



TOWNSHIP OF
HURON-KINLOSS
**CLIMATE CHANGE
AND ENERGY PLAN**

2020

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1. Executive Summary

Across the globe, in Canada, Ontario, and Huron-Kinloss – our climate is changing. Scientists have been warning us that the climate system has been changing in an unprecedented manner since the 1950s. In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change stated that “human influence on the climate system is clear, and recent human-induced emissions of greenhouse gases are the highest in history”, further concluding that warning of the climate system is unequivocal.

Having felt the impacts of climate change directly, the Township recognizes the importance of proactive climate change planning through mitigating the causes of climate change, reducing energy, and preparing for future climate change impacts. Although effort is required from all levels of government and across all sectors, municipalities are uniquely positioned to take action as over half of emissions are under the direct influence or control of local governments and they are also on the front lines of responding to impacts.

With this in mind, the Township of Huron-Kinloss Climate Change and Energy Plan (CCEP) is a long-term strategy that outlines the path forward to a low-emissions, resilient community. Its overall objective is to prepare for and adapt to future impacts of a changing climate, as well as to reduce greenhouse gas (GHG) emissions generated both from the community and the Corporation of the Township of Huron-Kinloss.

The Plan development followed two well-established Canadian frameworks for climate change planning. The mitigation planning process followed the Federation of Canadian Municipalities (FCM) and ICLEI Canada’s Partners for Climate Protection (PCP) five-milestone framework – a performance-based model used to guide communities to reduce GHG emissions. The adaptation planning process followed ICLEI Canada’s Building Adaptive and Resilient Communities (BARC) program, a municipal planning process and framework for local governments.

Development of the CCEP included identifying climatic impacts, outlining baseline and business-as-usual scenarios, conducting a vulnerability and risk assessment of the projected climatic impacts, setting GHG reduction targets, establishing a clear vision and themes, and finally, developing strategies to combat climate change and determining implementation considerations for those strategies.

The CCEP includes 41 actions that the Township will undertake to mitigate the causes of and adapt to the impacts of climate change. These actions are rooted across nine overarching theme areas and further categorized under more specific high-level objectives the Township will strive towards as it implements the CCEP. The nine theme areas are as follows:

1. Buildings and Infrastructure
2. Energy Systems
3. People, Health, and Safety
4. Natural Environment and Green Infrastructure
5. Water, Wastewater, and Stormwater Management
6. Waste
7. Transportation
8. Agriculture
9. Enabling Actions

Successful implementation of the CCEP will require a multi-year commitment of resources, although the level of resources needed may change throughout implementation to reflect existing decision-making

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processes, annual review, budget, and other external factors. An implementation schedule was developed for the actions to inform who, when, and how they will be implemented. The schedule will be an important tool for reporting on the Township's progress related to climate change action.

The Climate Change and Energy Plan is intended to be a living document that will continue to be revised and updated as climate change science evolves, opportunities arise, practices change. It will serve as a guide for the Township as it continues to adapt its assets, operations, and services to the impacts of a changing climate.



2. Glossary

Adaptation: Includes any initiatives or actions in response to actual or projected climate change impacts and which reduce the effects of climate change on built, natural, and social systems.

Adaptive Capacity: The ability of built, natural, and social systems to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Climate Change: Climate change refers to changes in long-term weather patterns caused by natural phenomena and human activities that alter the chemical composition of the atmosphere through the build-up of greenhouse gases which trap heat and reflect it back to the earth's surface.

Climate Projections - Climate projections are a projection of the response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols. These projections depend upon the climate change (or emission) scenario used, which are based on assumptions concerning future socioeconomic and technological developments that may or may not be realized and are therefore subject to uncertainty.

Extreme Weather Event: A meteorological event that is rare at a place and time of year, such as an intense storm, tornado, hailstorm, ice storm, windstorm, flood, or heatwave, and is beyond the normal range of activity. An extreme weather event would normally occur very rarely or fall into the tenth percentile of probability

Greenhouse Gas (GHG) Emissions: Greenhouse gases are those gaseous constituents of the atmosphere, both natural and human-caused, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation, emitted by the Earth's surface, the atmosphere itself, and by clouds. Water vapour (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), ozone (O₃), and chlorofluorocarbons (CFCs) are the six primary greenhouse gases in the Earth's atmosphere in order of abundance.

Mitigation: The promotion of policy, regulatory, and project-based measures that contribute to the stabilization or reduction of greenhouse gas concentrations in the atmosphere.

Representative Concentration Pathway: Representative Concentration Pathways (RCPs) are four greenhouse gas concentration (not emissions) trajectories adopted by the IPCC for its fifth Assessment Report (AR5) in 2014. It supersedes Special Report on Emissions Scenarios (SRES) projections published in 2000.

Resilience: The capacity of a system, community or society exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.

Tonnes of CO₂e: Tonnes of carbon dioxide equivalents, a standard unit of measurement for all greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.)

Weather: The day-to-day state of the atmosphere, and its short-term variation in minutes to weeks.

Acronyms

BARC – Building Adaptive and Resilient Communities

BAU – Business-as-Usual (projections of emission in a future scenario where no further action is taken on climate change)

CCEP – Climate Change and Energy Plan

CCWG – Climate Change Working Group

CO₂e – Carbon Dioxide Equivalent

FCM – Federation of Canadian Municipalities

GHG – Greenhouse Gas

GJ – Gigajoule (unit for measuring energy)

GJ/m² – Gigajoule per metres squared (m²) of floorspace (unit for measuring energy use intensity)

GPC – Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC Protocol)

IESO – Independent Electricity System Operator

IPCC - Intergovernmental Panel on Climate Change

LIC – Local Improvement Charge

LID – Low Impact Development

OMAFRA – Ontario Ministry of Food and Rural Affairs

PCP – Partners for Climate Protection

RCP – Representative Concentration Pathways

tCO₂e – Tonnes of Carbon Dioxide Equivalent

3. Acknowledgements

The Township would like to gratefully acknowledge everyone who participated in the development of the Climate Change and Energy Plan. It is a culmination of strong leadership from the Township Council and Mayor Twolan as well as efforts displayed by the Project Team, Climate Change Working Group, Agricultural Advisory Group, and key external stakeholders. As such, the CCEP is reflective of a diverse range of knowledge and expertise.

Climate Change Working Group

The Climate Change Working Group was made up of Township staff from a wide range of departments as well as key representatives from the Grey Bruce Health Unit and the Maitland Valley Conservation Authority. These individuals worked closely with the Project Team to develop the Climate Change and Energy Plan, contributing their knowledge, expertise, and guidance to each step of the planning process.

Chris Cleave, Fire Chief/CEMC, Emergency Services, Township of Huron-Kinloss

Chris Davey, Facility Operator, Community Services, Township of Huron-Kinloss

Emily Dance, Clerk, Clerk's Department, Township of Huron-Kinloss

Jason Wepler, Health Promoter, Grey Bruce Public Health Unit

John Yungblut, Director of Public Works, Public Works, Township of Huron-Kinloss

Lillian Abbott, Councillor, Township of Huron-Kinloss

Matt Farrell, Building & Planning Manager/CBO, Building & Planning, Township of Huron-Kinloss

Mary Rose Walden, Chief Administrative Officer, Township of Huron-Kinloss

Mike Fair, Director of Community Services, Community Services, Township of Huron-Kinloss

Nicole Griffin, Business & Economic Officer, Administration, Township of Huron-Kinloss

Phil Beard, General Manager – Secretary Treasurer, Maitland Valley Conservation Authority

Taralyn Cronin, Business & Economic Officer, Administration, Township of Huron-Kinloss

Additional Municipal Staff

The Township would also like to acknowledge the additional staff that helped in the development and refinement of climate change actions. This includes additional staff from the Clerk's Department, Public Works, and Community Services.

Community Advisory Group

This group of individuals provided a range of sector-specific knowledge, input, and advice from a community perspective at different steps of the planning process and were particularly involved in identifying risks and vulnerabilities of climate change to the community.

Agricultural Advisory Group

This group provided valuable on-the-ground experience and insight into the interaction of climate change and the agricultural sector. They worked with the Project Team to inform the perceived climate change risks as well as key actions that the Township can take to support the agricultural community.

Blair Scott

Joel Armstrong

Mike Smith

Project Team

Mike Fair, Director of Community Services, Township of Huron-Kinloss

Megan Meaney, Executive Director, ICLEI Canada

Ewa Jackson, Managing Director, ICLEI Canada

Sarah Shenstone-Harris, Climate and Energy Planner, ICLEI Canada

Hana Lapp, Climate Change Project Coordinator, ICLEI Canada

Hiba Kariem, Climate Change Project Officer, ICLEI Canada

Caitlin MacGregor Rodger, Climate and Energy Project Intern, Township of Huron-Kinloss

Tijo Joseph, Energy Manager, Wood

Shawn Fewkes, GIS Specialist, Wood

4. Project Funders

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5. Message from the Mayor

On behalf of Township Council, I am pleased to present to you the Township of Huron-Kinloss Climate Change and Energy Plan. The Township has developed this strategy to guide our efforts as we address climate-related challenges in our community. The goal of this Plan is two-fold: to reduce energy and carbon emissions and keep energy dollars in the community, as well as to adapt to the expected climatic changes and extreme weather and minimize the severity of their impacts.

Huron-Kinloss is committed to providing its residents with a prosperous, sustainable, and resilient community. Building off important work already underway by our Township, residents, and community partners, we have developed a strategy that sets goals, targets and actions for both municipal operations and our community members in the hopes of improving the local economy and quality of life for current and future generations. Let's work together to create meaningful changes in Huron-Kinloss and achieve our plan for the future.

Yours truly,
Mayor Mitch Twolan



6. Overview of the Township of Huron-Kinloss Climate Change and Energy Plan

6.1 Overview and Vision Statement

The Township of Huron-Kinloss Climate Change and Energy Plan (CCEP) is a long-term strategy that outlines the path forward to a low-emissions, resilient community. Having felt the impacts of climate change directly, the Township recognizes the importance of mitigating the causes of climate change, reducing energy, and preparing for future impacts of a changing climate. The Plan centres around residents, local businesses and organizations, visitors and summer-residents, and the Township government, and details specific actions for the Township of Huron-Kinloss and the community to achieve its emission reduction targets and adapt to the future impacts of climate change. This includes projects and programs, and changes to policies, practises, and planning, as well as an implementation approach, to ensure the plan can be put into action.

The overall objective of the Climate Change and Energy Plan is to prepare and adapt to the changing climate, as well as to reduce greenhouse gas (GHG) emissions generated both from the community as well as the Corporation of the Township of Huron-Kinloss. The guiding vision for the plan is:

"Huron-Kinloss will proactively address climate change to ensure a healthy, prosperous, energy efficient, and resilient community."

6.2 Climate Change Mitigation and Adaptation

The plan takes on a two-pronged approach to taking action on climate change, focusing on both **mitigating** future carbon contributions to climate change and **adapting** to the impacts of a changing climate. Mitigation efforts start with developing an inventory of GHGs emitted in the Township of Huron-Kinloss, setting a reduction target, exploring opportunities to reduce emissions, and laying out an action plan to reach the target. Planning for climate adaption involves examining how the Township may be affected by expected climatic impacts, assessing how vulnerable the Township is to each of those impacts and assessing the risk levels, and then creating a prioritized action plan to address the impacts.

Mitigation: Mitigation includes any measures that help reverse the effects of climate change and prevent further contributions to climate change; this includes any measures that reduce the amount of GHGs released into our atmosphere. Examples include using low-emission vehicles, driving less, using renewable energy instead of fossil fuels, using energy-efficient lighting and equipment, appliances and lightbulbs and reducing consumption of goods.

Adaptation: Adaptation includes any measures that help us adjust to the impacts of climate change. Examples of adaptation measures including planning for more unexpected and large storm events, increasing the capacity of stormwater management systems, using different paving materials, updating operating procedures, and modifying outdoor work and HR policies.

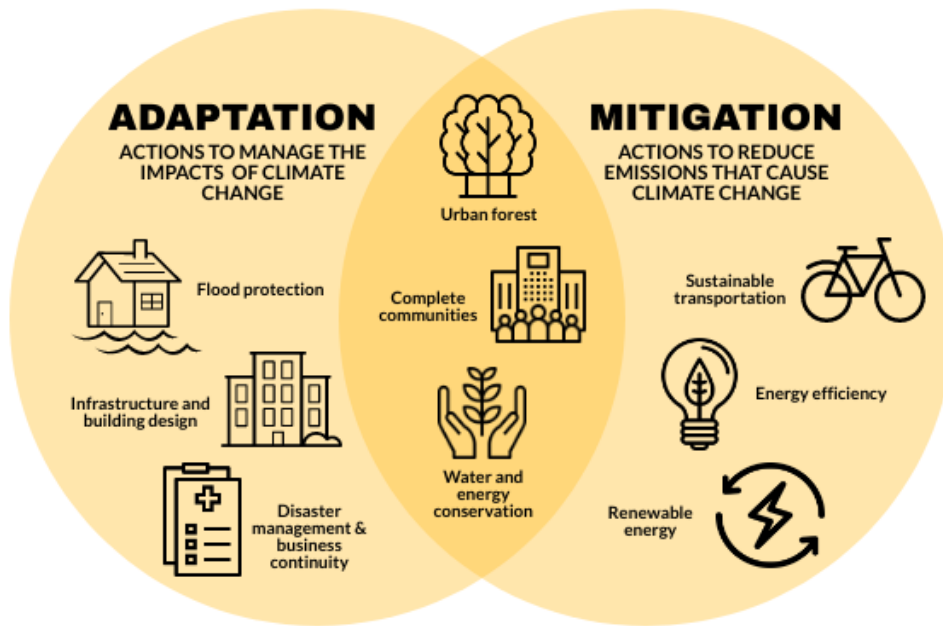


Figure 1: Overlap and Differences between Adaptation and Mitigation

Figure 2: Partners for Climate Protection (PCP) Framework
Figure 3: Overlap and Differences between Adaptation and Mitigation

6.3
Take
on Climate Change

Why
Action

Across Canada, Ontario, and the Township, the impacts of climate change are more apparent and impactful every year. The window for avoiding the serious impacts of climate change—heat waves, droughts, floods and storms, rising water levels, and widespread loss of plant and animal species—is shrinking. Internationally, we are close to the 1.5°C threshold that many scientists and organizations identify as the “safe” upper limit for global warming. To stay below this limit, global greenhouse gas (GHG) emissions must begin to decline within the next 10 years. For countries like Canada, scientists recommend that GHG emissions are reduced by 45% below 2010 levels by 2030, and net-zero emissions by 2050.ⁱ

Furthermore, in 2016, the Office of the Auditor General of Canada published a report by the Commissioner of Environment and Sustainable Development titled “Mitigating the Impacts of Severe Weather”. The report states that from 2009 through 2015, the federal government spent more on recovering from large-scale natural disasters than in the previous 39 years combined through Disaster Financial Assistance Arrangements (see Figure 2).ⁱⁱ The report goes on to highlight that disaster mitigation measures (climate change adaptation) can be very cost-effective for government and society. For example, the estimated \$63 million invested in disaster mitigation measures to build the Manitoba Red River Floodway in 1960 saved \$8 billion by 2008 in avoided recovery costs. In addition, such foresight can reduce disruption of local economies and communities.

Township of Huron-Kinloss – Climate Change and Energy Plan

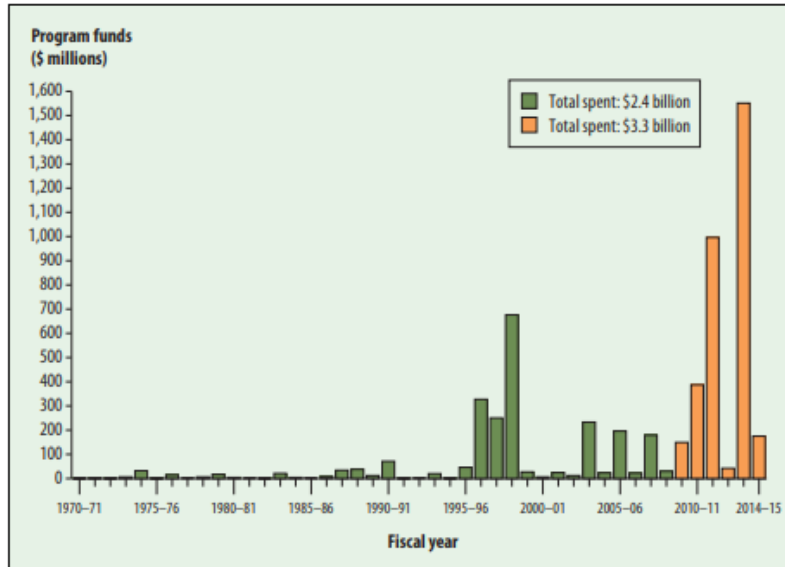


Figure 4: Disaster Financial Assistance Arrangements Costs from 1970 to 2015

Public Safety Canada estimates that for every dollar invested in climate change adaptation \$3 to \$5 is saved in recovery costs.ⁱⁱⁱ Similarly, an independent study commissioned by the U.S. Federal Emergency Management Agency found that the return on investment in the United States was \$4 in cost savings for every \$1 spent on disaster mitigation (adaptation). Studies in Australia have found a return of 3:1, while in the United Kingdom, 5:1.^{iv}

Both the federal and provincial government have committed to reducing GHG emissions by 30% from 2005 levels by 2030. In 2016, Canada ratified the Paris Climate Accord with 194 other countries, pledging to keep a global temperature rise below two degrees Celsius this century. In the same year, Canada also released the Pan Canadian Framework on Clean Growth and Climate Change, which outlines the pathways to meeting Canada’s 2030 target, while growing the economy and building resilience to adapt to a changing climate. In 2018, the Ontario government released its Made-In-Ontario Environment Plan to meet its GHG target and prepare for climate change.

Although effort is required from all levels of government and across all sectors, municipalities are in a critical position to take action; over 50% of emissions are under the direct influence or control of local governments. The Township of Huron-Kinloss can significantly reduce local sources of GHG emissions by investing in energy efficiency and cutting greenhouse gas emissions in areas such as building energy use, transportation and waste. The Township can also demonstrate leadership by reducing its own emissions generated by government operations and services.

The municipality has shown steady population growth over the last ten years and is projected to grow to 8,000+ residents by 2031.^v Current and future vulnerabilities posed by climate change will only be compounded by stressors such as population growth and development. Additionally, the Township boasts an economy based largely on agriculture, agricultural services, and tourism sectors that could be significantly impacted by a changing climate.^{vi} As such, it is important to address how climate change will affect the Township of Huron-Kinloss’ social, economic, natural, and infrastructure systems, to ensure a prosperous, healthy, and safe community for the future.

6.4 Other Local Benefits of Taking Action on Climate Change

Taking action on climate change, both through adaptation and mitigation measures can provide numerous financial, environmental and social benefits to the community and Township government.

Competitive and Innovative Economies & Increased Employment

- Investing in energy efficiency and renewable energy can create jobs and grow the construction and buildings industry, green buildings, and clean energy/cleantech industry. Mitigation investment supports new forms of employment and innovation.
- The local economy can stay competitive with other regions, as the global economy shifts towards low-carbon one.

Financial Savings & Reduced Energy Costs

- Reducing energy consumption through energy efficiency technologies, practices and buildings can significantly reduce energy costs, keeping energy dollars in the community and allowing our local economy to continue to grow.
- Reduced energy costs can help protect against rising electricity and energy prices in Ontario. It can also help alleviate energy poverty, which is defined as households that spend a disproportionate amount of income on home heating and power.
- Adapting public and private infrastructure (i.e. buildings, homes, to potential impacts of climate change can reduce more short-term maintenance requirements and replacement needs as well as significant financial savings over the long-term, as it would drastically reduce recovery and insurance costs from extreme weather events (i.e. flooding, snowstorms, ice storms, windstorms, etc.).

Increased Social Cohesion and Community Preparedness

- Residents and the community are more connected to and feel an increased sense of responsibility to vulnerable community members (e.g. children, seniors, socially isolated, etc.) during hazardous weather conditions and periods of extreme weather.
- Residents and community members are better informed and prepared for up to 72-hours if an emergency were to occur.

Improved Health and Safety of Vulnerable Populations & the Public

- Improved air pollution from less fossil fuel combustion (e.g. gasoline, diesel) and more active transportation.
- Improved safety of employees and residents from potential impacts of extreme weather events (i.e. extreme heat and cold, snowstorms, ice storms, windstorms, flooding, etc.)
- Reduced rates of hospitalization, illness, mortality, and mental health impacts amongst community members and vulnerable populations (i.e. children, seniors, socially isolated, those with existing health challenges).

Increased Quality of Life

- With more renewable energy generation, citizens will be less affected by power outages and interruptions, and less impacted by the rising price of energy in Ontario.
- With more sustainable and low-energy buildings, housing, building quality, and resilience to extreme weather are improved, making buildings more comfortable and secure.
- More access to natural, recreational, and cultural spaces through the expansion of green spaces and improved infrastructure and amenities.

Conservation of Natural Heritage and Surrounding Ecosystems

- Preserving beaches and shorelines and protecting the surrounding water quality through natural adaptive measures around erosion and runoff control.
- Improved protection, enhancement, and development of natural and naturalized areas that sequester carbon, improve biodiversity, regulate our climate, and provide ecosystem services (i.e. water purification, pollination, etc.)

6.5 Huron-Kinloss' Commitment to Climate Change

Energy and climate change are high priorities for the Township of Huron-Kinloss, and many energy-saving measures and adaptive climate practices exist in a number of the Township's Plans and Policies. This CCEP will provide a more comprehensive, Township-wide approach to reducing emissions and preparing for climate change.

In 2019, the Township of Huron-Kinloss joined the Global Covenant of Mayors for Climate & Energy (GCoM), the largest global alliance for city climate leadership, with over 10,000 cities and local governments around the world. Participation means that Huron-Kinloss must take action on both the causes and effects of climate change by reducing emissions and building local resilience to climate change. Huron-Kinloss is also part of the FCM-ICLEI Partners for Climate Protection Program and ICLEI's Building Adaptive and Resilient Communities Program, two Canadian programs aimed at building the capacity of communities to reduce emissions and adapt to climate change, respectively.

Consistent with our internal commitments, Huron-Kinloss has set the following GHG reduction target:

24% reduction below 2016 by 2036 of greenhouse gas emissions generated by the community and by the Corporation of the Township of Huron-Kinloss

The 24% reduction target from 2016 by 2036 is aligned with the federal target of 30% reduction by 2030 from 2006 levels. The annual target reduction from the federal target was applied to Huron-Kinloss' baseline and target years to achieve the 24% reduction value; this is in compliance with the method set out by Global Covenant of Mayors.



6.6 Plan Development and Approach

Development of the CCEP included identifying climatic impacts, outlining baseline and business-as-usual scenarios, conducting a vulnerability and risk assessment of the projected climatic impacts, setting GHG reduction targets, establishing a clear vision and themes, and finally, developing strategies to combat climate change and determining implementation considerations for those strategies. The Plan development followed two well-established Canadian frameworks for climate change planning and was developed throughout 2019 and early 2020.

The climate change mitigation planning process follows the Federation of Canadian Municipalities (FCM) and ICLEI Canada’s Partners for Climate Protection (PCP) five-milestone framework (see Figure 3). Huron-Kinloss is a member of the PCP program, which was established over 25 years ago and is a network of over 400 Canadian municipalities. PCP’s milestone framework is a performance-based model used to guide communities to reduce GHG emissions. Through this project, Huron-Kinloss worked through and completed Milestones 1 – 3 of the framework for community and corporate emissions.



Figure 5: Partners for Climate Protection (PCP) Framework

The climate change adaptation planning process follows ICLEI Canada’s Building Adaptive and Resilient Communities (BARC) program. BARC is a five-milestone framework that provides a structured approach to adaptation planning for local governments. The comprehensive planning methodology guides municipalities through areas of research and climate impact assessment methods, plan development, action-setting processes, implementation planning, and monitoring and review strategies (see Figure 4). Through this project, Huron-Kinloss worked through and completed Milestones 1 – 3 of the framework, which culminates in the creation of a climate change action plan.

