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# The Regional Municipality of Durham Report

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To: Finance and Administration Committee  
From: Chief Administrative Officer  
Report: #2021-A-3  
Date: March 9, 2021

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**Subject:**

2021 Climate Change Update and Corporate Climate Action Plan

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**Recommendation:**

That the Finance and Administration Committee recommends to Regional Council that it:

- A) Approve new short, medium, and long-term targets to reduce corporate greenhouse gas (GHG) emissions, namely:
- 20 per cent GHG emissions reduction by 2025, below 2019 levels,
  - 40 per cent GHG emissions reduction by 2030, below 2019 levels,
  - 100 per cent GHG emissions reduction by 2045, below 2019 levels.
- B) Approve the Durham Region Corporate Climate Action Plan which identifies how climate change considerations will be embedded across all elements of Regional business, included as Attachment #1, and as outlined in this report;
- C) Endorse 2025, 2030 and 2050 community GHG emissions targets, as outlined in this report;
- 10 per cent GHG emissions reduction by 2025, below 2019 levels,
  - 30 per cent GHG emissions reduction by 2030, below 2019 levels,
  - 100 per cent GHG emissions reduction by 2050, below 2019 levels.
- D) That a copy of this report and the Durham Region Corporate Climate Action Plan be sent to local area municipalities, the Ministry of Environment, Conservation and Parks, the Ministry of Energy Northern Development and Mines, Infrastructure Canada, Environment and Climate Change Canada, the Federation of Canadian Municipalities, and the Association of Municipalities of Ontario (AMO).

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**Report:****1. Purpose**

- 1.1 This report presents the Corporate Climate Action Plan (the Plan) for consideration and adoption. The Plan responds to Regional Council's declaration of a climate emergency in January 2020 and provides the framework required for Durham Region to reduce GHG emissions associated with Regional corporate operations.
- 1.2 The report includes:
- a. Updates for Regional Council on the results of the 2019 corporate GHG inventory, and progress in implementing the Region's corporate climate change initiatives since the 2018-2019 Climate Change Update Report to Council (Report #2019-A-34);
  - b. Recommended new short, medium, and long-term GHG emissions reduction targets for the Region of Durham's corporate operations;
  - c. A proposed Corporate Climate Action Plan, which identifies how climate change considerations will be embedded across all elements of Regional business;
  - d. Updates for Regional Council on the results of the 2018 community GHG inventory, and progress in implementing the Region's community climate change initiatives since the 2018-2019 Climate Change Update Report to Council; and
  - e. Recommended updates to short, medium, and long-term community GHG emissions reduction targets for the Region of Durham.

**2. Background**

- 2.1 Climate change is an unprecedented global social, economic, and environmental challenge. It poses a serious threat to quality of life, jobs and the physical and natural assets upon which Durham Region residents depend. There is broad scientific consensus that human induced GHG emissions in our atmosphere are on track to surpass critical thresholds and pose a significant risk to human well-being. If GHG emissions are not reduced soon, communities around the world are expected to be impacted by more floods, windstorms, heat waves, and wildfires which will erode social systems, impact natural resources, damage communities and ecosystems, and limit our ability to respond and recover.
- 2.2 Analysis conducted in 2019 as part of Durham's Future Climate Study indicates that Durham Region will not be immune to these climate impacts. Temperatures in Durham Region have already increased between 1 to 2°C since the middle of the

20th century and, under a “business as usual” trajectory, the warming trend is projected to continue. By the 2050’s, average annual temperatures are projected to rise by an estimated 3°C in Durham Region over mid-20th century levels, leading to a dramatic increase in extreme heat and precipitation events which will exacerbate existing health risks for vulnerable residents. Without mitigation measures, these conditions may disrupt critical infrastructure systems leading to economic impacts. Expected economic and environmental impacts underscore the urgency to address GHG emissions in Durham Region as part of the collective global effort to address the climate crisis.

- 2.3 Although current climate trends are alarming, there is great economic opportunity in advancing expeditiously towards a low-carbon future, including job creation, cost savings, air quality improvements, and more comfortable and durable buildings and infrastructure. Modelling conducted as part of the Durham Community Energy Plan’s low carbon pathway to 2050 indicated upwards of \$20 billion in cumulative energy cost savings from reduced energy consumption, and 210,000 direct person years of employment generated as a result of low carbon investments.<sup>1</sup>

### **3. Previous Reports and Decisions**

- 3.1 Regional Council declared a climate emergency in January 2020 for the purposes of naming, framing, and deepening our commitment to protecting our economy, our ecosystems, and our communities from climate change. This declaration was a key decision point in more than a decade of Regional Council decisions supporting the need to focus on climate action as a critical priority guiding Regional policy, investment, and operations.
- 3.2 In 2009, Regional Council:
- a. Unanimously adopted the position that: “Scientific evidence overwhelmingly supports the conclusion that human activities are fundamentally altering the conditions for life on earth. Climate change and associated global warming is recognized as a severe threat to global systems with the potential for catastrophic outcomes” (Report #2009-J-37); and,
  - b. Directed that corporate climate change initiatives be integrated into the Region’s Businesses Planning and Budgets, Asset Management, and Risk Management programs, processes, and reporting requirements.
- 3.3 In 2010, Regional Council adopted community GHG emission reduction targets consistent with the Intergovernmental Panel on Climate Change (IPCC) consensus on levels of decarbonization necessary to limit global warming to below 2°C and prevent catastrophic climate change (Report #2010-J-24):

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<sup>1</sup> Durham Region (2019). *Durham Community Energy Plan*. Page 3. Available online: <https://www.durham.ca/en/citystudio/resources/Durham-Community-Energy-Plan-Part-1.pdf>

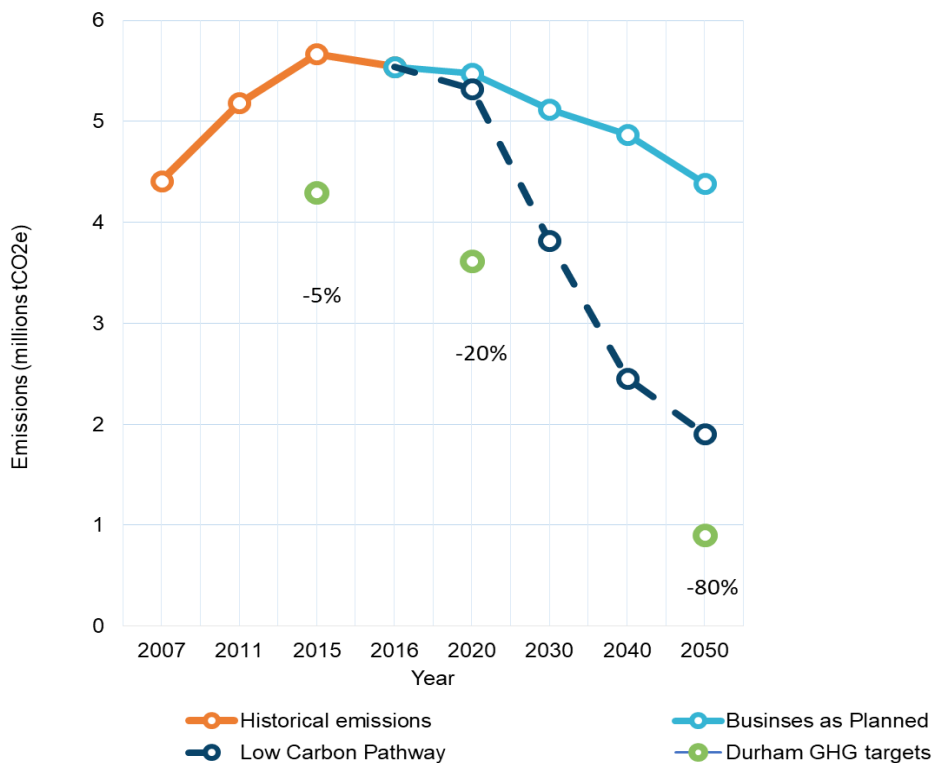
- 5 per cent below 2007 levels by 2015,
- 20 per cent below 2007 levels by 2020,
- 80 per cent below 2007 levels by 2050.

3.4 In 2011, Regional Council approved both the implementation of annual Climate Change Update reporting and a corporate climate change operational protocol to ensure a robust, repeatable, consistent, and verifiable corporate carbon footprint (2007 baseline) and the ongoing monitoring of climate change and the carbon implications of Regional programs, plans, and initiatives (Report #2011-J-26).

3.5 In 2012, Regional Council endorsed the Durham Community Climate Change Local Action Plan (LAP) (Report #2012-J-32) which established a long-term vision of “Durham Region is a carbon-neutral, sustainable, prosperous and resilient community with a high quality of life” and a mission to “work with our community to develop and advocate innovative policies, strategies and actions that address the threat of climate change.”

3.6 Implementation of programs outlined in the LAP was limited, as evidenced by Figure 1 showing the trend of community wide GHG emissions to 2016 against the targets adopted by Regional-Council in 2010 (shown as green dots).

