THE CITY OF WINDSOR ONTARIO, CANADA

Council Report: S 18/2020

Subject: Acceleration of Climate Change Actions in response to the Climate Change Emergency Declaration - City Wide

Reference:

Date to Council: February 19, 2020
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Pollution Control
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To: Mayor and Members of City Council

Recommendation:

1. That City Council **RECEIVE** the Acceleration of Climate Change Actions in response to the Climate Change Emergency Declaration; and
2. That City Council **REQUEST** Administration to begin considering Climate Change risks (mitigation and adaptation) under the Risk Section of City Council reports; and
3. That Administration **REPORT BACK** before the end of 2020 on 1) the feasibility of the City of Windsor reporting on a carbon budget, 2) further expanding asset management tools to consider climate change, and 3) inclusion of climate change considerations into the development of the 2021 corporate budget documents; and
4. That City Council **APPROVE** the creation of a Climate Change Reserve Fund; and
5. That City Council **APPROVE** the transfer of $150,000 from the Budget Stabilization Reserve Fund into the Climate Change Reserve Fund; and
6. That City Council **APPROVE** the use of funding from the Climate Change Reserve Fund, for climate change initiatives broadly described in this report, through CAO Delegation of Authority (DOA) reports, subject to technical content being satisfactory to the City Engineer and financial content being satisfactory to the City Treasurer, and that these approvals **BE REPORTED** to Council as part of the regular semi annual DOA reporting; and
7. That, as part of the 2021 Budget Process, Administration **BRING FORWARD** a request for the additional operating budget funding required to undertake the measures noted in this report and as detailed in the Financial Matters section; and

8. That City Council **APPROVE** Administration to submit applications for grant funding ("the Grant") in support of climate change initiatives, along with the following recommendations:
    a. That the Chief Administrative Officer **BE AUTHORIZED** to execute any agreements, declarations or approvals required to submit the application to the Grant;
    b. That the Chief Administrative Officer and the City Clerk **BE AUTHORIZED** to take any such action and sign any such documentation as may be required to effect the recommendations and funding for the Grant, subject to all documentation being satisfactory in legal form to the City Solicitor, in technical content to the City Engineer, and in financial content to the City Treasurer;
    c. That in the event the City receives written confirmation of the Grant funding being awarded to the City, implementation of the Project does not result in a need for additional City funding not already approved by City Council and where the Grant provider confirms that expenditures as of that date are eligible, then City Council **APPROVES** the following recommendations:
        i. The Chief Administrative Officer **BE AUTHORIZED** to delegate signing of all claims and applicable schedules and other such documents required as part of the request for payment to the Supervisor, Environmental Sustainability & Climate Change or designate, subject to financial content approval from the area's Financial Planning Administrator or their manager; and,
        ii. The Chief Administrative Officer and City Clerk **BE AUTHORIZED** to sign agreements or contracts with successful vendors / proponent / bidders satisfactory in technical content for all projects to the City Engineer, in financial content to the City Treasurer, and in legal form to the City Solicitor; and,
        iii. The Purchasing Manager **BE AUTHORIZED** to issue Purchase Orders or RFPs as may be required to effect the recommendations noted above, subject to all specification being satisfactory in technical content to the City Engineer, in legal content to the City Solicitor and in financial content to the City Treasurer.

Executive Summary:

This report has been developed in response to council direction (CR570/2019) under the Climate Change Emergency Declaration of November 18, 2019. Three broad categories for climate action are thoroughly discussed including: climate change mitigation; adaptation; and opportunities to integrate climate change decisions into municipal decisions.

Climate Change Mitigation

In 2017, City Council approved the City's first Community Energy Plan (CEP) and Corporate Climate Action Plan. The CEP aims to create economic advantage, mitigate climate change, and improve energy performance. It strives to position Windsor as an energy centre of excellence that boasts efficient, innovative and reliable energy systems that contribute to the quality of life of residents and businesses.

The CEP set an ambitious and transformative greenhouse gas target of 40% below the 2014 baseline by 2041. Similarly, the corporate greenhouse gas target is also 40% below the 2014 baseline by 2041. These targets are currently in-line with the federal greenhouse gas reduction targets. However, the Government of Canada has also recently announced that it will develop a plan to set Canada on a path to achieve a prosperous net-zero emissions future by 2050.

Reaching the council-approved targets will require a reduction in yearly emissions of 760,000 tonnes of CO_2 annually. This report outlines seven priority mitigation strategies that, if fully implemented, will achieve a reduction of 540,000 tonnes of CO_2 annually or 71% of the target reductions. In addition, three additional strategies were recommended to mitigate future growth in emissions. Failing to address future growth emissions will further challenge the feasibility of meeting targets.

The Intergovernmental Panel on Climate Change (IPCC) Special report "Global Warming of 1.5°C" in 2018 outlined that emissions must decline by about 45% by 2030 and reach net zero by 2050. Due to the scale of changes required, each year mitigation actions are delayed, the feasibility of reaching targets is diminished. The IPCC also identifies that most adaptation needs will be lower if global warming is limited to 1.5°C compared to 2°C, therefore reinforcing the urgency of mitigation actions.

In 2014, the Windsor Community spent $842 million on energy. The Community Energy Plan estimated that without concerted effort the annual energy costs for the Community could rise to $1.8 billion (low price risk) and $3.1 billion (high price risk) per year in 2041.

Climate Change Adaptation

Since 2010, the City of Windsor has been actively implementing adaptation actions. Then in 2012, the City's first Climate Change Adaptation Plan formally outlined actions to reduce the risk of extreme temperatures and precipitation. The successful implementation of the 2012 plan lead to the redevelopment of the Climate Change Adaptation plan in 2018/2019 (S20/2020).

This report outlines five priority adaptation actions to be completed in the short-term. These include notable projects such as the Sewer Master Plan and the Urban Forestry Master Plan.

Public Safety Canada estimates that for every dollar invested in climate change adaptation $3 to $5 is saved in recovery costs.

Opportunities for Integration

Infrastructure Canada developed a Climate Lens document for all infrastructure projects seeking grant funding of $10,000,000 or more. The climate lens is intended to incent behaviour change and consideration of climate impacts into the planning of infrastructure projects, which will facilitate better decision making in both current and future infrastructure projects.

Following Infrastructure Canada's lead, the City of Windsor should seek opportunities to integrate climate change considerations into daily decision making. A number of Ontario municipalities are already leading the way by developing local climate lens guidance documents, including climate change into annual budget documents and developing carbon budgets to ensure, where possible, projects don't negatively impact GHG emission targets and increase risk under climate change impacts.

Additional Resources Will Be Required

The proposed measures are ambitious and aspirational. It is noted that reaching mitigation targets and adaptation objectives will not be easy. In addition to a strong Council, corporate, and community focus on prioritizing climate change mitigating measures, dedicated and sustainable resources (funding and staffing) will be required to maintain and accelerate climate action within the Corporation and the Community.

Background:

Emergency Declaration

On November 18, 2019, City Council approved the Windsor Essex County Environment Committee's motion that the City of Windsor pass a Climate Change Emergency Declaration.

> *Decision Number: CR570/2019*
> *That report no. 105 of the Windsor Essex County Environment Committee – Climate Change Emergency Declaration indicating:*
> *That the following Climate Change Emergency Declaration prepared by the Air Subcommittee of the Windsor Essex County Environment Committee BE APPROVED:*
>
> *WHEREAS the most recent report by the UN Intergovernmental Panel on Climate change (IPCC) has indicated that within less than 12 years, in order to keep the global average temperature increase to 1.5 degrees Celsius and maintain a climate compatible with human civilization, there must be a reduction in carbon emissions of about 45% from 2010 levels, reaching net zero carbon emissions by 2050; and*
>
> *WHEREAS based on current projections of the future impacts of human caused climate change, climate change will adversely impact Windsor-Essex's local economy, damage local infrastructure and property, put a strain on*

municipal budgets and result in significant economic and health burdens for the constituents of Windsor-Essex, particularly our vulnerable populations; and

WHEREAS climate change will jeopardize the health and survival of many local plant and animal species as well as their natural environments and ecosystems; and

WHEREAS Windsor-Essex is already experiencing large and increase climate change impacts including but not limited to overland flooding, heavy rain event flooding, emergence of invasive species, an increased number of high heat days, the rise of vector borne diseases, the re-emergence of blue-green algae and harmful algal blooms in our lakes and rivers; and

WHEREAS municipalities are understood to produce and/or have regulatory jurisdiction over approximately 50% of carbon emissions in Canada; and

WHEREAS the City of Windsor join the Government of Canada and 444 Canadian municipalities (including Vancouver, Ottawa, Montreal, and 18 other Ontario municipalities, among them Chatham-Kent, Sudbury, Sarnia, Guelph, and Kingston) that have declared climate emergencies, some of which are also implementing strategic plans in order to help reduce global carbon emissions and mitigate the impacts of climate change; and

WHEREAS the City of Windsor, the Essex Region Conservation Authority (ERCA) and the Windsor Essex County Health Unit (WECHU) are committed to and currently undertaking city and regional climate change planning, encompassing both mitigation and adaptation, in partnership with others; and

WHEREAS this emergency is an opportunity to bring together County, City and Town governments as well as regional stakeholders to work together on climate change planning and implementation with the aim of protecting our region and contributing to greater national and global climate change response; and

WHEREAS implementing climate action and making a transition to a low-carbon economy also represents a significant opportunity to stimulate economic growth, increase job opportunities and develop new technologies;

THEREFORE BE IT RESOLVED that the City of Windsor declare a Climate Emergency in the knowledge that this is an emergency with no foreseeable conclusion which will require robust and permanent changes in how the City and County conduct their business; and further,

That in response to this emergency, the need to reduce overall emissions from the City of Windsor and the County of Essex as well as continue to prepare for Windsor-Essex County's climate future are deemed to be high priorities when considering budget direction and in all decisions of council; and further,

That the City of Windsor administration BE DIRECTED to prepare reports for consideration by their respective Councils within 90 days containing recommendations for priority actions items, implementation measures, cost requirements to accelerate and urgently work towards the reduction of emissions and preparing for our climate future and include any initiatives that we are aware of by our Detroit neighbours and any other neighbouring municipalities across the border

***BE APPROVED**; and,*

*That the County of Essex **BE REQUESTED** to consider adopting the resolution as outlined above.*
Carried.

The climate change emergency declaration was also approved by the County of Essex on November 20, 2019.

This report was prepared as directed by City Council in the above council decision.

Discussion:

Definitions

Climate change adaptation refers to any initiative or action that seeks to reduce the vulnerability of social, economic, built, and natural systems to changing climate conditions. Adaptation efforts may focus on changing individual behaviour, updating municipal by-laws and policies, enhancing the capacity of physical infrastructure, and improving ecological services.

Climate Change mitigation refers to the implementation of policy, regulatory and project-based measures that contribute to the stabilization or reduction of greenhouse gas concentrations in the atmosphere. These include anti-idling by-laws, active transportation, building retrofits to conserve energy, and transitioning to low-carbon energy sources.

While mitigation efforts work to contain the long-term impacts of climate change, adaptation measures are needed to address the impacts that are already happening. Possible action items to address climate change adaptation and mitigation are shown in Figure 1.