Township of Huron-Kinloss – Climate Change and Energy Plan

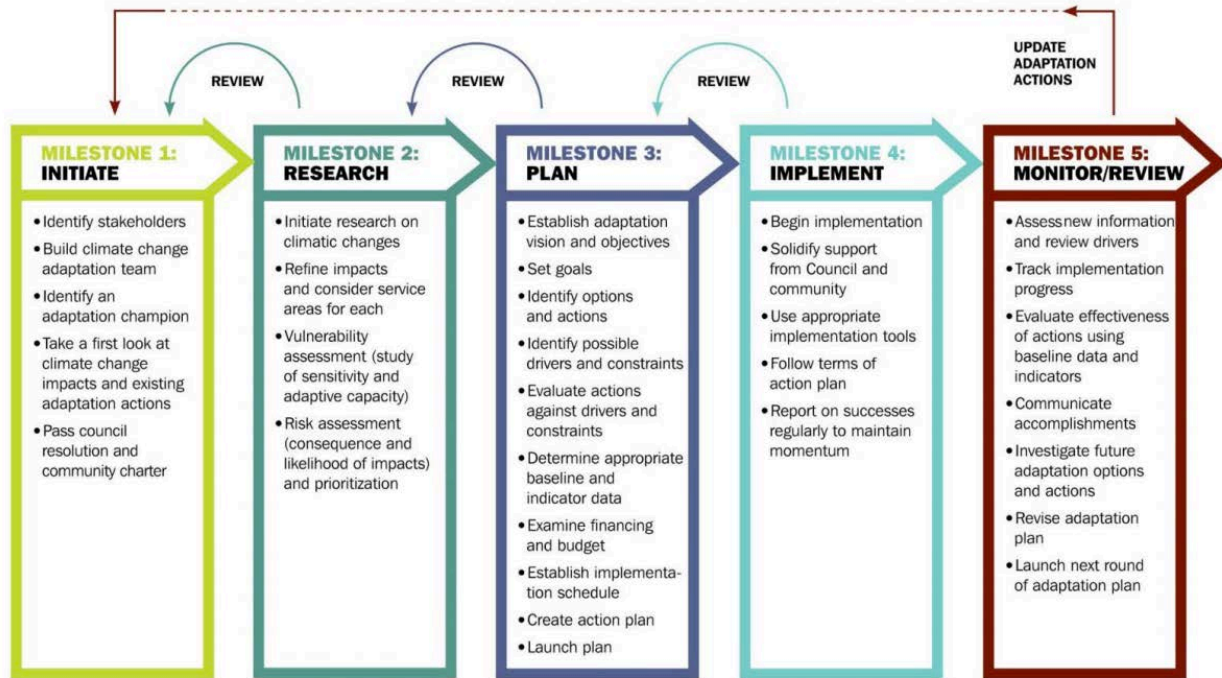


Figure 6: Building Adaptive and Resilience Communities (BARC) Framework

The Plan was developed through an iterative and collaborative process with Huron-Kinloss staff members and relevant stakeholders. A Climate Change Working Group (CCWG) was assembled, comprising of Huron-Kinloss staff from a range of departments as well as key external stakeholders from neighboring conservation authorities and the local health unit. Throughout 2019 and early 2020, the CCWG was crucial in providing topic-specific knowledge and input, ensuring the Plan aligned with departmental functions and objectives and community needs and priorities. Throughout the planning process, the CCWG was the central body to contribute to, review, and provide strategic direction to the overall development of the Plan.

In addition to the CCWG, a Community Advisory Group and an Agricultural Advisory Group were established to provide on-the-ground insight as well as sector-specific knowledge by individuals who live and work in the Township. These groups were mainly involved in identifying risks and vulnerabilities of climate change to the community and in some cases, brainstorming actions that would combat the impacts of climate change.

7. Climate Change – Science and Impacts

7.1 Climate Change Projections for the Township of Huron-Kinloss

Recent events in the Huron-Kinloss area, including flooding, ice storms, and other occurrences of extreme weather over the past several decades, have highlighted the need to be prepared for the ongoing challenges posed by climate change. However, in planning for these challenges, it should be noted that regional effects of climate change can vary in nature. When global temperature changes, the changes in climate are not expected to be uniform across the Earth. As such, it is important to downscale climate data to determine how the climate is projected to change in Huron-Kinloss, specifically until the end of the century.

Projecting future climate conditions requires historical weather data from the region, as well as an ensemble of global climate models (GCMs), which provide the best available scientific assessment of how future social and economic conditions will influence the climate system in Huron-Kinloss.^{vii} The climate data presented for the Township is based off GCMs and emission scenarios defined by the Intergovernmental Panel on Climate Change (IPCC).^{viii} Future conditions are modeled on future climate “scenarios”, which are assumptions of future atmospheric composition and on an understanding of the effects of increased atmospheric concentrations of greenhouse gases (GHG), particulates, and other pollutants.^{ix} Producing scenarios requires estimates of future population levels, economic activity, the structure of governance, social values, and patterns of technological change. The climate change scenarios used in this plan draw from Representative Concentration Pathways (RCPs), the newest climate change scenarios in IPCC’s Fifth Assessment Report (AR5) publications.^x

It is to be noted that while it is not possible to anticipate future climate changes with absolute certainty, climate change scenarios create plausible representations of future climate conditions. Uncertainty is factored into climate change scenarios, models, and data, and reflects the complex reality of environmental change and the evolving relationship between humans and the planet.




The climate change projections for the Township of Huron-Kinloss primarily focus on changes in temperature and precipitation patterns, while also expanding on some extreme weather events, which all affect the social, natural, built, and economic systems in the Township. The information that follows will develop a basis for a deeper and more thorough exploration of climate change impacts in the municipality and will illuminate the realities of Canadian climate change more generally.

The table below summarized projected changes for Huron-Kinloss using climate change scenarios that utilized RCP 8.5 – which is the high emissions, ‘business-as-usual’, scenario. This was selected because if current emissions trends continue, RCP8.5 and associated temperature increases will likely apply. Please see Appendix B for more detailed climate projections.



Township of Huron-Kinloss – Climate Change and Energy Plan

Table 1: Summary of Climate Change Projections for Huron-Kinloss

Climate Driver	Summary of Projected Changes
<p data-bbox="282 533 456 562">Temperature</p> 	<ul data-bbox="610 369 1419 930" style="list-style-type: none"> • The current baseline average annual temperature is 7.4°C. Average annual temperatures are expected to increase by 1.4°C in the 2020s, by 3.5°C in the 2050s, and 6.3°C in the 2090s. • The largest seasonal temperature increase will be in the Winter. • Average number of hot days (>30°C) will more than double from 3 days/year historically, to 14 days by 2030s and 35 days by the 2060s. • Fewer freeze-thaw days are expected by the end of the century due to overall warmer temperatures. • Growing season length is expected to increase from 166 days/year to 218 days/year by the end of the century. This will reflect earlier start dates and later end dates.
<p data-bbox="282 1129 456 1159">Precipitation</p> 	<ul data-bbox="610 968 1419 1493" style="list-style-type: none"> • Average annual precipitation is expected to increase by 3.8% by the 2030s, and 8.1% by the 2060s. • The largest seasonal precipitation increase will be in the Winter and Spring, whereas Summer months are expected to become slightly drier on average. • Precipitation is expected to become more intense and frequent. • Heavy precipitation events (> 10 mm) are expected to increase from 24.2 days/year to 26.1 days by the 2030s and 27.9 days by the 2060s. • Freezing rain events are expected to increase most significantly in January, with severe freezing rain events (>6 h per day) projected to increase by up to 30% by 2100.
<p data-bbox="326 1612 412 1642">Water</p> 	<ul data-bbox="610 1545 1419 1822" style="list-style-type: none"> • Lake Huron is expected to see its water levels reach higher highs and lower lows more often compared to historical levels. • Lake Huron basin temperatures are expected to increase by up to 5.6°C towards the end of the century. • Lake Huron is expected to see ~20% loss in coldwater stream habitat (< 19°C).

7.2 Priority Impacts for the Township of Huron-Kinloss

While climate change projections tell us how the climate is expected to change over time, it is also important to evaluate how those changes will affect our community. The physical, social, economic, and ecological health of Huron-Kinloss is influenced by our changing climate in a variety of complex and interconnected ways, but how will Huron-Kinloss be affected by increased precipitation? By more extreme weather events? By higher temperatures?

From a built environment perspective, increasing intensity and frequency of precipitation, more freezing rain events, and extreme weather will likely lead to private and public infrastructure damage as well as increased maintenance and replacement costs. From a people-focused perspective, more extreme precipitation, heat, and other weather events will likely be disruptive and could limit access to key Township services, close down schools and other important sites, and impact people’s physical and mental health. This will make health and safety concerns for Township staff and residents an even more prominent issue. Furthermore, from an environmental perspective, climate change will likely add to existing pressures on Huron-Kinloss’ ecosystems by the spread of invasives, increased shoreline erosion to our beaches and waterfronts, and water quality impacts. This, in turn, can compromise the integrity of our natural features, areas, and systems.

Following an extensive impact identification process and vulnerability and risk assessments, the Township of Huron-Kinloss has identified how these projected changes will manifest locally, in the form of 16 priority impact statements. These 16 impacts are listed below, organized by the climate threat to which they are tied. The CCEP will address a wide range of climate impacts that may pose risks to systems and sectors across the community.



CHANGES IN TEMPERATURE

Increase in average temperatures, summer temperatures, dry periods, and hot days over 30°C

- shifting eco-regions for flora and fauna and warmer freshwater (i.e. streams) temperatures, leading to increased spread of invasive species (e.g. Garlic mustard, Phragmites, etc.).
- increased need for shade trees and/or shade structures.
- increased health and safety risks to the public, especially vulnerable populations (e.g. elderly, socially isolated, etc.).
- increased heat stress/health and safety risks to outdoor workers (e.g. construction, recreation, public works) and decreased labour hours due to heat/smog alerts.
- increased evaporation of Lake Huron and more dramatic fluctuations of lake levels, leading to increased erosion to beaches and shorelines and reduction in nearshore water quality

CHANGES IN PRECIPITATION

Increased frequency and/or intensity of precipitation events and freezing rain events

- overburdening of sewers and drains and higher rates of erosion, leading to damage to Township property and infrastructure (storm sewers, municipal drains, sanitary sewers, bypass drains, agricultural fields, roads, bridges, culverts, building foundations, landscaping, etc.)
- minor sewer system surcharging resulting in basement flooding.
- increased riverine and non-riverine flooding, leading to increased streambank erosion, sediment accumulation, and damage to crops from non-riverine flooding.
- basement flooding, resulting in physical injuries, infections from contaminated water, and mental health stress to residents
- increased hazardous conditions (e.g. black ice) on roads, parking lots, and sidewalks, leading to increased transportation and pedestrian-related safety issues (i.e. slips, falls, accidents, etc.).

EXTREME WEATHER

Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), freezing rain events, and warmer and wetter winters

- increased damage to tree canopy, causing damage to transportation infrastructure and increased transit disruptions.
- damage to electrical infrastructure, leading to more power outages (brown-outs and black-outs) and service disruptions.
- reduced visibility due to blizzard conditions, leading to more school closures, road closures, and transit disruptions.
- damage to Township-owned assets and infrastructure (trees, signs, streetlights, buildings, roads, etc.).
- accelerated concrete corrosion (e.g. wear and tear, cracks, potholes, etc.) and infrastructure deterioration (i.e. buildings, roads, sidewalks, trails, parking lots, etc.), leading to increased winter maintenance requirements (i.e. salting), mechanical replacement and repairs, and call volumes to Township staff.
- reduced ice coverage on the lake, resulting in increased shoreline erosion.

7.3 Potential Opportunities for the Township of Huron-Kinloss

While the focus was primarily on identifying how the community in Huron-Kinloss and the Township's assets, operations, and services would be negatively affected by climate change, a number of potential opportunities were also identified. The intent behind identifying opportunities was not to suggest that climate change is desirable, but rather to assist us in our planning, as we know that some amount of change is inevitable based on historical emissions. The opportunities include:

- A longer growing season due to warmer temperatures, dry conditions, and shifting precipitation patterns
- A longer summer tourism season (i.e. beaches open longer, more outdoor events/activities) due to warmer temperatures
- Decreased snowfall due to warmer winter temperatures
- Longer construction seasons (i.e. more productivity) due to longer shoulder seasons
- More year-round active transportation due to warmer winter temperatures

These opportunities have the potential to be realized as a result of the incremental changes expected in our climate. As such, it will be important to gauge if and how they come to be, and whether specific actions need to be identified for them as time moves forward



8. Current and Future Greenhouse Gas Emissions

8.1 Current GHG Emissions

A GHG inventory and forecast is the foundation for any climate change or energy strategy. It reveals how a community or municipal government consumes energy and generates waste, helps identify opportunities for mitigation strategies, and provides the necessary baseline from which progress can be measured. The following section outlines the 2016 greenhouse gas emissions generated by the community at large (referred to as community emissions) and emissions generated by municipal services and operations (referred to as corporate emissions).

All the GHG emissions data were calculated using the 2016 baseline energy consumption data that has been summarized in the Energy Consumption Supplement on Page 93 of this CCEP.

8.1.1 Profile of 2016 Community Emissions

The Township of Huron-Kinloss' community inventory accounts for all emissions from activities taking place within the Township of Huron-Kinloss, including fuel and electricity use for heating and powering homes and businesses, fuel for transportation within the Township, and emissions from the treatment of solid waste and wastewater. In 2016, the community of Huron-Kinloss produced 35,214 tonnes of carbon dioxide equivalents (tCO₂e) (Figure 5).

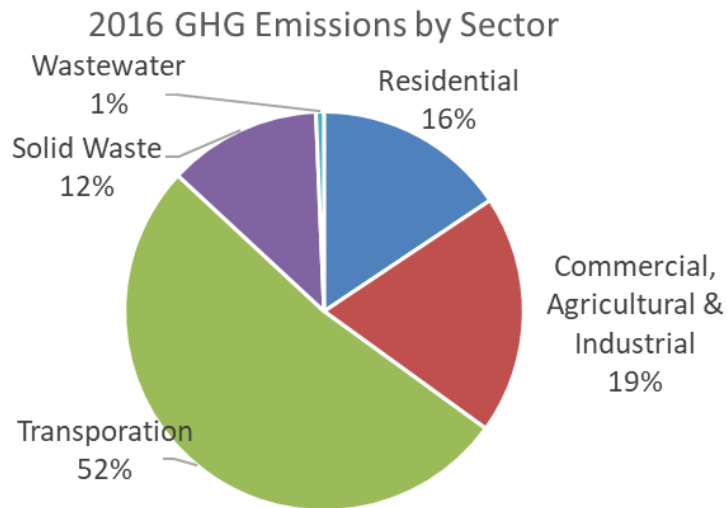


Figure 7: Percentage of community GHG emissions by sector in 2016

Transportation accounts for the largest proportion of emissions, representing 42% of total energy use and 52% of all community GHGs. Of this, 78% of transportation emissions are from on-road transport, while 22% are from off-road transportation, which refers to all-terrain vehicles, snowmobiles, and other unlicensed vehicles. Gasoline, used for transportation, also accounts for the greatest share of emissions relative to other fuel sources (Figure 6).

2016 GHG Emissions by Source

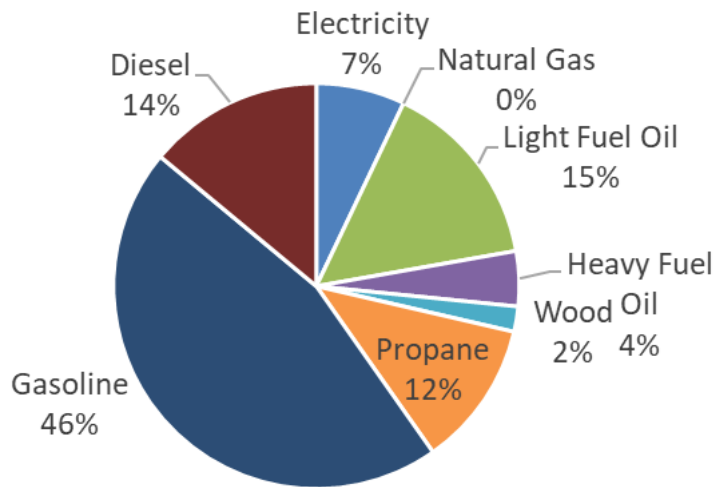


Figure 8: Percentage of community GHG emissions by fuel type in 2016

Residential buildings, commercial and institutional buildings and facilities, industrial facilities, and agricultural energy use also represent a significantly large sector, accounting for 58% of community energy use and 35% of all community emissions. Residential buildings make up 56% of emissions in this buildings & facilities category. The stock of residential buildings is primarily made up of single-family detached homes. In both residential and non-residential categories, electricity makes up the largest share of energy use, followed by propane.

Emissions from the treatment of waste and wastewater together account for 13% of emissions in 2016. The majority of this is from the 2,726 tonnes of solid waste generated by Huron-Kinloss residents, businesses and institutions, which produced 4,377 tonnes of GHG emissions. Roughly half of all Huron-Kinloss residents use septic tanks, generating approximately 200 tonnes of GHG emissions in 2016.

8.1.2 Profile of 2016 Corporate Emissions

The corporate inventory estimates emissions generated as a result of the Corporation of the Township of Huron-Kinloss’ services and operations: (1) buildings and facilities; (2) fleet vehicles; (3) streetlights and traffic signals; and (4) water and wastewater facilities. In 2016, the Township generated 518 tonnes of CO₂e, as a result of the use of electricity, gasoline, diesel and other fuels. The corporate inventory is considered a subset of the community inventory and represents 1% of the Township’s total community emissions.

2016 Corporate GHG Emissions by Sector

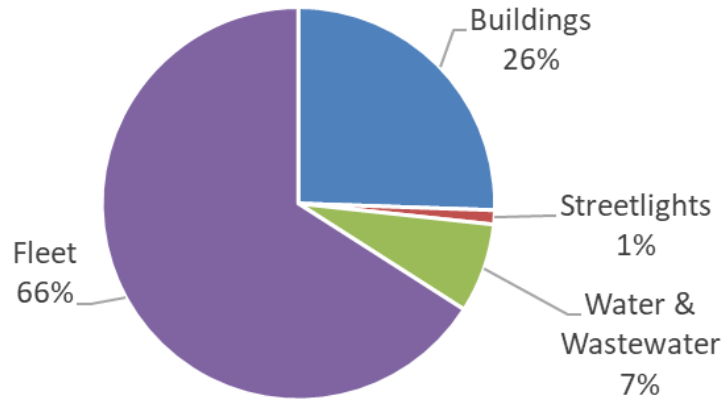


Figure 9: Percentage of corporate GHG emissions by sector in 2016

Fleet emissions account for 60% of emissions, representing the largest share of the corporate inventory. Buildings represent 31%, followed by water and wastewater facilities (8%), and streetlights (1%) (Figure 7). In terms of fuel sources, diesel accounts for the largest share of emissions (53%) which is used in the fleet sector, followed by propane (22%) and electricity (13%) which are used to power and heat buildings and water and wastewater facilities (Figure 8).

2016 Corporate GHG Emissions by Source

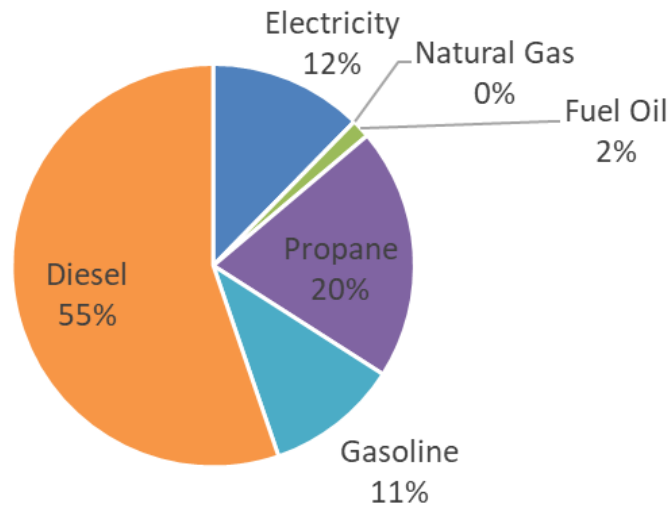


Figure 10: Percentage of corporate GHG emissions by fuel type in 2016

8.2 Business-As-Usual Emissions Projections

The business-as-usual (BAU) forecast is an estimate of how energy and emissions in the Township of Huron-Kinloss will change in the future, if no further action is taken to reduce GHG emissions. Forecasting estimates of GHG emissions into the future sets the context and helps determine the scale and level of effort required to meet the desired targets. Emissions were projected until the GHG reduction target year of 2036, in alignment with the target year. The primary drivers of future emissions are population and employment growth, which both increase by roughly 16% between 2016 and 2036. Since emissions levels are largely driven by the activities of residents and businesses in the Township (e.g. heating and powering homes, travelling in personal vehicles, etc.), as population and employment levels grow, community emissions will increase accordingly. However, it is expected that actions from higher levels of government, technology changes driven by broader economic trends, and other factors, may influence emissions within the Township of Huron-Kinloss. Some of these anticipated policy and technological changes, which occur outside the influence of the municipality, have been incorporated into the BAU projections. These include improved fuel economy in vehicles and better energy efficiency of new buildings, which offsets growth in emissions as a result of population growth. The forecast of emissions under a scenario where no further action is taken by the Township and its community confirms that achieving the GHG reduction targets of 24% reduction by 2036 requires significant action.

It is estimated that without any climate action at the local level, community GHG emissions will decline by approximately 1,865 tonnes of CO₂e between 2016 to 2036, or 5% during this period (Figure 9).

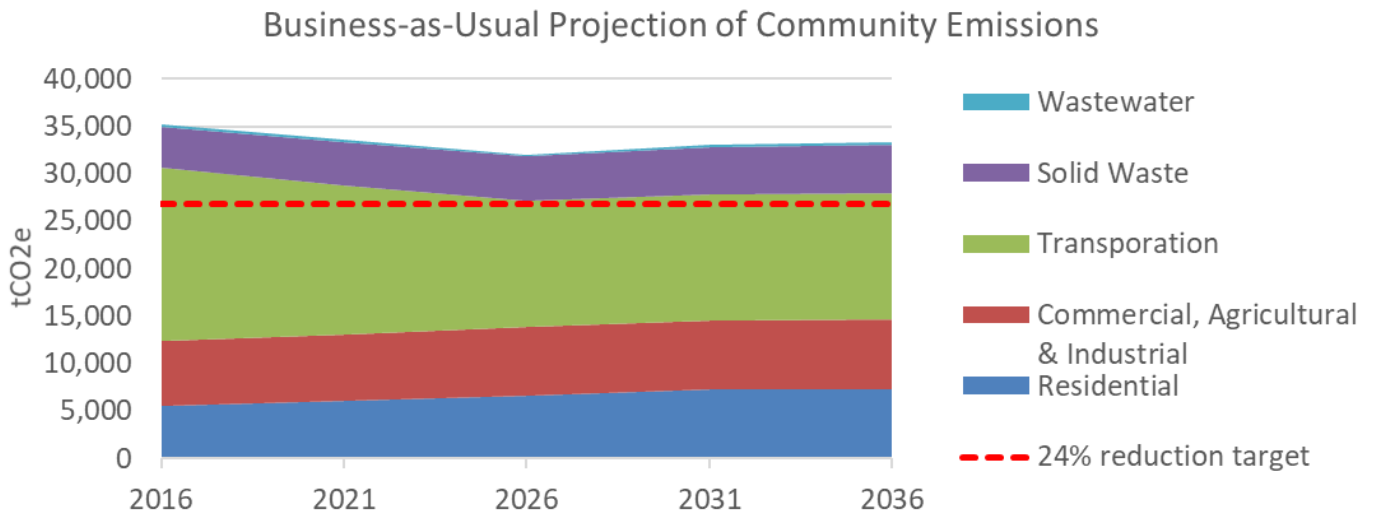


Figure 11: Business-as-usual projections for community emissions from 2016 to 2036

At the corporate level, GHG emissions will decline 1% by 2036 from 2016 levels, or a reduction of approximately 3 tonnes of CO₂e (Figure 10).

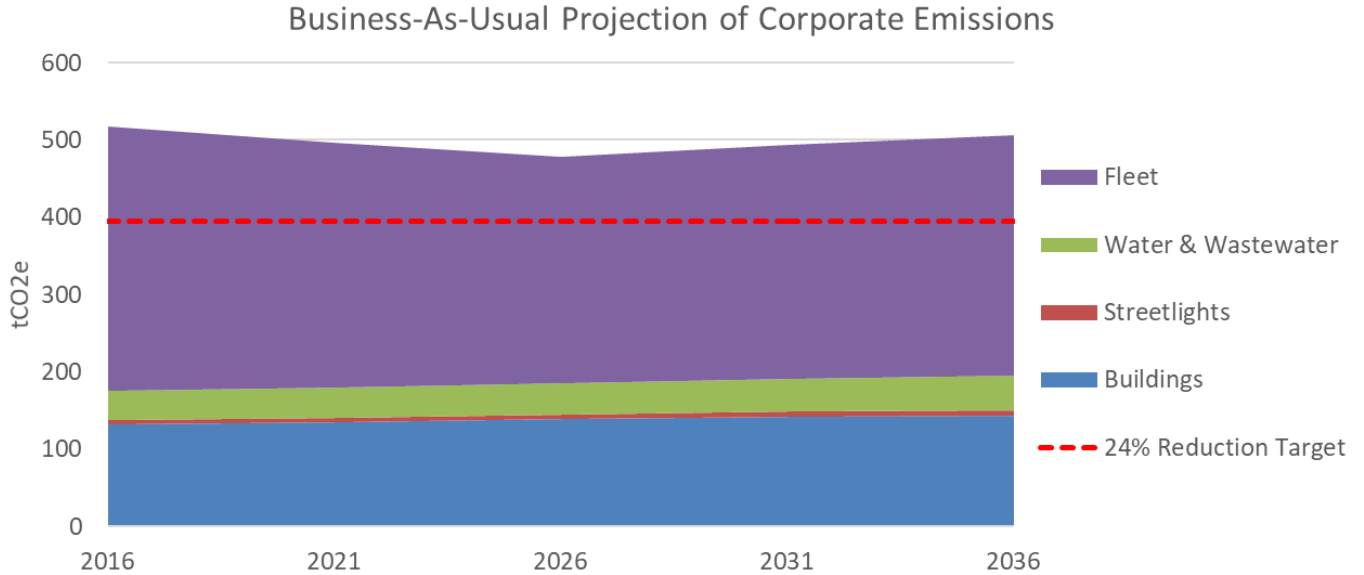


Figure 12: Business-as-usual projections for corporate emissions from 2016 to 2036

8.3 Climate Change and Energy Plan Emission Reduction Potential

A high-level analysis was undertaken to determine the emission reduction potential, energy savings and energy cost savings potential for the actions within the Climate Change and Energy Plan. These actions were identified and developed by the Working Group and the Project Team and are outlined in Sections 9 and 10 below.

