect, monitor, restore and expand the natural heritage systems within the City to support biodiversity and improve resiliency to climate change impacts.

OBJECTIVE 3: Promote and provide opportunities to participate in Environmental Stewardship and Education initiatives.

OBJECTIVE 4: Reduce emissions and consumption through an increase in reductions, reusing, and recycling.

Year	Action Project	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsible Department
2021	Parks and Facilities Green Tool and Equipment Transition	Potential KPIs: - GHG emission reductions	TBD	TBD	Electric chainsaws, trimmers and leaf blowers purchased 2019-2021	Parks and Facilities Operations
2021	Community Garden Policy	Using inventory baseline track number of community gardens established.	TBD	Approved July 2021	Completed July 2021	Parks and Facilities Operations
2021	Green Tools Management Strategy	Potential KPIs: - GHG emission reductions	Electric Ice Resurfacer: $150,000 (move to Engineering, Fleet Mgmt. Strategy)	Approved January 2021	Electric Ice Resurfacer purchased January 2021 using funds from the Fleet Replacement funding for 2021	Parks and Facilities Operations
2021	Urban Street Tree Inventory	None - baseline information for Item 2	$100,000	Approved 2021 Capital Project	On-track for completion by end of 2021	Forestry & Horticulture
2022	Tree Canopy Assessment	None - baseline information for Item 2	$10,000	Approved 2021 Capital Project	On-track for completion by end of 2022	Forestry & Horticulture
2022	10-year Urban Forest Management Plan	Potential KPIs: - canopy cover % targets - diversity targets - new tree survival rate - canopy structure targets	$60,000	Approved 2021 Capital Project	On-track for completion by end of 2022	Forestry & Horticulture

Year	Action Project	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsible Department
2023	Green Development Standards	Potential KPIs: - Climate targets and by-laws adopted - Policies updated/amended - Building energy performance - Instances of building standard certification (e.g., Passive House) - Greenhouse gas emissions (tonnes/year) - Total building energy consumption (MWh/year) - Number of secondary plans or new developments built to the green development standard	TBD	TBD	TBD	Planning Engineering and Operations
2025	Salt Management Plan	Potential KPIs: - % reduction of salt usage	TBD	Council approved in 2006; included in Sarnia Official Plan 2014	Winter Operations and Salt Management Plans underway; Implementation by 2025	Engineering and Operations
On-going	Natural Environment Education and Awareness Communication Campaigns	Potential KPIs: - social media likes and engagements - # of communication campaigns/posts - - # of community groups engaged	none	TBD	On-going	Parks and Facilities Operations Communications
On-going	Environmental Stewardship Initiatives	Potential KPIs: - # of initiatives and activities - # of participants in incentive programs - # of trees used in community planting projects	Part of $30,000 naturalization budget	Adopted by Council	On-going	Parks and Facilities Operations

Year	Action Project	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsible Department
	Develop a Green Infrastructure Strategy	Potential KPIs: - Plans/policies updated - Permeable to nonpermeable surface area ratio - Number of stormwater infrastructure assets implemented/maintained/ upgraded	TBD	TBD	TBD (Mitton Parking Lot project in 2022, uncertain beyond that)	Engineering & Operations
	Municipal Tree By-law review	Timeline for completion.	TBD	TBD	TBD	Forestry & Horticulture
	Natural Areas Management Plan	Potential KPIs: - % of increased hectares of natural green spaces - # of natural areas protected, restored, or created	TBD	TBD	TBD	Parks and Facilities Operations
	Invasive Species Management Strategy	Potential KPIs: - hectares controlled - # of sites restored	2020 Approved Capital Budget $82,000 for Gypsy Moth Control Program	TBD	2019: Controlled Burn Targeting Phragmites at the Suncor Nature Way SWMF 2021: Garlic Mustard Spraying in Canatara Park 2020-2021: Gypsy Moth Control Program	Parks and Facilities Operations
	Memorandum of Understanding with St. Clair Regional Conservation Authority	Potential KPIs: - Service Standards	TBD	TBD	TBD	Planning Parks and Facilities Operations