**Figure 1 - Durham Community-wide GHG emissions (Historical & Future Projections)**



- 3.7 In 2014, Regional Council approved the Region's first Climate Five-year Adaptation Plan, subsequently updated through the Business Planning Cycle, including Asset Management Planning (Report #2014-J-1).
- 3.8 In 2016, Regional Council approved the Durham Community Climate Adaptation Plan which included 18 proposed programs across seven theme areas to address resilience to climate impacts (Report #2016-COW-103).
- 3.9 In 2019, Regional Council approved:
  - a. the Durham Community Energy Plan, which included a modelled Low Carbon Pathway based on the implementation of six priority programs (Report #2019-A-19). These two plans replaced the 2012 LAP as the guiding documents for community climate action in Durham Region, and;
  - b. the Region's Asset Management Policy, which commits to consideration of climate adaptation and mitigation as a key aspect of Asset Management Planning (Report #2019-COW-16).
- 3.10 In February 2020 Council directed staff to develop a Low Carbon Fleet Strategy, (Notice of Motion 9.1) as part of the Corporate Climate Action Plan.
- 3.11 In June 2020 Regional Council approved an investment plan for the \$5 million Climate Mitigation and Environmental Initiatives reserve fund, (Report #2020-A-14), as well as a proposed conceptual program design for the Durham Home Energy Savings Program (D-HESP) (Report #2020-A-12).

#### **4. Corporate Energy and Emissions Update**

- 4.1 Durham Region has taken concrete steps to reduce corporate GHG emissions since the last Climate Change Update Report was presented to Council in November 2019. Key initiatives of note include:
  - a. Investment in electric buses – As part of an electric bus pilot project Durham Region Transition (DRT) is developing specifications for battery electric buses and charging infrastructure, together with key project components such as training, re-tooling, software, and performance monitoring, all of which are essential steps to support the procurement of the vehicles in 2021 and to prepare for their launch in 2022. DRT staff plan to complete a full electric vehicle feasibility study in 2021 that addresses the facility infrastructure requirements, operating and financial impacts to transition to a fully electric vehicle fleet, including a multi-year vehicle acquisition plan.
  - b. Durham Regional Police Service – Successfully piloted hybrid pursuit vehicles in 2019 and have been procuring hybrid vehicles every year since.
  - c. Electric vehicle (EV) charging infrastructure – As part of a collaborative funding application with Whitby, Clarington, Ajax and Oshawa PUC Networks, the Region has been conditionally approved for \$160,000 in funding from

Natural Resources Canada (NRCan) for the installation of 32 Level 2 EV charging stations across 9 Regional facilities. Installation is expected to be complete by the end of 2021, enabling charging of electric vehicles in public spaces and community based GHG emissions reductions.<sup>2</sup> These new EV charging stations are in addition to the six EV chargers previously installed at Headquarters and one at DRT East.

- d. Blackstock landfill mining pilot project - Mining at the Blackstock landfill was completed in January 2019, with final restoration including grading, planting and habitat creation completed in fall 2020. A total of approximately 30,000 metres cubed of waste was removed from the site (Report #2020-INFO-9). With the removal of waste from the site, the landfill GHG emissions from 2020 onward are now assumed to be zero.
- e. Facilities retrofits – 155 King St, Oshawa (DRLHC Seniors Building) – A comprehensive building envelope upgrade combined with low carbon mechanical systems is projected to reduce electricity consumption by 62 per cent. The retrofit is projected to reduce natural gas consumption by 80 per cent, resulting in GHG emissions reductions of 137 tonnes of CO<sub>2</sub>e per year.
- f. New facilities – Works Department’s Design Construction and Asset Management (DCAM) Group completed preliminary low carbon designs on four new facilities that are planned to be delivered over the coming years:
  - Beaverton supportive housing project – this new facility is being planned to operate without fossil fuels which would be the first of its kind in the Regional portfolio. A high-performance envelope combined with high efficiency heating and cooling equipment and other interventions mean that this building is projected to operate at close to 20 per cent above Ontario Building Code (OBC) energy requirements. Staff are exploring opportunities for a rooftop solar PV system at the site which would produce close to 20 per cent of annual building energy needs.
  - Region of Durham Paramedic Services Station and Training Facility in Seaton – this facility is being designed with a geothermal heating and cooling system, as well as efficient ventilation, lighting and above-OBC levels of insulation. It is projected that the building’s energy consumption will be reduced by 36 per cent and GHG emissions by 71 per cent as compared to a similar building built to the OBC energy requirements. Staff are exploring the potential for rooftop solar PV generation which would further reduce energy demand and GHG emissions.
  - Clarington Police Complex (CPC) Phase 2 (two buildings) - CPC Phase 2 is being designed with a highly efficient building envelope, low carbon

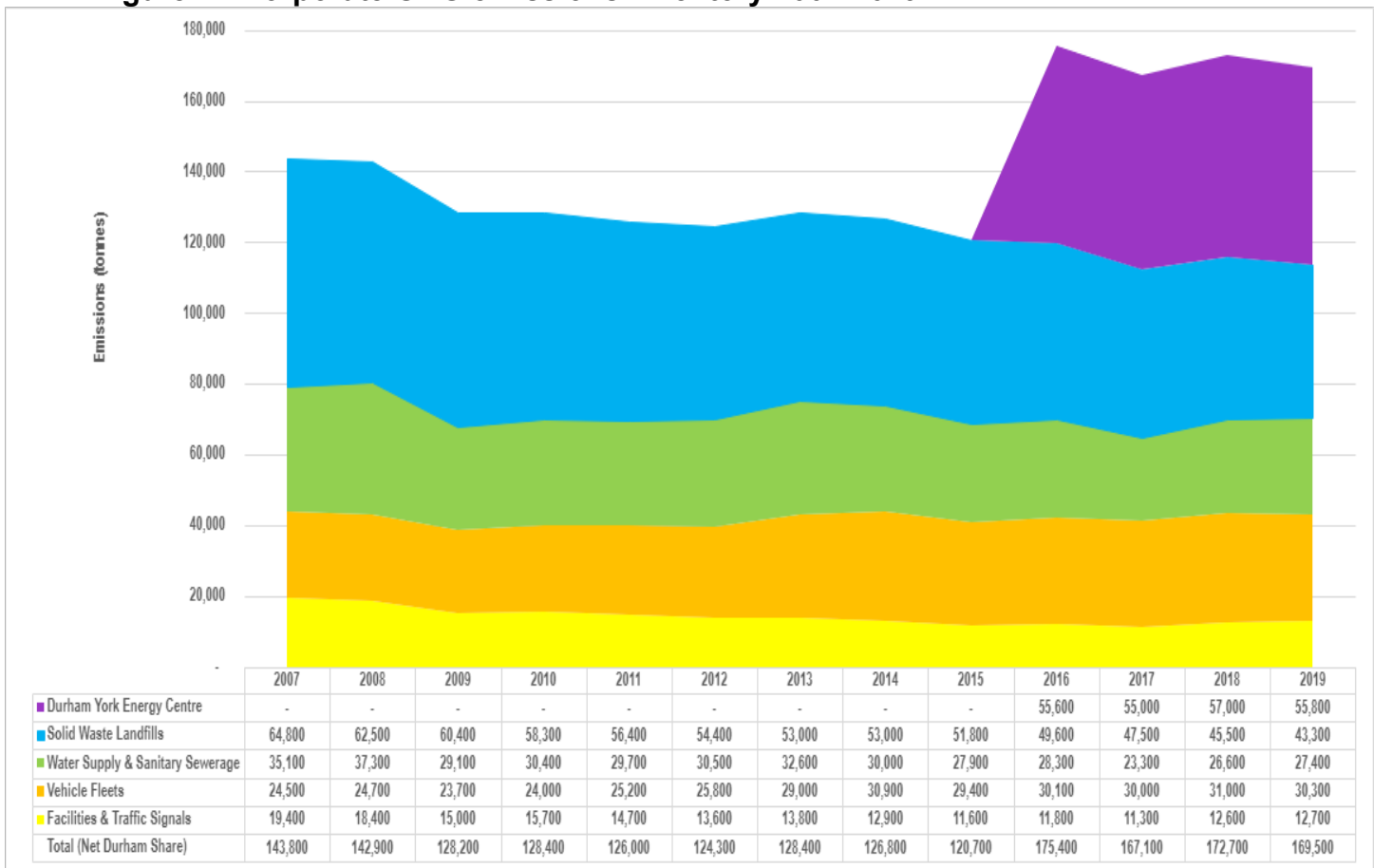
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<sup>2</sup> Total NRCan funding under the contribution agreement is \$296,408 for 60 EV charging stations across all co-applicant locations.

heating and cooling systems (including geothermal) and rooftop solar PV electricity generation. At a minimum, the design-based case specifications are required to meet OBC; however, design components were improved where possible. It is projected that these buildings will reduce energy consumption by approximately 35 per cent, GHG emissions by 70-80 per cent and energy costs by 55 per cent as compared to OBC minimum required performance.