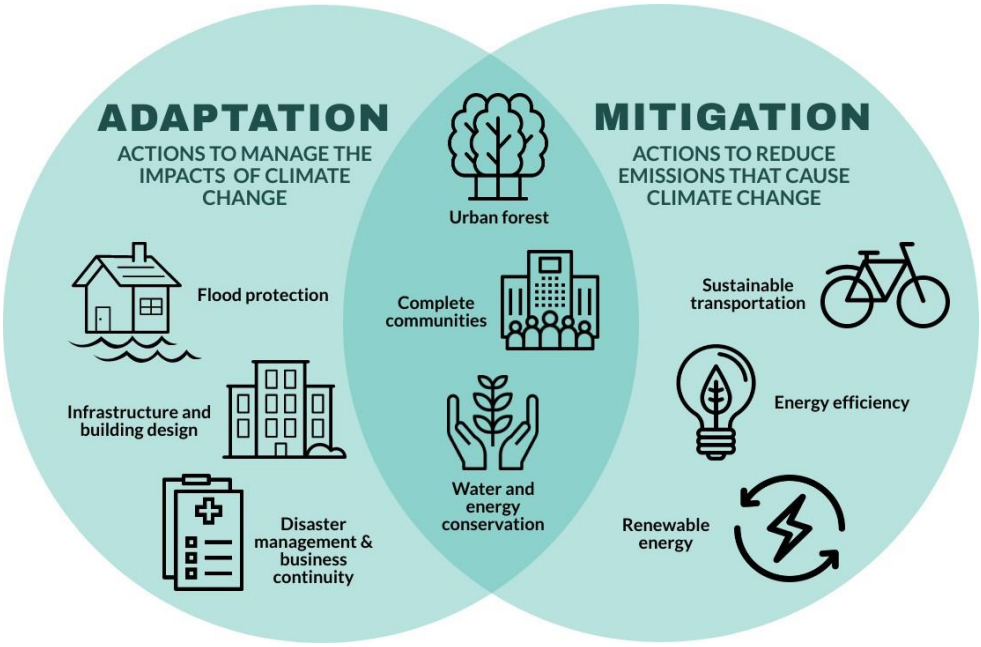

Figure 1: Examples of Actions to address Climate Change Adaptation and Mitigation

This report has been divided into two major sections (Mitigation and Adaptation) with the hope to clearly demonstrate the priority actions to both reduce emissions and adapt to expected climate risks

Section 1: Climate Change Mitigation

The History of Climate Change Mitigation Planning in the City of Windsor

In 2002, the City of Windsor undertook the first steps to address reducing emissions through its commitment to the Federation of Canadian Municipalities (FCM) Partners for Climate Protection network (PCP). The City's 2006 Environmental Master Plan provided further direction to implement the milestones of the PCP program, which lead to the completion of the City's first greenhouse gas (GHG) inventory in 2010 (Milestone 1 of the PCP Program).

In 2015, the City of Windsor committed to the Compact of Mayors (now the Global Covenant of Mayors), a global network of cities pledging to reduce GHG emissions, enhance resilience to climate change (adaptation) and track progress in a standardized and transparent manner. In 2015, City Council also approved the development of the City's Community Energy Plan (CEP) and Corporate Climate Action Plan (CCAP).

The CEP approved by City Council in July 2017, aims to create economic advantage, mitigate climate change, and improve energy performance (CR426/2017). It strives to

position Windsor as an energy centre of excellence that boasts efficient, innovative, and reliable energy systems that contribute to the quality of life of residents and businesses. The CEP looks at Community-wide energy and emissions, while the CCAP is focused on direct corporate emissions (ex. City owned and operated buildings, corporate fleet). Corporate emissions represent less than two percent of the overall Community Emissions.

The Corporate Energy Management Plan is prepared in compliance with Ontario Regulation 507/18 of the Electricity Act 1998. The purpose of the Corporate Energy Management Plan is to create a flexible living document that sets goals, strategies, and initiatives to reduce the Corporation's energy consumption and greenhouse gas emissions. Generally, the Corporate Energy Management Plan focuses on stationary energy usage (ex. buildings). In June 2019, City Council approved the 2019-2023 Corporate Energy Management Plan (CR301/2019).

Strategy 10 of the CEP called for the development and implementation of an Active Transportation Master Plan. On July 22, 2019, City Council approved the key principles around the implementation of the Active Transportation Master Plan (CR378/2019). The Active Transportation Master Plan sets a mode split target of 25% by 2041.

On December 2, 2019, City Council tabled Transit Windsor's Service Delivery Review for comment until December 18, 2019. The Service Delivery Review supports CEP Strategy 9: Encourage a Modal Shift towards Public Transit. The More Than Transit Plan was approved unanimously by City Council on January 20, 2020.

Windsor's Actions to Date

Windsor's actions working towards climate change mitigation are relatively new, having ramped up in June 2018 with the hiring of a temporary Community Energy Plan Administrator. As such the actions to date have involved the following:

- Completion of GHG inventories for 2017 and 2018
- Presentation of a GHG inventory report to council outlining both the corporation and communities progress towards the community energy plan goals
- Development of the business case for the Windsor home energy retrofit program (CEP – Strategy 1) as presented in Report No S1/2020.
- Development of an Integrated Site Energy Masterplan for the Lou Romano Water Reclamation Plan and the Little River Pollution Control Plant outlining recommendations to reduce energy use and actions that could be taken to achieve carbon neutrality of the Plants. (CCAP Strategy W3) Corporate Climate Action Plan
- Continued engagement with both the Corporate Task Force and Community Task Force
- Incorporation of eight plug-in EV vehicles into the City Fleet (CCAP Strategy F1)
- Street lighting LED retrofit (CCAP S1)

As predicted in the Community Energy Plan, emissions and energy consumption for the Windsor community have continued to increase as priority actions have yet to be implemented. In 2018 a total of 1,945,603 tonnes of Carbon Dioxide equivalent (CO_2e) was emitted to the atmosphere compared to the 1,812,728 tonnes CO_2e emitted in 2014. These emissions totals result in per-capita emissions of 8.96 tonnes CO_2e per person for 2018 compared to 8.49 tonnes CO_2e per person for the 2014 CEP baseline. The CEP target is a per capita emissions of 5 tonnes CO_2e by the year 2041.

Notable Accomplishments

As noted above the City of Windsor is committed to the Global Covenant of Mayors. As part of the Global Covenant of Mayors, Windsor annually reports through the Carbon Disclosure Project. In 2019, the City of Windsor received an overall score of A recognizing climate change leadership. However, for the City's actions on mitigation a B score was received. This is still higher than the average North American scores of a C and average global scores of D.

The City of Windsor was one of twenty-five Canadian municipalities selected to join the first Showcase Cities cohort led by the Global Covenant of Mayors for Climate and Energy (GCoM) Canada. The Global Covenant of Mayors Canada is a collaboration between the Federation of Canadian Municipalities, ICLEI Canada, the Global Covenant of Mayors Secretariat and the International Urban Cooperation Project supported by funding from the European Union. Over the next year, Showcase Cities will receive intensive support to help reduce their greenhouse gas (GHG) emissions and adapt to climate change and advance their ambitious climate actions.

Municipal Comparisons

The Showcase Cities, noted above, were selected to compare Council approved plans and targets. A summary of the findings from the municipalities are provided in Appendix A.

It should be noted, that each of these Showcase Cities has committed to advancing climate action over the next year in at least one area (i.e. mitigation or adaptation).

City of Detroit

The City of Detroit has a robust and aggressive mitigation strategy with the goal of reducing both community-wide and municipal emissions. The community target is a 30% reduction in GHG emissions by 2025 from a 2012 baseline. For the municipality the target is to reduce emissions by 35% by 2024 and 75% by 2034 from a 2012 baseline. The City also has a target specifically for Industrial and Commercial energy consumption of a 10% reduction in energy intensity by 2024 and a 30% reduction by 2029.

While a comprehensive climate mitigation plan is currently being developed, preliminary strategies identified for reducing emissions include

- Increase in adoption of solar PV
- Launch a Mayor's Challenge program for commercial building efficiency
- Development of electric vehicle infrastructure
- Enhance energy and water efficiency at City-owned facilities

Province of Ontario

In 2001, Ontario began the process of closing its coal plants and in the years since, has significantly reduced pollutants such as carbon dioxide, nitrogen dioxide, sulphur dioxide, mercury and particulate matter. Ontario's low-emission combination of hydroelectric, nuclear, natural gas and non-hydro renewable generating capacity has enabled the province to avoid up to 30 megatonnes of annual greenhouse gas emissions. Ontario now has one of the cleanest energy grids in North America. Since 2005, the province's total greenhouse gas emissions have dropped by 22% - while the rest of Canada saw emissions increase by 3% during that same time.

Set out in the in Made-in-Ontario Environment Plan, released on November 29, 2018, the province has set a target to reduce its emissions by 30% below 2005 levels by 2030. The province estimates they will achieve this reduction via the following objectives:

- Low Carbon Vehicle Uptake: primarily through electric vehicle adoption in Ontario and the expansion of compressed natural gas in trucking;
- Industry Performance Standards: regulating large emitters of GHGs;
- Clean Fuels: Increasing the ethanol content of gasoline and encouraging uptake of renewable natural gas and use of lower carbon fuels, specifically to increase the renewable content in gasoline to 15% by 2025;
- Clean Fuel Standard: an estimate of the additional impact of the proposed federal standards;
- The Natural Gas Conservation: programs that are well established in Ontario to conserve energy and save people money;
- The Ontario Carbon Trust: an emission reduction fund, using public funds to leverage private investment in clean technologies;
- Other policies: applies to actions applying to climate change adaptation; and
- Innovation: potential advancements in energy storage

On November 28, 2019, the province announced some significant progress towards their targets, including but not limited to:

- Establishing an Advisory Panel to provide the Minister of the Environment, Conservation and Parks with advice on the implementation and development of actions in the province's climate change plan;

- Finalized the Ontario Emissions Performance Standards for large, industrial emitters to ensure polluters are accountable for the GHG emissions; and
- Successfully issued Green Bonds for $1.7 billion

Government of Canada

In September of 2019, the environmental commissioner of Canada announced the intention of the Liberal government to set a target for Canada to be Carbon Neutral by the year 2050. This was further emphasized by Prime Minister Justin Trudeau during his throne speech following the 2019 election.

Carbon neutrality means achieving no net emission of greenhouse gas by eliminating carbon emissions altogether or balancing emissions with carbon removed from the atmosphere.

Brief History of Canada's Emissions Reduction Targets

The Government of Canada has a long history of setting emissions reduction targets and signing agreements to environmental protocols dating back to the 1992 Earth Summit. Information regarding the agreements and Canada's historic performance in achieving them is summarized in the table below.

Table 1: Federal Emission Reduction Targets and results

Year	Name	Target	Result
1992	Earth Summit	1.3% reduction from 1992 levels by 2000	Emissions increased 21.4% over this period
2002	Kyoto Protocol	6% reduction from 1990 levels by 2012	Emissions increased 30% over this period
2009	Copenhagen Accord	17% below 2005 levels by 2020	Latest emissions inventory of 2017 shows 1.8% decrease in emissions over this period
2016	Paris Agreement	30% reduction from 2005 levels by 2030	Latest emissions inventory shows 1.8% decrease over this period

A commitment to carbon neutrality is a drastic increase in emissions reduction over the current Paris Accord reduction target of a 30% reduction over 2005 levels by 2030. Canada's emissions in 2005 were 730 megatonnes.

As of the last published federal GHG inventory, Canada's emissions in 2017 were 717 megatonnes – representing a 1.8% decrease in emissions over the 2005 baseline. In the second biannual National emissions reduction report published by the Canadian government in 2016 it was projected that by 2030 national emissions would be 815

megatonnes representing an 11.6% emissions increase over the 2005 baseline. An additional projection has recently been published which includes all efforts which have been enacted by government, consumers, industry and business as of September 2018. This projects that Canada's emissions will be 701 Megatonnes by 2030, representing a 4% decrease from 2005 levels, still missing the Paris accord target by 26%.

Assuming that Canada does meet the 2030 Paris accord emissions reduction target of 30% emissions reduction from 2005 levels by 2030 there is still a remaining 512 Megatonnes of emissions which would need to be eliminated or balanced by carbon removal in order to meet the 2050 Carbon neutrality goal. For context, if this 512 megatonnes were to be removed from the atmosphere through tree planting it would require the planting of 84 billion trees per year. As part of the same Carbon Neutral announcement it was stated that 2 billion trees would be planted as part of government programs over the next ten years.

Priority 1 Mitigation Actions

Windsor Deep Energy Efficiency Retrofit (DEER) Program

The creation of an energy efficiency retrofit program is the first emissions reduction strategy identified in the CEP. Windsor's emissions profile is challenged by the age of building stock. The average home in Windsor was built in 1955 while the average Ontario house was built in 1974. Older homes utilize significantly more energy and result in significantly more emissions than newer homes. To address this problem, homes need to be retrofitted with the installation of high efficiency equipment such as windows, doors, furnaces, water-heaters and insulation. In 2017, the City of Windsor received an FCM grant to develop a business case for a retrofit program with the target of retrofitting 80% of Windsor homes by 2041. This program was under development throughout 2019. Administration report, S1/2020, summarizes the Business Case for the program and outlines the proposed next steps.

District Energy Expansion

District energy (DE) is a high efficiency and low-carbon approach to heating and cooling buildings. Thermal energy is generated at a central location using high-efficiency equipment and this heat or cooling potential is then distributed throughout an urban area with a system of pipes, typically located under roadways. A comprehensive district energy system is a critical aspect of infrastructure for cities that lead the way in low-carbon development, energy sustainability and energy resilience. The City of Copenhagen provides an aspirational example of DE integration with 97% of the City's heating provided by DE reducing emissions by 650,000 Tonnes $C0_2$ per year and saving residents an average of 1400 EUR annually, per resident.