COMMUNITY PILLAR # 2

FLOODING – STORMWATER MANAGEMENT, OVERLOAD & EROSION

OBJECTIVE 1: Reduce the inflow and infiltration in the municipal sewer system.
OBJECTIVE 2: Protect the municipal shoreline from rising water levels.
OBJECTIVE 3: Provide staff with decision making tools to identify areas of high vulnerability and risk of flooding and erosion.
OBJECTIVE 4: Enhance the resiliency of Stormwater management and infrastructure across areas of known high flooding risk.

Year	Action Project	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsible Department
2020	Water and Sewer User Rate Study	Timeline for completion	$150,000	2020 - Council Approved	Study completed Implementation deferred by council during covid	Engineering and Operations
2021	Basement Flooding Grant Program	Potential KPIs: - number of claims - % of participants who completed installation and repairs to reduce flood risk	Part of Sewer Operating Budget	2021 - Council Approved	2021 - program underway	Engineering and Operations
2022	Flooding and Stormwater Education and Awareness Communication Campaigns	Potential KPIs: - social media likes and engagements - # of communication campaigns/posts - # of community groups engaged	None	On-going	2022	Engineering and Operations Communications
2023	Green Development Standards	Potential KPIs: - Climate targets and by-laws adopted - Policies updated/amended - Building energy performance - Instances of building standard certification (e.g., Passive House) - Greenhouse gas emissions (tonnes/year) - Total building energy consumption (MWh/year) - Number of secondary plans or new developments built to the green development standard	TBD	TBD	TBD	Planning Engineering and Operations
2023	Sewer Rehabilitation Program	Potential KPIs: - m of sewer repaired/replaced	TBD	On-going	2023	Engineering and Operations

Year	Action Project	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsible Department
2023	Stormwater Management Plans	Potential KPIs: - Ha of restricted/unrestricted flood vulnerable area - Permeable to nonpermeable surface area ratio - Number of stormwater infrastructure assets implemented/maintained/upgraded - Land area that has stormwater management controls for water quality and quantity in place	TBD	On-going	TBD	Engineering and Operations
2023	Stormwater Pond Management Maintenance Plan	Timeline for completion	$10,000 annually	On-going	In development for 2023, annual sampling of and sediment depth, part of the O&M SWMF manual	Engineering and Operations
2024	Residential Stormwater Management Outreach Program	Potential KPIs: - # of outreach program participants - # of residential LIDs implemented - volume of runoff entering the municipal storm sewer system reduced - volume of runoff naturally filtered	TBD	Not started	2024	Engineering and Operations Communications
2025	Stormwater Hazard Identification and Risk Assessment	Timeline for completion	TBD	TBD	2025	Engineering and Operations

Year	Action Project	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsible Department
On-going	Inflow and Infiltration Reduction Study & Flow Monitoring	Potential KPIs: - # of km of sewer surveyed - # of potential problem areas identified	TBD	On-going	Ongoing	Engineering and Operations
On-going	Combined Sewer Separation Flooding and Overflow Mitigation Project	Potential KPIs: - km of combined sewer remaining - Amounts of storm water to the urban water system - amount of flow to treatment plant reductions	TBD	On-going	TBD	Engineering and Operations
On-going	Shoreline Protection Program	Potential KPIs: - m2/Ha of shoreline protected - number of shoreline protection projects - hard/soft armouring ratio	3.25M/year	On-going	On-going Shoreline Revetment and stabilization projects using soft and hard armouring measures	Engineering and Operations

COMMUNITY PILLAR # 3

EMERGENCY PREPAREDNESS & RESPONSE

OBJECTIVE 1: Minimize safety risks to outdoor workers and community members and ensure priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information.