- 4.2 Many of these investments are supported by capital funding available through the Region’s Climate Mitigation and Environmental Initiatives Reserve Fund, as well as leveraged funding from senior government sources, as outlined in Attachment #2 and #3.
- 4.3 An update of the Corporate GHG Inventory is provided in Figure 2. This graph provides historical corporate GHG emissions grouped by sector, noting the tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) for 2007 to 2019. The preliminary 2019 data will serve as the baseline for evaluating future progress towards proposed corporate GHG emissions targets.

**Figure 2 - Corporate GHG emissions inventory 2007-2019**



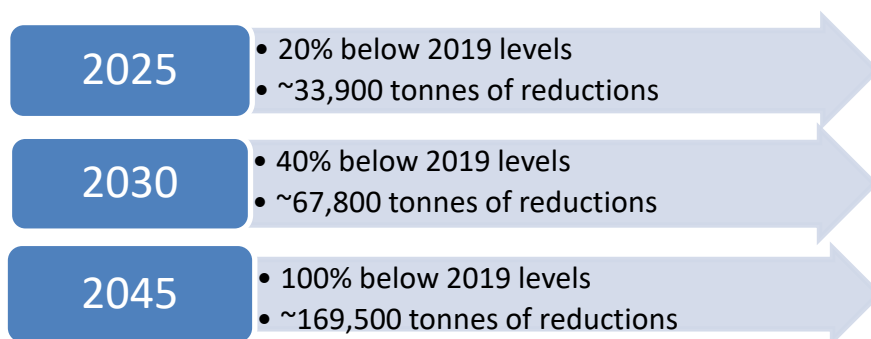
- 4.4 Overall, the corporation has made substantial progress with GHG reductions in key areas. From 2007 to 2015, the Region decreased GHG corporate emissions by 25,600 tCO<sub>2</sub>e or 15.9 per cent, due to energy and fossil fuel avoidance as well as the provincial phase out of coal-powered plants in 2013-2014, which reduced corporate-wide electricity-related emission intensity.
- 4.5 With Durham York Energy Centre (DYEC) operations beginning in 2016, net corporate GHG emissions rose by 53,700 tCO<sub>2</sub>e. However, it is critical to note that DYEC operations largely eliminated long-haul waste trucking to and disposal in distant landfill sites outside of the Region. The related emissions avoidance and reductions are not reflected in the corporate GHG inventory due to the chosen calculation methodology, including contracted third-party fleet and landfill emissions for managing Region-generated waste are not included in the Region's corporate GHG footprint. Further, landfills are not required to calculate and report on GHG emissions under the Ontario GHG reporting program. A lifecycle analysis completed by the Region estimates a net GHG reduction benefit associated with DYEC as compared to the landfill disposal alternative (see Attachment #4). Nonetheless, waste management operations present a long-term challenge for corporate decarbonization that will require innovative solutions.

## **5. Recommended Corporate GHG reduction targets**

- 5.1 As part of Council's climate emergency declaration, staff were directed to establish recommended short-term, medium-term, and long-term GHG reduction targets for the Regional corporation that position Durham Region as a leader in the effort to reduce GHG emissions.
- 5.2 While emissions from Regional operations are a small percentage of overall GHG emissions in Durham Region (estimated at approximately three per cent of total), Regional capital investment and service provision plays a critical role in influencing community wide GHG emissions. Leading by example is necessary to set the pace, spur innovation, and catalyze community action. The Plan includes a long-term corporate target to achieve net zero emissions reductions by 2045. This target aligns with the federal government target as well as leading public and private sector organizations.
- 5.3 Figure 3 identifies the short- and medium-term targets that the Region would need to meet to stay on a trajectory to achieve the net zero by 2045 target. Numerical values are subject to change over time.



**Figure 3 - Durham Region Corporate GHG emissions reduction targets**



5.4 In support of this recommended reduction pathway, Regional staff have identified and are investigating potential short-term GHG emissions reduction opportunities to support achievement of the proposed 2025 target as outlined in Figure 4.

**Figure 4 - Potential Short-term Corporate GHG Reduction Priorities to 2025**

<b>Operating Area</b>	<b>GHG Reduction Initiative(s)</b>	<b>Potential GHG reduction impact by 2025</b>
Solid Waste	Internal utilization of renewable natural gas generation from anaerobic digestion and other Regional processes (e.g. sanitary sewerage)	0-7,500 tCO <sub>2</sub> e
Solid Waste	Landfill biocover pilot	12,000 tCO <sub>2</sub> e
Facilities	Deep energy retrofits of existing DRLHC buildings in corporate portfolio (155 King St., Oshawa, 850 Green St. Whitby, 655 Harwood Ave., Ajax, 315 Colborne St., Whitby, and 1910 Faylee Cres., Pickering)	1,000-2,000 tCO <sub>2</sub> e
Fleet – Four Fleet Groups including Paramedics, Police, Transit, and Works	Pursue battery electric and hybrid electric vehicles for all corporate-owned fleets, where operationally feasible. With an estimated baseline of approximately 28,500 tCO <sub>2</sub> e in 2019, this target represents a 7% to 14% GHG reduction by 2025.	2,000-4,000 tCO <sub>2</sub> e
<b>Total</b>		<b>15,000– 25,500 tCO<sub>2</sub>e</b>
<b>GHG emissions reduction target</b>		<b>33,900 tCO<sub>2</sub>e</b>
<b>% of target</b>		<b>44% to 75%</b>

5.5 Assuming successful implementation of these potential opportunities, the Region will have achieved between 44 to 75 per cent of its 2025 target. The above initiatives as well as additional GHG emissions reduction opportunities will be identified through subsequent asset level decarbonization studies and be coordinated as part of the Annual Business Planning and Budget Cycle and Asset Management Plan and be subject to approval as part of the annual Business Plans and Budgets.

## **6. Corporate Climate Action Plan**

6.1 The Corporate Climate Action Plan proposes a comprehensive approach to reducing GHG emissions from the Region's corporate operations.

6.2 As identified by the IPCC, significant action and investment are required in the next 10 years. The next five years are critical to putting Durham Region on the path to meet GHG emissions reduction targets. The Plan identifies a total of five priority actions for the next five years (2021-2025) that can be embedded into Regional operations:

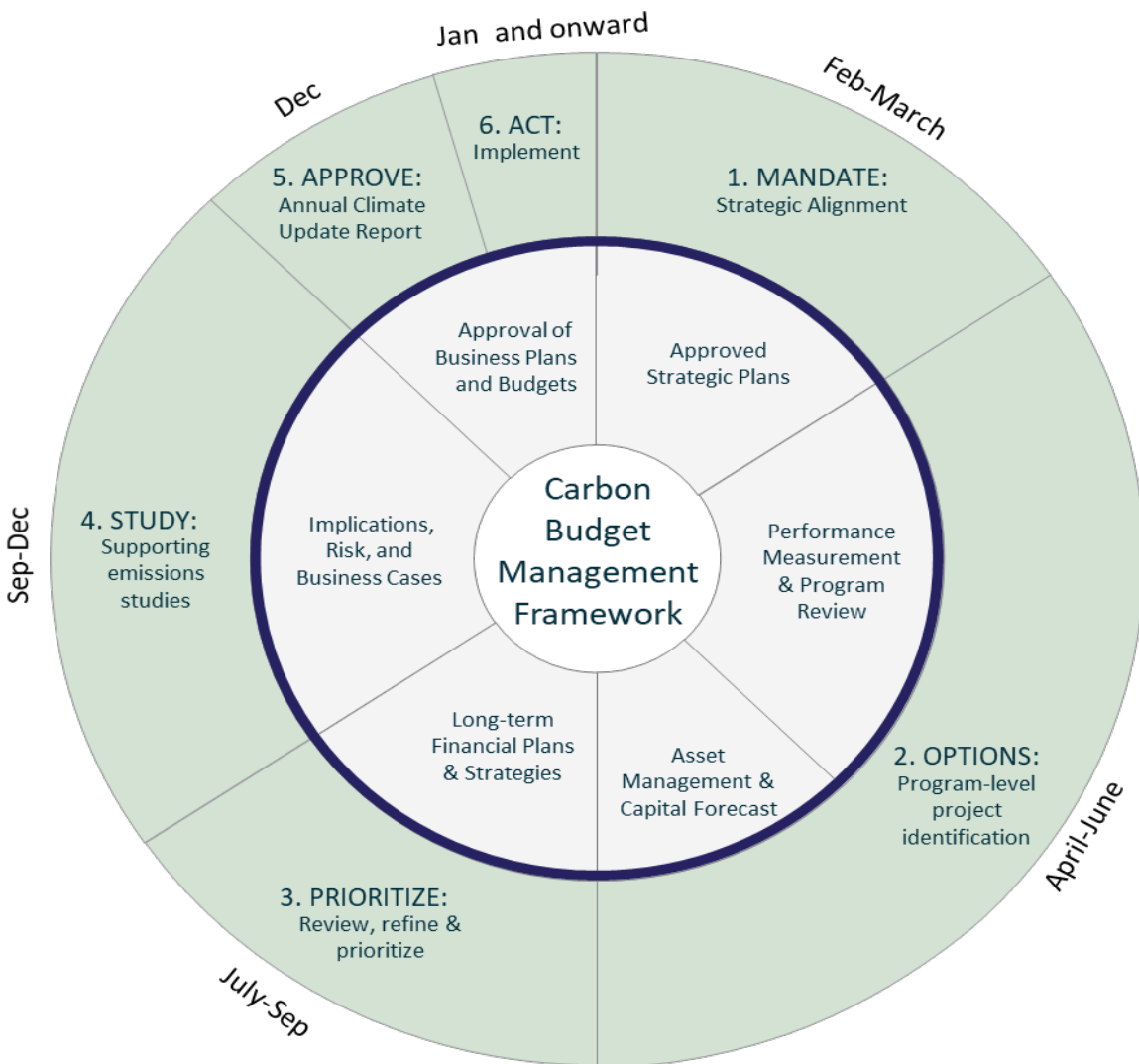
- a. Establish a carbon budget management framework that formalizes climate lens in capital investment planning and forecasting, and robust annual monitoring and reporting of progress against Council-approved targets.
- b. Implement a strategic governance framework to further build corporate capacity, align priorities, and share accountability in meeting the Region's targets.
- c. Continue to improve asset portfolio standards and policies in facilities and fleet to support systemic decarbonization; pursue viable pacesetter pilot projects across corporate GHG sectors to close the gap to near and mid-term corporate GHG targets (see Figure 4 above for examples).
- d. Continue to leverage senior government funding and consider innovative financing and risk management approaches as part of a corporate climate financing strategy, once related five-year operational and 10-year capital and operational plans are developed, assessed, and costed. Attachment #3 provides an overview of recently leveraged funding.
- e. As part of the revitalization of the Durham Strategic Energy Alliance (DSEA), lead the creation of a Corporate Energy Managers community of practice to share successes and lessons learned across Durham-based organizations with a low carbon or net zero mandate. Corporately, Regional staff can learn about local best practices, showcase successes, and potentially collaborate on green technologies.