Windsor presently has a small district energy system located in the downtown core, which provides heating for a few private and municipally owned buildings including City Hall, WIATC, Transit Terminal and Caesar's Windsor.

The Community Energy Plan outlines the goal of having 10% of existing heating and cooling demands within the city being met with district energy. Modern district energy systems typically result in 65% increase in efficiency compared to conventional boilers and furnaces. To meet the CEP goal a drastic expansion of the existing system is required. It is recommended that the city engage with the Windsor Utilities Commission with the aim of retaining consultants to complete a City-wide District Energy Expansion study based on international best practices. This study would identify additional areas outside of the downtown core which would also benefit from District Energy.

The figure below, which is extracted from the CEP, outlines priority areas for DE expansion.

Figure 2 – District energy expansion proposal from the 2017 Community Energy Plan

Biosolids and Source Separated Organics Management

Anaerobic digestion (AD) is a technology commonly used throughout Europe and growing in popularity in North America for converting organic matter into carbon-neutral renewable natural gas. The process can utilize a variety of feedstocks including wastewater sludge, municipally collected organic waste, FOG (fats, oils, greases) as well as agricultural wastes.

By 2025, the City of Windsor is required to have a curb-side organics collection program in place. One method of treating organics is through anaerobic digestion.

The recent Integrated Site Energy Master Plan completed for the Lou Romano Water Reclamation Plant and the Little River Pollution Control plant identified anaerobic digestion as a feasible option for managing sewage sludge. This study also identified the opportunities to co-mingle sewage sludge with source separated organics.

Early estimates indicate that anaerobic digestion of the City's sewage sludge and collected organics could offset 70,000 tonnes of CO_2 through the generation of renewable natural gas.

There is significant opportunity for working alongside neighbouring municipalities in order to create a regional biosolids management program (CCAP Strategy G3). This would increase the available feedstock for the system and improve the economic feasibility of the system through economies of scale.

The next step for this initiative is to undertake a feasibility study to determine the appropriate biosolids disposal strategy and identify opportunities for regional collaboration along with exploring the opportunity to co-mingle source separated organics as identified in CCAP Strategy G3.

A 2016 Capital account has already established a project called Biosolids Disposal Strategies (project 7161018) with funding to hire a consultant to investigate the various technologies pertaining to bio-solids reduction, harnessing of bio-gas and disposal of bio-solids. This funding is currently available to proceed with this next step.

Active Transportation Master Plan (Walk Wheel Windsor)

Active transportation describes human powered forms for transportation typically including walking, cycling, in-line skating and skateboarding. Public transit is also included in the context of active transportation as every public transit ride begins with walking or cycling. Providing effective and safe infrastructure for these activities entices communities to utilize these transport methods, which contributes greatly to emissions reductions and the equally important livability of a city. Using active transportation benefits the health of those who participate, saves them money by eliminating or reducing the need for an automobile, and positively contributes to local businesses as those walking or riding through a shopping district are more likely to patronize those businesses compared to those in a vehicle. It can also contribute to the reduction of traffic, which improves local air quality and relieves congestion.

Walk Wheel Windsor, Windsor's Active Transportation Masterplan was recently presented to Council and this plan outlines a transformative strategy for improving comprehensiveness as well as safety of the network. This plan recommends a number of actions dealing with active transportation infrastructure, maintenance, and policy. These recommended actions include a recommendation to build on the existing bicycle and pedestrian network with the installation of an additional 914 km of sidewalks, off-street pathways, and on-street bicycle facilities. The overall target of the plan is a 20% non-auto mode share by 2031 and a 25% non-auto mode share by 2041, resulting in an emissions reduction of 60,000 tonnes of CO_2 per year upon full build-out.

Transit Windsor Service Delivery Review

The City of Windsor has adopted a new Transit Master Plan, “More than Transit” and 2020 will provide an opportunity for some major implementation planning in addition to some early wins to improve transit service and attract more riders over the next eight years. With some service enhancements to the Sunday service in 2020, the Plan recognizes that the Transit Windsor service facility on North Service Rd is currently at capacity. Additional buses, fleet changes including smaller buses for industrial and residential areas, as well as larger articulated buses for main routes will require a change in how Transit Windsor services vehicles. It is imperative that a feasibility study be conducted on the Transit Windsor garage to plan and prepare for the growth of transit services in the City of Windsor, before any major service adjustments are implemented. This feasibility study, at a cost of approximately $250,000 will be funded through the 2019 Operating Budget Surplus.

The emissions reduction potential for Transit is calculated based on estimated ridership under the 25% modal split identified in the Active Transportation Master Plan and is included in the 60,000 tonnes reduction outlined above.

Electric Vehicles

The CEP aims to have 10% of light duty cars and trucks to be alternative fuel (or electric) by 2041. The very low emissions of Ontario’s electricity system and the lower cost relative to gasoline and diesel favour electrification of vehicles. Municipalities have limited capacity to influence the uptake of electric vehicles, however, there are some measures that can be taken to encourage electric vehicles including: increasing visibility of electric vehicles through adoption in the municipal fleet and installation of public charging stations.

In September 2019, the Corporation of the City of Windsor submitted an application to Natural Resources Canada (NRCan)’s “Zero-Emission Vehicle Infrastructure Program”. Of the $5M available, Windsor requested approximately 10 per cent ($500,000) to create 22 electric vehicle charging spaces strategically located at points of interest throughout the City. The results of the application are expected in February 2020.”

Building Efficiency Audit

The Efficiency Audit study will analyze and benchmark the energy performance on an approved development in the City of Windsor and determine how the development could have achieved higher energy performance under two scenarios (i.e. 20 % and 50 % below baseline or Ontario Building Code). The report will specifically identify energy conservation and demand reduction initiatives (ex. building orientation, solar controls, building envelope, daylight harvesting and high efficiency mechanical system) and low-carbon solutions (ex. rooftop solar, geo-exchange and air-source heat pumps) that could have been applied to reduce the energy intensity for these buildings. The study would also identify the cost and benefits of undertaking this type of analysis and may inform future energy policy and requirements for new development applications.

By undertaking an energy strategy study on a proposed development, the City of Windsor will be able to use the findings to guide future energy policy for new developments.

Gordie Howe International Bridge Low Energy Economic Development Area

With the future construction of the Gordie Howe International Bridge there are significant opportunities to establish this area as a showcase for low-carbon and low-energy development. The construction of the bridge will bring significant development interest in the area, particularly in the industrial sector as proximity to the international border crossing is advantageous and strategic for manufacturing products for export.

In order to ensure that development in this area contributes positively to the environmental profile and climate change mitigation efforts, a study is to be conducted identifying opportunities for a low energy economic development area. An example of technology to be applied in this area is an extensive District Energy network which would allow for the mutually beneficial exchanges of thermal energy between industrial facilities. For example, waste heat generated at one facility from a production process is injected into the network for building heating in another facility. Low carbon industrial parks such as these have been successfully applied throughout Europe and China.

Sandwich South Energy Chapter

Many cities in Canada and around the world are seizing the opportunity to plan neighbourhood scale developments as Net Zero Energy Areas. These neighbourhoods create as much energy in a typical year as they consume. They are viewed as desirable places in which to live and work.

Greenfields and large redevelopment sites represent opportunities to plan and design Net Zero neighbourhoods.

To support this CEP strategy (Strategy 4), it would be appropriate to complete a neighbourhood energy and climate change strategy for the Sandwich South area. This strategy may include the following: land-use plan with emphasis on walkable mixed use areas that reduce vehicle use; access to transit; enhanced construction efficiency standards; and smart energy networks. This strategy must be completed before significant development is proposed or the opportunity to reach this goal may be lost.

Education and Engagement

The CEP acknowledges a need for ongoing community discussion and education about smart energy communities and how they can address job creation, the City's reputation and quality of life. A survey completed during the creation of the CEP revealed that there are a number of key energy concepts that Windsorites are not familiar with (ex. district energy). Having a better understanding of our energy system will help everyone

make better informed decisions about the energy used in the community, at work and at home.

There is also a need for education and engagement for Climate Change adaptation as well and will be further discussed under Adaptation Priorities.

Gap Analysis

The following table outlines possible GHG reductions possible per year for fully implemented Priority 1 actions.

Table 2: Greenhouse Gas Reduction Potential for Various Fully Implemented Actions

Priority 1 Mitigation Action	CEP/CCAP Strategy Number	GHG reduction (Tonnes/year)	Aspirational Target Participation
DEER Retrofit	1	235,000	80% of homes by 2041
DEER Non Residential	5	70,000	60% of all Commercial and Institutional
District Energy Expansion	13	65,000	10% heating and cooling loads
Biosolids and Source Separate Organics Management	W3/G3	70,000	All Source Separate Organics and Wastewater sludge
Active Transportation Master Plan (Walk Wheel Windsor)	10	60,000	25% mode split
Transit Windsor Service Delivery Review	9	(Emissions Reduction included as part of the Active Transportation Master Plan)	
Electric Vehicles	11/F1	40,000	10% vehicles
Building Efficiency Audit	2/4	Control Future Emissions	

Gordie Howe International Bridge Low Energy Economic Development Area	14	Control Future Emissions	
Sandwich South Energy Chapter for Secondary Planning	4	Control Future Emissions	
Education and Engagement	16		Supporting all actions identified and increasing community awareness of energy and GHG emissions
TOTAL GHG reduction (Tonnes/year)		**540,000**	

The council-approved target for reducing GHG emissions outlined in the CEP requires a reduction in yearly emissions of 760,000 tonnes of $C0_2$. Implementing actions outlined above would result in a reduction of 540,000 tonnes of $C0_2$. This reduction represents 71% progress towards CEP goals. There remains a 220,000 tonne shortfall between the CEPs council-approved target and mitigation actions outlined above. Future growth could increase this gap significantly if a development's emissions profile does not align with emission reduction targets.

Actions outlined above and the affect they have on yearly emissions is depicted in Figure 3 below.

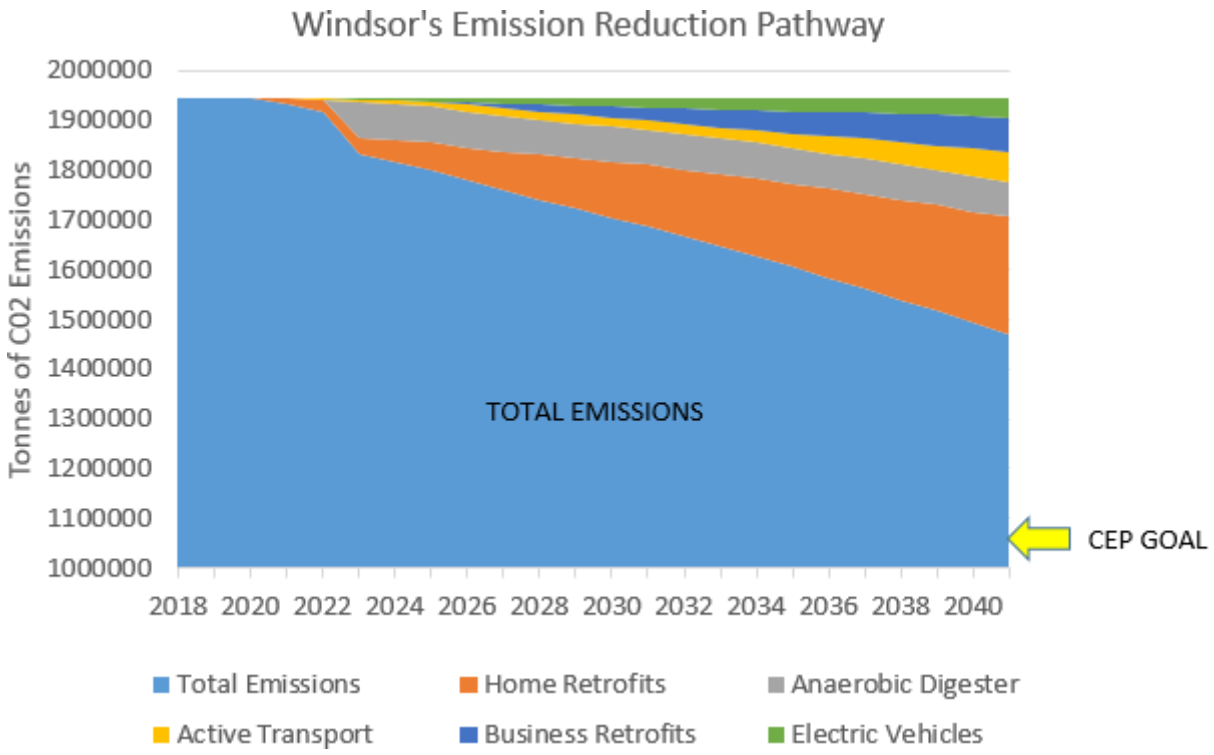

Figure 3: Windsor's Emission Reduction Pathway

The priority mitigation elements outlined above represent a significant transformation of the way energy is used in Windsor. While a 29% gap does exist between CEP goals and the actions outlined above, there are opportunities to close this gap by increasing participation rates of mitigation measures, changes in the fuel mix provided by utilities, and other measures. Additional measures are outlined below

- Increased participation rate of District Energy system from 10% to 30% would result in an additional 130,000 Tonnes of $C0_2$ reduced per year.
- Increased utilization of electric vehicles from 10% to 30% would result in an additional 80,000 Tonnes $C0_2$ reduced per year.
- Renewable natural gas supply on existing natural gas network. The current goal for Enbridge is 10% renewable natural gas by 2050. This would result in an additional 105,750 Tonnes C02/year reduced per year.