OBJECTIVE 2: Generate awareness of changing climate conditions with staff and the public and ensure priority populations and businesses are communicated with about emergency preparedness and have access to emergency resources and information.

OBJECTIVE 3: Support a coordinated response to and recovery from extreme weather events.

OBJECTIVE 4: Minimize disruption to City services.

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
2014	Emergency Notification System (MyCNN) Expansion and Implementation	- Templates created in system - Recipients identified - Templates, tested - Create Standard Operating Procedure (SOP) for staff to use when needed	Part of Emergency Management Budget	Approved	Completed in 2014; followed by ongoing implementation	Emergency Management, Communications
2021	Extreme Weather Event Staff Training	- Create training for outdoor and event staff - Provide training to staff	TBD	TBD	2021; followed by ongoing implementation	Emergency Management, Human Resources
2021	City Hazard Identification and Risk Assessment (HIRA) tool Review	- Ensure climate change considerations are incorporated into the City's Risk Assessment tool as part of the annual review process and training	Part of Corporate Services Existing Budget	TBD	The HIRA tool is utilized and reviewed annually 2021; followed by ongoing implementation	Emergency Management
2022	Alternative Work Arrangement Strategy	Potential KPIs: - Emergency plans/protocols updated or created	Part of Corporate Services Existing Budget	TBD	2021 – 2022; followed by ongoing implementation The pandemic in 2020 aided the City to implement work from home strategies. The long-term offering of this ability is being reviewed.	Emergency Management, Human Resources, Information Technology

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
2023	Emergency Management Policy updated to accommodate climate change impacts	Potential KPIs: - Emergency plans/protocols updated or created	Part of Emergency Management Budget	TBD	2021-2023; followed by ongoing implementation	Emergency Management Human Resources
2023	Emergency Preparedness Education and Engagement Activities	Potential KPIs: - # of participants - # of activities - social media likes and engagements - # of communication campaigns/posts	Part of Emergency Management Budget	TBD	2021-2023; followed by ongoing implementation	Emergency Management, Communications, Fire, Police
2023	Warming and Cooling Centre Study	Potential KPIs: - # of city owned assets that could serve as warming and/or cooling centres. - # of active warming and/or cooling centres	Part of Emergency Management Budget	TBD	2021-2023; followed by ongoing implementation	Emergency Management, Community Services
2023	Climate Change and Extreme Weather Existing Communication Gap Analysis	Potential KPIs: - Emergency plans/protocols updated or created	Part of Corporate Services Existing Budget	TBD	2021-2023; followed by ongoing implementation	Emergency Management
2023	Emergency Closure/Extension Corporate Policy	Timeline for completion	Part of Corporate Services Existing Budget	TBD	2021 – 2023; followed by ongoing implementation	Emergency Management, Community Services

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
2023	Business Continuity Planning and Training	Potential KPIs: - Emergency plans/protocols updated or created	TBD	TBD	2021 – 2023; followed by ongoing implementation	Emergency Management, Risk Assessment
2023	Fuel Supply Protocol during extreme events and emergencies	KPIs: - Emergency plans/protocols updated or created	Part of Corporate Services Existing Budget	TBD	2023 and onwards	Emergency Management, Fleet Management, Support: Community, Services, Public Works
2023	211 Service Agreement Review	KPIs: - Emergency plans/protocols updated or created	Part of Corporate Services Existing Budget	TBD	2021 – 2023	Emergency Management, Communications, Customer Service
2024	Back-up Power Generation Review	Potential KPIs: - Emergency plans/protocols updated or created - # of critical facilities and assets with back-up power systems	TBD	TBD	2021 – 2024; followed by ongoing implementation	Emergency Management Office Facilities

COMMUNITY PILLAR # 4

GHG EMISSIONS - BUILDINGS, ENERGY, TRANSPORTATION & WASTE DIVERSION

OBJECTIVE 1: Implement the Transportation Masterplan and promote Active Transportation.
OBJECTIVE 2: Explore and research opportunities to develop a Fleet Management strategy that will consider and support the purchase of transportation electrification and or highly efficient Eco-vehicles.
OBJECTIVE 3: Introduce measures to increase transit ridership.
OBJECTIVE 4: Introduce measures to reduce the usage/ storage of hazardous chemicals and or designated s substances including refrigeration systems and lighting.