6.3 The CCAP provides a framework for addressing climate mitigation and GHG reductions. Future iterations of the Plan will also integrate corporate climate

adaptation and resilience as part of a renewal of the Corporate Climate Adaptation Plan.

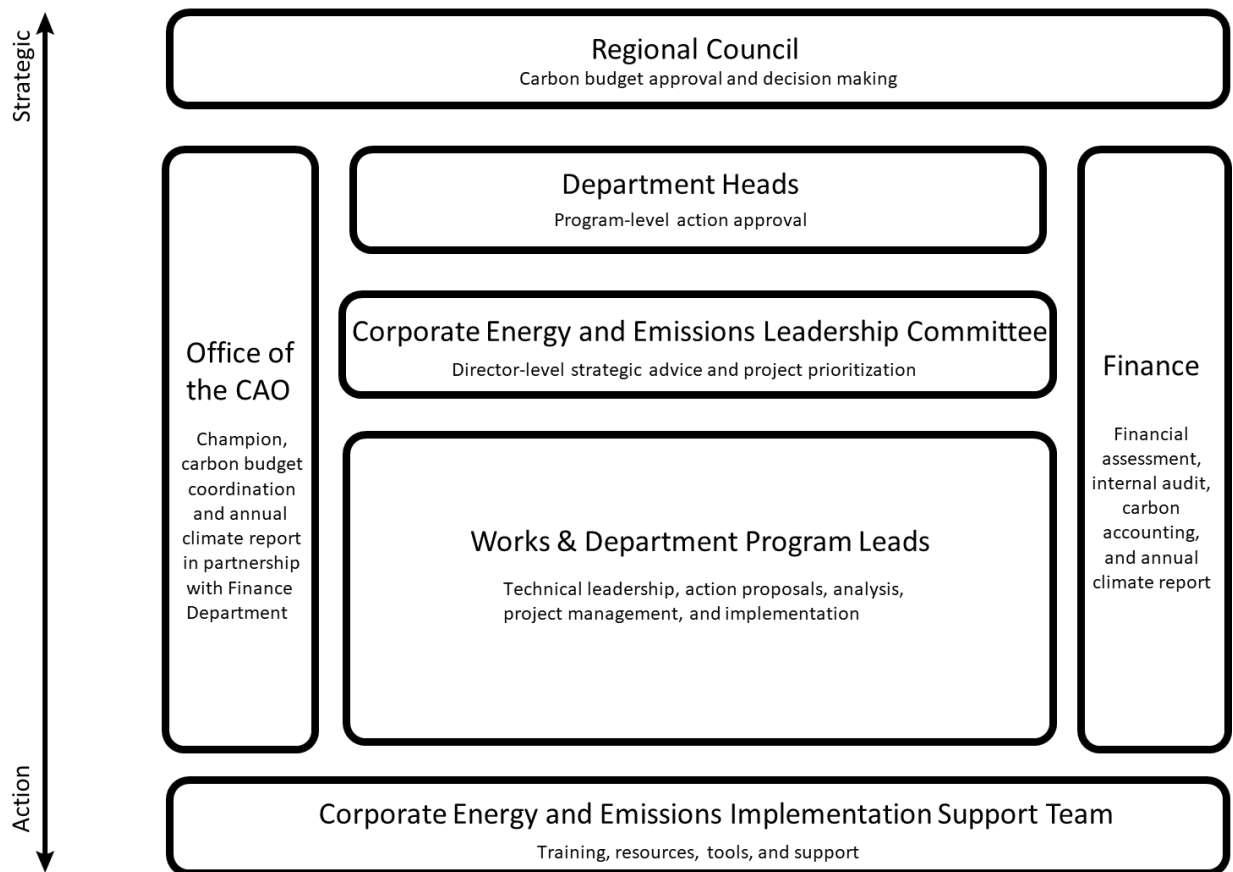
- 6.4 The Plan, provided in Attachment #1, includes the following key procedural elements:
- a. Corporate GHG emissions reduction targets outlined above in Section 0.
  - b. Carbon Budget Management Framework, designed to integrate with the annual business planning and budget cycle, as outlined in Figure 5 below and described in more detail in the attached Plan. While the carbon budget management framework is positioned as an annual process, it is recognized that most projects will likely require multiple years to plan, study, procure, design, and implement and therefore that realized emissions reductions will increase over time.

**Figure 5 - Proposed Durham Carbon Budget Management Framework**



- c. The governance structure of the Carbon Budget Management Framework including roles and responsibilities for Regional staff and Council, is outlined in Figure 6 below. Additional Regional staff resources will likely be required to fully implement the proposed governance structure, including technical expertise in Works department to manage low carbon facilities retrofits and fleet electrification infrastructure integration.

**Figure 6 - Carbon Budget Implementation Governance Structure**



6.5 In addition to these procedural and governance elements, the Plan provides recommendations on the decarbonization pathway for the Region’s fleet and facilities portfolios, including:

- a. Solid Waste – Building on the success of the 2018-2019 Blackstock Landfill mining project (see Section 4.1d) implement innovative landfill bio-cover pilot on the closed Oshawa landfill. Staff will continue to investigate the potential to utilize RNG as part of the Region’s natural gas purchases as a strategy for achieving material GHG emission reductions in Regional facilities. The investigation will consider RNG volumes, enabling framework, regulatory approval, associated agreements, financial implications and will be the subjective of future Council reports. Furthermore, staff will investigate opportunities to influence emissions related to contracted third party emissions associated with waste haulage.

- b. Facility retrofits – Prioritize deep energy retrofits for facilities with major equipment reaching end of life before 2030 and strive to carry out each action. Aligning with a corporate net zero trajectory would require an average of three to four deep energy retrofits of existing facilities per year, starting in late 2022 (with feasibility studies and design work starting in 2021). Noting that not every facility can accommodate deep retrofits due to inherent limitations, each facility will require an investigation and associated design phase prior to implementation. Project management capacity and expertise within the Works Department Design, Construction and Asset Management (DCAM) Group will be expanded to coordinate and deliver portfolio-wide deep retrofits at a pace required to align with the corporate net zero trajectory.
  - c. Facilities new builds – Finalize the Durham Building Standard, which incorporates recent experience with the design of energy efficient new corporate buildings (see Section 4.1f), and provides updated construction standards to align with corporate carbon reduction commitments and Regional Council approvals.
  - d. Fleet – Given an average estimated 10-year fleet vehicle lifespan, achieve substantial emissions reductions to 2025 and 2030 by shifting annual vehicle procurement (both new and replacement) towards low and zero carbon options, with a focus on fleet electrification, where operationally feasible. In direct support of the Region’s climate commitments, Durham Region fleets will adopt low-carbon mobility solutions, deploy supporting infrastructure in facilities including necessary building system upgrades and modernize fleets with a goal of moving towards 75 per cent of annual average unmodified light duty vehicle purchases being zero carbon or hybrid between 2022-2025, and 100 per cent between 2026-2030. For the Region’s medium and heavy-duty fleets, including DRT’s bus fleet, timelines for electrification require further analysis with a focus on understanding necessary facility infrastructure requirements and operating impacts.
  - e. Water Supply and Sanitary Sewerage Infrastructure – In 2021, the Environmental Services Branch within the Works Department will initiate a study to develop climate action strategies for the Regional water supply and sanitary sewerage systems. These strategies, once developed, will provide a more comprehensive roadmap for GHG emissions management.
- 6.6 The Plan provides direction for the development of a Climate Financing Strategy which will position the Plan’s funding needs in the Region’s ten-year capital forecast. It also seeks to mitigate impacts to the tax base and user rates through pursuit of and advocacy for external funding from senior levels of government and other public and private sector sources.
- 6.7 Finally, the Plan provides direction for the development of a Region-wide Corporate Energy Managers community of practice, as part of a broader Durham Strategic Energy Alliance (DSEA), to encourage knowledge sharing and

collaboration with public and private sector organizations in the Region with a shared decarbonization commitment.