By proceeding with these additional measures the CEP target would be met. It is aknowledged that many of these goals are aspirational in nature and will be difficult to achieve.

Priority 2 Mitigation Actions

In order to exceed the CEP target and potentially **reach the carbon neutral goal** there are a range of priority 2 mitigation actions which can be undertaken, including but not limited to the following.

Greening Transit

Replacement of fossil fuel powered transit buses with electric alternative. This would drastically improve the emissions profile of the transit fleet and ensure that transit trips have minimal emissions per kilometre, regardless of ridership on a specific route.

Solar installations

The CEP outlines a target of 90 MW of solar electricity generation for Windsor. By meeting this target emissions from electricity generation can be reduced. Solar thermal systems, which generate heat from the sun's energy should be integrated with district energy systems to reduce emissions from thermal energy generation.

Local Food Initiative

Windsor is ideally located for the growth and harvest of common vegetables such as tomatoes, cucumbers, beets, and salad greens which are a staple in most diets. A local food initiative would work to establish a network of community gardens located within walking distance of major population centers in the city. Providing residents with fresh vegetables grown locally has many benefits including reduced transport emissions, improved resident health and increasing pollinators which are vital in a healthy ecosystem.

Another local food measure could be to offer fruit trees as part of the city tree program. Fruit trees provide the standard benefits of deciduous trees including shading and water retention with the added benefit of edible fruits which reduce transport emissions.

Section 2: Climate Change Adaptation

The History of Climate Change Adaptation Planning in the City of Windsor

On November 8th, 2010 Windsor City Council approved participation in ICLEI Canada's Climate Change Adaptation Initiative (CR408/2010) which provided a straightforward methodology to adaptation planning. This initiative resulted in the development and approval of the City's 2012 Adaptation Plan (M498/2012).

This plan created a vision to create a more resilient city to the effects of a changing climate. This first adaptation plan focused on the impacts of increasing precipitation and extreme heat and outlined 22 actions to reduce risk.

In 2018, Windsor had the opportunity to build upon the success of the 2012 Climate Change Adaptation Plan through participation in ICLEI's Adaptation Changemakers project. The Adaptation Changemakers project was funded through FCM's Climate Adaptation Partner Grants. This project provided an opportunity to update the City's vulnerability and risk assessments under a Changing Climate, identify impacts not considered in the 2012 plan, and assess additional actions to reduce risk. This project

also included a focus on the Community. A Community Task Force was created to undertake a similar process as the Corporate Departments to identify community vulnerability and risks to a changing climate and discuss appropriate community driven actions to reduce such risk. This plan was tabled at the Environmental, Transportation and Public Safety Standing Committee on November 20, 2019 for public comment.

Planning for Extreme Heat in Windsor

In 2009, Health Canada approached the City of Windsor about participating in a pilot project that would see four communities develop Heat Alert and Response Plans. The City of Windsor, along with community partners (ex. Windsor Essex County Health Unit, County of Essex, Red Cross, etc.) launched the Stay Cool Windsor Heat Alert and Response plan in 2011.

The close partnership created through this initiative resulted in Health Canada supporting the development of several other studies including:

- Assessment of Vulnerability to the Health Impacts of Extreme Heat in the City of Windsor (2011)
- The Urban Heat Island Effect in Windsor, ON: An Assessment of Vulnerability and Mitigation Strategies (2012)
- Improving Thermal Comfort in Windsor, ON: Assessing Urban Parks and Playgrounds (2013)
- Downtown Windsor Heat Island Study (2016)

Windsor's Actions to Date

The 2012 Climate Change Adaptation Plan outlined 22 actions to reduce the risk of increasing precipitation and temperatures. The status of the 22 actions are included in Appendix B.

Actions have not been limited to the actions proposed in the 2012 plan. The following are additional actions supporting Climate Change Adaptation.

Climate Resilient Home

A City-owned home was retrofitted as a pilot demonstration house to help educate residents on available lot-level resiliency actions to reduce risk for flooding. The retrofit included the completion of the basement flooding subsidy program (sump pump with overflow, backwater valve, downspout disconnection) and the installation of a rain garden and infiltration trench. YouTube videos were created documenting the installation and purpose of the flood risk reduction measures.

East Riverside Flood Study

The City of Windsor recently received funding from FCM's Municipal Climate Innovation Program to undertake a flood risk assessment for the study area along Riverside Drive East and inland, from St. Rose Beach easterly to the city limit with the Town of Tecumseh. This area of Riverside and East Riverside has historically been protected by a dike system that was constructed along the Ganatchio Trail in the 1980s. The flood risk assessment evaluated the integrity of the existing dike system to determine vulnerability under current and climate future flood levels. This report was presented to City Council on October 7, 2019 (CR523/2019). This study is now being incorporated into the Sewer Master Plan.

Thermal Comfort Improvements in Parks

In addition to the additional shade structures installed (Appendix A), the Parks Development team has installed three new splash pads to help residents beat the heat. These splash pads have been located at Captain Wilson Community Park, Jackson Regional Park and Realtor Regional Park. Water bottle fill stations have also been added along the Central Riverfront.

Parks Development and Forestry have work closely together to strategically plant 27 parks with additional trees to enhance shade coverage of playgrounds and trails.

Urban Forestry Inventory

Objective C8 of the 2017 Environmental Master Plan calls to protect and enhance the quality and condition of our urban forest canopy. Trees have many climate change benefits from uptaking water, providing shade and sequestering carbon. The Forestry division is currently wrapping up the City's urban forest inventory and canopy cover study. It is expected that following the completion of the inventory, the Urban Forestry Master Plan will begin.

Notable Accomplishments

In April 2019, the Government of Canada announced that it was contributing over $32 million to the City of Windsor to support flood mitigation work through the Disaster Mitigation and Adaptation Fund. The Disaster Mitigation and Adaptation Fund (DMAF) is a national merit-based program that will invest $2 billion to support large-scale infrastructure projects to help communities better manage the risks of disasters triggered by natural hazards. DMAF projects support the Government of Canada's objectives laid out in the Pan-Canadian Framework on Clean Growth and Climate Change.

As noted above the City of Windsor is committed to the Global Covenant of Mayors. In 2019, the City of Windsor received an overall score of A from the Carbon Disclosure Project recognizing climate change leadership, as well as an A for our Climate Change Adaptation actions. This score is higher than the average North American scores of a C and average global scores of D.

Municipal Comparisons

As with the municipal comparisons on mitigation, Appendix A provides a status of adaptation planning from the Showcase Cities. To summarize, significantly fewer municipalities have undertaken holistic climate change adaptation planning than mitigation planning and target setting.

As mentioned above, each of these Showcase Cities has committed to advancing climate action over the next year in at least one area (i.e. mitigation or adaptation).

City of Detroit

In 2019, the City of Detroit completed the Detroit Sustainability Action Agenda. Goal 9 outlines actions to enhance infrastructure and operations to improve resilience to climate impacts.

Some of the key recommendations for action are as follows:

- Aim to double the acres managed through green stormwater infrastructure and related techniques citywide in 10 years, resulting in at least 1,800 acres managed by 2029;
- Green streets guidelines will be incorporated into the City's Transportation Master Plan of Policies to be completed in 2020;
- As part of the 2020 Hazard Mitigation Plan update, Detroit will integrate information on climate change risks for residents and infrastructure and identify potential mitigation strategies;
- Improve resident access to sustainability-related City services; and
- Expand emergency preparedness and communication tools.

Province of Ontario

As described in the Made-in-Ontario Environment Plan, addressing the effects of climate change is a priority for the province. The following actions are listed:

- Building resilience - Helping families and communities prepare
    - Providing the right information, tools and resources to adapt and respond to climate change.
    - Understanding where the province is vulnerable and knowing which regions and economic sectors are most likely to be impacted.

- Improving our understanding of how climate change will impact Ontario:
    - Undertaking a provincial impact assessment to identify the potential impacts to communities, critical infrastructure, economies and natural environment, guiding future decision making.
    - Undertaking impact and vulnerability assessments for key sectors
- Help Ontarians understand the impacts of climate change:
    - Make practical climate change information available for all
    - Identify and create adaptation solutions.
    - Support communities by demonstration how climate science can be applied in decision-making.
- Update government policies and build partnerships to improve local climate resilience:
    - Modernize building code
    - Review the Municipal Disaster Recovery Assistance Program
    - Consult on tax policy
    - Review land use planning policies
    - Build resilience in the province's critical infrastructure
    - Support improvements to existing winter roads
    - Continue to support programs and partnerships intended to make the agriculture and food sectors more resilient to current and future climate impacts

Included in the update announced on November 28, 2019, the province listed some of the following progress toward those targets:

- Consulted on proposed changes to the Provincial Policy Statement, which sets out the province's policies for how land is used and developed in Ontario, including proposed changes to build resilience and support municipalities in preparing for the impacts of a changing climate.
- Named a Special Advisor on flooding who has delivered his report on ways that all levels of government, and individuals, can make Ontario more resilient to flooding.
- Released a request for bids for a third-party expert to undertake the first-ever broad, multi-sector provincial climate change impact assessment to identify where the province is vulnerable to climate change and help decision-makers better understand the impacts so they can protect communities and the environment.

Government of Canada

Over the past two decades, Canada has produced three broad, national climate change assessments, one in 1997, one in 2008, and the most recent in 2014, as well as sector- or region-specific assessments on human health, transportation, and marine coasts. These reports communicated to Canadians the risks and opportunities climate change presents and focused on assessing our readiness to adapt to potential impacts.

To combat this projected increase in climate change effects, in the 2016 Pan-Canadian Framework on Clean Growth and Climate Change, Canada identifies the following adaptation actions:

- Translating scientific information and Traditional Knowledge into action
    - Providing authoritative climate information
    - Building regional adaptation capacity and expertise
- Building climate resilience through infrastructure
    - Investing in infrastructure to build climate-resilience
    - Developing climate-resilient codes and standards
- Protecting and improving human health and well-being
    - Addressing climate change-related health risks
    - Supporting healthy Indigenous communities
- Supporting particularly vulnerable regions
    - Investing in resilient infrastructure to protect vulnerable regions
    - Building climate resilience in the North
    - Supporting community-based monitoring for Indigenous Peoples
    - Supporting adaptation in coastal regions
- Reducing climate-related hazards and disaster risks
    - Investing in infrastructure to reduce disaster risks
    - Advancing efforts to protect against floods
    - Supporting adaptation in Indigenous Communities

Recommended Priority 1 Adaptation Actions

Sewer Master Plan and East Riverside Flood Risk Assessment

The City of Windsor is developing a Sewer Master Plan to better understand flooding issues in the City with the final plan expected to be presented to Council in summer 2020. Modelling of the whole City sewer network and overland flood routes was completed using various historical storm intensities and current rainfall intensity curves. In addition, the climate change future 1:100 year storm was used to stress test the model to determine possible future conditions.

Recently, the findings of the East Riverside Flood Risk Assessment study conducted by Landmark Engineering has been incorporated into the Sewer Master Plan.