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
2021	GHG emissions Education and Awareness Communication Campaigns focusing on Active Transportation, Waste, and GHGs	Potential KPIs: - social media likes and engagements - # of communication campaigns/posts - # of community groups engaged	none	TBD	On-going	Community Services
2021	Anti-Idling Bylaw	TBD	None	On-going	Idle time can be monitored through the new GPS system installed in the fleet in 2021. New equipment ordered with an idle shutdown timer when available. Strong policy required to ensure idling is reduced.	Engineering and Operations

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
2021	Strategies and Projects to Increase Public Transit Ridership and Active Transportation Usage	Potentials KPIs: - Ridership	Part of 2021 Approved Capital Budgets: $250,000 for Active Transport, $3.3M for Transit	On-going	2021 - Increase service levels and frequencies to include weekend service and service to new areas in the city: A Sarnia bus route has been extended as part of a six-month pilot project to make stops in Aamjiwnaang First Nation. 2021 - installation of bike racks on conventional buses for year round use completed on all conventional buses 2021 - Sarnia Transit now free for kids 12 and under 2021 - Automatic transfer and smart card fare system to make obtaining and paying fares more convenient for passengers. 2022 - dial-a-ride program upgrading to include bookings by smartphone app On-going	Transit

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
2023	Fleet Management Strategy (working towards Green Fleet Plan)	Potential KPIs: - Greenhouse gas emissions (tonnes/year) - Average fleet kilometrage (km/equivalent) - Annual operating costs ($/km) - % of fleet EV or zero-emission	TBD 148000 for Zamboni	TBD	2021-2022 for Zamboni and Ice Edgers. Start purchasing electric buses in 2023 -2024 Future purchase in 2024-2025 when a replacement mower is required. Side discharge electric riding mower tested. The test was a success for a 5-foot mower. We plan to purchase one in the future. Green Fleet Plan anticipated for 2023 Corporate Fleet Reductions: Several underutilized vehicles removed from the fleet through monitoring vehicle usage and mileage. Also, through vehicle sharing with P/W Community Service and Transit sharing equipment such as RTV, dump truck and pickups. Fleet reductions also accomplished through multi-purpose vehicle utilization and purchasing.	Engineering
2025	Waste Diversion and Reduction Strategies	Potential KPIs: - Town, residential, and commercial waste generation and diversion rates - Waste reduction and diversion programs implemented - GHG emission reductions-	TBD	TBD	Household Hazardous Waste Program via Lambton County and Clean Harbours 2025 - Province mandated municipal organic waste program 2025 - Producers will be fully responsible for providing blue box services across Ontario	Engineering and Operations

Year	Action	Key Performance Indicators (KPIs)	Budget	Project Approval Status	Project Timeline	Responsibility
On-going	Transportation Master Plan Review and Update	TBD	TBD	TBD	TBD	Engineering and Operations Transit
On-going	Energy Conservation and Demand Management Plan Projects and Retrofits	Potential KPIs: - Greenhouse gas emissions (tonnes/year) - Natural gas consumption (m3/year) - Electricity consumption (kWh/year) - Annual energy costs ($/year) - Number of annual retrofits	A spending target of a minimum of $300,000 per year is to be spent on energy conservation projects for the next 5 years	Each project will be assessed by Council as part of the normal budget processes	~50 energy efficient projects completed since 2017; on-going implementation	Facilities
	Baseline Corporate GHG Emissions Inventory	Timeline for completion	TBD	TBD	GHG Emissions for City Owned Properties and Facilities Completed in 2016 GHG Emissions for city vehicles, waste, and other categories TBD	Engineering and Operations Facilities