The GHG, energy, or energy cost reduction potential of a specific action measures the amount of emissions, energy, or energy costs that action would reduce if it was implemented, relative to the BAU projections. Determining the reduction potential for each action and the Plan as a whole not only sheds light on which actions will reduce the most emissions and energy, but will also demonstrate that Huron-Kinloss’ Climate Change and Energy Plan has the potential to reduce emissions by 24% from 2016 to 2036 for both community and corporate sources of emissions (Figures 11 and 12, respectively)

Community GHG Reduction Protection by Sector

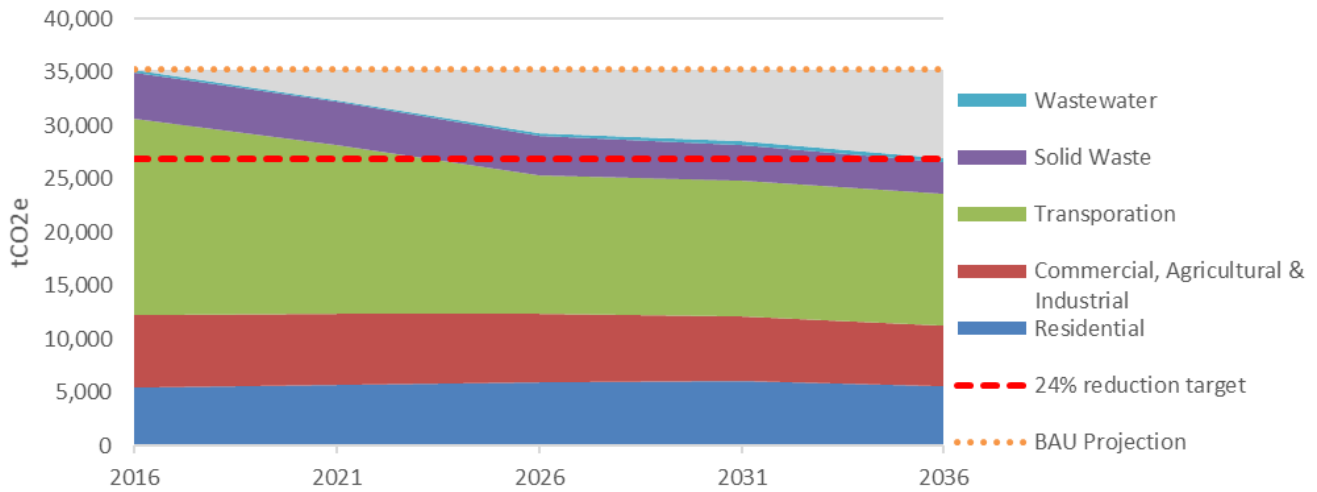


Figure 13. GHG Reduction Potential for Community Actions.

Corporate GHG Reduction Potential by Sector

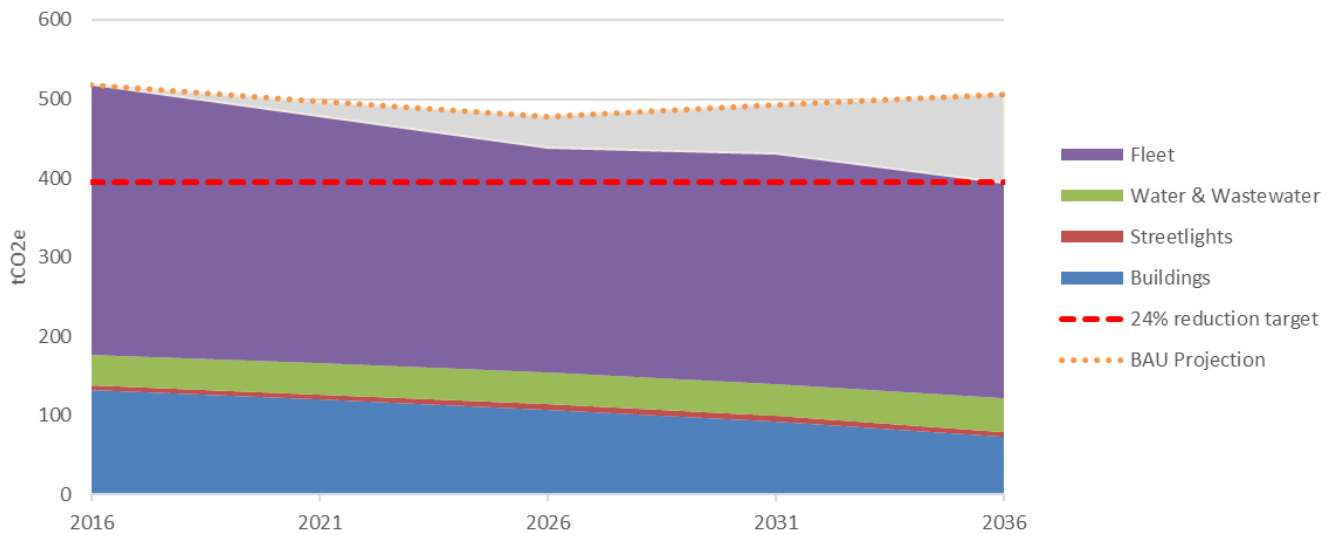


Figure 14. GHG Reduction Potential for Corporate Actions.

9. Themes, Objectives, and Actions

A series of 21 objectives were developed to guide the development of both the mitigation and adaptation actions. The objectives represent the physical, social, economic, and ecological implications of climate change and target emissions from all major sources within Huron-Kinloss. They are grouped into theme areas, according to these climate implications and emission sources. An additional set of enabling actions and objectives have been included in their own section.

Actions have been identified for each objective and are categorized as so below. They are presented for both the municipality and the community as a whole. A more detailed explanation of each action, as well as their recommended supporting actions and implementation considerations, are outlined in the following section.



Buildings and Infrastructure

In recent years, the Township of Huron-Kinloss has experienced greater instances of flooding, freezing rain events, and extreme weather events, which are only expected to increase and intensify as a result of climate change. These impacts can lead to greater instances of basement flooding, damaged foundations and homes, washed-out roads, and damage to built infrastructure, among others. Adaptation actions in this theme area focus on minimizing the risks from climate change to private property and public infrastructure, in order to protect public health and safety and reduce costs incurred by property owners and the Township.

Buildings contribute approximately 58% of all community energy use, and 35% of all community emissions, with residential buildings representing 56% of emissions in this category. Targeting energy use in this sector has a significant potential to reduce GHGs across the community, as well as save energy costs for community members and businesses. Likewise, municipally-owned buildings represent 29% of corporate energy use, 27% of energy costs, and 26% of GHG emissions. Mitigation actions in this category focus on both reducing energy use and improving energy efficiency in both existing buildings, as well as buildings that will be built in the future.

Objective 1: Consider climate change impacts in the design, construction and maintenance of municipal buildings and infrastructure

Action 1.1 – Assess vulnerability and investigate the possibility of adapting roads, culvert and bridge infrastructure to protect roads from washouts and extreme weather (e.g. ice storms, blizzards, snowstorms, windstorms, etc.).

Objective 2: Increase household-level flood protection

Action 2.1 – Investigate the feasibility of increasing home resilience measures (e.g. backflow valves) and educate community members on flood risk reduction methods.

Action 2.2 – Investigate the feasibility of implementing a downspout disconnection program.

Objective 3: Reduce energy use, energy expenditures, and emissions in municipal buildings

Action 3.1 – Develop an energy efficiency retrofit plan to retrofit existing municipal buildings, according to age and energy use.

Action 3.2 – Require all new buildings to be as energy efficient as possible.

Objective 4: Reduce energy use and emissions in residential and commercial buildings

Action 4.1 – Implement an energy efficiency retrofit program for residential and commercial buildings.

Action 4.2 – Ensure developers are constructing new buildings in the community that reduce energy demand and increase efficiency, and building new developments that are compact and mixed-use.

Objective 5: Improve energy literacy in Huron-Kinloss

Action 5.1 – Raise awareness on how to reduce energy and improve energy efficiency among residents, businesses owners, and building operators.

Energy Systems

Power outages and brown-outs can have a major impact on local businesses as well as the delivery of Township services and operations. They can also be especially threatening to vulnerable populations, most notably during extreme heat events or winter storms. Adaptation actions in this theme area focus on preventing and minimizing risks from power outages, which are especially susceptible to extreme weather events that are projected to worsen and intensify with climate change.

Energy generation from renewable, low-carbon sources can significantly reduce the carbon content of energy sources in Huron-Kinloss. Renewable energy is energy derived from sources that are naturally replenished faster or at the same rate than they are consumed, such as sunlight, wind, and geothermal heat. As technology has improved and renewables have become more widely adopted, many renewable options are cost-competitive with more traditional sources, but with little to no emissions. Mitigation actions focus on increasing the adoption of solar power, which will both reduce emissions while also providing locally generated sources that aren't impacted by rising provincial energy prices or major, regional power outages.

Objective 6: Reduce the risks of power outages due to extreme weather events

Action 6.1 – Investigate the feasibility of increasing the resilience of electricity distribution infrastructure to extreme weather events through strategic planning and retrofits.

Action 6.2 – Identify critical functions that are vulnerable to power outages and develop priority response and power restoration protocols.

Objective 7: Explore more renewable energy generation options in the Township

Action 7.1 – Support the expansion of renewable energy generation on Township-owned facilities and assets, to increase energy security and reduce risk of rising energy prices.

Action 7.2 – Explore waste to energy systems at Township landfills.

People, Health and Safety

Extreme weather events often come with great public health and safety concerns, especially to vulnerable populations including children, the elderly, and those with special existing health conditions. They also place a large burden on the Township's ability to provide services, including an increased demand on emergency response resources. Adaptation actions in this theme area will focus on minimizing health and safety risks to outdoor workers, residents, and vulnerable community members through improving their personal emergency preparedness and institutionalizing better practices around sun safety and winter maintenance at the Township. In addition, the Township will ensure a

coordinated response to and recover from extreme weather events at the Township through updating businesses continuity planning procedures, staff training, rigorous communications to the public, and more.

Objective 8: Minimize health and safety risks to outdoor workers and community members from extreme weather events

Action 8.1 – Protect the health, safety and productivity of outdoor workers (employees and contractors) during extreme weather conditions.

Action 8.2 – Review winter control practices to ensure climate change impacts are considered and to identify opportunities for improvement.

Objective 9: Improve the personal emergency preparedness of community members

Action 9.1 – Establish buddy systems/help-your-neighbour programs to implement during extreme weather events.

Action 9.2 – Increase the community's uptake of household emergency kits.

Objective 10: Improve Township response to and recovery from extreme weather events

Action 10.1 – Implement warming and cooling centres outside of normal business hours.

Action 10.2 – Continue to provide rigorous communications to the public regarding road conditions and municipal facility closures during extreme weather events.

Action 10.3 – Undertake business continuity planning and staff training to plan for the Township's essential and secondary services and ensure informed response to extreme weather events.

Natural Environment and Green Infrastructure

Our natural areas and ecosystems offer numerous benefits to the community of Huron-Kinloss – from providing outdoor recreational opportunities to cleaning our water and air and housing a diverse population of plants and animals. These systems in the Township are vulnerable to climate change impacts through issues such as increased erosion, spread of invasive species, and water quality deterioration. Projected increases in extreme hot days as well as heavy rainfall events will compound the stresses on our natural systems, likely increasing incidences of heat-related illness amongst community members and flooding in urban spaces, respectively. Adaptation actions in this theme area will focus on utilizing green infrastructure strategies (i.e. LID, tree planting) to better manage runoff and flooding issues, as well as using sediment and erosion control measures to protect and enhance our riverbanks, streambanks, beaches, and shorelines.

Objective 11: Incorporate use of green infrastructure to manage the impacts of climate change

Action 11.1 – Explore and expand tree planting, streetscaping, and other strategies to increase shade and cooling, including the planting of strategic plant species (e.g. native grasses, shrubs, trees, and, pollinators, etc.) on private and public land.

Action 11.2 – Encourage the incorporation of Low Impact Development (LID) features and green infrastructure into new development and redevelopment projects.

Objective 12: Enhance the resiliency of the Township’s forests and natural landscape

Action 12.1 – Develop an invasive species response strategy, including funding for these efforts and guidance materials for private landowners.

Objective 13: Protect and enhance riverbanks, streambanks, and shorelines from the impacts of flooding and erosion

Action 13.1 – Improve flood-prone riverbanks by implementing natural, rural stormwater management measures upstream.

Action 13.2 – Promote and support dune development along backshore of beach and include planting dune grasses and sand fencing to induce settling of wind-blown sands.

Action 13.3 – Improve sediment and erosion control from construction activities through improved inspections, reporting, and operational controls.

Water, Wastewater, and Stormwater Management

Municipal infrastructure, especially stormwater management systems, are increasingly susceptible to climate change impacts. In the Township, projected increases in heavy rainfall and extreme precipitation will exert further pressure on already ageing pipes, sewers, and drains leading to even more flooding events, increased financial costs to property owners and the Township related to recovery and repairs, and potential physical and mental health impacts. As such, adaptation actions will focus on improving the resilience of stormwater and sewer infrastructure, ensuring that the stormwater management system is capable of managing these impacts into the long-term.

The Township of Huron-Kinloss treats and distributes safe and reliable drinking water to residents and businesses and collects and treats wastewater. Collecting, pumping, treating and distributing water or wastewater requires energy, and was responsible for consuming 27% of energy and 7% of corporate emissions. Mitigation actions focus on implementing operational and maintenance best practices to improve energy efficiency and lower energy costs for the Township, while also reducing emissions. Actions also focus on encouraging residents and businesses to conserve water use, thereby reducing the volume of water and wastewater treated, lowering the associated energy use, costs and emissions.

Objective 14: Improve the resilience of stormwater infrastructure to heavy rainfall and extreme weather events

Action 14.1 – Continue to improve and invest in stormwater and sewer infrastructure.

Objective 15: Reduce energy use, energy expenditures, and emissions from water and wastewater services and operations

Action 15.1 – Increase the operational efficiency of water and wastewater systems to reduce energy and emissions.

Action 15.2 – Implement an educational campaign to encourage less water use, specifically targeting citizens and businesses connected to the municipally operated water system

Waste

In 2016, the community of Huron-Kinloss generated almost 3,000 tonnes of waste, which generated 13% of all emissions generated by the community – will increase to 16% by 2036. Mitigation actions in this category focus on reducing waste generation by households, individuals and the business community, as improving and expanding waste management programs to divert waste from landfills, such as through expanding recycling or diversion of food and yard waste.

Objective 16: Divert waste from landfills and reduce solid waste generation

Action 16.1 – Expand waste diversion programs.

Action 16.2 – Engage and educate community on waste reduction.

Transportation

As the frequency and intensity of extreme weather events are expected to increase in the coming decades, our transportation networks are likely to be disrupted. Impacts of this may include damaged roads, bridges, and sidewalks, increasingly hazardous conditions for drivers and pedestrians, school closures, and more. Adaptation actions in this theme area focus on minimizing disruptions to the transportation of goods, services and people while also protecting public health and safety within the Township.

Transportation is a major source of energy and emissions in Huron-Kinloss; it is responsible for 42% of energy used by the community and 52% of all emissions. At the corporate level, fleet vehicles use 39% of energy and generate 66% of corporate emissions. Tackling gasoline and diesel consumption and their associated emissions have a significant potential to reduce GHGs across the community and Township municipal operations. Mitigation actions in this category focus on both improving the energy efficiency of privately and publicly owned vehicles and promoting the adoption of low-emissions vehicles. This will not only reduce household and municipal energy expenditures but will also improve air quality in the Township.

Objective 17: Minimize transportation disruptions from extreme weather events

Action 17.1 – Improve winter travel conditions for pedestrians.

Objective 18: Reduce energy use, energy expenditures, and emissions from fleet operations

Action 18.1 – Increase the fuel efficiency and rightsizing of fleet and equipment.

Action 18.2 – Promote a corporate culture of fuel efficiency and less dependency on individual vehicle trips for Huron-Kinloss staff.

Objective 19: Support and promote low-carbon transportation options that are safe, affordable, and accessible

Action 19.1 – Promote and ensure the availability of safe active transportation options in the community.

Action 19.2 – Support and encourage the adoption of electric and low emission vehicles.

Agriculture

The agriculture sector is a key economic sector in Huron-Kinloss and is integral to the fabric and culture in the Township. Farming has always required continuous adaptation to seasonal variability and changing growing conditions, however, farmers and farm businesses are facing increasingly larger climate change-related challenges in the operation of their farms. Localized impacts of wetter winters, heavy rainfall, and more temperature variability can affect crop and livestock loss, increased pest survival rates, washouts and runoff issues, and more.

From a municipal perspective, one method in which the Township can support the agricultural community is through improving drainage systems to mitigate flooding and soil saturation concerns. Additionally, since many programs and policies to assist farmers are often controlled by higher orders of government, adaptation actions under this theme will also focus on supporting farmers in their existing and future adaptation efforts through greater collaboration with provincial and federal government agencies, assistance with funding applications, and promoting agritourism and agribusinesses in the Township.

Objective 20: Improve and support agricultural resilience to climate change

Action 20.1 – Investigate innovative drainage techniques for managing flooding and runoff issues on agricultural lands.

Action 20.2 – Support farmers and the agricultural community in their existing and future efforts to adapt to risks from climate change.

Enabling Actions

Enabling actions are actions that are required to build capacity and enable the continued integration of climate change into daily business and decision-making. As such, they apply across multiple themes and objectives, focusing on both adaptation and mitigation. Enabling actions centre around governance, planning, monitoring, and evaluation in the Township and are crucial to the successful implementation and long-term success of the CCEP.

Objective 21: Integrate climate change adaptation and mitigation considerations into the Township's strategies, plans, policies, procedures and operations

Action 21.1 – Investigate and apply methods of incorporating climate change considerations into infrastructure (grey, green, and urban forests) asset management.

Action 21.2 – Monitor and track implementation of the Climate Change and Energy Plan and report on progress annually.

Action 21.3 – Incorporate climate change considerations into the Township's Official Plan.

Action 21.4 – Implement a system to track energy and emissions and foster a culture of energy efficiency.



10. Implementation, Monitoring, and Review

10.1 Implementation

The Township of Huron-Kinloss has made great strides in planning for climate change through development of the Climate Change and Energy Plan. However, to ensure that the actions set out in this Plan are implemented in an effective manner, a preliminary implementation schedule has been developed. This schedule was the result of extensive feedback and consultation with the CCWG and other Township staff and can be seen in section 12.3.

The following implementation plan and considerations includes timelines and high-level supporting actions required for implementation. It does not include programmatic details explaining how each initiative will be delivered; in many cases, feasibility studies and further program design will be required. The schedule takes into account existing projects and programs that are already planned or underway and is intended to be a living document that will be updated over the course of its application, should differing parameters or new opportunities arise. Alongside every action, the schedule includes:

Description: Description of the intent of the action, what it hopes to achieve, and its relative scope.

Supporting Actions: Actions to help support the implementation of the action, or steps that need to be taken before the action itself can be considered

Anticipated Timing: How long implementation of the supporting actions would take (i.e. short-term (<2 years), medium-term (2-5 years), long-term (5+ years), ongoing implementation)

Lead Department(s): The department(s) leading implementation of action.

Supporting Organization(s): The department(s)/stakeholder(s)/organization(s) supporting implementation of the action.

Current Practice: Policies, programs, or practices currently happening in the Township or community that speak to or align with this action.

Monitoring Metric(s): Metric(s) to measure the success of the action.

GHG Emissions, Energy, & Energy Cost Reductions: Total greenhouse gas reductions, energy savings, and energy cost savings forecasted to be saved through the action's implementation. Only actions that specifically address GHG emissions and energy use include this information; adaptation actions or mitigation actions where the emissions reductions are indirect do not include this information.

10.2 Monitoring and Review

Monitoring and review are an important part of the planning process as they enable the Township to assess whether the actions outlined in the Plan are producing the desired results. It sets the stage for Plan longevity, allowing the Township and the community to build upon the networks created and lessons learned throughout plan development. Since adaptation and mitigation are moving targets, a monitoring framework also ensures that the community can assess whether local risks and vulnerabilities are changing, or if there have been any changes to federal and provincial legislation and

Township of Huron-Kinloss – Climate Change and Energy Plan

regulations, technological advances, or new climate hazard data. With any new information, adjustments can be made to future climate change actions.

Indicators used in this Plan can be categorized into two types: process-based indicators and outcome-based indicators. Process-based indicators measure activities and outputs, while outcome-based indicators measure whether expected effects/changes are being achieved. In many cases, process-based indicators are easier to identify and easier to measure. As such, many indicators identified in the plan are process-based. Where feasible, outcome-based indicators have been identified, especially for indicators that the Township or community are already tracking. For each action in the plan, one or more monitoring metric has been identified. These indicators will be measured and tracked by lead departments or supporting organizations as identified in the action.

Internal check-ins and meetings with a formalized, multi-stakeholder Climate Change Action Working Group will occur on a periodical basis to discuss updates and measures progress. Lead departments will be responsible for providing updates on the status of action implementation, timelines, costs, drivers and constraints, and any other additional reporting details as needed. It is anticipated that a report to Council and the public will occur annually, with a review of the CCEP occurring every five years. It is to be noted that this schedule is flexible and may change according to perceived needs and resources.