Many of the proposed actions in the draft Climate Change Adaptation Plan are tied to the implementation of the Sewer Master Plan.

The Sewer Master Plan study is currently funded and there are no additional funding requests in regards to climate change at this time. The Sewer Master Plan will outline long-term funding requirements when the final plan is brought forward to Council in summer 2020.

Little River Watershed Flood Plain Mapping

Dillon Consulting has been retained by the City of Windsor and the Essex Region Conservation Authority to create updated flood plain mapping for the entire Little River Watershed. Existing flood plain mapping for Little River was last completed in 1985. The assignment includes updating the existing mapping for areas already developed, as well as completing new mapping to be used as a guideline, based on the proposed land uses within the Sandwich South Lands, as well as Town of Tecumseh Lands within the Little River Watershed. Part of the assignment also includes the incorporation of resiliency into the analysis on account of climate change, which has not been considered in the previously completed flood plain mapping. This project has been fully funded by Council.

Urban Forestry Master Plan

The City of Windsor is preparing to undertake an Urban Forestry Management Plan following the completion of the tree inventory update project. These management plans are strategic documents designed to help guide the City's actions to achieve a desired vision for the future. The urban forest plays a crucial role in building a climate resilient community by most notably up-taking storm water, increasing the absorption rates of Carbon Dioxide and providing the community with shade on hot days. However, it is also important to note that our urban forest is also vulnerable to the impacts of climate change. It is recommended that the Urban Forestry Management Plan include an analysis of our urban forest under a changing climate. For example, the plan will provide recommendations and guidance to the City's Tree Planting program and identify for example which tree species to plant, (or not), and the importance of tree seed origins so that our urban forest are resilient and able to adapt to the changing climate. The loss of urban trees results in more stormwater runoff and increases the urban heat island effect.

The Forestry Division has plans to provide Council with a report in the fall of 2020 detailing the results of the tree inventory update project and the canopy cover assessment. It will provide details on the health, diversity, size and challenges facing the Urban Forest. This report will also notify Council that the Urban Forest Management Plan process has been initiated and that the objectives of the forthcoming plan is to identify the many ways the City can protect and enhance the City's stewardship programs and the Urban Forest over the next 20 year period.

Pilot Projects for LID Practices at Residential Scale

One method to reduce the risk of flooding in the City is to control rainwater entering the system. One action recommended in the Sewer Master Plan is to implement low impact development practices (LIDs) within Residential Yards. Soak-away pits, rain gardens, permeable pavements and rain barrels are examples of LID practices that can be used within the constraints of a residential yard.

A rain garden and an infiltration trench have been installed at the city-owned 'Climate Resilient' home and are currently being monitored for effectiveness. It is recommended that the City undertake a few more pilots across the City, particularly in areas of high clay soils to determine the effectiveness of various LID methods.

Education and Engagement

The draft Climate Change Adaptation Plan states that building a more resilient community will not be achieved through municipal actions alone. Community action needs to be significant if Windsor is to become a more resilient community. To achieve this the Community must be fully aware, engaged and understand why their individual actions are so crucial to the success of the Plan. Community engagement must be seen as a priority as 23 of the proposed actions in the draft adaptation plan speak to the need to educate, engage and build awareness for successful implementation.

Administration must seek new ways of reaching the community as public information sessions generally result in low engagement rates. New opportunities need to be explored for example creating of video or webinar series to help residents understand personal risk to basement flooding and actions to mitigate those risks or creating citizen science programs to further engage the community.

Opportunities for Integration (Adaptation and Mitigation)

Infrastructure Canada recently developed a Climate Lens document for all Infrastructure projects seeking grant funding of $10,000,000 or more. The Climate Lens is intended to incent behavioural change and consideration of climate impacts into the planning of infrastructure projects. By systematically evaluating each project's GHG emissions and/or resilience to the impacts of climate change, project managers will become increasingly familiar with key considerations, risks, and mitigation strategies, which will facilitate better decision making in both current and future infrastructure projects.

Following Infrastructure Canada's lead, the City of Windsor should seek opportunities to integrate climate change considerations into daily decision making. Though the primary intent of a project may not be to mitigate or adapt to climate change, there may be opportunities to ensure that projects don't negatively impact GHG emission targets and minimize risk under climate change impacts.

This section identifies various opportunities to embed climate change considerations into municipal decisions. Integration helps ensure that decisions are not made without climate change considerations, therefore reducing risks posed by climate change or energy use.

Council Report Section

One tool to support Council decisions is to include climate change considerations into Council reports. An example of a municipal best practice is from the City of Burlington. The City of Burlington declared a climate emergency in April 2019. City Council then directed staff to apply a climate lens to decision making documents including Council reports and budgets. The City of Burlington Council reports now have a sub-heading titled Climate Implications, where staff are to consider climate change mitigation, adaptation, cost/benefit analysis and co-benefits. To aid staff in preparing this section, a Climate Lens guidance document relevant to City staff was created.

Alternatively, climate change can be reviewed under the current risk section of the Council reports. Requiring Administration to consider climate change under the risk section can be an easy and quick action to integrate climate change into City decisions. To do this effectively, a climate lens document would be developed and distributed to all staff responsible for preparing council reports. This climate lens document would include a checklist to determine if addressing a climate risk (mitigation/adaptation) is warranted.

Long-term planning documents

A number of recent long-term planning documents have included considerations of climate change (Appendix C). It is recommended that any new or updated master planning documents include considerations for climate change adaptation and mitigation. The intent of master planning documents is to develop a long-term vision for the service in question. A changing climate may impact that long-term vision. By identifying possible impacts early, the plan can address future risks. The plans should also include considerations for climate change mitigation to reduce emissions and energy use where possible.

Carbon Budget

Globally and internationally, carbon budgets are being established. A carbon budget is essentially the upper limit of total carbon dioxide emissions remaining before a specific global average temperature is reached. Global emissions budgets are calculated according to historical cumulative emissions from fossil fuel combustion, industrial processes, and land-use change, but vary according to the global temperature target that is chosen (ex. 1.5°C or 2°C), the probability of staying below the target and the emissions of other greenhouse gases.

In 2017, C40 Cities published a report in which they assessed the contribution of the C40 cities to the COP21 Paris Agreement's aspirations of limiting climate change to 1.5 and 2 degrees respectively. Specific GHG emissions reduction trajectories were identified for each of the C40 cities, as well as potential actions to achieve those trajectories. C40 is a network of the world's megacities committed to addressing climate change.

Since then, the same methodology has been used to calculate carbon budgets for other cities. These city-specific carbon budgets are an effective way of communicating the urgency of the required emission reductions. In November 2019, the City of Edmonton, released an information brief on Carbon Budgeting and Accounting. This brief outlines that carbon budgeting will be an effective way of communicating the urgent need to reduce emissions. With a carbon budget superimposed over a City's project emissions, the impact of delaying reductions in emissions becomes very clear. Edmonton's carbon budget between 2019 and 2050 is 155 Megatonnes. The brief also clearly outlines that if the City continues to operate as it does currently, this carbon budget will be exhausted by 2028. In order to make the reductions required, a carbon accounting framework is recommended. This framework will allow administration and City Council to understand the emissions "costs" associated with any project all the way through the project's lifecycle. Based on this understanding, projects that are approved will need to have their GHG emissions entered against the carbon budget. In this way, the City is constantly aware of how their decisions are reducing or increasing their carbon budget.

Asset Management

The need to bring climate change information into asset management is key and identified in the City's Asset Management Policy. The Asset Management Plan 2018-2019 includes a thorough review of climate impacts and risks to City's assets.

Using a triple bottom line framework and full life-cycle costing are two ways already identified to embed climate change into asset management decisions.

Budget Considerations

A number of municipalities are looking to incorporate climate change considerations into budget documents. Some best practices include the Region of Peel and the City of Burlington.

The Region of Peel undertakes Integrated Budget Planning with the process explicitly identifying climate change as a driver for decision-making. To assist with this integration a Corporate Social Responsibility (CSR) checklist, which includes climate change considerations, was introduced in 2019 as a guide for staff to determine how budget priorities are enabling CSR. Additionally, Peel has plans to complete a Climate Change Financing Strategy in 2020 to guide how Climate Change action will be resourced, embedding the need for advocacy and securing external funding to mitigate costs to the tax base and utility rate. The Climate Change Financing Strategy will also provide a schedule for Plan action expenditures.

The City of Burlington includes an Environmental Impact section, which includes climate change consideration, on business cases developed for their capital budget. These business cases are similar to the City of Windsor's budget issues documents.

The Cost of Doing Nothing

In 2014, the Windsor Community spent $842 million on energy. The Community Energy Plan estimated that without concerted effort the annual energy costs for the Community could rise to $1.8 billion (low price risk) and $3.1 billion (high price risk) per year in 2041. A failure to mitigate will result in costs beyond that of simple energy costs. In a high emissions scenario, the City of Windsor is expect to have 70 days above 30°C compared to 51 days in a low emissions scenario. The consequences of not mitigating will put more burden on emergency response and adaptation measures.

A 2011 report by the National Round Table on the Environment and Energy estimated that climate change costs for Canada could escalate from roughly $5 billion per year in 2020 to between $21 and $43 billion per year by the 2050s. The magnitude of costs depends upon a combination of two factors: global emissions growth as well as the economic growth and population growth in Canada during that time.

Public Safety Canada estimates that for every dollar invested in climate change adaptation $3 to $5 is saved in recovery costs. 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.

The costs of not adapting to climate change has been well documented in the Climate Change Adaptation Plan (S20/2020).

Current Dedicated Resources

Staffing

The 2019 staffing levels of the Environmental Sustainability and Climate Change Office includes two full-time permanent staff and one full-time temporary staff. Minor funding is also available to support two Co-op students throughout the year.

Operating Budget

The Environmental Sustainability and Climate Change Office currently operates annually with minimal discretionary funds to implement actions in the Environmental Master Plan, Community Energy Plan, Corporate Climate Action Plan and Climate Change Adaptation Plan. Aside from wages, the annual operating budget for this area in 2020 is approximately $42,000.

Capital Funding

The Environmental Sustainability and Climate Change Office currently has two active capital projects. The first capital project was created in 2009 to track expenses

associated with the development of the first Heat Alert and Response plan (Project ID: 7093001). This project has also funded the early years of the Stay Cool Windsor-Essex Campaign (now implemented by Windsor Essex County Health Unit), the various Thermal Comfort reports and some minor initiatives to improve thermal comfort. The funds for this capital project were received from Health Canada through various Memorandums of Understanding from 2009 through 2016 totalling $279,500. There is currently approximately $32,000 remaining to continue this work.

The second capital project was established in 2015 for the completion the Corporate and Community Climate Change Mitigation Plan (Project ID 7159001). Funding for this project was initially from the City of Windsor funding $150,000 towards the plan development. Administration was subsequently successful in receiving grant funding from the Federation of Canadian Municipalities ($148,300) and the Ontario Ministry of Energy ($90,000). A surplus was remaining following the completion of the plan.

To show an ongoing commitment to the CEP, City Council approved an additional $40,000 in funding for the Corporate and Community Climate Change Mitigation Plan, for total City funding in this project $190,000. This increase was to supplement the surplus funds identified following the completion of the plan and were to be used to undertake a few key short-term initiatives including; public education, detailed energy mapping, the Deep Energy Efficiency Retrofit (DEER) business case and a study for expansion of District Energy. These funds were intended to be used to leverage additional funding opportunities through FCM's Municipal Climate Innovation Program (MCIP). The City of Windsor was successful in receiving funding of $125,000 through this program to support the development of the business case for the DEER. Upon completion of the DEER business case, it is expected that a surplus of approximately $90,000 will remain.

Due to oversubscription of the FCM MCIP grants, the City of Windsor pulled the District Energy application to prioritize the applications for the Active Transportation Master Plan, the East Riverside Flood Risk Study and the Integrated Site Energy Study for the Lou Romano and Little River plants. The City of Windsor was successful in receiving MCIP grants for those projects.

Risk Analysis:

Reputational Risk - Globally and locally, Climate Change awareness is rapidly rising. There is a reputational risk to the city if action on climate change is not seen as progressing.

Financial Risk – Both the Community Energy Plan and the Climate Change Adaptation Plan outline the financial risk to the Community from not taking action on Climate Change. These include escalating energy and carbon costs as well as the possible losses from climate change impacts (ex. basement flooding). Climate change actions may increase the cost of projects and add expenditures to other initiatives. Given the limited resources available, this may result in the reprioritization of future, planned projects or the requirement to identify new funding sources to fund such initiatives.