## **7. Durham Community Energy Plan Update - Implementation Update**

7.1 Durham Region has taken concrete steps to drive implementation of the Durham Community Energy Plan (DCEP) since the last Climate Change Update report was presented to Council in November 2019. Key initiatives include:

7.2 Durham Home Energy Savings Program D-HESP (Community Deep Retrofit Program)

- a. Durham Community Energy Plan's Low Carbon Pathway called for retrofits of nearly all the residential, commercial, and institutional buildings in the Region between 2020-2050. The Pathway calls for a focus on deep, whole-building retrofits that deliver 40-50 per cent energy savings.
- b. In 2020, staff developed a conceptual program design for D-HESP which relies on partnerships with local energy utilities, lending institutions, and contractors to deliver a one-stop-shop service platform for homeowners, as outlined in [Report #2020-A-12](#).
- c. In July 2020, the Region applied to the Green Municipal Fund (GMF) for support of program start-up and the initial four years of operations to 2025. In January 2021, the Region received a conditional notification of almost \$1.9 million in grant funding for program administration and \$1.5 million in funding for a loan loss reserve fund to support private sector lending by lending institutions. Staff are negotiating a funding agreement with the GMF, and other necessary agreements with local utilities, lending institutions and other partners to enable program launch in 2021.
- d. This program is anticipated to support more than 1,000 home energy retrofits by 2025 and establish the program architecture to enable scale-up to commercial and institutional building sub-sectors over time.

7.3 E-Mission Electric Vehicle Joint Venture

- a. The Durham Community Energy Plan's Low Carbon Pathway called for a joint strategy between the Region, area municipalities, and utilities to support electric vehicle uptake, including coordinated infrastructure investments, educational activities, and municipal policies relating to charging stations and incentives.
- b. Throughout 2020, Regional staff worked with local municipalities and utilities on two successful rounds of funding applications to NRCan's Zero Emissions Vehicle Incentive Program (ZEVIP).
- c. ZEVIP Round 1 funding will support the installation of 60 publicly available charging stations across the Region, 32 of which are on Regional property.

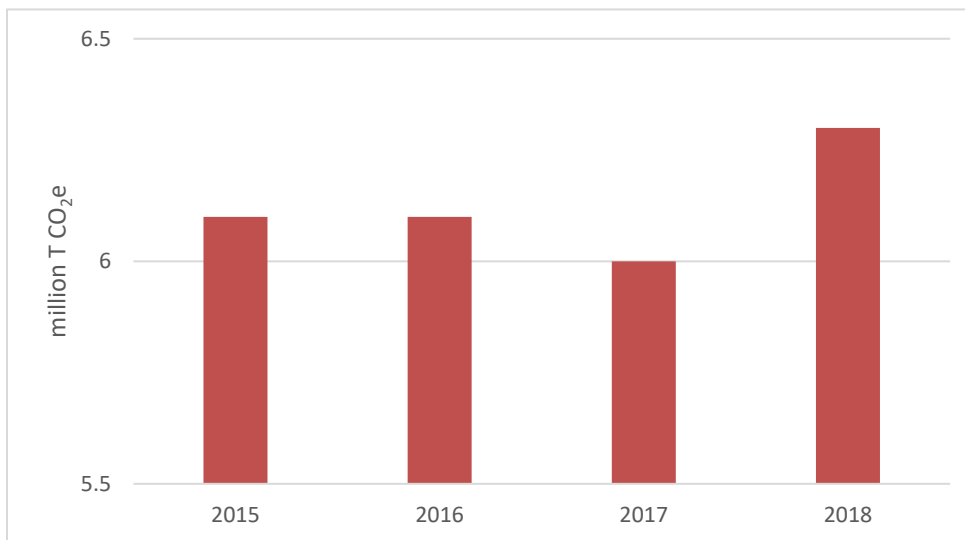
These stations will be installed through 2021 (See Attachment #2 for more details).

- d. ZEVIP Round 3 funding will support the implementation of an education and awareness campaign in collaboration with Oshawa Power and Utilities Corporation (OPUC) and Elexicon Energy. The campaign will include a branded web platform, mobile EV test drive events, and partnerships with local auto dealers to mobilize awareness of EV options for residents.

## 8. Community GHG Inventory Update

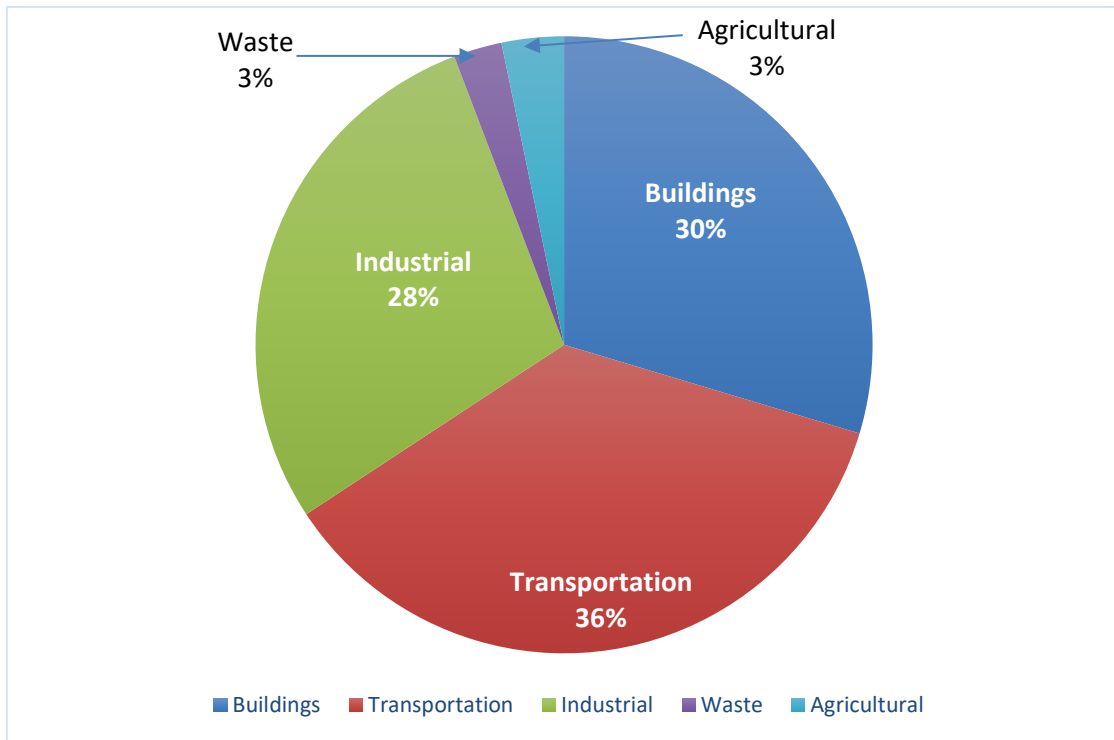
- 8.1 The Atmospheric Fund (TAF) has developed a GHG emissions inventory for the Greater Toronto and Hamilton area, with data at the single-tier and upper-tier municipal level. The most recent version of this inventory, covering 2018 community wide emissions, shows Durham Region emitted 6.3 megatonnes of CO<sub>2</sub>e, which represents approximately 5 per cent increase over 2017 levels, largely due to increased energy consumption (natural gas and electricity) (See Figure 7 below).
- 8.2 Note that TAF GTHA inventory data is not directly comparable to the low carbon pathway (Figure 1 in this report) as it includes industrial emissions associated with St. Mary's Cement Facility in Bowmanville which alone was responsible for 1.5 M tCO<sub>2</sub>e in 2018.

**Figure 7 - Durham Region Community GHG Emissions 2015 - 2018**



- 8.3 As shown in Figure 8, the largest sources of community GHG emissions are transportation and buildings, both of which increased between 2017 and 2018, even when normalized for population growth and weather.