Township of Huron-Kinloss – Climate Change and Energy Plan

10.3 Implementation Schedule

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
1.1	Assess vulnerability and investigate the possibility of adapting roads, culvert and bridge infrastructure to protect roads from washouts and extreme weather (e.g. ice storms, blizzards, snowstorms, windstorms, etc.).	The projected increase in extreme heat events, freezing rain, and frequency and intensity of precipitation will all have impacts on the Township's infrastructure repair and recovery costs and could lead to prolonged infrastructure service disruptions. By adapting road, culvert, and bridge infrastructure to greater withstand the impacts of climate change, the Township of Huron-Kinloss will ensure the resilience and longevity of municipal infrastructure.	Develop an inspection procedure to identify damage from extreme weather events.	Short-term (<2 years)	Township of Huron-Kinloss – Public Works	Township of Huron-Kinloss – Building and Planning	The Township's Asset Management Plan was approved by Council in 2018. The Plan describes the characteristics and condition of assets, the levels of service expected from them, planned actions to ensure the assets are providing the expected level of service, and financing strategies to implement the planned actions. This Plan includes some analysis of the expected impacts of climate change on municipal infrastructure and provides recommendations for implementation. The Township is currently in the process of implementing this plan. In addition, Public Works routinely conducts road repair (i.e. asphalt patching, sealing cracks) as required.	<ul style="list-style-type: none"> Number of road washouts on Class 4 and 5 roads (i.e. larger roads) Number of projects where climate projections are integrated into design/maintenance/assessment Number of potholes reported by residents and/or staff Annual number of Insurance claims against Township related to potholes or infrastructure damage Road network condition metrics (Pavement Condition Index [PCI]) 	N/A
			Conduct research on Reclaimed Asphalt Pavement recycling and reuse for flexible pavement patching and/or rehab.	Short-term (<2 years)					
			Continue to increase investment in pavement preservation.	Long-term (5+ years)					
			Upgrade of critical infrastructure segments currently at risk for failure during extreme weather	Long-term (5+ years)					
2.1	Investigate the feasibility of increasing home resilience measures (e.g. backflow valves) and educate community members on flood risk reduction methods	Flooding in homes can be caused by runoff, melting snow, or heavy precipitation overwhelming the sanitary sewer connection system and storm sewer connections in Ripley. Additionally, the shallow burial of water pipes in Lucknow often leads to pipes freezing in the winter and an increased	Review options for increasing uptake, including incentives and subsidies	Short-term (<2 years)	Township of Huron-Kinloss – Building and Planning	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works, Business and Economic Development, Administration, and Community Services Insurance Agencies Contractors Plumbers 	Incidences of pipes in Lucknow freezing during the winter have increased over the years due to the shallow burial of water services in that area. Given the increased risk of them bursting, the Township currently has a program in place to upgrade the infrastructure in Lucknow and decrease some of the infrastructure damage and associated flood-risks over the long-term (2021 onwards). Additionally, the Township has plans to establish a flow monitoring	<ul style="list-style-type: none"> Inventory of houses that have improper connections to sanitary sewers Inventory of houses that have increased risk of their water system freezing Number of incentives/subsidies used by community members to implement home resilience measures 	N/A
			Research available Federal and Provincial funding for incentive programs	Short-term (<2 years)					

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Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		risk of them bursting. Flooding can lead to cracked building foundations, damaged landscapes, basement flooding, as well as mental health impacts to community members. As the climate continues to change, it will be important for the community to be better prepared and informed on stormwater controls and how they can better adapt their homes to withstand the impacts of heavy precipitation. The Township will encourage the use of preventative measures and various lot-level resilience actions.	Conduct communications campaign for residents on low cost, easy adaptive home retrofit measures (e.g. leak detection, stormwater maintenance/cleaning, rain gardens, etc.) and insurance options for homeowners and renters	Short-term (<2 years)			program for sanitary sewers over the next few years. The Maitland Valley Conservation Authority has outlined strategies to encourage landowners in high-risk areas for runoff and erosion to incorporate the following systems to help keep soil and nutrients on the land and out of watercourses: rural storm water management, cover crops and restoring flood plain and river valleys as natural areas or permanent hay. to conservation practices as one of its priorities.	• Survey of homes experiencing flooding annually during extreme rain or snowmelt events	
			Conduct one-to-many interventions (e.g. demonstration events, training programs for at-risk neighbourhoods)	Medium-term (2-5 years)					
2.2	Investigate the feasibility of implementing a downspout disconnection program.	Downspouts are routinely utilized in homes to collect water from a roof and direct it to a municipal drain below ground. During heavy rain, the municipal storm sewers can become overloaded, increasing the risk of basement flooding and causing significant damage. By properly disconnecting downspouts, stormwater can be directed away from a home's foundation	Identify data sources that can be used to indicate where downspouts are problematic and categorize areas by risk	Short-term (<2 years)	• Township of Huron-Kinloss – Building and Planning	• Township of Huron-Kinloss – Public Works, and Administration • Neighboring Conservation Authorities	N/A – no programs or practices in place.	• Creation of a downspout disconnection by-law • Number of downspouts disconnected	N/A
			Identify items that need to be considered before disconnecting (i.e. extending downspout away from foundation walls towards gardens/dry well, using a splashpad to help direct flow of water, avoid creating tripping hazards, proper maintenance of eavestroughs, etc.) and outline tips on how to disconnect downspouts (by yourself or with a contractor)	Short-term (<2 years)					

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Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		and onto gardens, landscaped areas, or a dry well on residential property. This method allows the water to soak slowly into the ground, where it is naturally filtered and returned to the water table. The Township will explore the feasibility of creating a mandatory disconnection program.	Investigate the feasibility of implementing a by-law for mandatory downspout disconnection	Medium-term (2-5 years)					
			Disseminate and promote this information to residents through different communications channels (e.g. Conservation Authorities, Township website, etc.) to ensure proper disconnection	Medium-term (2-5 years)					
3.1	Develop an energy efficiency retrofit plan to retrofit existing municipal buildings, according to age and energy use.	Existing buildings are a significant share of energy and emissions for the Township. Improving the energy efficiency of existing buildings through energy efficiency retrofits will significantly reduce energy use, energy costs, and emissions, while making the building more comfortable for occupants. Energy efficiency retrofits are designed to reduce the amount of heat (increased insulation), reduce the amount of energy used by appliances and lighting; and integrate automatic controls to optimize energy use (i.e. lighting and thermostats). <i>Target:</i>	Explore funding opportunities and incentive programs for improving energy efficiency	Ongoing implementation	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services/Facilities 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Building/Planning 	The 2019 Corporate Conservation & Demand Management Plan aims to reduce energy from buildings and outdoor lighting (among other areas) through energy efficiency projects, fuel switching, renewable energy projects, energy procurement, and a culture of conservation. One of the objectives of the Township is to reduce energy consumption in all the Township’s buildings by 2 percent over the next three years. An energy audit of the buildings will be conducted, and energy conservation opportunities identified. Upgrades to outdoor lighting will also continue, as the baseball diamond and park lighting will be switched to LEDs. Through the Plan, the Township also aims to encourage staff to conserve energy by turning off and engaging in other conservation practises.	<ul style="list-style-type: none"> Number of retrofits completed Energy and energy dollars saved per retrofit, and emission reduced 	GHG reduction: 40 tonnes CO ₂ e Energy savings: 1,000 GJ Cost savings: \$42,000 <i>Reduction potential: High</i>
		Conduct energy assessments and audits to prioritize buildings for energy efficiency retrofits.	Ongoing implementation						
		When feasible and appropriate, implement energy efficiency retrofits and building improvements, including: high efficiency windows and doors, upgraded insulation/building envelope, high efficiency (e.g. Energy Star) appliances, building automation (motion sensor lights, automated controls), lighting upgrades, and phasing out of propane and fuel oil	Short-term (<2 years); ongoing implementation						
			Provide resources on energy conservation to building occupants and staff, and develop a culture of energy conservation	Ongoing implementation					

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Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		<i>Retrofit 65% of existing buildings by 2036 to achieve average energy efficiency improvements of 45% (from 2016 baseline)</i>	Consider geothermal heating and cooling systems and explore installation of heat air recovery systems	Long-term (5+ years)					
3.2	Require all new municipal buildings to be as energy efficient as possible	Buildings and infrastructure can typically last over 100 years; new building constructed to high energy efficiency standards can help reduce energy and emissions for decades, while also providing comfortable conditions for occupants, and providing educational benefits to the community around energy efficient, smart design. <i>Target: Build new buildings that are on average 50% more energy efficiency than the 2016 baseline by 2036</i>	Establish and implement a policy to require new buildings be built to a high energy efficiency standard	Medium-term (2-5 years); ongoing implementation	• Township of Huron-Kinloss – Community Services/Facilities	• Township of Huron-Kinloss – Building/Planning	The 2019 Corporate Conservation & Demand Management Plan aims to reduce energy from buildings through energy efficiency projects, fuel switching, renewable energy projects, energy procurement, and a culture of conservation. The Plan also aims to encourage staff to conserve energy by turning off lights and engaging in other conservation practises.	<ul style="list-style-type: none"> • Energy and energy dollars saved by constructing energy efficiency buildings, and emissions reduction • Efficiency standard and/or energy use intensity (GJ/m²) of new buildings 	GHG reduction: 8 tonnes CO ₂ e Energy savings: 200 GJ Cost savings: \$8,200 <i>Reduction potential: Low-Medium</i>
			Explore funding opportunities and incentive programs for building energy efficient buildings	Ongoing implementation					
			Provide resources on energy conservation to building occupants and staff, and develop a culture of energy conservation	Ongoing implementation					
			Consider geothermal heating and cooling systems and explore installation of heat air recovery systems	Long-term (5+ years)					
4.1	Implement an energy efficiency retrofit program for residential and commercial buildings	Existing residential and commercial buildings are a significant share of energy and emissions in the community of Huron-Kinloss. Improving the energy efficiency of existing buildings through energy efficiency retrofits will significantly reduce energy use and costs,	Explore funding mechanisms for a voluntary energy efficiency retrofit program. Consider using local improvement charges (LIC) to finance program (homeowners receive loans, pay the cost of retrofit back through property tax bill)	Medium-term (2-5 years); ongoing implementation	• Township of Huron-Kinloss – Economic Development	<ul style="list-style-type: none"> • Township of Huron-Kinloss –Community Services/Facilities • Township of Huron-Kinloss – Treasury/Finance • Utilities: Epcor Utilities, Westario Power Inc. • Local Developers • Local Contractors 	The Township currently offers Community Energy Efficiency grants of up to \$3000 for energy upgrades for the commercial business, as part of their Downtown Improvement Programs. The Township also promotes existing incentive programs for businesses from local utilities.	<ul style="list-style-type: none"> • Number of home and businesses participating in program(s), program participation levels • Energy and energy dollars saved through program, and emission reduced 	GHG reduction: 2,740 tonnes CO ₂ e Energy savings: 72,050 GJ Cost savings: \$2.5 million across the community <i>Reduction potential: High</i>
			Provide resources and training to contractors and industry workers building energy efficiency,	Ongoing implementation					

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		helping to keep energy dollars in the community. <i>Target: Retrofit 50% of existing buildings by 2036, to achieve energy efficiency improvements of 50% (from 2016 baseline)</i>	and/or partner with industry associations to educate industry						
			Work with utilities/province to promote existing programs, such as Hydro One’s SaveOnEnergy and IESO programs	Ongoing implementation					
			Every Five years						
			Submit to IESO regional electricity planning group now underway in the sub-region of Greater Bruce/Huron to support a long-term electricity plan – Integrated Regional Resource Plan (IRRP) – developed to assess Southern Grey-Bruce electricity system and support recommended set of actions to maintain a reliable supply of electricity over the next 20 years						
			Promote and advance opportunities to encourage adoption of low carbon appliances, such as electric heat pump systems to replace existing gas/propane/basic electric heating systems	Ongoing implementation					
			Develop a program to encourage homeowners and building operators to switch to less carbon-intensive fuels	Ongoing implementation					
			Encourage Epcor to develop community programs for natural gas conversion	Ongoing implementation					

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Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
			Continue Community Energy Efficiency grant program for commercial buildings	Ongoing implementation					
4.2	Ensure developers are constructing new buildings in the community that reduce energy demand and increase efficiency, and building new developments that are compact and mixed-use	Buildings and infrastructure can typically last over 100 years; new building constructed to high energy efficiency standards can help reduce energy and emissions for decades. <i>Target: Improve energy efficiency by 60% by 2036 from 2016 baseline</i>	<p>Consider using municipal planning policies and zoning bylaws to ensure that new development is compact, smart and mixed-use to prevent and reduce sprawl</p> <p>Encourage EnerGuide energy performance labeling on new homes</p> <p>Work with industry associations to provide guidance to developers and prospective buyers on energy efficiency construction and performance, and for new developments that are compact and mixed-use</p>	<p>Short-term (<2 years); ongoing implementation</p> <p>Ongoing implementation</p> <p>Ongoing implementation</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Building/Planning 	<ul style="list-style-type: none"> Local Contractors, local unions Local Developers Industry Associations 	The Huron-Kinloss Building & Planning department ensures that the Ontario Building Code and the Comprehensive Zoning By-law is enforced. Through the building permit and inspection process the Building Department verifies that all building projects meet the minimum standards as set out in the Ontario Building Code, the Comprehensive Zoning By-Law and the requirements of other regulating bodies.	<ul style="list-style-type: none"> Energy and energy dollars saved through building higher efficiency homes relative buildings older than those built in 2016, and emission reduced Proportion of units approved and built that are compact, mixed use 	<p>GHG reduction: 740 tonnes CO₂e</p> <p>Energy savings: 19,500 GJ</p> <p>Cost savings: \$680,000 across the community</p> <p><i>Reduction potential: Medium</i></p>
5.1	Raise awareness on how to reduce energy and improve energy efficiency among residents, businesses owners, and building operators	If provided with the right tools and resources, community members, families, businesses owners, and community organizations can significantly reduce energy and emissions, and make more sustainable choices in how they live, move, work, and play. The Township can provide them with resources, tools, and knowledge to help reduce energy and emissions across the community.	<p>Consider using high-efficiency municipal buildings or building features for educational purposes with the community</p> <p>Encourage local businesses and commercial building owners to participate in energy benchmarking through Natural Resources Canada</p> <p>Provide education to residents and building owners on energy conservation</p> <p>Expand the integration of climate change, energy efficiency and water conservation literacy into school programs and curriculum</p>	<p>Ongoing implementation</p> <p>Ongoing implementation</p> <p>Ongoing implementation</p> <p>Ongoing implementation</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services 	<ul style="list-style-type: none"> Bluewater District School Board Chamber of Commerce & Business Community 	Awareness raising among commercial building owners and operators is a component of the Township’s Community Energy Efficiency grants.	<ul style="list-style-type: none"> Number of website page visits Number of people engaged, participation levels (at in-person events, etc.) 	Emission reductions, cost and energy savings are indirect and unquantifiable.

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
6.1	Investigate the feasibility of increasing the resilience of electricity distribution infrastructure to extreme weather events through strategic planning and retrofits.	Ice and snow accumulation on vegetation coupled with high winds can lead to trees or branches falling onto electrical lines. With a projected increased in extreme weather events (i.e. ice storms, windstorms, heavy snowfall, etc.), climate change poses a major threat to energy and electricity infrastructure, including damage to power generation, distribution, and storage. The Township has already experienced power outages in the past and will partner with utility companies and use a myriad of management practices to ensure greater resiliency of electricity distribution infrastructure.	Partner with utility companies on urban forest programs and to bury power lines to ensure safety and protection of energy infrastructure and prevent power outages caused by extreme weather	Medium-term (2-5 years)	• Utilities (Hydro One)	• Township of Huron-Kinloss – Community Services and Public Works	The Township does not monitor power interruptions as it is under the purview of the Utility companies in the area. The Township is equipped with back up power generators for all their major facilities and infrastructure.	• Number of incidences where power disruption occurs due to weather (complaint calls or logs) (This indicator can be tracked by Utilities)	N/A
			Review existing vegetation management strategies to ensure that they are aggressive enough to reduce risk of falling branches and trees	Short-term (<2 years)					
			Modifying future tree planting strategies in terms of location and species	Short-term (<2 years)					
6.2	Identify critical functions that are vulnerable to power outages and develop priority response and power restoration protocols.	Energy needs for critical infrastructure and functions that are vulnerable to power outages must be identified and analyzed for interdependencies, co-location, and consequence of loss. Once critical infrastructure and functions have been	Identify critical functions and infrastructure. This could include the following: critical road intersections, sewage lift stations, water pump stations, the public works operations centre, vulnerable population facilities (such as long-term care facilities, seniors' facilities, daycares), telephones, building and data security, and critical equipment are types of assets	Short-term (<2 years)	• Township of Huron-Kinloss – Emergency Services	• Township of Huron-Kinloss – All departments • Neighboring Conservation Authorities	In the event of a power loss significant in nature, the Township's Municipal Emergency Response Plan is activated. The Plan includes a detailed list of all critical infrastructure including power-related systems, detailed plans on how the municipality will mitigate, respond and recover from such events, contacts for all of the external agencies required to assist with the management of these types of events and plans that direct how we will communicate these types of	• Creation of a database of locations and protocols • Which locations have reliable back-up power	N/A

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		identified, priority response and power restoration protocols must be developed.	that could be vulnerable to power outages.				emergencies and important information to their community members. It further details all of their critical Township facilities that would be required to remain operational to assist in the management of affected community members, businesses, and services throughout the duration of the event.		
	Regularly inspect and maintain power sources		ongoing implementation	The Emergency Response Plan outlines that in addition to their other duties, the Director of Public Works (or alternate – Lead Hand) is responsible for arranging back-up power and standby generators on behalf of the Community Control Group.					
	Update priority power restoration list provided to Utilities to ensure that critical infrastructure is a top priority		Short-term (<2 years)	Further to the activation of the Emergency Response Plan, an Emergency Operations Centre would be activated and staffed under the Incident Management System to specifically manage all of the objectives and tasks associated with responding to and mitigating a critical infrastructure failure.					
							Backup generators for all identified critical infrastructure are in place including: fire halls, water pumping and delivery stations, telecommunications/Information Technology sites, township faculties (that are used for warming/cooling, reception/evacuation centres, or critical Township operations) and the municipal office.		

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
7.1	Support the expansion of renewable energy generation on Township-owned facilities and assets, to increase energy security and reduce risk of rising energy prices	Renewable energy produces power without burning fossil fuels or generating significant waste. Installing renewable energy on Township owned facilities or assets has the potential to significantly reduce emissions, while also protecting the Township from the growing risk of energy prices, keeping energy dollars in the community, and increasing local energy security and resiliency. <i>Target: Install 600 kw of solar capacity in Huron-Kinloss by 2036.</i>	Develop and/or expand renewable energy pilot installations on appropriate municipal buildings and facilities.	Medium-term (2-5 years); ongoing implementation	Township of Huron-Kinloss – Community Services/Facilities	Township of Huron-Kinloss – Chief Administration Office	The Township is actively exploring options and funding for renewable energy installations on municipal buildings and assets. For instance, Township staff is reviewing a pre-feasibility analysis for the introduction of solar generation on the roof of municipally owned buildings, and land owned by the municipality.	<ul style="list-style-type: none"> Energy generated through renewable energy (kw) Emissions offset through renewable energy 	GHG reduction: 24 tonnes CO ₂ e Energy savings: NA Cost savings: \$125,000 <i>Reduction potential: High</i>
			Use renewable energy installations on municipal buildings as an education opportunity for community members on the benefits and effectiveness of renewable energy	Ongoing implementation					
			Undertake a research study to evaluate the best opportunities for expanding renewable energy (rooftop solar at point of use, combined heat and power, etc.)	Medium-term (2-5 years)					
			Explore funding options, rebates, and provincial/federal incentives for renewables	Ongoing implementation					
			Consider partnering with local energy providers to facilitate the uptake of energy efficiency	Ongoing implementation					
7.2	Explore waste to energy systems at Township landfills	As landfilled waste decomposes, methane, a potent greenhouse gas is released. Methane gas capture systems at landfills capture methane, reducing emissions. The captured methane can be used to produce renewable natural gas.	Conduct feasibility studies to explore opportunities to capture methane gas generated from landfills, which can significantly reduce emissions, while also providing a source of renewable natural gas.	Short-term (<2 years); ongoing implementation	Township of Huron-Kinloss – Public Works		The 2019 Corporate Conservation & Demand Management Plan aims to reduce energy water and wastewater facilities through fuel switching, renewable energy projects, and energy procurement (among other strategies).	<ul style="list-style-type: none"> Waste to energy systems installed Methane gas captured 	Since the scope of this action is primarily exploratory, GHG reductions, and energy and cost savings were not quantified.
			Explore sources of funding (for feasibility studies and capital installations)	Ongoing implementation					
8.1	Protect the health, safety and productivity of outdoor	The Township will enhance the protection of outdoor workers (employees and	Continue targeted education to at-risk municipal workers and employers (e.g. maintenance staff, farmers, roofers,	ongoing implementation	Township of Huron-Kinloss – Emergency	Township of Huron-Kinloss – All departments	Using their HR Downloads program videos and quizzes, the Township staff is trained on dealing with extreme heat and cold stress. Information regarding	<ul style="list-style-type: none"> Number of hazards related to extreme heat Number of hazards related to winter maintenance concerns 	N/A

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Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
	workers (employees and contractors) during extreme weather conditions.	contractors) during extreme weather conditions by implementing policies, procedures and increasing awareness concerning extreme weather conditions, high temperatures, and sun safety. Additionally, efforts will be taken to strengthen the culture to support alternative work arrangements during extreme weather and hazardous conditions.	landscapers and construction workers, etc.) Promote sun and heat protection measures during heat alerts and days with high UV index. Identify eligible employees and/or projects where flexible work hours or remote work are feasible.	Short-term (<2 years); ongoing Short-term (<2 years); ongoing	Services and Administration (i.e. Health and Safety Officer and Human Resources)		warning signs of heat or cold stress is also circulated amongst staff. The Township’s Severe Weather Policy outlines employee compensation during severe weather conditions and extended power outages. Additionally, the Township’s Inclement Weather Procedure for the Community Services department outlines that during inclement weather, staff have the option to close the arena for the purpose of going home early. When a significant/severe weather event has been declared, the CAO will notify all department heads and relevant personnel, in order to begin notifications to the public through: Township website updates; Cancellations/Notifications of any changes to meetings; Township social media; Notification to any staff that may be affected; Updating the voicemail at the Township arena and notifying renters; and Updating voicemail messages for key departments	caused by extreme cold, snowstorms, ice storms, etc.	
8.2	Review winter control practices to ensure climate change impacts are considered and to identify opportunities for improvement.	The Township review its winter maintenance practices set out in the Winter Maintenance Policy as well as those applied to Township-owned and managed facilities. Through this review, Huron-Kinloss will use education, training	Administer Smart about Salt training for staff. Develop/Update protocol and practice standards for contractors. Identify opportunities for salt reduction as well as types of salt-alternatives (e.g. such as brine, beet juice, etc.)	Short-term (<2 years) Short-term (<2 years) Short-term (<2 years)	• Township of Huron-Kinloss – Public Works	• Township of Huron-Kinloss – Community Services	The Township’s Winter Maintenance Policy outlines procedures for snow removal, sidewalk winter maintenance and de-icing activities (i.e. salting). It also defines Significant Weather Criteria (i.e. significant snow accumulation in a 24 hour period, ice formation that occurs with no warning, high winds leading to large snowdrifts, and/or cold temperatures at which de-icing	<ul style="list-style-type: none"> • Number of training events • Number of contractors/drivers trained with Smart about Salt • Number of winter accident claims • Kilometres of maintained pathways 	N/A

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Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		opportunities, and changes to operational practices to ensure climate change impacts are adequately addressed.	Implementing a monitoring tour for trails that occurs seasonally in spring, summer, and fall (but not during winter seasons)	ongoing implementation			operations will not be effective) and briefly outlines that a declaration of a Significant Weather Event occurs at the discretion of the Director of Public Works, or based on information received by Environment Canada’s Public Weather Alerting Program, Township patrol reports and/or the County of Bruce’s Transportation and Environmental Services Department.		
9.1	Establish buddy systems/help-your-neighbour programs to implement during extreme weather events	Extreme temperatures and conditions will likely affect some members of the community more than others. As these events are projected to increase with climate change, family, friends, and neighbours are an important source of support during these times. The Township will continue to encourage community members to proactively participate in individual responses such as help-your-neighbour or buddy system programs, to maintain the safety of their neighbours and vulnerable community members.	<p>Connect community groups to learn from each other on how to establish and maintain informal buddy systems in buildings or neighbourhoods</p> <p>Explore the possibility of a program to link student populations with community members in need, particularly for new Canadians and providing language support</p> <p>Consider how to encourage informal actions (such as neighbourly check-in) in areas without community/neighbourhood associations</p> <p>Encourage existing neighbourhood-level programs to continue and expand where possible</p>	<p>Medium-term (2-5 years)</p> <p>Short-term (<2 years)</p> <p>Short-term (<2 years)</p> <p>Short-term (<2 years)</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Emergency Services 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services Neighborhood groups/associations Faith-based communities Local landlord and tenant associations Victorian Order of Nurses (VON) OPP Grey Bruce Health Unit 	The Township participates in Emergency Preparedness Week (EP Week), an annual event that takes place each year during the first full week of May. It is an opportunity to encourage residents to take concrete actions to be better prepared to protect themselves and their families during emergencies. As part of this ongoing education, information regarding helping your neighbours during hazardous conditions is encouraged.	<ul style="list-style-type: none"> Number of neighbourhood group/association members participating in a formal help-your-neighbour program Number of vulnerable community members (i.e. socially isolated, seniors) that are checked in on during periods of extreme weather 	N/A
9.2	Increase the community's uptake of household emergency kits	Community members play a crucial role in maintaining the safety of their family and neighbors during weather-related emergencies. As such,	Consider who needs information (prioritize audiences, e.g. vulnerable populations); who can help share information (communication partners); and who has the information	Short-term (<2 years)	<ul style="list-style-type: none"> Township of Huron-Kinloss – Emergency Services 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services Food banks 	The Township participates in Emergency Preparedness Week (EP Week), an annual event that takes place each year during the first full week of May. It is an opportunity to encourage residents to take concrete actions to be better	<ul style="list-style-type: none"> Emergency kit uptake including number of kits) and qualitative information (e.g. how are kits maintained, how did people learn about emergency kits, etc.) 	N/A

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		enhancing their collective capacity to effectively engage in emergency preparedness is essential to maintaining the health and safety of residents. 72-hour preparedness recommended by emergency management professionals is key in cases where community members don't have access to basic services (i.e. electricity, water).	(reliable sources of information and new research).			<ul style="list-style-type: none"> • Neighborhood groups/associations • Faith-based community groups • Local landlord and tenant associations • Grey Bruce Health Unit • Christmas Hamper program 	<p>prepared to protect themselves and their families during emergencies.</p> <p>To complement this, an emergency survival checklist as well as information regarding emergency preparedness for seniors (i.e. additional items to note while planning and assembling emergency survival kits), for those with visible (i.e. hearing, mobility, vision) and non-visible (i.e. communication, mental health, learning/intellectual, etc.) disabilities, for those with service animals, and for those with travel considerations, are included on the Township website. Residents can also sign up to receive emergency notifications via e-mail, and access information and assistance by calling the Township's partners at Community Connections via their 2-1-1 service.</p> <p>In addition, in order to engage further with their residents, Emergency Services staff attend the annual Fall Fairs in Lucknow and Ripley. At these events, an emergency management display/information booth is set up to conduct community engagement and distribute information on emergency and weather-related hazards and 72-hour emergency preparedness.</p>	<ul style="list-style-type: none"> • Number of educational training workshops • Number of people attending training workshops 	
	Host a community training workshop to encourage people to assemble their own 72-hour emergency kits as part of emergency preparedness events, summer camps for students, and other opportunities.		Short-term (<2 years); ongoing						
	Distribute information on household emergency planning and backup power via Township website and social media, PSAs, bulletin boards, mail outs, etc.		Short-term (<2 years); ongoing						
	Provide free or subsidized emergency kits for vulnerable populations and investigate funding to support this where possible.		Medium-term (2-5 years); ongoing						
10.1	Implement warming and cooling centres outside of normal business hours.	Extreme heat and cold pose major health and safety risks to vulnerable populations (i.e. seniors, children, socially isolated, etc.) within Huron-Kinloss.	Extend pool and splashpad hours during extreme heat events	Short-term (<2 years)	• Township of Huron-Kinloss – Emergency Services	• Township of Huron-Kinloss – Community Services	Appendix Q of the Township's internal Municipal Emergency Response Plan outlines that the Head of Council, Administrator, and/or CEMC will contact Utilities in the area regarding possible hydro reconnections, review the	<ul style="list-style-type: none"> • Website traffic to pages with warming/cooling centre information • Number of warming and cooling centres, as well as the number of people accessing them, and 	N/A
	Identify buildings that could serve as additional warming and/or cooling centres (e.g. libraries, community centres)		Short-term (<2 years)						