Resource Risk – The Environmental Sustainability and Climate Change office currently operates with 2 full-time staff and 1 temporary staff to implement the Environmental Master Plan, Community Energy Plan, Corporate Climate Action Plan and the Climate Change Adaptation Plan. The acceleration of climate action will be limited by the resources provided. Administration across the Corporation understands the role their departments play on adapting to climate change and this is shown by the number of adaptation actions currently underway. However, the City has yet to reach this level of engagement for Climate Change Mitigation. Implementing some of the actions for integration into municipal decision making will further support climate action.

Financial Matters:

Capital Requests

This table outlines the estimated costs for the next steps for Priority 1 Mitigation Actions.

Table 3: Priority 1 Mitigation Actions Estimated Next Step Costs

Priority 1 Mitigation Actions	Next Steps	Immediate Next Steps Estimated Costs	Funding Source
DEER Retrofit*	Business Plan	To be determined as part of future report to Council	Subject to future approvals
District Energy Expansion	Study and Class EA required	$400,000	Subject to Discussions with WUC and future approvals
Biosolids and Source Separated Organics Management	Feasibility Study for managing Biosolids and source separated organics	$300,000	Project 7161018 - $300,000
Active Transportation Master Plan (Walk Wheel Windsor)	Implementation of Walk Wheel Windsor	Various projects include Active Transportation within the overall project, see C 205/2019 for details	Various projects, see C205/2019 for details

Transit Windsor Service Delivery Review	Implementation of the Walk Wheel Windsor Plan	$250,000	Funded from 2019 year-end Operating Budget surplus
Electric Vehicles	Garage Feasibility Study	Federal EOI - stations	Subject to future approvals
Building Efficiency Audit	Consultant assessment of approved development and recommendations for future energy improvements	$47,300	Subject to future approvals
Gordie Howe International Bridge Low Energy Economic Development Area	Study to identify opportunities to create a low-carbon industrial area	$150,000	Subject to future approvals
Sandwich South Energy Chapter	Complete a neighbourhood energy and climate change strategy for the Sandwich South area	$150,000	Subject to future approvals
TOTAL		**$1,297,300**	
Components of Total amount subject to future approvals		**$747,300**	

*Note: * As per report S1/2020, administration is expected to review start-up funding in the detailed report. Based on the Consultant's estimates for start-up funding for the DEER program, approximately $400,000 could be required to move forward with the Business Plan.*

This table outlines the estimated costs for the next steps for Priority Adaptation Actions.

Table 4: Priority 1 Adaptation Actions Next Step Costs

Priority 1 Adaptation Actions	Next Steps	Immediate Next Steps Costs	Funding Source
Sewer Master Plan	Implementation of Sewer Master Plan	For Council decision when plan presented Summer 2020	Project 7199004 – Sewer Master Plan Implementation
Urban Forestry	Expansion of the Urban Forestry Management Plan to include Climate Change considerations	For Council decision when presented in Fall 2020.	Project 7131021 – Tree Maintenance Backlog
Pilot Green Infrastructure Projects for residential scale (raingardens, infiltration trenches)	Build and monitor green infrastructure in clay soils to determine effectiveness.	$50,000	Project 7169001 – Flooding Abatement Measures (Subject to Future Approvals)
Education and Engagement	Develop an education and engagement strategy and materials to support the Climate Change Adaptation Plan, which includes supports for the Sewer Master Plan and Stormwater Financing Study.	$50,000	Project 7169001 – Flooding Abatement Measures (Subject to Future Approvals)
Total		**$100,000**	

Additional Funding Requirements

As outlined in this report, there are a significant number of initiatives that would be required to be actioned in the future to implement many of the ambitious climate change measures detailed herein. Therefore, Council should be aware that future operating and capital budgets will inevitably reflect increased requests in order to provide continued funding for the new Climate Change Reserve Fund as well as additional funding for other identified priority mitigation and adaptation actions items. As always, City Council will need to consider these requests in conjunction with all other master plans

recommendations and other worthwhile funding requests and make funding decisions based on its priorities.

The Environmental Sustainability and Climate Change Office has been operating with three full-time staff positions (2 permanent and 1 temporary) since 2018. The current staffing contingent is insufficient to maintain the current workload and the growing Corporate and Community expectations much less to undertake the ambitious acceleration of actions detailed in this report. In order to carry on work, it is recommended that in the 2021 budget the Community Energy Plan Administrator position be filled permanently and that sustainable operating and capital funding be provided in order to ensure action and create opportunities to leverage grant dollars. Currently the Community Energy Plan Administrator position has one-time funding to carry on for 2020.

In addition to the recommendation to establish the Community Energy Plan Administrator as a permanent, full time position, additional funds of at least $42,000 annually will be required in the near term to accelerate climate action and enhance community engagement on an annual basis. As mentioned above, the Environmental Sustainability and Climate Change Office currently operates with minimal discretionary funds to implement actions in the Environmental Master Plan, Community Energy Plan, Corporate Climate Action Plan and Climate Change Adaptation Plan. These funds have historically been used to host the City's annual Earth Day event, host Community stakeholder workshops, development of limited promotional /education materials (generally one new topic per year), advertising, and support climate change workshops/training for corporate staff.

The following table outlines the preliminary estimates of additional near term funding requirements. Administration will bring forward the identified operating budget needs as part of the 2021 operating budget development process for council's consideration.

Table 5: Increase in Operating Costs to allow for an enhancement to the annual Community Engagement and Education on Climate Action

Community Energy Plan Administrator position (wages and benefits)	$91,480
Overtime salary	$2,000
Program Supplies	$12,000
Promotional Material and Product	$11,000
Graphic Design	$10,000
Advertising	$5,000
Business Expenses	$2,000
Annual Transfer to Climate Change Reserve	$150,000
Increased Annual Operating Budget Funding Requirements	**$283,480**

The Climate Change Reserve Fund in the table above is a new reserve that as noted would require permanent ongoing funding allocations in future years. Seed money to initially fund the reserve can be obtained this year from a higher than expected yearend

surplus in the 2019 utilities/energy budget. This surplus will be credited to the Budget Stabilization Reserve Fund (BSR). As such, Administration is requesting that $150,000 from the BSR be directed to the new Climate Change Reserve Fund to help fund mitigation actions in 2020. Administration will seek to leverage these dollars through grant or partnership opportunities. In order to ensure that we can act quickly in seeking grants and implementing priority initiatives, Administration is recommending that it be authorized to access funding in this reserve though Delegation of Authority reports to the CAO. Approvals would be restricted to initiatives which broadly aim to achieve the goals discussed in this report; all such DOA approvals would be reported to Council in the normal semi annual report on approvals made through the DOA process.

Administration will continue to monitor for applicable grant opportunities and has requested authority from Council to apply for grant funding to support climate initiatives, contingent upon any matching funding, if needed, being available for immediate use. Administration will provide notification to Council of any successful grant applications at an appropriate time.

Though this report outlines the immediate next steps to accelerate Climate Action, it is by no way an exhaustive list of actions that will be required over the next decade to meet current emissions reduction targets, build a resilient community or meet the IPCC recommendations to keep global average temperature increase to 1.5°C. The CEP recognized that complete implementation of the 16 strategies identified in the plan will fall short of achieving the current emissions target. Developing a pathway to carbon neutrality, as recommended by the IPCC, proposed by the Government of Canada and adopted by many municipalities, will require the actions well beyond those outlined in the CEP. These measures will no doubt require additional future funding allocations.

Consultations:

Engineering - Colleen Middaugh, Anna Godo, Pat Winters,
Transit Windsor - Pat Delmore
Planning - Greg Atkinson
Forestry - Paul Giroux
Environmental Services – Anne Marie Albidone
Transportation Planning – Jeff Hagan
Asset Planning – Cole Nadalin, Michael Dennis, Melissa Osborne

Conclusion:

The climate change emergency declaration speaks to the urgency for cli mate action. In response, this report proposes an ambitious and aspirational pathway towards reaching the current emissions target of 40% below 2014 levels by 2041 as well as prioritizing adaptation actions required to build climate resiliency. The City of Windsor is well positioned to take quick action as robust climate change mitigation and adaptation plans are already in place and next steps are known.

However, it is noted that reaching mitigation targets and adaptation objectives will not be easy. In addition to a strong Council, corporate, and community focus on prioritizing climate change mitigating measures, dedicated and sustainable resources (funding and staffing) are required to maintain and accelerate climate action within the Corporation and the Community.

Planning Act Matters:

N/A

Approvals:

Name	Title
Karina Richters	Supervisor, Environmental Sustainability and Climate Change
Carrie McCrindle	Financial Planning Administrator
Jake Renaud	Senior Manager Pollution Control
Natasha Couvillon	Manager Performance Measurement & Financial Administration
Mark Winterton	City Engineer
Joe Mancina	Chief Financial Officer
Onorio Colucci	Chief Administrative Officer

Notifications:

Name	Address	Email
Brian Lennie Senior Advisor, Municipal Affairs Public Affairs	ENBRIDGE GAS INC. 50 Keil Drive N. Chatham, ON N7M 5M1	brian.lennie@enbridge.com
Windsor Essex County Environment Committee (WECEC)	Meraal Yared	myared@citywindsor.ca
Anneke Smit	Cities & Climate Action Forum, U of W Law	asmit@uwindsor.ca

Appendices:

A. Municipal Comparisons
B. Implementation Status of Short-Term Climate Adaptation
C. Long-Term Planning Documents

Appendix A: Municipal Comparisons on Climate Change Mitigation and Adaptation Planning and Actions

City Name	Climate Emergency (yes/no)	Community Energy Plan (Yes/No)	Corporate Action Plan (yes/no)	Community GHG target	Corporate GHG target	Adaptation Plan Finalized (yes/no)	If not, status
City of Windsor	Yes	Yes	Yes	40% below 2014 by 2041	40% below 2014 by 2041	Yes	Second adaptation plan drafted
City of Burlington, ON	Yes	Yes (new plan to be approved in March)	Yes	Net carbon neutral by 2050	Net carbon neutral by 2040	No	To be completed by 2021
City of Nanaimo, BC	Yes	Yes	Yes	50% below 2010 levels by 2030 and 94% below 2010 by 2050	33% of 2007 levels by 2020 and 80% of 2007 levels by 2050	No	In process
City of Kitchener, ON	Yes	Yes	Yes	50% below 2010 by 2050	28% below 2016 by 2026	Yes	
City of Brampton, ON	Yes	Yes (to be approved in May 2020)	Yes	50% in 2041 and at least 50% by 2050	30% and 80% for 2030 and 2050. Looking towards a zero carbon transition in operations for the City's facilities, the City has set an interim target of 20% GHG emissions reduction by 2024	No	

City of Hamilton, ON	Yes	Yes	Yes (currently being updated to reflect new targets)	50% by 2030 and carbon neutral before 2050 based on 2006 baseline	Currently 50% by 2030 and 80% by 2050 based on 2005 baseline (to be updated by Q2 2020)	No	In beginning stages and developing Project Charter/Work Plan
City of Candiac, QC	No	Yes (to be approved in May 2020)	Yes (to be approved in May 2020)	In development	In development	No	Will be developed in 2021
City of Moncton, NB	Yes	No (we do have an ICSP)	Yes	Need to report back on the feasibility of reaching carbon neutrality by 2050 for both community and corporate	20% below 2002 by 2020 (has been achieved)	Yes	
Rivière-du-Loup, QC	Yes	Yes 2020, to be renewed	Yes 2020, to be renewed	20% below 2008 by 2020	20% below 2008 by 2020	No	Aiming for the end of 2021
Town of Orangeville, ON	No	No	No	None	None	No	Aiming for 2021
Town of New Glasgow, NS	No	No	No	Plans and targets expected Summer 2020.		No	Looking to start adaptation planning in 2021
City of Kington, ON	Yes	Yes, being updated in 2020/2021 Climate Leadership Plan		15 per cent below 2011 baseline levels by 2020 and 30 per cent by 2030.		No	Start work in 2020 with Climate Leadership Plan
City of London, ON	Yes	Yes, and being updated with Climate Emergency Action Plan		15% reduction from 1990 levels by 2020, 37% reduction from 1990 levels by 2030, and 80% reduction from 1990 levels by 2050.		No	Continue working in 2020 with the Climate Emergency Action Plan
Township of Huron-Kinloss, ON	No	Expected Summer 2020				No	Coming Soon

City of Beaconsfield, QC	No	Renew 2020					Summer 2020
Baie-Saint-Paul, QC	No	Yes	Yes			No	In beginning stages
Commission de services régionaux Nord-Ouest, , NB	Edmundston Yes, other municipalities no	No	No	No	No	No	Vulnerability assessment nearly complete, Edmunston plan March 2020, res of region in Summer/Fall 2020
Ville de Prévost, QC	Yes	In-progress	Yes	In-progress	In-progress	No	Initiated in Global Plan. To be completed in coming years
Ville de Laval, QC	Yes	Renew 2021					Renew 2021
Town of Oakville, ON	Yes	February 2020	Yes	February 2020	80 per cent below 2014 levels by 2050; 20 per cent below 2014 levels by 2030	Yes	Updating
City of Ottawa	Yes						

Note: Information as provided by the municipality through request.