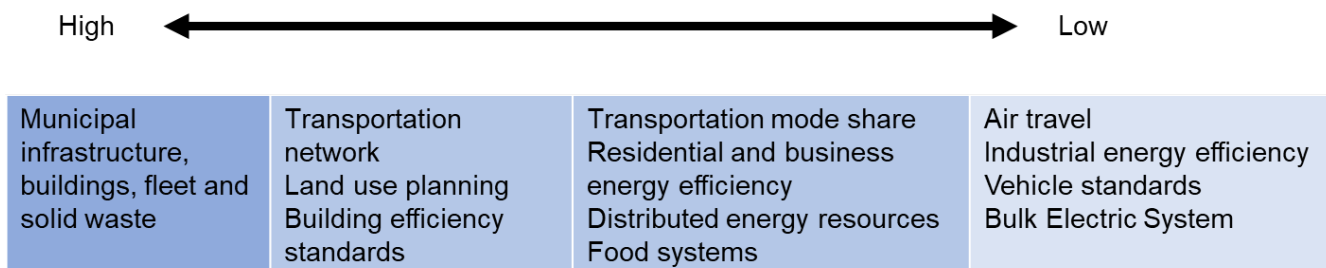
**Figure 8 - 2018 Durham Community GHG emissions by sector**



**9. Proposed Updated Community GHG Reduction Targets**

9.1 The Regional Municipality of Durham does not directly control emissions beyond its own operations, but has influence through its role in land use planning (e.g. Regional Official Plan) through the provision of infrastructure (e.g. transit, solid waste, etc.), and through community mobilization initiatives developed in partnership with local area municipalities, and energy utilities (e.g. tree planting, building energy retrofits, etc.) (See Figure 9 below). As part of a broad community mobilization strategy it is recommended that Regional Council continue to set community targets, monitor GHG emissions regularly, and communicate those results to the community. This is consistent with municipal actions across much of the country and responds to the IPCC’s call for action.

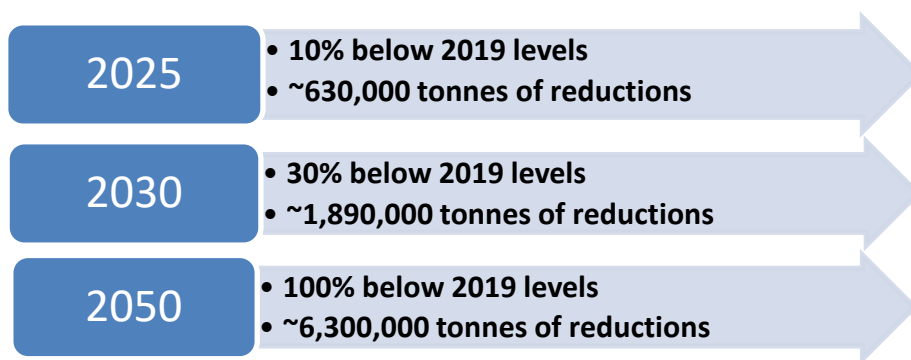
**Figure 9 - Regional Corporate Influence over GHG Emissions**





- 9.2 Durham’s current community GHG reduction targets, referenced in Section 3.3, were set prior to the Paris Agreement and the release of the IPCC’s Special Report on Global Warming of 1.5°C. Furthermore, the recently passed Canadian Net Zero Emissions Accountability Act legally binds the federal government to a process to achieve net zero emissions by 2050.
- 9.3 As directed by Regional Council’s climate emergency declaration and presented in Figure 10, community GHG emission reduction targets are recommended to be aligned the Region’s corporate targets and those set by senior levels of government.<sup>3</sup> It is recognized that meeting these community targets will require sustained policy and investment by all levels of government and community stakeholders, including residents, businesses, large industry, and broader public sector entities.

**Figure 10 - Proposed Revision to Community-wide GHG emissions reduction targets**



## 10. Next Steps and Reporting

- 10.1 Over the next five years, Regional staff will advance projects aligned with the Corporate Climate Action Plan (CCAP), the DCEP, and the Energy CDM Plan (2020-2024). To lead the way, staff will bring reports to relevant committees on the five-year priority projects, as required.
- 10.2 In addition to individual project reports, staff will provide an annual update on the CCAP and DCEP that includes:
- Annual corporate and community GHG inventories;
  - An assessment of how the Region is tracking towards community and corporate targets;
  - An update on the identified corporate and community implementation priorities;

<sup>3</sup> The Government of Ontario has established a target to reduce emissions by 30 per cent below 2005 levels by 2030. The Federal Government has established a legislated target of net zero emissions by 2050.

- d. Recommendations to advance additional identified priorities to close the gap to the 2025 corporate and community GHG reduction targets; and
  - e. Budget, staffing, resource pressures and challenges. Any associated funding/budget considerations will be brought forward as part of the annual business planning and budget process.
- 10.3 Detailed estimates of financial resources required to implement the GHG targets are being developed. Specific projects to address the corporate GHG reduction targets are being identified as part of the Region's five year operating and ten-year capital forecast. Finance staff will continue to develop a financing strategy for Council's consideration as part of the annual business planning and budget process, that continues to leverage available senior government funding and considers innovative financing and risk management approaches aligned with affordability, operational, and environmental objectives.
- 10.4 A full review and update of the CCAP, including the guiding principles, GHG emission reduction targets, and priority actions will be completed in 2025. At the same time, the Durham Community Energy Plan (DCEP) and Durham Community Climate Adaptation Plan will be reviewed with a view to merging the three action plans into one comprehensive document.
- 10.5 [Durham's climate change website](https://durham.ca/ClimateChange) (durham.ca/ClimateChange) will link to updated documents as they are approved. Where possible, relevant data will be made available through the Region's Open Data portal to ensure transparency of information.

## **11. Consultation**

- 11.1 The Corporate Climate Action Plan was developed over a 10-month process with input from Regional staff from the CAO's Office, Works, Finance, Planning and Economic Development, Health and Social Services departments, as well as Durham Region Transit, and Durham Regional Police and Paramedic Service.
- 11.2 Staff made four presentations throughout the latter half of 2020 to the Works, Finance, Corporate Services and Social Services departmental leadership teams.
- 11.3 Staff from the Office of the CAO and Finance Department met regularly through Q1 2021 to identify and operationalize opportunities to align the carbon budget management framework with the annual business planning and budget process to ensure efficiency and integration for business units across the corporation.

## **12. Relationship to Strategic Plan**

- 12.1 This report addresses the following strategic goals and priorities in the Durham Region Strategic Plan:
- a. Goal 1 - Environmental Sustainability
    - Priority 1.1: Accelerate the adoption of green technologies and clean energy solutions through strategic partnerships and investment;

- Priority 1.4: Demonstrate leadership in sustainability and addressing climate change;
- Priority 1.5: Expand sustainable and active transportation.

### **13. Conclusion**

- 13.1 In response to Regional Council's 2020 declaration of a climate emergency, this report provides recommended responses in the form of:
- a. GHG emissions reduction targets for the Regional corporation that position it as a leader in the community-wide effort to mitigate climate change;
  - b. A Corporate Climate Action Plan that identifies how climate change considerations will be embedded across all elements of Regional business;
  - c. Near-term implementation priorities for the next five years to support achievement of the proposed 2025 corporate GHG reduction target; and
  - d. Updated community targets, based on the modelling conducted for the DCEP, and aligned with federal government's recently legislated net zero by 2050 commitment.
- 13.2 For additional information, contact: Ian McVey, Manager, Sustainability, at 905-668-7711, extension 3803.

### **14. Attachments**

Attachment #1: Durham Region Corporate Climate Action Plan

Attachment #2: Climate Initiatives Investment Update

Attachment #3: External funding confirmed by the Region between Nov 2019-February 2021 to enhance Climate Projects

Attachment #4: Realized Benefits of the Durham York Energy Centre and Government Positions Supporting Energy-from-Waste

Respectfully submitted,

#### **Original signed by**

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Elaine C. Baxter-Trahair  
Chief Administrative Officer

**Attachment #1**

**Durham Region Corporate Action Plan**

Presented as a second document.