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		The Township will pursue various cooling strategies and provide spaces for extreme temperature relief outside of business hours.	Identify accessibility, capacity, and staffing considerations.	Short-term (<2 years)			environment Canada Weather forecast, and will use the internal guidelines to determine when a facility will be activated as a warming/cooling centre.	the frequency and rate of access and activation	
			Review non-municipal venues offering Township services.	Short-term (<2 years)					
			Update the Township's Emergency Response Plan with changes and/or additional information (i.e. changes to protocol, updates to notification system, etc.) regarding warming and cooling centres.	Short-term (<2 years)					
10.2	Continue to provide rigorous communications to the public regarding road conditions and municipal facility closures during extreme weather events.	The Township is already experiencing extreme weather events such as freezing rain, thunderstorms, and snowstorms and more. As these events are expected to increase with climate change, improved communications on road conditions and municipal facility closures will be crucial in helping reduce vehicle accidents and improve public safety. The Township will continue to explore new ways to improve communication to the public on road conditions and municipal facility closures during extreme weather events.	Refine organizational charts and establish Standards of Practice so that contact information for the relevant staff members who are responsible for assets is up to date.	Short-term (<2 years)	<ul style="list-style-type: none"> Township of Huron-Kinloss – CAO's office 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services and Public Works Neighboring Conservation Authorities Grey Bruce Health Unit County of Bruce 	<p>According to the Township's Winter Maintenance Policy, once a Significant Weather Event is declared, notification to the public will be communicated through posts on the Township's website, social media (i.e. Facebook and Twitter) and a press release will be distributed through local radio stations, newspapers, and the local online news website. Declaration of a Significant Weather Event occurs at the discretion of the Director of Public Works or based on information received by Environment Canada's Public Weather Alerting Program, Township patrol reports and/or the County of Bruce's Transportation and Environmental Services Department. The Policy also outlines procedures for snow removal, sidewalk winter maintenance, and de-icing activities (i.e. salting).</p> <p>Once a significant/severe weather event has been declared, the CAO will notify all department heads and relevant personnel, in order to begin notifications to the public through: Township website</p>	<ul style="list-style-type: none"> Number of calls to Township concerning winter control issues Number of calls to Township with complaints regarding facility closures 	N/A
			Increase resident awareness around the winter maintenance policy and procedures during periods of extreme or inclement weather.	Ongoing implementation					
			Increase resident awareness around the winter maintenance policy and procedures during periods of extreme or inclement weather.	Ongoing implementation					

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							updates; Cancellations/Notifications of any changes to meetings; Township social media; Notification to any staff that may be affected; Updating the voicemail at the Township arena and notifying renters; and Updating voicemail messages for key departments		
10.3	Undertake business continuity planning and staff training to plan for the Township's essential and secondary services and ensure informed response to extreme weather events.	Strong collaboration between departments is required to respond effectively and ensure continuity of services during extreme weather. The Township will carry out business continuity planning using an all-hazards approach to address daily operations, roles and responsibilities, critical activities (e.g. emergency shelters, emergency staffing), and critical interdependencies with non-municipal infrastructure/facilities. Additionally, providing more targeted training for staff on how to respond to and address public concerns during an emergency will ensure emergency service requests are responded to in a timely manner.	<p>Train staff on how to respond during extreme circumstances (e.g. crowd management and weather-based emergency situations) and include climate change fundamentals as part of new staff onboarding processes.</p> <p>Research alternative suppliers and store Township records, documents, and vital data off-site.</p> <p>Review, finalize and integrate draft department-specific Business Continuity Plans into the Emergency Response Plan and provide training to staff in relation to their BCP roles and responsibilities.</p> <p>Update Township's Emergency Response plan with climate change considerations as required.</p>	<p>ongoing implementation</p> <p>Short-term (<2 years)</p> <p>Short-term (<2 years)</p> <p>ongoing implementation</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Emergency Services and Administration (i.e. CAO's Office, Human Resources) 	<ul style="list-style-type: none"> Township of Huron-Kinloss – All departments 	<p>The Township's Emergency Response Plan outlines the overall response in the event of an emergency, including individual and departmental roles and responsibilities, and where to obtain resources. It provides responders including Municipal Officials, with specific actions to guide their response in unfamiliar or stressful situations. Additionally, it includes information on where to find Flood Control Plans (through the Saugeen & Maitland Valley Conservation Authorities), a mutual aid agreement with neighboring municipalities to share resources and expediting response during an emergency, steps for the Municipal Emergency Control Group, and a list of Provincial and Federal agencies and authorities that can provide assistance if necessary (e.g. disaster relief assistance, flood, forest fire, and drought assistance, etc.).</p> <p>Emergency Services is currently in the process of reviewing, updating, and finalizing the draft business continuity plans (BCPs) for each department, after which they will be integrated into the internal Emergency Response Plan.</p>	<ul style="list-style-type: none"> Number of staff trained in extreme weather procedures and protocol Number of staff trained in relation to their individual BCP roles and responsibilities 	N/A

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11.1	Explore and expand tree planting, streetscaping, and other strategies to increase shade and cooling, including the planting of strategic plant species (e.g. native grasses, shrubs, trees, and, pollinators, etc.) on private and public land.	Extreme heat can pose severe health risks to residents in the Township and can be especially threatening to vulnerable populations (e.g. seniors, children, socially isolated, etc.). To address the projected increase in annual temperatures and extreme hot days (days above 30 °C), the Township (with technical support from neighboring conservation authorities) will engage in various shading and cooling strategies (e.g. tree planting on private property and appropriate municipal spaces, native shrubs and grasses on streets and boulevards, etc.) to help reduce the risk of heat-related illness in the future.	Use best practices in site and infrastructure design/development (e.g. Ontario One Call [‘Call before you dig’] program) to determine strategic trees, shrubs, and other native vegetation for planting (e.g. age diversity, species diversity, etc.).	Medium-term (2-5 years)	• Township of Huron-Kinloss – Community Services	<ul style="list-style-type: none"> • Township of Huron-Kinloss – Public Works • Neighboring Conservation Authorities • Pine River Watershed Initiative Network • School Boards • Grey Bruce Health Unit • Lucknow Horticultural Society • Ripley & District Horticultural Society 	In response to the Township’s invasive species concerns (e.g. Emerald Ash Borer), Huron-Kinloss has planted over 500 trees in 2019 and has plans to continue this in the coming years. Additionally, intermittent planting of trees, shrubs, and grasses are done in appropriate municipal spaces, as required.	<ul style="list-style-type: none"> • Number of people purchasing plants/trees and attending maintenance workshops • Number of trees planted (i.e. per year)/Percentage of greenspace • Long-term measured increase in canopy cover 	N/A
			Deliver community plant sales, design, and maintenance workshops for residents in collaboration with community partners (e.g. local horticultural societies)	Short-term (<2 years); ongoing					
			Develop a funding mechanism/program to subsidize tree planting costs for residents, especially for native trees and plant species.	Medium-term (2-5 years)					
11.2	Encourage the incorporation of Low Impact Development (LID) features and green infrastructure into new development	During heavy rainfall events, runoff from impermeable urban surfaces can lead to flooding. Low Impact Development (LID) and green infrastructure include a range of strategies to increase the	Encourage the use of on-site storm water management (e.g. LID and other green infrastructure technologies) in new developments, redevelopments, and major renovations	Long-term (5+ years)	• Township of Huron-Kinloss – Building and Planning	<ul style="list-style-type: none"> • Township of Huron-Kinloss – Public Works • Developers • Contractors 	Currently, the Township’s Official Plan outlines Natural Hazard Areas where development is restricted and required approval from the relevant Conservation Authority (including lands adjoining a river, channel or stream susceptible to flooding and areas susceptible to erosion). In terms of low impact design	<ul style="list-style-type: none"> • Number of LID features and projects completed in the Township • Measured change/increase in impermeable spaces • Inspection to see if updated design standards are followed 	N/A

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	and redevelopment projects.	infiltration of rainwater into the ground, thereby reducing the risk of overland flooding. Examples of LID and green infrastructure include rain gardens, permeable pavers, blue roof systems, and more. LID features also provide social and economic benefits, including improved property aesthetics and property value, as well as health benefits. The Township will review design standards to incorporate a higher level of stormwater management and support education to developers on how they include more LID features and green infrastructure usage in developments and redevelopments.	<p>Review Design Standards for property development to incorporate a higher level of storm water control on private lands based on downstream objectives.</p> <p>Communicate information on best management practices for storm water, options for LID and the preservation of natural features to during development and redevelopment</p>	<p>Long-term (5+ years)</p> <p>Long-term (5+ years)</p>			specifically, there are no requirements by the Township at this time.		
12.1	Develop an invasive species response strategy, including funding for these efforts and guidance materials for private landowners.	Invasive species lack natural enemies or other forms of competition, and therefore can rapidly increase in number and cause significant negative impacts to our natural environment, economy, and society. An invasive species response strategy will provide clear	<p>Partner with neighbouring jurisdictions, conservation authorities, and other levels of government (e.g. Ontario Invasive Plants Council, Ontario Invasive Species Centre, CFIA) to plan for and identify new invasive species threats.</p> <p>Identify invasive species through signage, web apps, etc.</p>	<p>Long-term (5+ years)</p> <p>Short-term (<2 years)</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services 	<ul style="list-style-type: none"> Lake Huron Centre for Coastal Conservation Ontario Invasive Plants Council Neighboring Conservation Authorities Grey Bruce Health Unit Landowners 	The Township has continuously engaged in a number of strategies to tackle invasive species such as Phragmites Australis, Giant Hogweed, Poison Ivy, and Emerald Ash Borer in the area. In 2019, the Township planted over 500 trees to combat Emerald Ash Borer threats and has plans to continue this in the coming years.	<ul style="list-style-type: none"> Number of trees planted Number of residents participating in the Green Ribbon program Percentage of trees in good or excellent health 	N/A

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		direction for the management of invasive species. It will include direction on all aspects of managing threats in forested areas, identify challenges and opportunities for improvement, outline objectives for long-term sustainability of forested areas, recommended actions including programs (e.g. public education), policies, and partnerships, short and long-term resource requirements (i.e. funding, staff, etc.), and monitoring indicators	Hire licensed exterminators (part-time or temporary) to support operations and roadside staff and/or consider building staff capacity to do identify and remove invasive species	ongoing implementation		<ul style="list-style-type: none"> Community members 	Information about these species and methods used to address the threats are outlined on the Township website. The website also provides information on the Invasive Species Hotline set up for residents to call in and report an invasive species observation and includes a link to the Ontario’s Invading Species Awareness Program website to report sightings. Fact sheets on invasive species in the area, information on how to detect them, and a map of Emerald Ash Borer infestations are all available to download.		
	Define roles and responsibilities for different departments for addressing invasive species		Medium-term (2-5 years)						
	Develop a citizen science program for residents to identify and inform Township of invasive species.		Medium-term (2-5 years)						
	Research possible funding opportunities/grants for research, mapping, and development of invasive species policy		ongoing implementation						
	Engage with community stakeholders for dissemination of educational material (i.e. fact sheets for residents on how to manage invasive species on their properties)		Short-term (<2 years); ongoing implementation						
13.1	Improve flood-prone riverbanks by implementing natural, rural stormwater management measures upstream	Soils along the shorelines of rivers and streams are gradually weathered and displaced and deposited by various climatic forces including heavy rainfall, wind, and ice. Although erosion is a natural process, increased intensity and frequency of precipitation and flooding caused by climate change can dramatically	Restoring river valleys and flood plain	Long-term (5+ years)	<ul style="list-style-type: none"> Neighboring Conservation Authorities 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works Pine River Watershed Initiative Network Agricultural community OMAFRA (to support training of drainage engineers and erosion control contractors) 	MVCA is leading the development of the methodology for identifying areas where rural stormwater management is needed and will assist in training other conservation authorities on how to identify these areas in their respective watersheds.	<ul style="list-style-type: none"> Inventory of flood-prone riverbanks before the implementation of measures and after Change in maintenance efforts Number of natural stormwater management and erosion control measures taken 	N/A
	Buffering watercourses using trees, shrubs, and hay		Medium-term (2-5 years); ongoing						
	Installing berms		Medium-term (2-5 years); ongoing						
	Using cover crops		Short-term (<2 years)						

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		accelerate this process. As such, installing rural stormwater management systems on lands and municipal drains upstream of natural watercourses will allow the water to slow down, spread out, and soak into the ground. Additionally, rural stormwater management systems can be designed by a watershed and subwatershed basis to identify where the water needs to be slowed down and what specific measures are needed to make it happen.	Promoting wetland restoration development	ongoing implementation					
13.2	Promote and support dune development along backshore of beach and include planting dune grasses and sand fencing to induce settling of wind-blown sands.	Climate change projections show that increased evaporation and precipitation are likely to result in more dramatic lake level fluctuations (i.e. higher highs and lower lows). As a result, shorelines and beaches in Huron-Kinloss will experience greater erosion. The Township will continue to monitor lake levels and update flood and erosion risk	<p>Review, update, and expand flood and erosion mapping for all relevant shorelines</p> <p>Continue to monitor lake levels</p> <p>Communicate with those who are at risk</p> <p>Identify keystone frontal dune and secondary (backdune) plant species to provide stabilization and vegetative cover to catch sand (i.e. ability to withstand sand burial, flooding, heat, limited nutrient supply, etc.)</p>	<p>Medium-term (2-5 years); ongoing</p> <p>ongoing implementation</p> <p>ongoing implementation</p> <p>Short-term (<2 years)</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services 	<ul style="list-style-type: none"> Lake Huron Centre for Coastal Conservation (Green Ribbon Champion Program) Neighboring Conservation Authorities Environment Canada 	N/A – no policies or practices currently in place.	<ul style="list-style-type: none"> Erosion controlled near beaches and shorelines over time Expansion of flood and erosion mapping 	N/A

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		mapping where possible. In addition, dune vegetation provides more long-term structure and stability of beach dunes. The Township will also continue to support dune development through natural processes.	Explore the need for and feasibility of creating a Shoreline Emergency Plan (i.e. detailing how the municipality will respond in case of a flood or erosion emergency)	Long-term (5+ years)					
13.3	Improve sediment and erosion control from construction activities through improved inspections, reporting, and operational controls	Frequency and intensity of precipitation and flooding events are expected to increase in the Township. As such, increased erosion of exposed soil can lead to a myriad of issues, including degradation of aquatic habitats and damage to downstream recreational areas and infrastructure. The Township will work to prevent erosion during construction activities through increased inspections, monitoring, and maintenance where feasible.	<p>Develop inspection and mitigation protocols in relation to sediment and erosion control and improve design and construction field inspection record-keeping.</p> <p>Require all design and construction inspectors, consultants, and/or contractors responsible for site monitoring to have Certified Inspector of Sediment and Erosion Control (CISEC) training.</p> <p>Research and evaluate tools for tracking spills and non-compliance issues.</p> <p>Evaluate feasibility and benefit of increasing erosion and sediment control requirements for Township projects</p>	<p>Medium-term (2-5 years)</p> <p>Short term (<2 years)</p> <p>Medium-term (2-5 years)</p> <p>Short term (<2 years)</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works Neighboring Conservation Authorities 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Building and Planning Developers 	<p>For all road construction projects, the Township requires silt fencing and conducts regular inspections. In addition, private construction projects also have certain sediment and erosion-control requirements as well as monitoring and maintenance measures in place, where possible.</p> <p>The Township’s Official Plan outlines Natural Hazard Areas where development is restricted and required approval from the relevant Conservation Authority (including lands adjoining a river, channel or stream susceptible to flooding, Lake Huron shorelines, and areas susceptible to erosion).</p>	<ul style="list-style-type: none"> Number of sediment and erosion control plans prepared and implemented to the Township’s satisfaction Number of complaints for infractions or issues 	N/A
14.1	Continue to improve and invest in stormwater and	Improving the capacity of stormwater infrastructure where needed, will reduce the impacts of stormwater runoff,	Inventory and assess storm structures to determine vulnerability to increased intensity of precipitation and flooding	ongoing implementation	Township of Huron-Kinloss – Clerk’s Department (i.e.	Township of Huron-Kinloss – Public Works and Building and Planning	The Township regularly inspect sewers that do not appear to be functioning as expected and are replaced if they cannot be cleaned sufficiently. In addition, the Township will also replace and upgrade	<ul style="list-style-type: none"> Percentage of watershed area treated for peak control Percentage of watershed area treated for volume control 	N/A

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	sewer infrastructure	resulting in improved water quality and reduced risk of flooding. With the projected increase in the frequency and intensity of precipitation events, continued investment into stormwater infrastructure as well as regular inspections and proper operational maintenance activities will ensure that the system is functioning properly.	<p>Conduct vulnerability and risk assessments for critical infrastructure</p> <p>Ensure appropriate databases and maintenance processes are in place to support stormwater capacity and modelling needs</p> <p>Invest in municipal storm sewer improvements</p>	<p>ongoing implementation</p> <p>ongoing implementation</p> <p>Long-term (5+ years); ongoing implementation</p>	<p>Drainage Superintendent)</p> <ul style="list-style-type: none"> Landowners in the Township 	<ul style="list-style-type: none"> Neighboring Conservation Authorities 	storm sewers that are either in poor condition or are undersized during capital projects.		
15.1	Increase the operational efficiency of water and wastewater systems to reduce energy and emissions	Water and wastewater facilities contribute almost 10% of emissions from municipal operations and services. By investing in energy efficient practises and equipment, these facilities, energy consumption can be reduced, saving energy dollars and reducing emissions. <i>Target: Achieve 5% efficiency improvement from operational and maintenance best practises by 2036.</i>	<p>Work with Veolia to increase operational efficiencies at W&WWs and investigate possible infrastructure upgrades</p> <p>Regularly review and/or audit energy performance of water and wastewater facilities</p> <p>Continue to look for, and implement opportunities to upgrade water and wastewater facilities to improve operations, such as the installation of aeration blower upgrades, variable frequency drives (VFD) on pumps, ultra-fine bubble diffusers, low-lift pumps, etc. (add continue to)</p> <p>Consider using an energy and performance benchmarking program for township-wide facilities, such as Natural Resource Canada’s Energy Star Portfolio Manager</p>	<p>Ongoing implementation</p> <p>Ongoing implementation</p> <p>Ongoing implementation</p> <p>Short-term (>2 years); ongoing implementation</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works 	<ul style="list-style-type: none"> Veolia Water 	The 2019 Corporate Conservation & Demand Management Plan aim to reduce energy from water and wastewater facilities through energy efficiency projects, fuel switching, renewable energy projects, energy procurement, and a culture of conservation. Through the Plan, the Township aims to encourage staff to conserve energy by turning off lights, using less water, and other conservation measures.	<ul style="list-style-type: none"> Energy use per unit output (litres of water treated, litres of wastewater treated), cost savings from energy efficiency measures, and emissions reduced 	<p>GHG reduction: 2 tonnes CO₂e</p> <p>Energy savings: 200 GJ</p> <p>Cost savings: \$11,400</p> <p><i>Reduction potential: Low</i></p>

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			Provide facility operator training on operational and maintenance best practices	Short-term (>2 years); ongoing implementation					
			Explore sources of funding and grant programs to fund facility upgrades	Ongoing implementation					
15.2	Implement an educational campaign to encourage less water use, specifically targeting citizens and businesses connected to the municipally operated water system	Water and wastewater facilities contribute almost 10% of emissions from municipal operations and services and are large consumers of energy. If residents and businesses use less water, then there is less water and wastewater to treat and pump, and therefore less energy consumed.	<p>Deliver education and outreach programs for the public on reducing water consumption. Consider summer residents as well as year-round residents</p> <p>Encourage and raise awareness on appliances and practices such as low-flow toilets and showerheads, rainwater collection (i.e. cisterns) and xeriscaping (drought-resistant plantings), and fusion landscaping</p> <p>Expanding water metering program to heavy water users (industrial, commercial, etc.), and expand among residential customers</p> <p>Explore methods to improve water conservation, and consider incentives to encourage use water conservation measures</p>	<p>Ongoing implementation</p> <p>Ongoing implementation</p> <p>Medium-term (2-5 years); ongoing</p> <p>Ongoing implementation</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works 		The Township of Huron-Kinloss has established a by-law to regulate the use of water for the watering of lawns and gardens. Our Future Huron-Kinloss Sustainability Plan also identifies further opportunities to reduce water consumption.	<ul style="list-style-type: none"> Water treated and wastewater treated per capita Water consumed per capita or per household Energy use per unit output (litres of water treated, litres of wastewater treated) 	Emission reductions, cost and energy savings are indirect and not quantified.
16.1	Expand waste diversion programs	Waste diversion programs not only reduce emissions from landfill, they also preserve landfill capacity. Diverted materials can be	<p>Set a waste diversion target</p> <p>Support the development and implementation of a Solid Waste Management Plan</p>	<p>Short-term (>2 years)</p> <p>Medium-term (2-5 years); ongoing</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works 	<ul style="list-style-type: none"> Bruce County Waste Contractors 	Our Future Huron-Kinloss Sustainability Plan identifies some opportunities to reduce landfilled waste. The Township also sells and distributes Green Cone	<ul style="list-style-type: none"> Total tonnes of solid waste to landfill Total residential diversion rate Waste generation per capita Remaining landfill capacity 	GHG reduction: 2,000 tonnes CO ₂ e <i>Reduction potential: High</i>

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		reused, recycled or composted instead of being buried in a landfill forever. <i>Target: Divert 40% of waste from landfills by 2036 (from 2016 baseline)</i>	Regularly review the effectiveness of waste collection programs and implement changes to improve waste diversion. Consider an organic collection program	Ongoing implementation			Digesters, helping to reduce household organic waste.		
	Continue to promote backyard composting (e.g. green cone composters)		Ongoing implementation						
	Continue to work with Bruce County to promote waste diversion		Ongoing implementation						
16.2	Engage and educate community on waste reduction	Waste diversion programs not only reduce emissions from landfill, they also preserve landfill capacity. Diverted materials can be reused, recycled or composted instead of being buried in a landfill.	Implement a “less waste challenge” to encourage reduction in waste generation, with a focus on food waste	Short-term (<2 years); ongoing implementation	• Township of Huron-Kinloss – Public Works	• Township of Huron-Kinloss – Community Services	Our Future Huron-Kinloss Sustainability Plan identifies some opportunities to reduce waste generation, and the Township continues to educate citizens on waste reduction and diversion.	<ul style="list-style-type: none"> • Total tonnes of solid waste to landfill • Total residential diversion rate • Waste generation per capita 	Emission reductions, cost and energy savings are included in action 16.1 (waste diversion).
			Implement an awareness campaign to encourage elimination of wasted food in the home, workplaces, and schools	Short-term (<2 years); ongoing implementation					
			Expand awareness campaigns with citizens, businesses and visitors on proper waste diversion (e.g. what can be recycled and what cannot)	Ongoing implementation					
			Support local organizations that work with citizens and businesses on waste reduction and efficient use of resources.	Ongoing implementation					
17.1	Improve winter travel conditions for pedestrians	Snowy and icy conditions make winter travel difficult for everyone but can be especially hazardous for those using	Identify priority needs for snow/ice clearing of sidewalks and trails (e.g. between shelters and social services, grocery stores, near seniors' homes	Short-term (<2 years)	• Township of Huron-Kinloss – Public Works	• Neighborhood Associations • Grey Bruce Health Unit	The Township’s Winter Maintenance Policy outlines procedures for snow removal, sidewalk winter maintenance and de-icing activities (i.e. salting). It also defines Significant Weather Criteria (i.e.	• Number of calls to Township regarding slips, falls, injuries due to icy or snowy conditions	N/A