Appendix B: Status of Proposed short-term adaptation actions for the City of Windsor

Adaptation Action	Cost	Status	Comments	Next Steps
Reducing Risks Associated with Increased Precipitation				
1. Mandatory Downspout Disconnection	2013 - $2,000,000 2014 - $400,000 2015 - $0 2016 - $330,000 2017 - $200,000 2018 - $1,000,000 2019 - $0 2020 - $0 Capital Budget and Flooding Report (CR128/2012) and Capital Budget B22-2015	Progressing	There are currently two mandatory downspout disconnection areas (roughly bound by Tecumseh Rd. E (north), CPR tracks/Grand Marais Road (south), Howard (west) and Norman Rd. (east)). The engineering department has sent out letters to home owners systemically by postal code. Residents can take advantage of the free disconnection program by calling 311 to register. To date, we're able to disconnect an average of 5 – 8 % of homes that register for the disconnection program. Ads were placed in the Summer 2017 Activity Guide to encourage participation in the downspout disconnection program.	Discussions regarding making downspout disconnection mandatory are continuing and recommendations will be forthcoming in the Sewer Master Plan
2. Mandatory Backwater valves	2011 - $500,000 2012 - $250,000 2012 - $500,000* 2013 - $250,000 2014 - $900,000 2014 - $150,000* 2015 - $250,000 2016 - $1,200,000 2017 - $1,200,000 2017 - $3,500,000* 2018 - $420,000 2019 - $540,000 2020+ - $1,000,000	Progressing	Effective January 1, 2012, the Building Department's City-wide enforcement of the Ontario Building Code by mandating backwater valves on all newly constructed single family dwellings, semi-detached dwellings and townhouse dwellings. (M357/2011) The Basement Flooding Protection Subsidy Program was introduced in July of 2011 to encourage retrofits of existing homes. The Program also includes retrofits of sump pits and pumps to existing homes with no pre-existing sump pit or pump. In the fall of	Continue to work with homeowners to encourage them to undertake improvements to mitigate risk of basement flooding. Additional educational resources are to be developed.

	Capital Budget B22-2015 Note: * indicates one time funding		2017, the City of Windsor increased the subsidy from 80% to 100% of the cost incurred up to the maximum amounts already in effect for the works undertaken. The maximum household subsidy of $2,800 remains in effect. The life-to-date subsidy payments total $14,487,505. This total amount is associated with payments to 6,950 subsidy applicants. The City has actively promoted the Basement Flooding Protection Subsidy Program. In the spring of 2017 and 2019, City of Windsor staff manned a booth at the Home & RV show to educate the public on the Program. Backwater valves, sump pumps and educational videos were all on display to assist with informing the public.	
3. Enhance Sewer Maintenance & CCTV Program (camera inspections of sewers)	2014 - $100,000 2015 - $100,000 2016 - $100,000 2017 - $100,000 2018 - $100,000 2019 - $100,000 Capital Budget B22-2015	Progressing	The current funding for CCTV inspections will allow between 10 and 12 kilometers of sewers to be inspected. The results of the CCTV inspections allow City staff to determine where repairs, rehabilitation or replacement is needed. These results are also needed to enhance the asset management plan. Clean Water Waste Water Funding allowed PW to issue a tender to have the inspection of most of the sewer system that has not been reviewed using CCTV using Zoom Camera technology. This will greatly assist with our asset management plan.	The results from the CCTV and Zoom Camera programs will be added to the City's infrastructure database allowing a more detailed assessment of the current conditions. This information is key to having a robust asset management plan.

4. Consideration of additional Off-Line Storage for Stormwater	Under review	The sewer modeling and sewer master plan currently underway will identify areas that may benefit from the addition of off-line storage. Off-line storage may also be part of the solution to deal with extreme rain fall events.	The sewer use master plan will identify areas of concern and will propose various actions that may mitigate the risks. One of these actions may include off-line storage for stormwater.
5. Increase the Use of Flow Restrictors on Catch basins	Progressing	Flow restrictors on catch basins slow the flow of stormwater into the sewer system. The result can be ponding of stormwater on a roadway. Slowing the flow into the sewer can reduce the risk of basement flooding in combined sewer areas. Flow restrictors are often used to control runoff from a parking area and may have limited use on residential streets where temporary flooding of a roadway is preferred over the risk of basement flooding. Catchbasins with goss gully traps were being piloted however, they were found to have operational challenges/constraints. The City of Windsor maintains a map of catchbasin restrictors. The majority of restrictors are currently located on combined sewers in areas prone to basement flooding.	Continue to investigate alternative catchbasin restrictors. Use the sewer use master plan once completed to identify additional areas that may benefit from the installation of catch basin restrictors.
6. Seal Manhole Covers	Progressing	Sealing manhole covers are best completed in low lying areas along sanitary sewers which are impacted by inflow of overland stormwater flows. In response to the risk of overland flooding from the Detroit River and Lake St. Clair in 2019, manhole covers were	The Sewer Master Plan will outline future requirements for Sealing Manholes

			sealed along Riverside Dr. to prevent flow into the City's sanitary sewer system.	
7. Update of the rainfall intensity duration frequency (IDF) Curves	2012 - $50,000 Capital Budget and Flooding Report (CR128/2012)	Completed	The Essex Region Conservation Authority on behalf of the City of Windsor and the municipalities of Essex County worked with researchers to predict a range of future IDF curves under a variety of climate change scenarios. ERCA completed Regional Stormwater guidelines which was adopted by all county municipalities. There is a requirement for undertaking a climate change stress test for developments over a certain size.	As part of the sewer master plan, the sewer network was analyzed for resiliency by running the model with climate change IDF curves. This will allow the City to identify vulnerabilities to the system under the specified climate projections.
8. Initiate flow monitoring of priority sewers	2012 to 2014 - $950,000 2015 - $700,000 (engineering) 2012 - $300,000 (plant) Capital Budget and Flooding Report (CR128/2012)	Completed	Initial flow monitoring is completed. Pollution Control installed some flow monitors permanently to gather data to be used for long term planning; including completion of an infiltration/inflow analysis.	The initial flow monitoring results were used to develop a baseline model of the City's sewer system. The sewer model is being expanded, and additional flow monitoring is being undertaken, for the sewer master plan project. The results from the flow monitoring will also be used to support other adaptation actions listed (i.e. sealing manhole covers, flow restrictors on catch basins, etc.) or recommendations to be made in the sewer master plan. Flow monitoring will also be completed to monitor the effectiveness of the Disaster

				Mitigation and Adaptation Fund projects.
9. Undertake Public Education on Sewer Use, Waste Water Treatment	2011 - $12,000 2012 - $15,000 Environmental Master Plan Operating Budgets	Completed	The main goal of this action is to help ensure that the sewers are operating under their design capacity. Improper use of the sewer system (i.e. disposal of materials not intended in a sewer) can decrease capacity along the sewer by creating blockages or contribute to pump failures at pump stations. Educating residents that toilets are not garbage cans is one way to help reduce these issues in the sewers. In 2011, the City of Windsor partnered with EWSWA to design an EnviroTips 'It's all Connected' to help educate residents that toilets are not garbage cans and the impact of flushing materials in the toilet. In 2012 a video "Wastewater: Where Does It Go?" was developed in collaboration with the Detroit River Canadian Clean-Up. The video educates about the City's sewer system (sanitary, storm and combined) and the wastewater treatment system. The video also tries to encourage individuals to take small actions (like downspout disconnection) to help alleviate flooding issues. The video has over 485,475 views between the City of Windsor and DRCC YouTube channels. The DVD has also been distributed as requested.	Pollution Control is continuously looking for ways to enhance the public's understanding of how the sewer and waste water treatment system works (i.e. additional marketing materials, public open house). The sewer use master plan is also looking at public education and engagement to increase the understanding of how the sewer system works and what actions may be required to enhance the resiliency of the system.

				Open houses have been hosted at both the Lou Romano Water Reclamation Plant (2015) and the Little River Pollution Control Plant (2016). Over 250 individuals toured the facilities. Tours are provided as requested at both wastewater treatment facilities. A toilet on wheels has also been constructed to help educate residents on the issues around 'Flushable' Wipes. This toilet is used at public events such as Earth Day and the Children's Water Festival. In 2016, ERCA also used the toilet in their Earth Day road show. Additional advertising about the hazards of 'Flushable' Wipes have also been developed including ads in the Activity Guide, brochures and signage for public washrooms at City facilities. In 2016, the City of Windsor launched the F.O.G. Cups (Fat, Oil and Grease Cups) to educate to residents proper disposal of F.O.G. The cups have been distributed at various public events and as requested. Cups may also be delivered to areas in the City were fat blockages have been a problem. Environmental Sustainability & Climate Change staff have also developed programs to provide in schools to educate students on wastewater and climate change.
10.	**Targeted Education towards homeowners**	2013 - $200,000 (for smoke testing)	Completed	694 km of sewers have been smoke tested under eleven tenders. These tests have

with suspected cross-connections to sanitary sewer	2015 - $20,000 (replacement of clean-out caps as identified in the smoke testing) Capital Budget and Flooding Report (CR128/2012)		identified more broken clean outs than actual cross-connections. Broken cleanouts allow for infiltration into the sewer. The entire City except combined sewers in the core and over/under sections are completed. Nothing further to be tested at this time. Residents with broken clean-out caps as identified through the smoke testing received new private drain clean-out caps.	
11. Use Social Media and other Communication tools to warn public of Risk of Basement Flooding	In-house	Progressing	YouTube videos have been created to help raise awareness of how to mitigate basement flooding in the City (i.e. Downspout disconnection). Social media should be used to continue the educational awareness of the City's sewer system. In the long run, social media can also be used to notify residents of possible flooding risks and to take immediate action to avoid losses (similar to flooding advisories issued by ERCA). However, in order to provide advisories, there needs to be better understanding of how the system reacts under storm conditions. The current flow monitoring and stormwater master plan will help develop criteria of how to use social media to notify residents of possible adverse effects on the sewer system.	Enhance the use of social media to educate residents on how to mitigate risks of basement flooding.
12. Enhanced Maintenance & Inspection of roads and sidewalks during		Progressing	Due to the freeze thaw cycles over the past few winters, deterioration of the roads has lead to a higher number of potholes. In response and to maintain a level of service	The extreme temperature flux is causing roads and sidewalks to succumb to frost heave and heat stress, shortening the life span of

snow or extreme weather events			additional staffing and budget resources have been required to maintain roads. In addition the City of Windsor has also undertook crack sealing and spray patching to maintain our roads. Sidewalks continue to be inspected on a priority basis every 1 – 4 years.	road and sidewalk pavements. Through the asset management process, a level of service and associated risks will be determined for City Roads and sidewalks. The process will aid the City in determining the appropriate level of maintenance (operating budget) in addition to the capital budget.
Reducing Risks associated with increasing precipitation and temperatures				
13. Development of a Green Roof Policy	In-house	Progressing	The City of Windsor currently has five garden roofs and 2 reflective roofs on City facilities. Current practices for roof replacements include consideration for 'cool' roofs (high albedo).	Develop an internal green roof policy to formalize the actions currently underway by Facilities. Explore opportunities to develop green development standards for new development in Windsor. These standards may include features that build resiliency to climate change as well as reduce energy/greenhouse gas emissions (mitigate Climate Change).
14. Develop pilot projects for the use of Porous Pavement on City properties and develop guidelines for development		Progressing	Low Impact Development (LID) experts from the Credit Valley Conservation Authority and the Toronto Region Conservation Authority were retained to provide on-site training to City Staff. The training included the benefits of LID (including porous pavement and other technologies), design, inspection and maintenance.	Tranby Park is under construction including the incorporation of porous pavement. Completion scheduled for end of May 2020. It is recommended that a monitoring program be put in place to assess the effectiveness of porous pavement.