## Attachment #2

### Summary of Climate Mitigation and Environmental Initiatives Reserve Fund

Project	Details	Proposed Investment
<b>Corporate high-performance new buildings</b>	<b>Incremental additional investment to meet net zero energy performance in new corporate facilities</b>	<b>Project Allocation \$2,250,000</b>
Seaton RDPS Station	Proposed installation of a geothermal system with an estimated incremental cost of \$745,000 and installation of solar panels at a cost of \$162,000 over the base design.	\$907,000
Durham Region Police Service Clarington Phase 2 Project	Allocation for envelope and HVAC measures.	\$1,342,700
Remaining funds uncommitted		\$300
<b>Retrofits of existing corporate facilities</b>	<b>Rooftop solar, energy audits, social housing retrofits</b>	<b>Project Allocation \$1,750,000</b>
Social housing project	Focus on DRLHC multi-unit seniors' buildings with opportunity to leverage FCM Social Affordable Housing program funding. Projects in scoping phase include: 850 Green St, 655 Harwood, 315 Colborne, 1910 Faylee.	\$500,000
Landfill biocover pilot project	Development and implementation of a landfill biocover project at the Oshawa landfill.	\$500,000
Remaining funds uncommitted		\$750,000
<b>Community-wide deep energy retrofits of existing community buildings</b>	<b>Launch of Durham Home Energy Savings Program</b>	<b>Project Allocation \$350,000</b>
Durham – Home Energy Saving Program	Leverage funding to secure ~\$1.9m in FCM Green Municipal Fund grant & \$1.5m loan loss reserve fund.	\$350,000
Remaining funds uncommitted		\$0

Project	Details	Proposed Investment
<b>Region-wide nature-based climate solutions program</b>	<b>Enhance tree planting and stewardship programs in partnership with Conservation Authorities and non-profit partners (e.g. Forests Ontario, Highway of Heroes Tree Campaign)</b>	<b>Project Allocation \$500,000</b>
Tree Planting Program	Partnership with 5 Conservation Authorities to expand private land tree planting with a goal of 740,000 trees planted by 2025.	\$439,000
Remaining funds uncommitted		\$61,000
<b>Adaptation studies</b>	<b>Urban flood risk vulnerability assessment and public health climate vulnerability assessment</b>	<b>Project Allocation \$150,000</b>
Adaptation and risk assessment	50% municipal and 50% federal funding through Natural Disaster Mitigation Fund (subject to Federal Government approval)	\$130,000
Remaining Funds Uncommitted		\$20,000
<b>Total Project Budgets Committed</b>		<b>\$4,168,700</b>
<b>Total Project Budgets Uncommitted</b>		<b>\$831,300</b>
<b>Total Funding</b>		<b>\$5,000,000</b>

### Attachment #3

#### External funding confirmed by the Region between November 2019 - February 2021 to enhance Climate Projects

Project	Funding Source	Funding Details	Funding Amount
Durham Region Transit Electric Bus Pilot	2019 Federal Gas Tax	In November 2019, Durham Region Council committed \$10.1 million in federal gas tax funding towards DRT's first battery electric buses and charging infrastructure.	\$10,100,000
	The Atmospheric Fund (TAF)	In May 2020, TAF awarded \$195,000 over two years for the "Scaling-up to Zero Emission Transit in Durham Region" to support DRT in advancing their electric bus project.	\$195,000
Durham Home Energy Savings Program (D-HESP)	The Atmospheric Fund (TAF)	In February 2020 TAF awarded \$68,000 to support the development of the D-HESP conceptual model, and FCM funding application.	\$68,000
	Federation of Canadian Municipalities' (FCM) Community Efficiency Fund	To support the implementation of the 4-year D-HESP with a loan guarantee up to \$1,500,000 combined with a \$1,889,470 grant for the Durham Home Energy Savings Program.	\$1,889,470
Adaptation and Risk Assessment	Natural Disaster Mitigation Fund	50% municipal and 50% federal funding through Natural Disaster Mitigation Fund.	\$130,000
Purchase and installation of EV Chargers	NRCan's Zero Emission Vehicle Infrastructure Program - Round 2	In 2021, the Region applied for eight Level 2 EV Charging Stations to support charging of corporate light-duty fleets.	TBD

Project	Funding Source	Funding Details	Funding Amount
EV Community Marketing Strategy	NRCan's Zero Emission Vehicle Infrastructure Program - Round 3	In 2020, the Region submitted a funding application in partnership with Oshawa PUC and Elexicon Energy to support the development of an EV marketing and awareness campaign.	\$50,000
Purchase and installation of community EV Chargers	NRCan's Zero Emission Vehicle Infrastructure Program - Round 1	In 2021, the Region, together with the Town of Ajax, the Municipality of Clarington, Oshawa PUC, and the Town of Whitby will be installing 60 new EV charging stations across 21 municipally owned and publicly accessible sites, of which 32 are Regional charging stations. Funding represents the Regional portion.	\$160,000
Courtice WPCP IRR Phase 2 Study	CWWF Funding		\$225,000
Energy Manager Incentives across Corporate Projects	2019 IESO - SaveOnEnergy		\$97,111
Energy Manager Incentives across Corporate Projects	2020 IESO - SaveOnEnergy		\$207,193
<b>Total Funding</b>			<b>\$13,121,774</b>



## Attachment #4

### Realized Benefits of the Durham York Energy Centre and Government Positions Supporting Energy-from-Waste

Sent via mail and email ([afoster@clarington.net](mailto:afoster@clarington.net))

March 19, 2020

Mayor Adrian Foster  
Corporation of the Municipality of Clarington  
40 Temperance Street  
Bowmanville, Ontario L1C 3A6

Dear Mayor Foster:



**The Regional  
Municipality of  
Durham**

Works Department

605 Rossland Rd. E.  
Level 5

PO Box 623  
Whitby, ON L1N 6A3  
Canada

905-668-7711  
1-800-372-1102

Fax: 905-668-2051

durham.ca

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**RE: Realized Benefits of the Durham York Energy Centre and  
Government Positions Supporting Energy-from-Waste**

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#### Summary

- The Durham York Energy Centre (DYEC) has positive benefits for climate change.
- Waste disposal at the DYEC results in fewer greenhouse gas (GHG) emissions than landfill at the current DYEC by-pass location.
- Governments and international bodies recognize energy-from-waste (EFW) as a preferred alternative to landfilling wastes.
- Diverting organics from the DYEC will result in a more efficient operation and greater energy generation.
- The numerous benefits of the DYEC for processing the Regional Municipality of Durham's (Region) waste are outlined in the original proposals and approvals for the project. When used appropriately as part of the waste hierarchy: Reduce, Reuse, Recycle, Recover Energy, EFW is recognized internationally as a more climate friendly disposal option for residual waste than landfilling.

#### For the Regional Municipality of Durham (Region), the DYEC:

- Provides an innovative and responsible long-term solution for managing residential waste within Regional boundaries.
- Follows stringent Ontario Ministry of the Environment,

Conservation and Parks' (MECP) air quality standards and Environmental Compliance Approval limits for stack emissions that are continuously monitored to ensure compliance, with Source Tests taking place twice annually.

- Reduces environmental impacts associated with climate change and supports the Region's call to action under the current climate change emergency.
- Showcases the Region's position as a leader in waste management in North America.

### **GHG Benefits of the DYEC versus Traditional Landfilling**

A comparative lifecycle analysis of landfilling waste versus thermal treatment of waste was completed as part of the original 2009 Environmental Assessment for the DYEC to demonstrate the GHG reductions that could be realized. This analysis has recently been reviewed and updated using actual Regional waste disposal data during the operation of the DYEC for the draft Environmental Screening Report (ESR) published in December 2019.

For the comparison, the landfill used is the one receiving most of the Region's by-pass waste when it cannot be processed at the DYEC due to tonnage restrictions. Based on the high-level analysis, one tonne of Region-landfilled waste results in the release of 19 kilograms (kg) of carbon dioxide equivalents or CO<sub>2</sub>e. That same tonne of waste when processed at the DYEC will release 11 kg of CO<sub>2</sub>e. This analysis supports the notion that waste processed at the DYEC reduces GHG emissions generated in comparison to traditional landfilling.

Since the landfill receiving site only flares landfill methane (i.e. does not currently have a cogeneration system to make electricity), there are no energy offsets associated with landfilling the Region's waste at this location. Additional CO<sub>2</sub>e is released as a result of energy consumed to operate the equipment to place the waste in the landfill, just as energy is consumed to operate the DYEC. However, the DYEC energy use is offset by the electricity generated from the process. When the energy use is converted to CO<sub>2</sub>e emissions, the landfill releases an additional 8.6 kg of CO<sub>2</sub>e per tonne of waste landfilled. The DYEC offsets or saves 82 kg of CO<sub>2</sub>e per tonne of waste processed.

These CO<sub>2</sub>e calculations are based on the average carbon dioxide emissions from the Ontario grid, including the carbon-free nuclear and hydro power generation used to meet Ontario's base load demand.

Based on the actual disposal options for the Region's residential waste, the DYEC results in a net off-set of 71 kg of CO<sub>2</sub>e for every tonne of waste processed (82 kg off- set from electricity generation – 11 kg generated from waste treatment). Landfilling the waste at an Ontario landfill would result in the release of 27.6 kg of CO<sub>2</sub>e per tonne of waste landfilled. Use of the DYEC for waste disposal provides a net climate benefit compared to the status quo.

## **Economic Stability**

The DYEC increases the level of cost certainty experienced by the Region for waste disposal. The Ontario Waste Management Association's (OWMA) 2018 report identified several key points related to the amount of available disposal capacity for Ontario's waste.

- Based on the current landfill capacity depletion rate, Ontario's available landfill capacity is expected to be exhausted in 12 years, by the year 2032. If the United States (U.S.) were to prohibit Ontario waste from crossing the border, Ontario's landfill capacity will be exhausted by 2028.
- Ontario's 805 active public and private sector landfill sites have a remaining capacity of 122 million tonnes. Most of this remaining capacity is in just a small number of large landfill sites, with 82 per cent of remaining capacity held by just 15 landfill sites (both private and public).
- In 2017, Ontario landfills received 8.1 million tonnes of waste, up five per cent from OWMA's 2016 Landfill Report. In addition, 3.5 million tonnes of waste was exported to landfills in the U.S., primarily to Michigan and New York.