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		sidewalks and trails, as they are more prone to falls and injuries. With a projected increased in freezing rain events and overall precipitation, the Township will ensure improved mobility and safety during the winter months through improved snow clearing, promotion of appropriate footwear and other injury prevention tips, and targeted infrastructure improvements.	Encourage local neighbourhood snow clearing programs (e.g. Snow Buddies Program in Waterloo Region, Niagara, Brantford, etc.)	Short-term (<2 years)			significant snow accumulation in a 24 hour period, ice formation that occurs with no warning, high winds leading to large snowdrifts, and/or cold temperatures at which de-icing operations will not be effective) and briefly outlines that a declaration of a Significant Weather Event occurs at the discretion of the Director of Public Works, or based on information received by Environment Canada’s Public Weather Alerting Program, Township patrol reports and/or the County of Bruce’s Transportation and Environmental Services Department. Additionally, in an effort to improve pedestrian safety, the Township annually installs new sidewalks and upgrades existing sidewalks that are not wide enough.		
			Explore possibility of Township expanding sidewalk clearing (with help from County GIS system for route mapping)	Short-term (<2 years)					
			Promote fall/injury prevention information	Ongoing implementation					
			Conduct targeted improvements to infrastructure and areas of concern (e.g. addressing drainage-related concerns)	Medium-term (2-5 years); ongoing implementation					
			Continue to increase the number of sidewalks and upgrade existing sidewalks that are not wide enough.	Ongoing implementation					
			Expand use of protective/anti-slip footwear amongst municipal employees	Short-term (<2 years)					
18.1	Increase the fuel efficiency and rightsizing of fleet and equipment	Fleet vehicles represent over 50% of energy and emissions for the Township. Improving the fuel efficiency of the vehicle fleet over time, as vehicles are replaced, can significantly reduce fuel consumption and save dollars spent on fuel.	Accelerate the retirement of large and the least fuel-efficient vehicles and equipment As vehicles are replaced and where feasible, prioritize the purchase of more fuel-efficient vehicles and low-emission vehicles (electric, hybrid, etc.). Examples include electric ice resurfacers, hybrid-electric public work trucks, etc.	Medium-term (2-5 years); ongoing implementation Ongoing implementation	• Township of Huron-Kinloss – Public Works	• Township of Huron-Kinloss – Community Services/Facilities, Chief Administration Office	The 2019 Corporate Conservation & Demand Management Plan aims to reduce energy from fleet vehicles through energy efficiency projects, fuel switching, and a culture of conservation. A current priority for the Township is to replace the propane powered ice resurfacer with an electric model within 1-2 years. The introduction of the electric ice resurfacer will reduce the greenhouse gas emissions associated	• Reduction in the amount of fuel consumption and costs, and emissions	GHG reduction: 25 tonnes CO ₂ e Energy savings: 290 GJ Cost savings: \$7,320 <i>Reduction potential: Medium</i>

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		<i>Target: By 2036, 7% of vehicles will be electric or hybrid, and there will be 10% fewer large trucks in the Township's fleet.</i>	As vehicles are replaced, ensure right-sizing of vehicles and equipment (where feasible), to ensure that new vehicles meet the specific job function requirements. For example, consider replacing mid-sized cars and vans with hatchbacks and other compact cars, or downsizing pickup trucks)	Ongoing implementation			with the propane powered machine and improve air quality inside the Ripley-Huron arena.		
			Require fuel efficiency be considered in procurement and purchasing evaluations and decision-making	Ongoing implementation					
18.2	Promote a corporate culture of fuel efficiency and less dependency on individual vehicle trips for Huron-Kinloss staff	Fleet vehicles represent over 50% of energy and emissions for the Township. Encouraging Township staff to reduce their individual vehicle trips, such as through carpooling or telecommuting, as well as promoting and facilitating a culture of fuel efficiency, can help reduce fuel consumption and costs, as well as improving the health and wellbeing of staff. <i>Target: Achieve 5% savings from fuel consumption as a result of eco driving and anti-idling.</i>	Provide operator training and education to staff to promote fuel-efficient driving habits including anti-idling, optimal driving behaviours, efficient stopping and acceleration techniques, etc	Ongoing implementation	• Township of Huron-Kinloss – Public Works	• Township of Huron-Kinloss – Community Services/Facilities, Chief Administration Office	The 2019 Corporate Conservation & Demand Management Plan aims to reduce energy from fleet vehicles through energy efficiency projects and a culture of conservation (among other initiatives). Through the Plan, the Township also aims to encourage staff to conserve energy by refraining from idling fleet vehicles, and other conservation measures.	<ul style="list-style-type: none"> Reduction in the amount of fuel consumption and costs, and emissions Proportion of staff trained on efficient vehicle use 	GHG reduction: 14 tonnes CO ₂ e Energy savings: 200 GJ Cost savings: \$6,800 <i>Reduction potential: Low-Medium</i>
			Implement an anti-idling policy for municipal fleet vehicles	Short-term (<2 years); ongoing					
			Continue to Encourage telecommuting among Township staff, and encourage carpooling to off-site meetings and visits	Ongoing implementation					

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
19.1	Promote and ensure the availability of safe active transportation options in the community.	Active transportation, such as walking and cycling, have numerous benefits, including reduced fuel consumption, improved health and wellbeing of community members, and better air quality. The Township can encourage more active transportation by making these options safe, available, and readily accessible. <i>Target: 2% shift from individual vehicle use to active transportation options by 2036</i>	Continue to maintain sidewalks and pedestrian walkways (i.e. snow removal) that facilitate convenient and safe pedestrian travel	Ongoing implementation	• Township of Huron-Kinloss – Public Works	• Township of Huron-Kinloss – Community Services/Facilities • Grey Bruce Health Unit	The Township of Huron-Kinloss’ Parks and Trails Master Plan 2010 establishes a ten-year strategy for trail development and forms the foundation of all decision making for the trail and parks system. Plan promotes and encourages active transportation, such as bicycling and walking, for both recreational and commuter uses on trails and shared roadways.	<ul style="list-style-type: none"> • Kilometres of multi-purpose trail routes • Public use of trails 	GHG reduction: 190 tonnes CO ₂ e Energy savings: 2,800 GJ Cost savings: \$100,000 <i>Reduction potential: Low</i>
			Expand bike trails and multi-purpose routes, and work with the County to continue to expand active transportation options across the region	Ongoing implementation					
			Install bike locking stations across Township, to encourage riding within Ripley, Lucknow, and other centres	Short-term (<2 years)					
			Install signage on active transportation routes (paths, multi-purpose routes, etc.) to improve the safety for users	Short-term (<2 years)					
19.2	Support and encourage the adoption of electric and low emission vehicles	Most of Huron-Kinloss’ community emissions are from transportation; since there are few feasible alternatives to vehicle use for most residents, electric vehicles can substantially help reduce emissions in the community, as well as improve air quality and health and wellbeing of community members. <i>Target: 10% of vehicles will be electric by 2036</i>	Encourage local institutions and commercial/retail/industrial owners to install electric vehicle charging stations for public use.	Ongoing implementation	• Township of Huron-Kinloss – Community Services	•	N/A - there are no current practices or policies regarding this action	<ul style="list-style-type: none"> • Number of available charging stations in Huron-Kinloss • Number of preferred parking spaces • If present, number of charges at charging stations owned by the Township 	GHG reduction: 770 tonnes CO ₂ e Energy savings: 9,000 GJ Cost savings: \$215,000 across the community <i>Reduction potential: Medium</i>
			Encourage utilities and the province to install electric vehicle charging stations, at strategic locations just as tourist areas	Ongoing implementation					
			Offer preferred parking for low emission or electric vehicles, where charging stations exist	Medium-term (2-5 years)					
			Investigate and access existing incentive programs and rebates available for electric vehicle charging infrastructure, for the Township to install charging stations for public use	Ongoing implementation					

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
			Provide information on the different rebates and incentives that are offered for low-emissions vehicles (e.g. federal rebates for EVs, etc.)	Short-term (<2 years); ongoing					
			Promote charging stations among tourism bureaus	Ongoing implementation					
20.1	Investigate innovative drainage techniques for managing flooding and runoff issues on agricultural lands.	Alongside removing excess water in various areas (e.g. roadside ditches, residential lots, schools, industrial and commercial lands, etc.), municipal drains are constructed to improve the drainage of agricultural land by serving as the discharge point for private agricultural tile drainage systems. Drainage systems can take the form of ditches, closed systems (e.g. pipes or tiles) buried in the ground, or structures (e.g. dykes, berms, pumping stations, grassed waterways,	Conduct inspections and identify high-risk areas where flooding/runoff occurs on agricultural fields.	Ongoing implementation	<ul style="list-style-type: none"> Township of Huron-Kinloss – Clerk’s Department (i.e. Drainage Superintendent) 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works Agricultural community OMAFRA 	The Huron-Kinloss Sustainability Plan, a long-term strategic plan that provides a vision of sustainability for the community, identifies to continue to implement and improve drainage and stormwater retention based on best management practices.	<ul style="list-style-type: none"> Number of runoff and flooding events on agricultural lands Profitability of agricultural sector in Huron-Kinloss over the long-term Availability of external grants (e.g. Provincial grants) to assist with municipal drain improvements 	N/A
			Liaise with farmers and agricultural community and consult on ways in which they may support the Township’s efforts.	Short-term (<2 years); ongoing implementation					

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		stormwater detention ponds). In the last few years, many agricultural fields in Huron-Kinloss often experience oversaturation, flooding, and runoff issues. With a projected increase in the intensity and frequency of precipitation events, it will be crucial for the Township to increase maintenance of aging municipal drains as well as investigate new drainage techniques to ensure agricultural lands are drained.	Research feasibility of drainage techniques such as contour drainage and more berm structures to reduce surface flows.	Ongoing implementation					
			Upsize stormwater infrastructure as part of renewal (where possible).	Long-term (5+ years); Ongoing implementation					
20.2	Support farmers and the agricultural community in their existing and future efforts to adapt to risks from climate change.	Agriculture can be quite sensitive to climate variations and even small to moderate changes in temperature and precipitation can affect the location, timing, and productivity of agricultural systems. Farmers in Huron-Kinloss are already experiencing these climatic changes in the form of reduced crop yield and livestock production, increased water and energy requirements, and flooding and runoff issues. Often recognized as	Attend relevant meetings with provincial or federal agencies (e.g. Bruce County Federation of Agriculture, OMAFRA, etc.) to stay informed and up to date on climate adaptation initiatives farmers and farm businesses will be undertaking.	Ongoing implementation	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Administration (i.e. CAO’s Office) Agricultural community Neighboring Conservation Authorities Bruce County Federation of Agriculture OMAFRA Ontario Soil and Crop Improvement Association (Bruce County chapter) ALUS Canada 	The Huron-Kinloss Sustainability Plan, a long-term strategic plan that provides a vision of sustainability for the community, identifies its aim to strengthen its agricultural and agri-business sector by 2024.	<ul style="list-style-type: none"> Number of climate change-related funds received through partnership with or support from the Township Number of external meetings attended by the Township 	N/A
			Support farmers and the agricultural community identify and apply for relevant Provincial and Federal funding related to implementing climate change adaptation measures, where possible.	Ongoing implementation					

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
		environmental stewards, farmers have also been adopting best practices and implementing adaptive measures to combat some of these impacts. The Township will continue to assist and support farmers in identifying and securing funding to increase their climate adaptation efforts as well as continuing to celebrate and promote agritourism and the agricultural community, where possible.	Integrate agritourism into the Township’s Strategic Plan to showcase best practices amongst farmers and the public.	Short-term (<2 years)					
21.1	Investigate and apply methods of incorporating climate change considerations into infrastructure (grey, green, and urban forests) asset management.	Huron-Kinloss is already engaging in strategic asset management planning. The Township will continue to incorporate climate change impacts and vulnerabilities into asset management planning, as a way to better manage physical and natural assets in a way that is environmentally and economically sustainable for the long-term.	<p>Investigate current best practices in Asset Management regarding climate change and green infrastructure during AM policy development and with AMP update cycle and implement as appropriate.</p> <p>Explore, evaluate, and report on options related to integration of natural assets into asset management planning</p> <p>Leverage available Asset Management grants</p>	<p>Long-term (5+ years); ongoing implementation</p> <p>Medium-term (2-5 years)</p> <p>Ongoing implementation</p>	<ul style="list-style-type: none"> Township of Huron-Kinloss – Treasury 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Public Works Federation of Canadian Municipalities (i.e. LAMP, MAMP) Municipal Natural Assets Initiative (MNAI) 	The Township’s Asset Management Plan was approved by Council in 2018. The Plan describes the characteristics and condition of assets, the levels of service expected from them, planned actions to ensure the assets are providing the expected level of service, and financing strategies to implement the planned actions. This Plan includes some analysis on the expected impacts of climate change on municipal infrastructure and provides recommendations for implementation.	<ul style="list-style-type: none"> Percentages of AMPs that explicitly include climate change considerations 	N/A
21.2	Monitor and track implementation of the Climate	Track implementation progress and report to Council and the public on the progress towards	Establish a formalized, multi-stakeholder climate change action working group to guide implementation of the CCEP. The	Long-term (5+ years); ongoing implementation	<ul style="list-style-type: none"> Township of Huron-Kinloss – 	<ul style="list-style-type: none"> Township of Huron-Kinloss – All departments 	N/A - There is currently no CCEP.	<ul style="list-style-type: none"> Monthly task list(s) and quarterly workplan Progress on CCEP actions and supporting actions 	N/A

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
	Change and Energy Plan and report on progress annually.	achieving the Township's commitment to climate change.	group would be comprised of key staff and community partners and would meet on a periodical basis to discuss progress on implementation, drivers and constraints to implementation, and other climate change-related plans or programming in the community. The group can also suggest and engage key partners required for successful implementation, increase collaboration with neighbouring municipalities on climate-related issues, and encourage local organizations/businesses to support local carbon reduction projects and implement sustainability initiatives.		Community Services	<ul style="list-style-type: none"> • Chamber of Commerce • Neighbouring Conservation Authorities • Neighborhood groups/associations, Utilities, etc. 		<ul style="list-style-type: none"> • Successful drafting of new Plans and policies with climate change considerations incorporated • Number of actions and supporting actions implemented • Number of council reports submitted on implementation 	
			Prepare annual reports to Council and the public to provide an update on the status of implementation. The report should include the status of each action (i.e. initiated, underway, complete) as well as a brief commentary on what was achieved and what is anticipated in the coming year.	Long-term (5+ years); ongoing implementation					
			Identify climate change adaptation and mitigation champions within the Township to spearhead tracking of progress	Short-term (<2 years)					
			Develop 'one-pagers' that are shared regularly with community to education and keep them up to date on climate change	Long-term (5+ years); ongoing implementation					

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
			mitigation and adaptation work locally.						
21.3	Incorporate climate change considerations into the Township's Official Plan.	Climate change considerations can be incorporated directly into a municipality's official plan, either in a dedicated section or embedded throughout the document, ensuring it is represented and formalized at the decision-making level. Mitigation strategies and actions in official plans include mainstreaming energy savings and waste reduction into all or selected municipal operations and decision-making. Integrating adaptation into official plans includes mainstreaming response to local climate change impacts and vulnerabilities into all or selected municipal operations or obtaining critical information or technical data to make effective and appropriate adaptation decisions.	Identify areas where climate change considerations could be incorporated into the Official Plan.	Long-term (5+ years); ongoing implementation	<ul style="list-style-type: none"> Township of Huron-Kinloss – Clerk's Department, Building & Planning 	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services, Treasury, County Planning 	The Township's Official Plan seeks to balance the goals of economic prosperity, community vitality, environmental responsibility, enriched cultural identity, and infrastructure sustainability.	<ul style="list-style-type: none"> Climate change, energy efficiency, energy savings, waste reduction, and other sustainability issues incorporated into the Official Plan 	N/A
			During the renewal of the Official Plan and other plans/policies, identify gaps, conflicts, and synergies. Where gaps exist, incorporate energy considerations, waste reduction, and strengthened policies and practices that reduce the Township's vulnerability and risk to climate change impacts.	Long-term (5+ years); ongoing implementation					
21.4	Implement a system to track energy and emissions and foster a culture	Regularly and systemically tracking energy and emissions for all municipal owned facilities, assets, and operations will help	Establish a cross departmental Energy Management Team that will identify and implement energy management policies and projects	Short term (<2 years)	<ul style="list-style-type: none"> Township of Huron-Kinloss – Community Services 	<ul style="list-style-type: none"> Township of Huron-Kinloss – All departments 	As part of the Green Energy Act, Ontario Regulation 397/11, the Township of Huron-Kinloss is required to measure and track the energy and emissions from for specific facilities identified in the	<ul style="list-style-type: none"> Energy efficiency measures implemented Energy saved, energy costs saved, and emissions reduced 	N/A

Township of Huron-Kinloss – Climate Change and Energy Plan

Action ID	Action	Description	Supporting Actions	Anticipated Timing	Lead Department(s)	Supporting Organization(s)	Current Practice	Monitoring Metric(s)	GHG Emissions, Energy & Energy Cost Reductions
	of energy efficiency.	identify opportunities for energy efficiency investments, will help create a culture of energy efficiency and energy conservation, and help track the impact and success of energy efficiency measures implemented by the Township.	<p>Continue to monitor and track energy use, energy expenditures, and waste (for buildings, water and wastewater facilities, landfill, and fleet vehicles/equipment)</p> <p>Use Natural Resource Canada’s Energy Star Portfolio Manager for municipalities, to benchmark energy use for all Township facilities. Develop indicators for energy intensity (e.g. GJ/m2) for all assets (buildings, water and wastewater facilities, fleet, etc.) and track these consistently.</p> <p>Monitor incentive programs offered through utilities, the province and federal governments to be leveraged for implementing energy efficiency improvements</p> <p>Consider/review the feasibility of implementing a fleet management system to track maintenance, and to monitor and evaluate the performance of existing vehicles to support future decision-making</p> <p>Support and improve staff training on energy efficiency practices across municipal operations</p>	<p>Short term (<2 years); ongoing</p> <p>Medium-term (2-5 years); ongoing</p> <p>Ongoing implementation</p> <p>Short term (<2 years); ongoing</p> <p>Ongoing implementation</p>			regulation. It is also required to develop and implement energy conservation demand management plans. The 2019 Corporate Conservation & Demand Management Plan aims to reduce energy from buildings, water and wastewater, outdoor lighting, and fleet vehicles through energy efficiency projects, fuel switching, renewable energy projects, energy procurement, and a culture of conservation.		

Appendix A: Energy Mapping

Study Background

As part of funding requirements for Ontario’s Municipal Energy Plan, energy maps were required to illustrate energy use across the Township’s built environment. Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) was contracted to provide energy mapping services. The following section presents energy maps illustrating the distribution of electricity consumption covering four categories, namely Residential, Commercial, Industrial and Others.



Energy Maps

Four energy maps, under the categories ‘Residential’, ‘Commercial’, ‘Industrial’, and ‘Others’ aligning with the category headers used by Hydro One, is presented in the sub-sections below (Figure 13 through to Figure 16) illustrating the estimated distribution of 2018 annual electricity uses (in GJ) across the Township:

Residential Category Energy Map

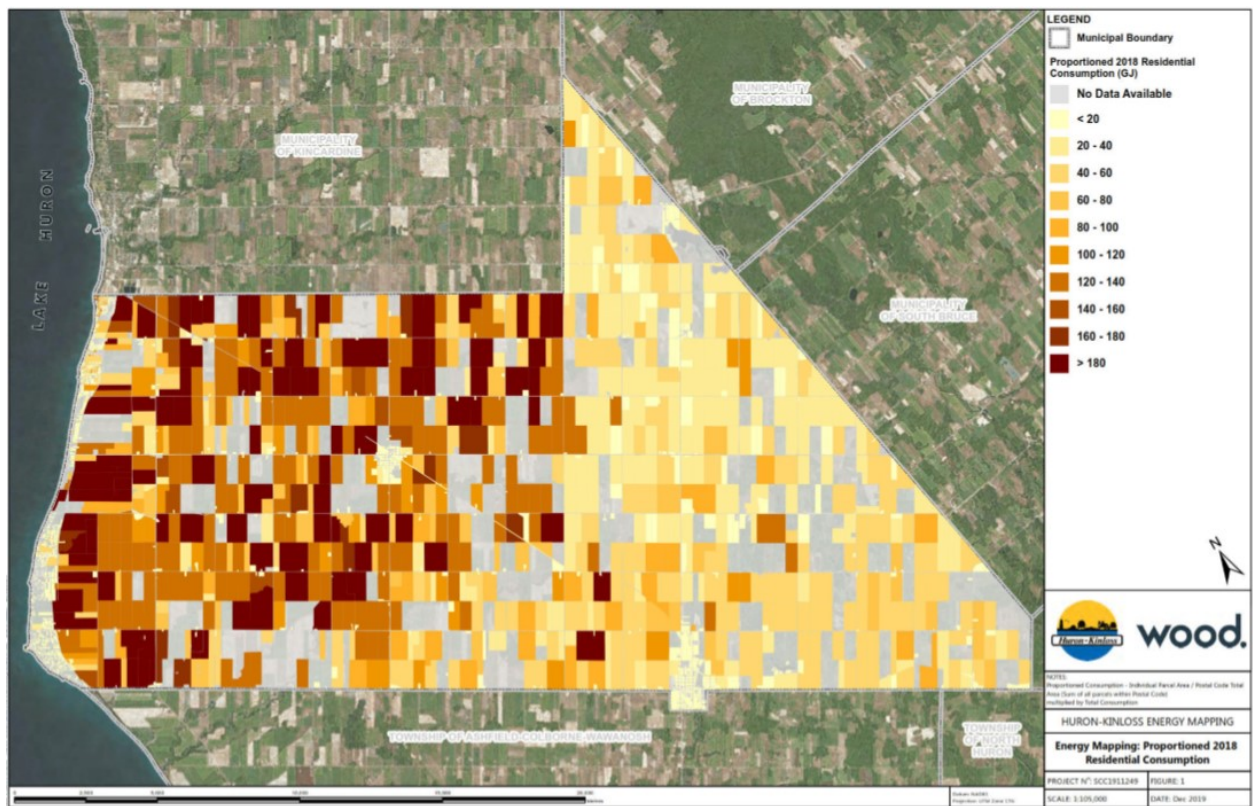


Figure 15. Residential Category Energy Map (Hydro One Service Area).

Commercial Category Energy Map

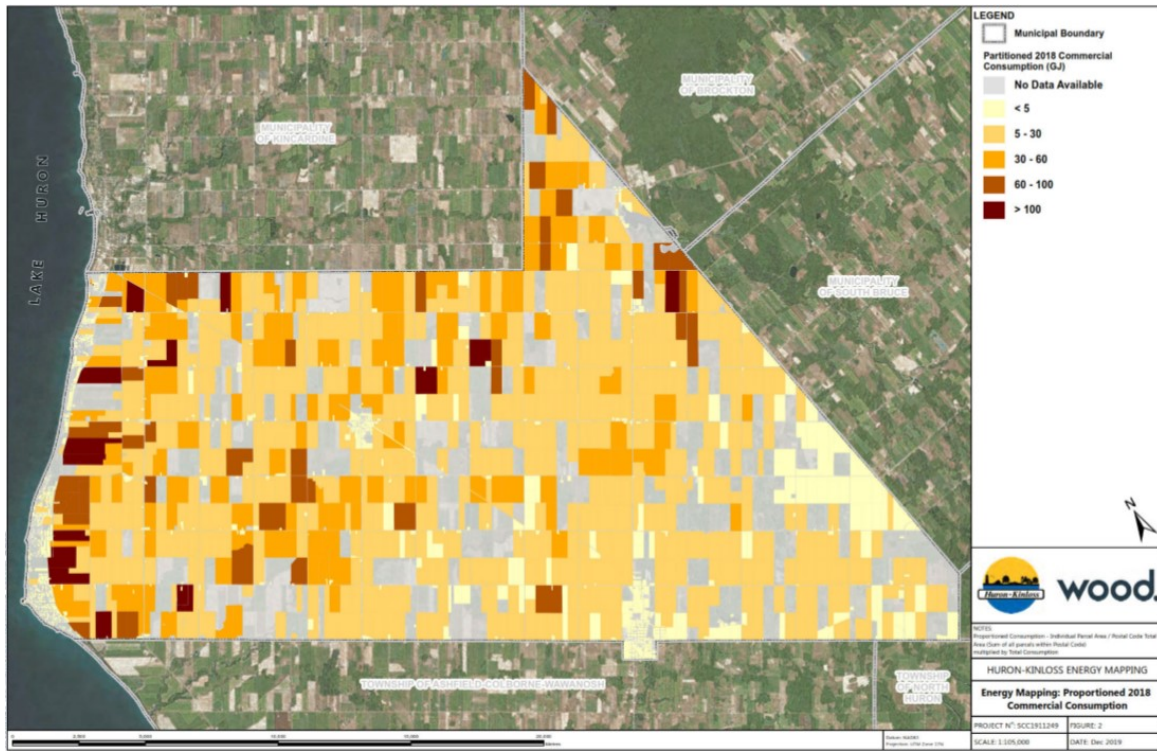


Figure 16: Commercial Category Energy Map (Hydro One Service Area).