15. Installation of Rain Gardens as a pilot project to determine effectiveness	2014 - $5,000 Environmental Master Plan Operating Budget	Completed	In the Fall of 2014, a demonstration raingarden was constructed at Ojibway Nature Centre. In the summer of 2017, a raingarden and infiltration trench were installed at a City owned home on Pierre. Both of these features have dedicated monitoring equipment installed to monitor the infiltration of rainwater into the surrounding soil. These demonstration sites can be used as an educational tool encouraging people to include raingardens in their landscaping to reduce runoff from private properties.	Continue to monitor the effectiveness of these sites. Find additional locations to further test the ability for local soils to infiltrate stormwater.
16. Improvement and Enhancement of Green Space to improve rain water retention		Progressing	Natural heritage and open space systems present opportunities to enhance and integrate stormwater management facilities. Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evaportranspiration. In addition, tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil. The presence of trees also helps to slow down and temporarily store runoff, which further promotes infiltration, and decreases flooding and erosion downstream.	The Parks Master Plan approved in 2016 listed several recommendations that support the improvement and enhancement of Green Space to improve rain water retention. The following is a list of the recommendation numbers as provided in the Parks Master Plan; 4.01, 4.02, 4.03, 4.04, 4.07, 4.09, 4.11 Tranby Park is being redeveloped under the Disaster Mitigation and Adaptation Fund and site design has considered the use of bio-swales, dry pond and porous pavement.

17. Increase Tree Planting	Progressing	In 2014, a report titled 'Designing City of Windsor Parks to improve Thermal Comfort in Summer' was completed. A portion of this study reviewed the current canopy (shade) coverage in City parks. In previous years, steps have been taken to increase the survival rate of City trees. For example, the introduction of tree root systems to give trees in commercial areas a better chance of surviving the stresses related to road salts, significant amounts of impermeable surfaces, and heat as a result of adjacent concrete and asphalt surfaces. In addition, Forestry has introduced the use of water gators for all newly planted trees to help with survival. During the public consultation process for the Parks Master Plan, groups identified the need for shade. Health factors related to climate change and the adverse effects of excessive UV exposure are the driving forces behind this growing concern.	The Parks Master Plan approved in 2016 listed recommendations (3.05 and 4.08) that support the increase of tree plantings. In 2020, the City Forestry division will be finalizing a tree inventory and canopy cover assessment. Following its completion, an Urban Forestry Management Plan will be undertaken. The Urban Forestry Management Plan will serve as a 20-year strategic document guiding urban forestry priorities. At this time a long list of recommendations will be considered ranging from canopy coverage, strategic planting initiatives and heritage tree protection.
Reducing Risks associated with increasing temperatures			
18. Increase Capital for Shade Structures	Completed	In recent years, Parks Development has added additional shade structures to City Parks. The following shade structures have been added to City parks since 2013.	Through the Parks Master Plan consultation phase, one of the main concerns for seniors and people with disabilities was the need for more trees or shelters for shade.

			2013 - Captain John Wilson park. 2015 - Mic Mac, Optimist, Wigle and Ford Test Track. 2016 – Jackson Park (west side) 2016 – Rotary Centennial Plaza 2019 – Bruce Ave Park, South Windsor Recreation Complex Shaded Seating – Kishkon Community Park, Realtor Neighbourhood Park, Rotary Centennial Park During the summer months, it is often observed that a significant amount of park users are taking advantage of this built shade.	All regional parks shall provide the same base amenities including shade structures. Shade structures however are not limited to regional parks and should be considered during Parks redevelopment when possible.
19. Increase in Heat Education at Community Centres and Pools	2011-2014 $22,000 (Completed through grant funding received from Health Canada)	Completed	The Stay Cool Windsor Campaign developed in partnership with the Windsor Essex County Health Unit and Health Canada launched in 2011. The campaign continues to focus on heat health education messages and each year expands it reach. Public education brochures are distributed to the City community centres and Ontario Early Years Centres. In 2013, signage was also developed to be used at all local outdoor pools.	Continue to work with the Essex County Health Unit to build on current successes of the education campaign and expand the campaign to address vulnerable populations not already reached.
20. Complete an Urban Heat Island Study	2012 - $12,000 (Completed through grant funding received from Health Canada)	Completed	In 2012, 'The Urban Heat Island Effect in Windsor, ON: An Assessment of Vulnerability and Mitigation Strategies' was completed with several recommendations. This report looked at the Urban Heat Island over the full City. A second report finalized in 2013 looked at the urban heat islands or micro-	Recommendations from the downtown urban heat island study shall be incorporated into other planning policies including the Official Plan and the Environmental Assessments underway for University Avenue.

			climates created in our parks. This report entitled 'Improving Thermal Comfort in Windsor, ON: Assessing Urban Parks and Playgrounds' analyzed the thermal comfort in six different City Parks and include taking actual temperature measurements of various parks features. A follow-up study was completed in 2015 titled "Designing City of Windsor Parks to Improve Thermal Comfort in Summer". Recommendations from these studies have been incorporated in the Parks Master Plan. In 2016, a further study was completed with a focus on the downtown. The Downtown Windsor Heat Island Study has been conducted as a complementary study to assess the thermal comfort in public outdoor spaces in downtown Windsor. This report analyses the results of the Downtown Windsor Heat Island Study in order to provide policy and design recommendations to help reduce the urban heat island effect and improve thermal comfort in public outdoor spaces. These recommendations will help ensure that the downtown remains a comfortable and desirable place to work, visit and live.	
General				
21. Develop Clear Policies for Weather Response	In-house	Progressing	In 2011, the City of Windsor in partnership with the Essex County Health Unit launched the Stay Cool Windsor Essex Campaign. The educational component to the Heat Alert and Response Plan (HARP).	The City of Windsor will continue to work with the Health Unit to enhance the HARP as more evidence of extreme heat impacts on health are realized.

		The Essex County Health Unit has also launched an Extreme Cold Weather plan.	Investigate gaps in emergency response planning under climate change scenarios.
22. Creation of an Extreme Weather Fund Reserve	Under review	The City of Windsor had unplanned expenses exceeding $2.5 million since in response to severe weather events.. These expenses were financed through surplus operating funds or through deficits.	In lieu of an extreme weather fund reserve, a corporate policy/procedure may be developed to provide guidance to areas impacted by extreme weather events.

Appendix C: Review of long-term planning documents for climate change considerations

Plan	Climate Change Reference	Climate Change Adaptation	Climate Change Mitigation	Energy Conservation/ Management
Official Plan (2013)	✓	✓	✓	✓
Official Plan – Chapter 3 (Development Strategy)				✓
Official Plan – Chapter 4 (Healthy Community)	✓	✓		
Official Plan – Chapter 5 (Environment)				✓
Official Plan – Chapter 6 (Land Use)				
Official Plan – Chapter 7 (Infrastructure)				
Official Plan – Chapter 8 (Urban Design)				✓
Official Plan – Chapter 9 (Heritage Conservation)				
Rediscover our Parks: Parks & Outdoor Recreation Master Plan (2015 - 2035)	✓	✓	✓	
Greening The Fleet (2012)	✓		✓	✓
Walk Wheel Windsor - Active Transportation Master Plan (2019)	✓		✓	✓
Environment Master Plan (2017)	✓	✓	✓	✓
Asset Management Plan (2018-2019)	✓	✓	✓	✓
Central Riverfront Implementation Plan (2000)			✓	✓
Municipal Culture Master Plan (2010)	N/A			
Recreational Master Plan (not completed)	N/A			
Community Improvement Plans				✓
Corporate Energy Management Plan (2014-2018)			✓	✓
Sewer Master Plan (2019)	✓	✓	✓	
Transit Windsor Action Plan	✓			✓
Downtown Windsor Transportation Master Plan (2008)	N/A			
Age Friendly Windsor Action Plan (2014-2017)			✓	
Economic Revitalization Community Improvement Plan (2011)				✓
Urban Structure Plan (2012)	N/A			
City Centre West Community Improvement Plan (2006)				✓

Brownfield Redevelopment Community Improvement Plan (2010)		✓	✓	✓
Downtown Windsor Enhancement Strategy and Community Improvement Plan (2017)		✓	✓	✓
Olde Sandwich Town Community Improvement Plan (2012)		✓	✓	✓
Ford City Community Improvement Plan (2018)	✓	✓		✓
Building Façade Improvement Program for Main Streets CIP (2018)		✓		
Windsor's Community Strategic Plan (2006)				✓
2015 Downtown Transportation Strategy		✓		

THE CITY OF WINDSOR
ONTARIO, CANADA

Date: March 9, 2019

To: Mayor and Members of Council

From: Kyle Bassett, Community Energy Plan Administrator, Pollution Control

RE: **Acceleration of Climate Change Actions in response to the Climate Change Emergency Declaration (518/2020) - Corporate Greenhouse Gas Emissions**

In follow-up to a question received at the February 19, 2020 Environmental, Transportation and Public Safety Standing Committee, the total greenhouse gas emissions from operations of the Corporation of the City of Windsor in 2018 was 32,345 Tonnes C02e. This represented an eight percent decrease in emissions over the 2014 baseline inventory (Table 1). Corporate emissions represent 1.6% of total Community emissions.

Table 1 - Emissions and Energy for Corporation of City of Windsor

Corporate Emissions	CEP Baseline 2014	2018	% Change to Baseline
Total Emission (C02e)	35,230	32,345	-8.19
Total Energy (GJ)	812,826	766,835	-5.66

Considering the specific sources of the Corporations emissions, emissions from buildings represent the largest proportion, followed by vehicle emissions (Corporate Fleet). The data from 2018 shows that all sources of corporate emissions dropped except for building emissions, which increased six percent. The drastic reduction in streetlight emissions is due to the replacement of all the streetlights with LED bulbs, which took place between 2015 and 2016. Data for the emissions from each source are shown in Table 2 below. Figure 2 depicts a pie graph of the distribution of total emissions to the four source areas.

Table 2 - Emissions per Source for Corporation of City of Windsor.

	Emissions (TC02e)		% Change to Baseline
	2014	2018	
Building	17,053	18,016	6%
Vehicle	12,247	11,528	-6%
Streetlights	1,484	308	-79%
Water/Wastewater	3,752	2,493	-34%

*Note: total emissions for 2014 vary slightly from Table 1 to Table 2 due to calculation methodology used for 2014 CEP baseline calculation.

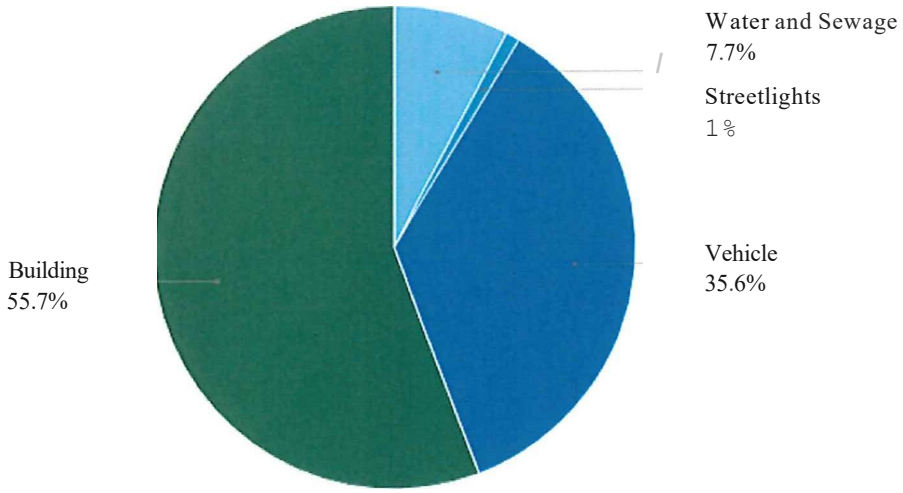

Figure 2 - Pie graph showing contributions of each emissions source on total Corporate emissions (2018)

On October 7, 2019, City Council received the Community and Corporate Greenhouse Gas Emissions and Energy Monitoring Report - 2018 (S164/2019) which provided a detailed analysis on Corporate and Community emission.

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I\anna Richters
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Jake Renaud
Senior Manager, Pollution Control

City Engineer

Chief Administrative Officer