While capacity is decreasing, there is continued talk of developing regulations resulting in the requirement for municipal approval for new or expanded landfills into communities, potentially limiting where new sites could be located.

Between decreasing capacity and increased approvals required to develop new capacity, there is likely to be a continued rise in market pricing for long term disposal. The DYEC's contract has provided long-term insulation against changes to market conditions as the Region's tipping fees are determined as part of the contract, while residue disposal is a requirement of the Contractor.

## **Government Positions Supporting EFW**

In recent years, there is increasing government support for EFW facilities. The DYEC allows the Region to support these initiatives.

**Province of Ontario:** In 2018, [Ontario released the Made-in-Ontario Environment Plan](https://www.ontario.ca/page/made-in-ontario-environment-plan). A component of this plan is reducing litter and waste in our communities. The province states it is looking for ways to reduce the quantity of waste going to landfill and increase the use of technologies including thermal treatment (<https://www.ontario.ca/page/made-in-ontario-environment-plan#section-5>).

The DYEC continually receives interest from MECP staff, and has been frequently visited by representatives to better understand how policy translates to the facility.

**Government of Canada:** The [G7 Ocean Plastics Charter](https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html), championed by Canada, includes a target to work with industry to ensure plastics are 100 per cent reusable, recyclable, or, where viable alternatives do not exist, recoverable by 2030. Energy recovery from plastics with no viable recycling option is considered better than landfilling. Many plastics cannot be recycled economically, and no recycling market exists for them (<https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html>, Action 1).

**European Commission:** In 2017, communication on the Role of Waste-to-Energy in the Circular Economy from the European Commission stated that disposal in landfills or incineration with no or limited energy recovery was the least favourable options for reducing GHG emissions from waste. [Waste-to-energy](https://ec.europa.eu/environment/waste/waste-to-energy.pdf) is recognized as a preferred alternative to landfilling wastes that do not have viable recycling options (<https://ec.europa.eu/environment/waste/waste-to-energy.pdf>).

**Global:** From the 2007 Working Group III Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC):

“Incineration and industrial co-combustion for waste-to-energy provides significant renewable energy benefits and fossil fuel offsets... Because landfills produce CH<sub>4</sub> for decades, incineration, composting and other strategies that reduce landfilled waste are complementary [mitigation measures](#) to landfill gas recovery in the short-to-medium term” (<https://www.ipcc.ch/report/ar4/wg3/>, Chapter 10).

Sincerely,



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c. Susan Siopis, P.Eng., Commissioner, Works, The Regional Municipality of Durham

Enclosed (Appendix A – Greenhouse Gas and Energy Calculations)

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## Appendix A – Greenhouse Gas (GHG) and Energy Calculations

### Transportation Emissions

Trucks arrive at the Durham York Energy Centre (DYEC) with loads averaging 34 tonnes per load meaning that 588 trucks would be required to haul an additional 20,000 tonnes of waste. Processing waste at the DYEC will reduce the waste mass and volume and generate ash for disposal. Based on 2018 DYEC ash production and truck counts, 20,000 tonnes of waste will result in the generation of 5,877 tonnes of ash, requiring 163 trucks to transport ash for disposal. There is a net reduction of 425 trucks required for hauling 20,000 tonnes of waste to landfill versus to the DYEC.

The majority of recent DYEC by-passed waste has been shipped to the Twin Creeks Landfill, over 300 kilometres from the DYEC. Based on the calculations in Table 1 below, assuming all materials were to be transported from the DYEC to a remote landfill, approximately 268 tonnes of CO<sub>2</sub> would be avoided.

**Table 1: Transportation Emissions of 20,000 tonnes of Waste**

<b>Factor</b>	<b>Value</b>
Number of Trucks	425
Distance per trip	600 km
Fuel Economy <sup>1</sup>	39.5 L/100 km
<b>Fuel Required per Year</b> (Number of Trucks*Distance*L/100 km)	<b>100,725 L</b>
Fuel Emission Rate <sup>2</sup>	2.66 kg CO <sub>2</sub> /L diesel fuel
<b>Resulting Emissions</b> (L fuel consumed*kg CO <sub>2</sub> /L fuel/1000kg per tonne)	<b>268 tonnes CO<sub>2</sub></b>

<sup>1</sup> [Natural Resources Canada:](https://www.nrcan.gc.ca/energy/efficiency/transportation/commercial-vehicles/reports/7607)

<https://www.nrcan.gc.ca/energy/efficiency/transportation/commercial-vehicles/reports/7607>

<sup>2</sup> [Natural Resources Canada:](https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oeef/pdf/transportation/fuel-efficient-technologies/autosmart_factsheet_6_e.pdf)

[https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oeef/pdf/transportation/fuel-efficient-technologies/autosmart\\_factsheet\\_6\\_e.pdf](https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oeef/pdf/transportation/fuel-efficient-technologies/autosmart_factsheet_6_e.pdf)

## **Methane Emissions**

In addition to the transportation emissions, methane (CH<sub>4</sub>) is generated from the landfilling of waste and according to the Intergovernmental Panel on Climate Change (IPCC) has 28 times the global warming potential of CO<sub>2</sub> over a 100-year time horizon.

([https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_Chapter08\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf)  
[Lifetimes, Radiative Efficiencies and Metric Values Appendix 8.A](#)).

One tonne of waste landfilled generates approximately 170 m<sup>3</sup> of landfill gas which is typically 50 per cent methane, although this value can vary between sites and climate regions<sup>1</sup>. If 20,000 tonnes of waste per year were landfilled without methane gas capture systems in place, approximately 1,700,000 cubic metres or 942 tonnes of methane would be generated, equivalent to over 26,300 tonnes of CO<sub>2</sub> in addition to the CO<sub>2</sub> in the remainder of the landfill gas. While modern landfills capture and either flare or use the methane to produce electricity, landfill gas capture systems are not capable of intercepting all produced methane. Consistent with the U.S. EPA's 2011 document 'Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Municipal Solid Waste Landfills' for areas with daily soil cover and active gas collection, 60 per cent methane recovery was assumed for these calculations. With this assumption, approximately 565 tonnes of methane would be captured and converted to CO<sub>2</sub> through flaring or combustion while the remaining 377 tonnes of methane would be released to the atmosphere, equivalent to 10,550 tonnes of CO<sub>2</sub>. The combination of these CO<sub>2</sub> emissions is avoided by processing the 20,000 tonnes of waste at the DYEC instead of landfilling.

## **Energy Generation**

An additional benefit of thermal treatment over the remote landfill scenario is that it provides a local source of energy, which generates a greater quantity of energy than a remote landfill. Further, landfills such as Twin Creeks do not capture methane for energy generation, and instead utilize flares for destruction of the landfill gas without energy recovery. Residual waste managed by an EFW facility is better than remote landfill with respect to energy consumption, emissions to air of GHG, acid gases, smog precursors and emissions to water. Annex E-5, the lifecycle analysis completed for the original Environmental Assessment of the DYEC, reviewed the energy offset from landfill and energy from waste scenarios for 250,000 tonnes of waste. Net energy refers to energy that is offset from the grid resulting from the energy produced by the facility, either via combustion in an energy-from-waste facility, or via landfill gas capture and

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<sup>1</sup> U.S. EPA. 2005. Landfill Gas Emissions Model (LandGEM) Version 3.02 User's Guide. EPA- 60/R-05/047

combustion, and the recycling of metals recovered from an energy-from-waste facility (also referred to as a virgin material displacement credit). The DYEC in 2018 exported 85,452 MWh of electricity to the Ontario grid, and recovered 3,440 tonnes of ferrous metals, and 408 tonnes of non-ferrous metals.

Using the model and assumptions from Annex E-5 the emissions from processing the current DYEC capacity of 140,000 tonnes of waste per year were estimated and compared between the remote landfill without electricity generation and energy-from-waste disposal options in Table 2. Values which display a negative result are represented as having a positive impact on the environment relative to their comparison. As detailed in the table below, the DYEC results in a net improvement of air emissions compared to landfill on a life-cycle basis as well as greater energy generation.

**Table 2: CO<sub>2</sub>e Emissions to Air for the Management of 140,000 tonnes per year of Residual Waste by Remote Landfill and Energy-from-Waste (DYEC)**

140,000 tonne scenario						
Remote Landfill				EFW by DYEC		
Energy Consumption	(GJ/yr)	(tonnes CO <sub>2</sub> e/year)	(kg CO <sub>2</sub> e /tonne waste)	GJ/year	(tonnes CO <sub>2</sub> e/year)	(kg CO <sub>2</sub> e /tonne waste)
	109096	1212	-8.6	1033988	-11489	-82

40g CO<sub>2</sub>e/KWh [based on Ontario grid average, 2017 National Inventory Report](https://www.cerrec.gc.ca/nrg/sttstc/lctrct/rprt/2017cndrnwblpwr/ghgmssn-eng.html)  
 (https://www.cerrec.gc.ca/nrg/sttstc/lctrct/rprt/2017cndrnwblpwr/ghgmssn-eng.html)