Industrial Category Energy Map

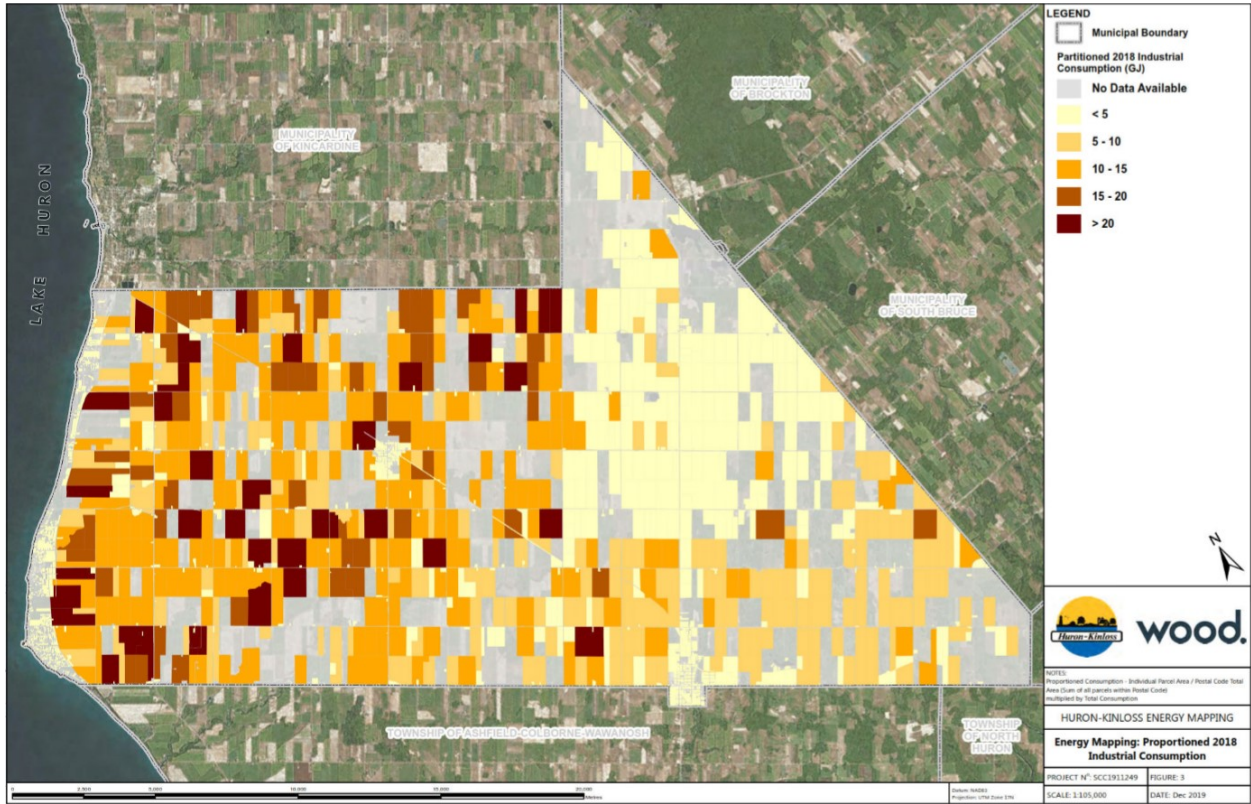


Figure 17: Industrial Category Energy Map (Hydro One Service Area).

Others Category Energy Map

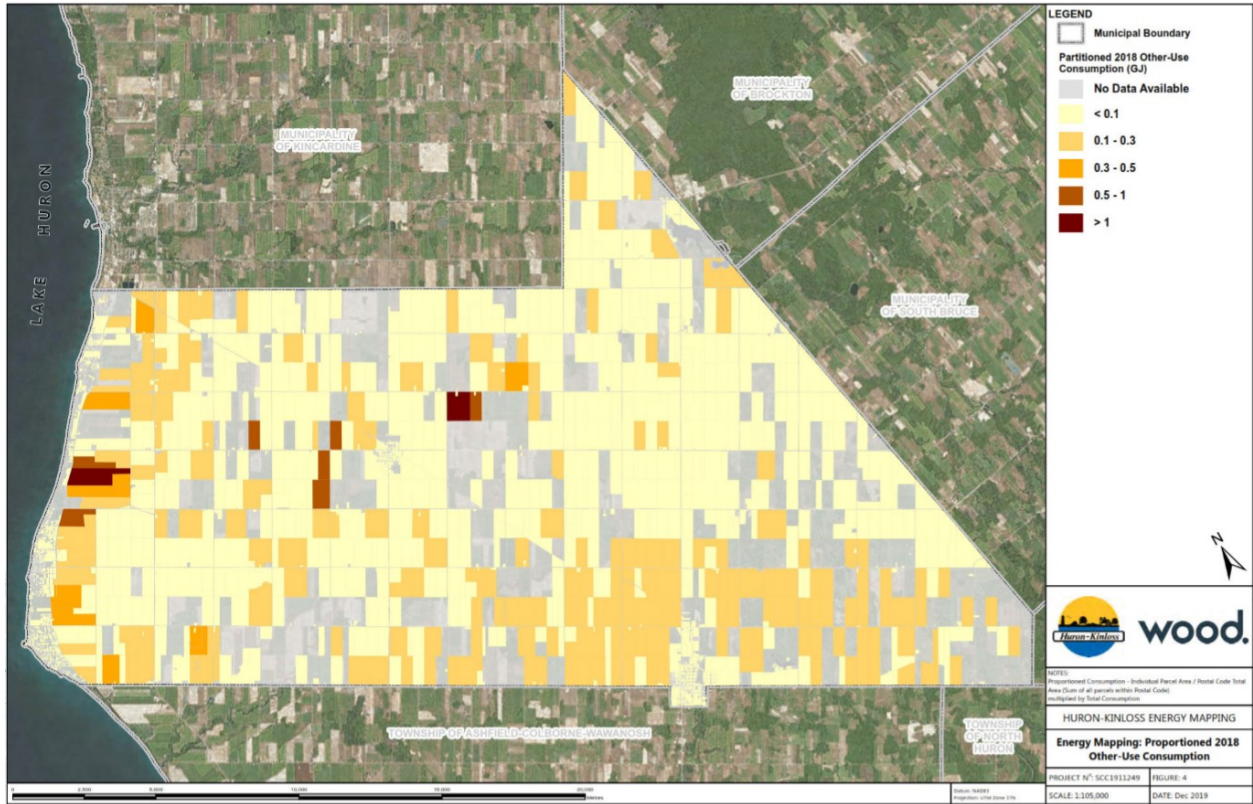


Figure 18: Others Category Energy Map (Hydro One Service Area).

Methodology

Data Gathering

Wood received the following dataset from the Township for this project:

- Total annual electricity use (for the years 2016 to 2018, in Excel file format) provided by Hydro One (one of the two local distribution companies servicing the Township) at a 6-character postal code level¹ broken down under the following category headings:
 - Residential
 - Commercial
 - Industrial
 - Others
- Total annual electricity use provided by Westario Power (the second local distribution company servicing the Lucknow and Ripley communities of the Township) for Lucknow and Ripley (in Excel file format) aggregated at the community level
- MPAC data (in Excel file format) with key reported fields including:

¹ Data was reported for the following postal codes - N0G2B0, N0G2H0, N0G2R0, N0G2S0, N0G2W0, N2Z0A4, N2Z0B3, N2Z0B8, N2Z0B9, N2Z0C1, N2Z0C2, N2Z0C3, N2Z0C4, N2Z0C5, N2Z0C6, N2Z0C7, N2Z2L2, N2Z2L4, N2Z2L6, N2Z2L8, N2Z2L9, N2Z2M2, N2Z2M3, N2Z2M5, N2Z2M6, N2Z2M8, N2Z2M9, N2Z2N1, N2Z2N2, N2Z2N3, N2Z2N5, N2Z2N6, N2Z2N7, N2Z2X3, N2Z2X4, N2Z2X5, N2Z2X7

- Roll number
- Street address
- Property code

Bruce County digital parcel form (each parcel with a unique roll number assigned) was sourced from the open data portal.

Data Review

Wood completed an assessment of dataset completeness on the data received from the Township and the following observations/data gaps were identified:

- Utility data from Westario Power was broken down by rate class
- Utility data from Westario Power was provided aggregated at the community level (separated for Lucknow & Ripley) and was not available broken down at the postal code geographical level
- As the Township has no access to natural gas, gas utility data is not applicable for this study
- Geospatial representation of the parcels obtained from the open data portal did not have postal code attributes
- No spatial files were received which provided delineations of postal code boundaries within the Township
- Building footprints GIS data is not yet available for the Township²
- Per MPAC dataset, ~5413 parcels (with unique roll number identifiers) were identified within the Township
 - MPAC data is assessed as not being completely accurate about residency status
 - A few parcels in the geospatial data sourced from the open data portal were not found in the MPAC data (based on associated roll number identifiers)
 - Of the balance parcels present in the MPAC dataset (i.e., ~5254), ~68% have electricity use data to report from the Hydro One utility data (the remaining 32% of parcels have no electricity use data to report from the Hydro One's data; however it was also noted that majority of these parcels also report a 'Lives outside Municipality' residency status per the MPAC data suggesting property owners of these parcels are most likely living outside the Township boundary)

Energy Mapping Methodology

Through correlating with the postal code attribute present in the spatial GIS file, the corresponding postal code level aggregated utility data (Hydro One data only; Westario Power data was not available at a granular geographical level), was assigned to the spatial data (i.e. Township parcels). The aggregated utility data was then disaggregated among the parcels under the respective postal code using the following approach:

- Parcel areas under each postal code were summed up and the proportion of each parcel area to the summed area was calculated to establish respective ratio values
- The postal code level utility data (2018 data) was then disaggregated proportionally³ based on the calculated ratios above (in place of uniformly distributing the aggregated postal code utility data among the parcels under the respective postal code)

² Communicated by Justin Kraemer, GIS Coordinator, Planning and Development, Corporation of the County of Bruce

³ This may not necessarily be representative of the actual distribution of utility use, but was adopted as the study approach as opposed to uniformly distributing the utility use among the parcels

The electricity use data was received in kilowatt hour (kWh) unit. This was converted to equivalent Gigajoules (GJ) before being applied to generate the energy maps.

Recommendations & Lessons Learned

As indicated above, there are significant data gaps and limitations identified with the dataset provided for this study that has a bearing on the accuracy of the resultant energy maps produced. It is highly recommended that the Township consider the following steps towards developing more accurate energy maps:

- Engage Westario Power to obtain more granular utility data
- Make available an accurate and up-to-date postal code shapefile providing delineations of postal code boundaries within the Township
- Make available up-to-date building footprints GIS data for the Township (this will enable more representative distribution of the aggregated postal code utility data among the parcels)
- Make available up-to-date MPAC data reflecting accurate residency status for property owners in the Township

Appendix B: Climate Change Projections



Intensity
Precipitation will fall at a faster rate (mm/h)



Duration
Shorter storms will have an increasingly high intensity



Frequency
Return periods of heavy storms will shorten, meaning increased frequency

PRECIPITATION EVENTS

Precipitation events in general are projected to become more intense and extreme.

DAYS WITH PRECIPITATION OVER 10 mm



Baseline



2030s



2060s



January



December & February



November, March & April

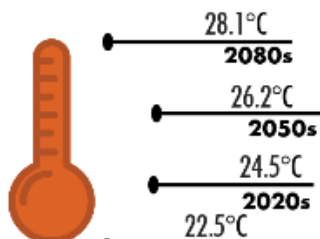
FREEZING RAIN EVENTS

Freezing rain events are expected to increase during January, slightly change in December and February, and decrease in November, March, and April.

Severe freezing rain events (> 6 h per day) are projected to increase up to 30% by 2100.

WATER LEVELS

Water levels in Lake Huron have dropped by approximately 1 metre since 1997. Since its record low in January 2013, water levels increased to above-average in 2015 and 2016. Future water levels are projected to remain within this range, with greater frequencies towards the extreme ends of this range.



Huron Basin Temp. in 2014
(includes wetlands, tributaries)



20%

Loss of coldwater (<19°C) stream habitat

WATER TEMPERATURES

Huron basin temperatures will increase. This can negatively impact wetlands, habitats, and biodiversity.

* Baseline period: 1990s (1976-2005); Primary projection periods: 2030s (2021-2050) and 2060s (2051-2080). In some cases, projection periods are: 2020s (2016-2035), 2050s (2046-2065), and 2080s (2081-2100)

Sources:

Climate Atlas of Canada Tool

Canadian Climate Change Scenarios Network

Computerized Tool for the Development of Intensity-Duration-Frequency Curves under Climate Change Version 3.0

Peach, G.H. (2016). Beaches, Dunes and Climate Change, Coastal Bulletin 16-1, Lake Huron Centre for Coastal Conservation.

Chad Shouquan Cheng , Guilong Li & Heather Auld (2011). Possible Impacts of Climate Change on Freezing Rain Using Downscaled Future Climate Scenarios: Updated for Eastern Canada, Atmosphere-Ocean, 49:1, 8-21.






Appendix C: Vulnerability and Risk Assessment Outcomes

Milestone Two of the BARC Framework involves developing impact statements which detail the ways in which climate change will affect a municipality’s physical, social, economic, and ecological systems. These impacts are then run through a vulnerability assessment and a risk assessment in order to prioritize the areas on which the Township should focus its efforts. A total of 47 impact statements were identified and run through the vulnerability assessment.

Vulnerability Assessment

Vulnerability refers to the susceptibility of the Township and community to harm arising from climate change impacts. It is a function of the community’s *sensitivity* to climate change and its capacity to adapt to impacts (or its *adaptive capacity*). The vulnerability assessment was carried out using an online survey and was completed by the Climate Change Working Group and the Community Advisory Group. We utilized a ‘dotmocracy’ methodology, and under the premise of the impact occurring today, both *sensitivity* and *adaptive capacity* were considered when assigning a vulnerability ranking to each of the 47 impact statements. The following scale was used to assign the vulnerability rankings:

-  **Low Vulnerability**
Not very sensitive and/or would be able to this change with ease.
-  **Medium Vulnerability**
The community is somewhat vulnerable to harm arising from the impact (moderate sensitivity, moderate adaptive capacity)
-  **High Vulnerability**
The community is not very/not at all vulnerable to harm arising from the impact (low sensitivity, high adaptive capacity)

Results from the Climate Change Vulnerability Survey provided an initial prioritization of impacts before Risk was explored in depth. Vulnerability rankings indicate the impacts to which the Township is sensitive or has low adaptive capacity (ability to cope/recover). Therefore, impacts that received a Low ranking were not carried forward into the Risk Assessment process, as the Township and community were not highly sensitive to these impacts and possess enough existing adaptive capacity to manage these concerns. Of the 47 impacts, 27 earned a Medium or High vulnerability ranking – moving them forward to the risk assessment to be further analyzed.

Risk Assessment

Risk is a function of the *likelihood* and *consequence* of an impact and is therefore equal to the probability of a climate impact multiplied by the consequence of that event.

Likelihood is based on the probability of an impact occurring and considers both the probability of the climate threat occurring and the probability of the associated outcomes occurring. *Likelihood* ratings from 1 to 5 were assigned to each impact, where 1 was ‘rare’ and 5 was ‘almost certain’, based on localized climate projections, as well as anecdotal knowledge of current conditions.

Township of Huron-Kinloss – Climate Change and Energy Plan

Likelihood Rating	Recurrent Impact	Single Event
Almost Certain (5)	Could occur several times a year	More likely than not – probability greater than 50%
Likely (4)	May arise about once per year	As likely as not – 50/50 chance
Possible (3)	May arise once in 5 years	Less likely than not but still appreciable – probability less than 50% but still quite high
Unlikely (2)	May arise once in 5 to 10 years	Unlikely not but not negligible – probability low but noticeably greater than zero
Rare (1)	Unlikely during the next 10+ years	Negligible – probability very small, closer to zero

Figure 19: Likelihood Ranking Scale

Consequence refers to the known or estimated outcomes of a particular impact. To determine *consequence*, the 27 impacts subject to the risk assessment were assessed against 12 consequence criteria. The consequence criteria were divided into three categories – social, economic, and environmental. *Consequence* ratings from 1 to 5 were assigned to each criterion, where 1 was ‘negligible’ and 5 was ‘catastrophic’.

Township of Huron-Kinloss – Climate Change and Energy Plan

CONSEQUENCE RATING	CRITERIA CATEGORY: SOCIAL			
	Public Health and Safety	Displacement	Loss of Livelihood	Cultural Aspects
Catastrophic	Large number of fatalities or serious injuries, or permanent illness	Large number of permanently displaced people on a widespread scale	Large disturbances leading to permanent changes in people’s normal routines and way of life	Unprecedented loss of cultural identity (i.e. traditions and customary practices) across the wider community (i.e. cancellation of flagship annual event)
	5	5	5	5
Major	Isolated instances of fatalities or serious injuries, or long-term illness	Isolated instances of permanently displaced people on a widespread scale	Large disturbances leading to prolonged changes in people’s normal routines and way of life	Significant loss of cultural identity (i.e. traditions and customary practices) for multiple social groups
	4	4	4	4
Moderate	Small number of injuries or cases of illness	Isolated instances of temporary displaced people on a widespread scale	Moderate disturbances leading to short-term changes in people’s normal routines and way of life	Moderate impact on cultural identity (i.e. traditions and customary practices) for multiple social groups
	3	3	3	3
Minor	Near misses or minor injuries	Isolated instances of temporary displaced people in localized areas	Minor and short-term changes to people’s normal routines and way of life	Minor impact on cultural identity (i.e. traditions and customary practices) for a small number of social groups
	2	2	2	2
Negligible	Appearance of a threat but no actual harm	Appearance of a threat but no actual displacement	No changes to people’s normal routine and way of life	Appearance of a threat but no actual impact on cultural identity (i.e. traditions and customary practices)
	1	1	1	1

Figure 20: Social Consequence Criteria

Township of Huron-Kinloss – Climate Change and Energy Plan

CONSEQUENCE RATING	CRITERIA CATEGORY: ECONOMIC			
	Property Damage	Local Economy and Growth	Community Livability	Public Administration
Catastrophic	Catastrophic damage and costs incurred by the owner (\$\$\$\$\$)	City-scale decline leading to widespread business failure, loss of employment and hardship	Permanent decline in services, causing the city to be seen as very unattractive, moribund, and unable to support the community	Public administration would fall into decay and cease to be effective
	5	5	5	5
Major	Major damage and costs incurred by the owner (\$\$\$\$)	City-scale stagnation such that businesses are unable to thrive	Widespread and severe decline in services and quality of life within the community	Public administration would struggle to remain effective and would be in danger of failing
	4	4	4	4
Moderate	Moderate damage and costs incurred by the owner (\$\$\$)	Isolated areas of reduction in economic performance relative to current forecasts	Isolated but noticeable examples of decline in services	Public administration would be under severe pressure on several fronts
	3	3	3	3
Minor	Minor damage and costs incurred by the owner (\$\$)	Inconveniences that cause minor shortfall relative to current forecasts	There would be minor areas in which the community is unable to maintain its current services	There would be minor instances of public administration being under more than usual stress
	2	2	2	2
Negligible	No damage and costs incurred by the owner (\$)	No real impact to the local economy and growth	No real pressure on current services	No real stress on public administration
	1	1	1	1

Figure 21: Economic Consequence Criteria

Township of Huron-Kinloss – Climate Change and Energy Plan

CONSEQUENCE RATING	CRITERIA CATEGORY: ENVIRONMENTAL			
	Air	Water	Soil and Vegetation	Ecosystem Function
Catastrophic	Very frequent periods of reduced air quality.	Irreversible, widespread reduction in water quality/quantity	Irreversible, widespread impacts to soil or vegetation	Major and widespread loss of ecological functions and irrecoverable damage
	5	5	5	5
Major	Considerable increase in periods of reduced air quality in the medium term	Major, widespread reduction in water quality/quantity in the medium/long-term	Major, widespread impacts on soil or vegetation in the medium/long-term	Severe and widespread loss of ecological functions and damage that could be reversed with intensive efforts
	4	4	4	4
Moderate	Moderate increase in periods of reduced air quality in the short/medium term	Moderate, widespread reduction in water quality/quantity in the short/medium-term	Moderate, widespread impacts on soil or vegetation in the short/medium-term	Isolated but moderate instances of damage to the ecosystem that could be reversed with intensive efforts
	3	3	3	3
Minor	Minor increase in periods of reduced air quality in the short-term	Minor, localized reduction in water quality/quantity in the short-term	Minor, localized impacts on soil or vegetation in the short-term	Isolated but minor instances of damage to the ecosystem that could be reversed
	2	2	2	2
Negligible	Appearance of a threat but no real impact to air quality	Appearance of threat but no real reduction in water quality/quantity	Appearance of threat but no real impacts on soil or vegetation	Appearance of a threat but no real damage to the ecosystem and its functions
	1	1	1	1

Figure 22: Environmental Consequence Criteria

For each impact, category-specific risk scores were calculated as well as an overall risk score by multiplying *consequence* ratings with *likelihood* ratings. Those scores were then compared against two risk spectrums. The first risk spectrum was applied to the category-specific risk scores. The second risk spectrum was applied to the overall risk score.

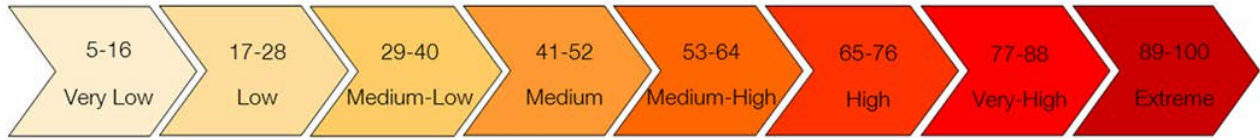


Figure 23: Category-Specific Risk Spectrum

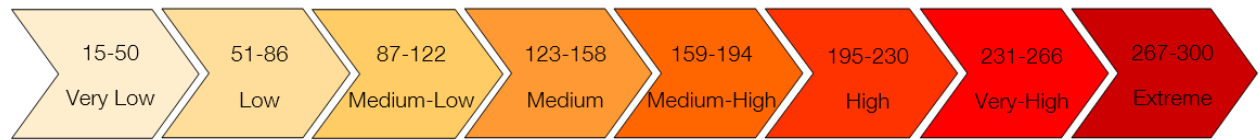


Figure 24: Overall Risk Spectrum

The purpose of calculating one overall risk score, as well as three category-specific risk scores, was to capture impacts that scored high in certain categories, but low in others. This ensures that impacts that pose a high risk to certain aspects of the corporation are still considered, despite having a lower overall risk score.

Limitations

The risk assessment process was an exercise that evaluated participants’ perceptions of the risks that impacts pose to the Township and the community. Outputs of the exercise were dependent on those that participated in the assessment. While great effort was made to engage key staff, the exercise did not capture every stakeholder perspective in the corporation. It is also important to acknowledge that the impact statements themselves are considered subjective. Once again, however, great effort was made to ensure the list was both inclusive and exhaustive and captured how climate change could affect the Township of Huron-Kinloss.

Results

The results of the vulnerability assessment and the risk assessment are summarized below. Provided are the vulnerability rankings for the 47 impacts subject to the vulnerability assessment, as well as the overall risk scores and rankings for the 27 impacts subject to the risk assessment. The impacts are organized based on their identification number and the climate threat to which they are tied.

Township of Huron-Kinloss – Climate Change and Energy Plan

Impact ID#	System Group	Climatic Threat	Impact Statement	Vulnerability Ranking	Likelihood	Social Risk Score /100	Economic Risk Score /100	Environmental Risk Score /100	Overall Risk Score /300	Overall Risk Ranking
44	Natural	Increased average annual temperatures	Increased average annual temperatures leading to shifting eco-regions for flora and fauna and warmer freshwater (i.e. streams) temperatures, resulting in increased spread of invasive species (e.g. Garlic mustard, Phragmites, etc.).	High	5	60 Med-High	60 Med-High	50 Med	170	Medium-High
8	Socioeconomic	Increased summer temperatures	Increased summer temperatures, causing increased frequency and duration of extreme heat days (>30 C), resulting in an increased need for shade trees and/or shade structures.	Medium	4	40 Med-Low	32 Med-Low	52 Med	124	Medium
11	Socioeconomic	Increased summer temperatures	Increased summer temperatures, resulting in an increased frequency and duration of extreme heat days (>30 C), causing increased health and safety risks to the public, especially vulnerable populations (e.g. elderly, socially isolated, etc.).	Medium	4	40 Med-Low	32 Med-Low	52 Med	124	Medium
14	Socioeconomic	Increased summer temperatures	Increased summer temperatures, leading to increased frequency and duration of extreme heat days (>30 C), resulting in increased heat stress/health and safety risks to outdoor workers (e.g. construction, recreation, public works) and decreased labour hours due to heat/smog alerts.	Medium	5	55 Med-High	45 Med	40 Med-Low	140	Medium
23	Built	Increased frequency/intensity of precipitation events	Increased frequency and intensity of precipitation events leading to overburdening of sewers and drains and higher rates of erosion, resulting in damage to Township property and infrastructure (storm sewers, sanitary sewers, bypass drains, agricultural fields, roads, bridges, culverts, building foundations, landscaping, etc.)	High	5	45 Med	55 Med-High	35 Med-Low	135	Medium
25	Natural	Increased frequency/intensity of precipitation events	Increased frequency/intensity of precipitation event, causing increased riverine flooding, leading to increased streambank erosion and sediment accumulation.	High	5	40 Med-Low	45 Med	40 Med-Low	125	Medium

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28	Socioeconomic	Increased frequency/intensity of precipitation events	Increased frequency and intensity of precipitation events causing increased basement flooding, leading to physical injuries, infections from contaminated water, and mental health stress to residents.	Medium	4	40 Med-Low	52 Med	52 Med	144	Medium
35	Natural	Warmer and wetter winters	Warmer and wetter winters leading to reduced ice coverage on the lake, causing increased shoreline erosion.	High	5	40 Med-Low	50 Med	40 Med-Low	130	Medium
36	Built/Socioeconomic	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.)	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), leading to increased damage to tree canopy, causing damage to transportation infrastructure and increased transit disruptions.	High	4	48 Med	52 Med	32 Med-Low	132	Medium
37	Socioeconomic	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.)	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), resulting in damage to electrical infrastructure, leading to more power outages (brown-outs and black-outs) and service disruptions.	Med	5	55 Med-High	55 Med-High	30 Med-Low	140	Medium
39	Built/Socioeconomic	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.)	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), resulting in reduced visibility due to blizzard conditions, leading to more school closures, road closures, and transit disruptions.	High	5	60 Med-High	65 High	20 Low	145	Medium
40	Built	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.)	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), resulting in damage to Township-owned assets and infrastructure (trees, signs, streetlights, buildings, roads, etc.)	Med	5	40 Med-Low	60 Med-High	30 Med-Low	130	Medium
41	Built/Socioeconomic	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.)	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), causing accelerated concrete corrosion (e.g. wear and tear, cracks, potholes, etc.) and infrastructure deterioration (i.e. buildings, roads, sidewalks, trails, parking lots, etc.), resulting in increased winter maintenance requirements (i.e. salting), mechanical replacement and repairs, and call volumes to staff.	Med	5	45 Med	55 Med-High	40 Med-Low	140	Medium

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46	Natural	Increased summer temperatures and dry periods	Increased summer temperatures and dry periods causing increased evaporation of Lake Huron and more dramatic fluctuations of lake levels, resulting in increased erosion of beaches and shorelines as well as a reduction in nearshore water quality.	High	5	45 Med	45 Med	40 Med-Low	130	Medium
1	Natural	Increased average annual temperatures and dry periods	Increased average annual temperatures and dry periods, leading to shifting eco-regions for flora and fauna, resulting in increased heat-related stress/damage to natural areas (e.g. forests, streams, watercourses, etc.) and decreased survivability (e.g. die-back) of vegetation (e.g. turf, trees, shrubs, annuals, perennials) especially along lakeshore bluffs.	High	4	36 Med-Low	40 Med-Low	40 Med-Low	116	Medium-Low
9	Built/Socioeconomic	Increased summer temperatures	Increased summer temperatures leading to increased frequency and duration of extreme heat days (>30 C), resulting in more power outages (brown-outs and black-outs) and service disruptions.	Med	3	33 Med-Low	30 Med-Low	33 Med-Low	96	Medium-Low
26	Socioeconomic	Increased frequency/intensity of precipitation events	Increased frequency and intensity of precipitation events, causing increased flooding, resulting in displacement and/or evacuation of residents from homes.	Med	3	36 Med-Low	39 Med-Low	39 Med-Low	114	Medium-Low
29	Built/Socioeconomic	Increased frequency/intensity of precipitation events	Increased frequency and intensity of precipitation events leading to minor sewer system surcharging, resulting in basement flooding.	High	4	44 Med	36 Med-Low	24 Low	104	Medium-Low
30	Socioeconomic	Increased freezing rain events	Increased freezing rain events, leading to increased hazardous conditions (e.g. black ice) on roads, parking lots, and sidewalks, resulting in increased transportation and pedestrian-related safety issues (i.e. slips, falls, accidents, etc.)	High	5	50 Med	40 Med-Low	25 Low	115	Medium-Low
32	Natural/Socioeconomic	Increased intensity/frequency of precipitation events	Increased intensity and frequency of precipitation events resulting in increased runoff from agriculture, leading to beach closures due to decreased water quality from algal blooms and elevated lake bacteria levels/counts.	High	5	35 Med-Low	35 Med-Low	35 Med-Low	105	Medium-Low
38	Socioeconomic	Increased extreme weather events (e.g. ice storms, blizzards,	Increased extreme weather events (e.g. ice storms, blizzards, snowstorms, windstorms, etc.), causing increased power outages and public safety risks, leading to increased demand	Med	4	40 Med-Low	36 Med-Low	16 Very Low	92	Medium-Low

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		snowstorms, windstorms, etc.)	on emergency response resources and continuity of support (e.g. increased call volumes to staff)							
3	Natural	Increased summer temperatures and dry periods	Increased summer temperatures and dry periods leading to general drying of the forest and grassy areas, resulting in increased susceptibility of natural areas to wildfires and bushfires.	Med	3	27 Low	33 Med-Low	21 Low	81	Low
6	Socioeconomic	Increased average annual temperatures and rainfall variability	Increased average annual temperatures and rainfall variability, leading to increased insect and pest survival rates, causing increased risk and spread of vector-borne diseases (e.g. Lyme Disease, West Nile Virus, etc.).	Med	3	30 Med-Low	21 Low	15 Very Low	66	Low
7	Natural	Increased average annual temperatures and rainfall variability	Increased average annual temperatures and rainfall variability causing reduced stream flow, leading to a loss of cold-water species (e.g. rainbow trout, brown trout, etc.).	High	3	12 Very Low	12 Very Low	30 Med-Low	54	Low
17	Natural/Socioeconomic	Increased summer temperatures	Increased average annual temperatures and rainfall variability resulting in increased water demand for water supply (e.g. drinking, landscaping), leading to water stress/shortage	High	5	20 Low	20 Low	20 Low	60	Low
43	Built	Increased water levels and extreme weather (i.e. storms)	Increased water levels and extreme weather (i.e. storms), leading to higher seiches and greater storm surges, resulting in damage to boats and other marina infrastructure.	Med	4	20 Low	28 Low	24 Low	72	Low

Appendix D: GHG Emissions Inventory and Business-as-Usual Project Methods and Sources

Inventory Approach & Background

A GHG inventory and forecast is the foundation for any climate change or energy strategy. It reveals how a community or municipal government consumes energy and generates waste, helps identify opportunities for mitigation strategies, and provides the necessary baseline from which progress can be measured. The following section outlines the 2016 greenhouse gas emissions generated by the community at large (referred to as community emissions) and emissions generated by municipal services and operations (referred to as corporate emissions). 2016 was selected as the baseline year, as it is the most recent year with a complete dataset. The inventories cover emissions from activities occurring inside the municipal boundary, and GHG emissions occurring as a consequence of the use of grid-supplied electricity within the Township. Emissions occurring outside the municipal boundary caused by residents, businesses or staff of the Township are not included.

The corporate inventory, which captures emissions from the Township's municipal operations and is considered a subset of community emissions, was developed using the *Partners for Climate Protection (PCP) Protocol*. This inventory includes emissions from activities wholly-owned or under the operational control of the Township, in the following sectors: (1) municipally-owned buildings and facilities; (2) street lights and traffic signals; (3) fleet vehicles; (4) energy consumed in water and wastewater facilities, and (5) waste emissions from municipal landfills. Emissions from solid waste facilities owned and operated by the Township are part of corporate inventory, however since the corporate inventory is a subset of the community inventory, and since the landfill collects waste from all residents and businesses in the Township, waste emissions are presented in the community inventory. A full profile of the corporate GHG emissions is detailed in Section 3.2.

The community inventory was developed using the *PCP Protocol* and the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories* (GPC Protocol), two well-established protocols for calculating and reporting emissions at the local level. The 2016 community inventory for Huron-Kinloss covers emissions from: (1) stationary energy use; (2) transportation; and (3) waste. Stationary energy includes emissions from: residential buildings; commercial and institutional buildings and facilities; manufacturing and construction activities, and agricultural energy use. Transportation consists of emissions from: on-road transport as well as off-road vehicles and machinery. Solid waste emissions cover emissions from the decomposition of solid waste collected and disposed of in the Township of Huron-Kinloss. Waste emissions are part of the corporate inventory but are presented in the community inventory since they capture waste collected from the entire community. The waste sector also includes emissions from the decomposition of wastewater. Emissions as a result of agricultural activities within the Township, and emissions associated with industrial processes and product uses, are not required by either protocol and are not included here. A full profile of the community GHG emissions is detailed in Section 3.3.

For both inventories, real activity data and fuel consumption data was prioritized. Data on community and corporate energy use and waste was obtained from the Corporation of the Township of Huron-Kinloss and local utility companies. Where data was unavailable, activity data was modelled using

robust assumptions based on the PCP Protocol and provincial or national data from Canada's most recent National Inventory Report. Greenhouse gas emissions were calculated using emission factors from Canada's 2019 National Inventory Report to quantify emissions. The basic formula for deriving emissions estimates is as follows:

$$\text{GHG emissions} = \text{Activity data} \times \text{Emission factor}$$

The inventory covers the three most common greenhouse gases: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The gases were converted to carbon dioxide equivalents (CO₂e), using the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment global warming potentials, and are represented as such throughout the report. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃) represent a very small portion of total emissions and are not included in the inventory.

Data Sources & Methods

Electricity data was provided by local utilities. Electricity data for commercial, agricultural, and industrial customers could not be disaggregated, and are therefore presented together. Other fuels, such as propane, fuel oil, and wood were modelled using survey data for Huron-Kinloss residents and businesses, completed in preparation for the expansion of natural gas in the region (Rodger 2014).

Transportation emissions are typically calculated using vehicle kilometres travelled or fuel sales, however, neither sources were available for Huron-Kinloss. Instead, GHG emissions were calculated using Ontario average per capita distance travelled and vehicle ownership information. Off-road transportation emissions were scaled from provincial estimates using population. Aviation and rail were not included as no railways or airports are located within the Township, and waterborne transportation was considered negligible and not included. Electricity consumption for electric vehicles could not be disaggregated from stationary energy use (i.e. charging stations attached to buildings), so only gasoline- and diesel-powered transportation were included.

Solid waste emissions were calculated using the methane commitment approach, in alignment with the PCP and GPC protocols. The waste category also includes emission from wastewater treatment. Urban wastewater systems in Canada are typically well-managed systems with little to no methane emissions, while rural populations often only have access to septic systems, which do release GHGs. It was assumed that 54% of residents use septic systems in Huron-Kinloss, which accounted for 230 tonnes of CO₂e.

For the corporate inventory, energy consumption data and fleet information were obtained from the Township of Huron-Kinloss.

Business-as-Usual Emissions Projections Approach

The business-as-usual (BAU) forecast is an estimate of how energy and emissions in the Township of Huron-Kinloss will change in the future if no further action is taken to reduce GHG emissions. The BAU forecast is not an absolute picture of future emissions but instead serves as a tool to guide decision making on emissions mitigation strategies.

The primary drivers of future emissions are population and employment growth, which both increase by roughly 16% between 2016 and 2036. Since emissions levels are largely driven by the activities of residents and businesses in the Township (e.g. heating and powering homes, travelling in personal

vehicles, etc.), it is assumed that as population and employment levels grow, community emissions will increase accordingly. For the purposes of this projection, the seasonal population has not been included in determining the rate of population or employment growth. In this BAU scenario, growth in residential buildings, vehicle kilometres travelled, and waste streams are driven by population growth, while emissions from commercial, industrial, and other non-residential buildings are based on employment growth. Likewise, the primary driver for corporate emissions is population growth.

However, it is expected that actions from higher levels of government, technology changes driven by broader economic trends, and other factors, may influence emissions within the Township of Huron-Kinloss. Some of these anticipated policy and technological changes, which occur outside the influence of the municipality, have been incorporated into the BAU projections. These include improved fuel economy in vehicles and better energy efficiency of new buildings. Expected improvements in vehicle fuel economy significantly offset growth in emissions as a result of population growth.

Supplement: BELOW

Summary of Community Energy Consumption (2016)

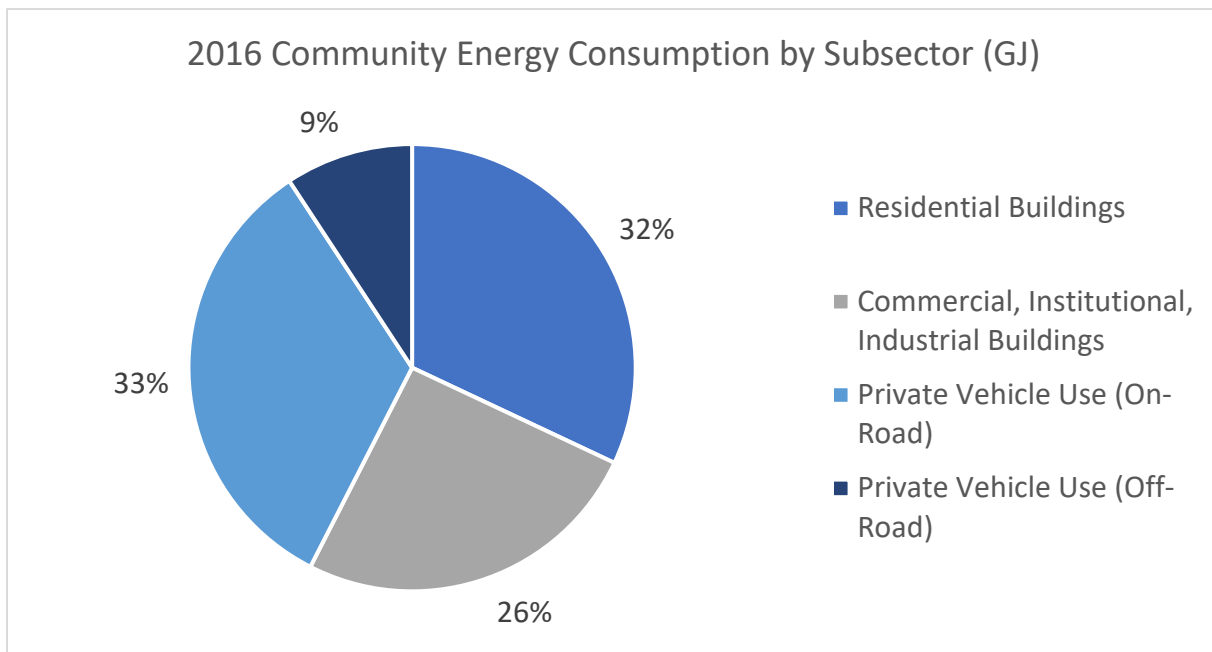


Figure 25 Community energy consumption by subsector

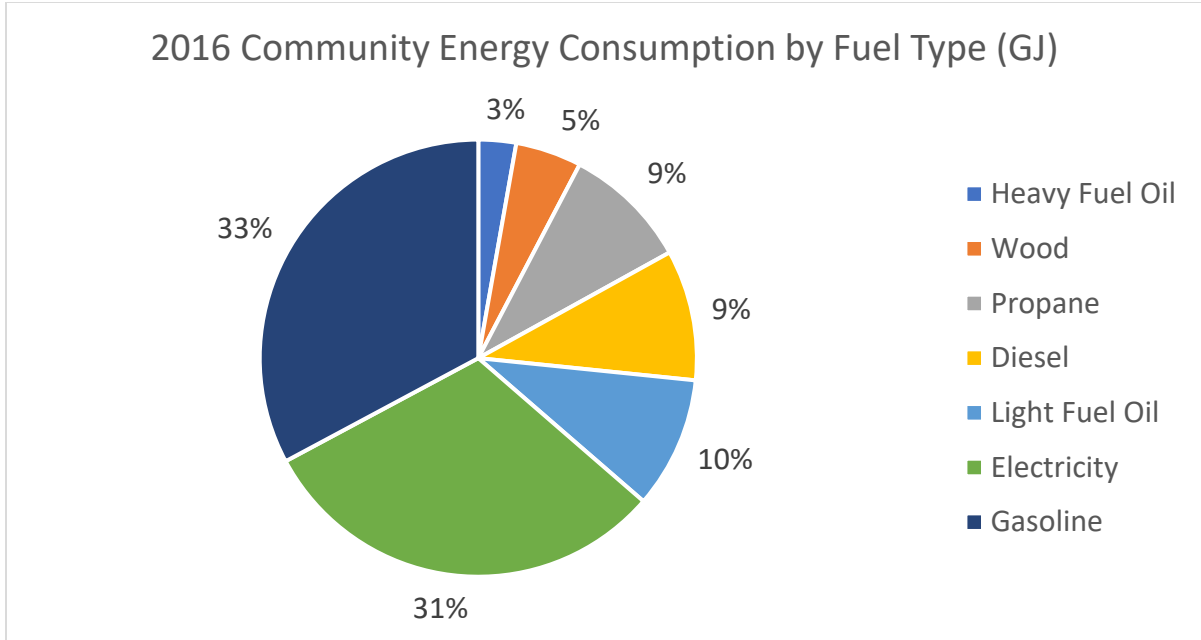


Figure 26 Community energy consumption by fuel type

Township of Huron-Kinloss – Climate Change and Energy Plan

INVENTORY SUMMARY (Community 2016)

SECTOR	Energy (GJ)	Energy %	GHGs (tCO2e)	GHG %
Stationary Energy				
Residential	202,449	56%	5,499	45%
Commercial & Institutional	161,474	44%	6,820	55%
Manufacturing Industries and Construction	Included elsewhere (included with commercial and institutional)			
Other/Non-Specified	Not occurring			
Energy Industries	Not occurring			
Agriculture, Forestry, Fishing	Not occurring			
Fugitive Emissions: Oil & Natural Gas	Not occurring (no natural gas in community)			
<i>subtotal</i>	363,923	58%	12,320	35%
Transportation				
On-Road	210,200	78%	14,131	77%
Railways	Not occurring			
Waterborne Navigation	Not occurring			
Aviation	Not occurring			
Off-Road	58,564	22%	4,156	23%
<i>subtotal</i>	268,764	42%	18,287	52%
Waste				
Solid Waste (Landfill)	NA		4,377	95%
Biological Treatment of Waste (compost)	Not occurring			
Wastewater	NA		230	5%
<i>subtotal</i>			4,607	13.08%
TOTAL	632,687	100%	35,214	100%

FUEL TYPE	Energy (GJ)	Energy %	GHGs (tCO2e)	GHG %
Stationary Energy				
Electricity	194,967	54%	2,166	18%
Natural Gas	Not occurring			
Propane	58,759	16%	3,562	29%
Light Fuel Oil	61,624	17%	4,632	38%
Heavy Fuel Oil	17,652	5%	1,344	11%
Wood	30,920	8%	615	5%
<i>subtotal</i>	363,923	58%	12,320	40%
Transportation				
Gasoline	207,646	77%	14,013	77%
Diesel	61,118	23%	4,275	23%
<i>subtotal</i>	268,764	42%	18,287	60%
TOTAL	632,687	100%	30,607	100%

Population (Statistic Canada 2016)	7,189	
Per CAPITA	Energy (GJ)	GHG (tCO2e)
Residential	28	0.76
Commercial	22	0.95
Industrial		
Transportation Fuels	37.39	2.54
Waste	-	0.64
Total	88.01	4.90

Summary of Corporate Energy Consumption (2016)

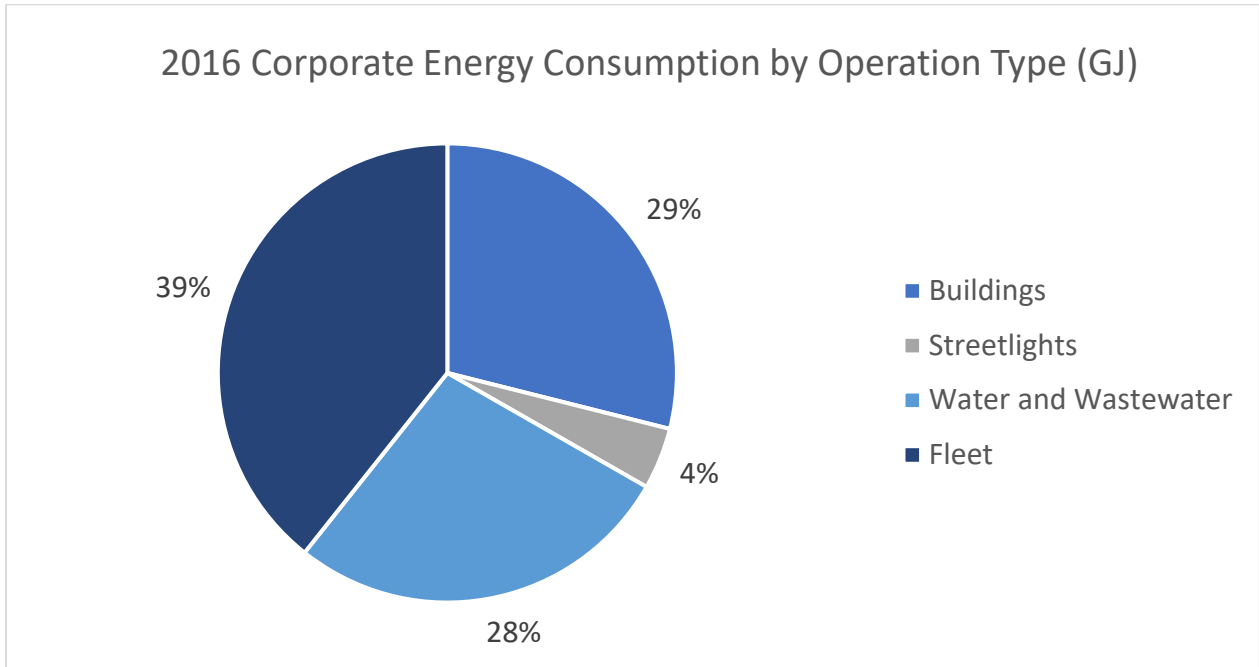


Figure 27 Energy consumption in corporate operations by operation type.

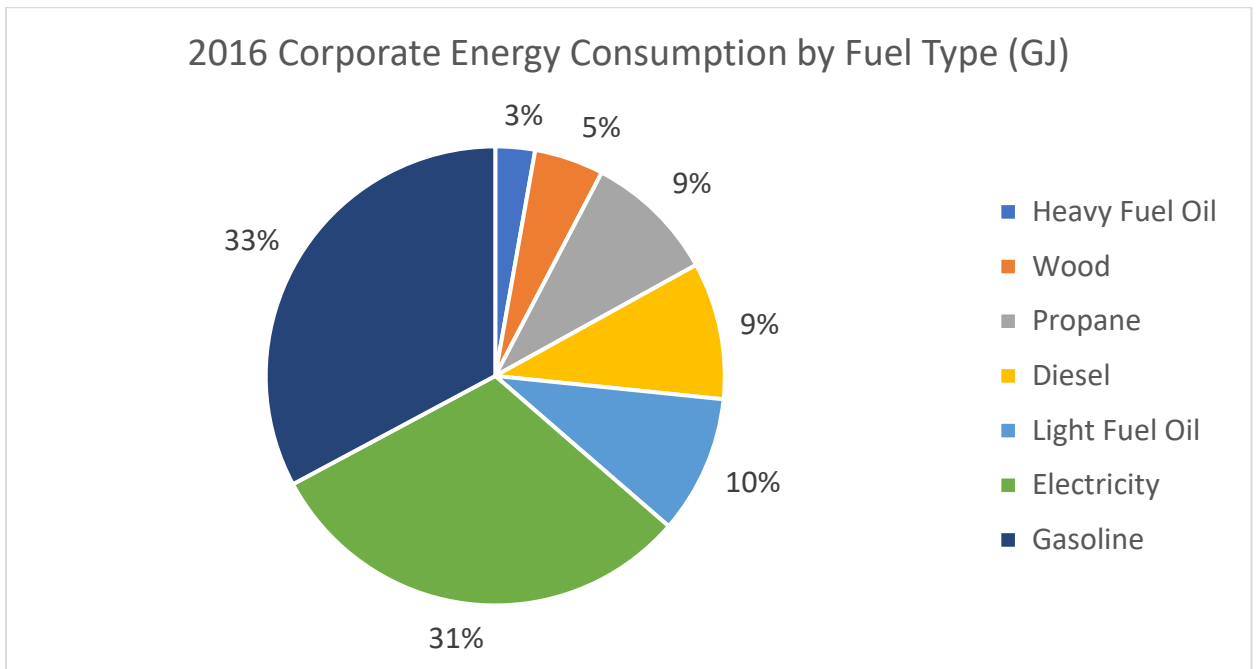


Figure 28 Energy consumption in corporate operations by fuel type

Township of Huron-Kinloss – Climate Change and Energy Plan

INVENTORY SUMMARY (Corporate 2016)				
SECTOR	Energy (GJ)	Energy %	GHGs (tCO2e)	GHG %
Stationary Energy				
Buildings	3,615	48%	132	75%
Streetlights	544	7%	6	3%
Water and Wastewater	3,427		38	
<i>subtotal</i>	7,586	61%	176	34%
Transportation				
Fleet	4,914	100%	342	100%
<i>subtotal</i>	4,914	39%	342	66%
TOTAL	12,499	100%	518	100%

FUEL TYPE	Energy (GJ)	Energy %	GHGs (tCO2e)	GHG %
Stationary Energy				
Electricity	5,756	76%	64	36%
Natural Gas	Not occurring			
Propane	1,726	23%	105	59%
Light Fuel Oil	103	1%	8	4%
Heavy Fuel Oil	Not occurring			
Wood	Not occurring			
<i>subtotal</i>	7,586	61%	176	34%
Transportation				
Gasoline	827	17%	55	16%
Diesel	4,087	83%	286	84%
<i>subtotal</i>	4,914	39%	342	66%
TOTAL	12,499	100%	518	100%

Population (Statistic Canada 2016)	7,189	
Per CAPITA	Energy (GJ)	GHG (tCO2e)
Residential	1	0.02
Commercial	0	0.00
Industrial		
Transportation Fuels	0.68	0.05
Total	1.74	0.07

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