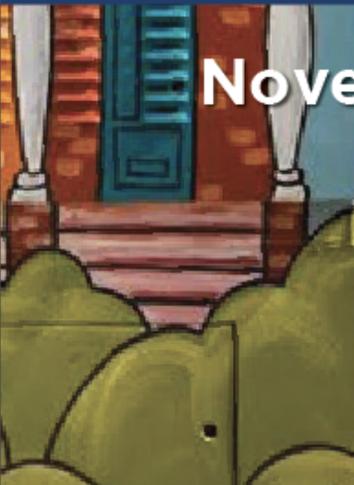




TransformTO Net Zero Strategy

A climate action pathway to
2030 and beyond



November 2021



Acknowledgements

Land Acknowledgement

The City of Toronto (“The City”) acknowledges that we are on the traditional territory of many nations including the Mississaugas of the Credit, the Anishnabeg, the Chippewa, the Haudenosaunee, and the Wendat peoples and is now home to many diverse First Nations, Inuit, and Métis peoples. The City also acknowledges that Toronto is covered by Treaty 13 signed with the Mississaugas of the Credit, and the Williams Treaties signed with multiple Mississaugas and Chippewa bands.

We acknowledge and recognize the efforts of Indigenous Peoples across Turtle Island for their climate leadership long before Toronto’s Net Zero Strategy and for being active drivers of positive change. In 2019, land defenders and water protectors fought against fossil fuel projects which is equivalent to nearly one quarter of annual total U.S and Canadians emissions or approximately 400 new coal-fired power plants¹. We are eternally grateful for Indigenous stewardship of these lands and waters since time immemorial.

General Acknowledgement

The City of Toronto would like to acknowledge the community members and staff from across the City that contributed to the development of the Net Zero Strategy. The City is grateful to all leaders and community members who have contributed their time and expertise to help advance the City’s efforts to address climate change.

About the artwork found in this report

For ten years, StreetARToronto ('StART') has helped instigate and provide space for individual and community expressions to come alive through street art, using the art itself as the catalyst to bring communities together, stimulate discussion and advance diversity, equity and inclusion. Working with the

¹ <https://www.ienearth.org/wp-content/uploads/2021/09/Indigenous-Resistance-Against-Carbon-2021.pdf>

artist community, StreetARToronto has innovated deep engagement processes that foster trust and meaningful relationships. Together, we have created world-class street art, helped build artist careers, and perhaps most importantly, the murals are intentionally designed to strengthen the sense of belonging and pride of place among individuals, neighbourhoods and communities. StreetARToronto is an initiative of the City of Toronto, Transportation Services Division.

Artist credits are included on the section cover pages throughout this document. Cover page image credits are as follows, working clockwise from the top left corner: Kayla Whitney (light bulbs), Erika Giraud (children's photo), Lacey and Layla Art ('Grandmother' mural), James Thomas (park photo), Colin Turner Bloom (streetcar mural), Julia Prazja (house painting).

For More Information

The following detailed documents, plus more resources, are available on the City of Toronto TransformTO web page at www.toronto.ca/TransformTO:

- TransformTO Net Zero Strategy staff report to City Council
- Net Zero Technical Modelling Report (Sustainability Solutions Group, 2021)
- Reports on community engagement

Foreword

[To be added once Strategy is considered by City Council]

Contents

Acknowledgements	2
For More Information	3
Foreword	3
Executive Summary	5
1. Introduction	15
2. Where We Are Now	19
2.1 Where are we now?	20
2.2 Development of the Net Zero Strategy	22
2.3 Guiding Principles	23
2.4 Indigenous Worldview	24
2.5 The Voice of the Community	26
2.6 Where do we want to go? Toronto's future	28
2.7 The COVID-19 Pandemic and Lessons for the Climate Emergency	30
3. A Pathway to Net Zero	31
3.1 Technical Analysis	32
3.2 Investing in a Net Zero Toronto	35
3.3 Benefits of Climate Action	37
4. Net Zero Targets & Actions	47
4.1 Buildings	50
4.2 Energy	58
4.3 Transportation	64
4.4 Sustainable Consumption & Waste	72
4.5 Natural systems	77
4.6 Engagement & Equitable Implementation	80
4.7 Leading by Example	87
5. Looking Forward	97
5.1 Summary of Challenges & Keys to Success (Dependencies)	98
5.2 Implementation & Next Steps	100
Glossary	101
TransformTO Net Zero Strategy Short-term Implementation Plan 2022-2025	103



Executive Summary

Mural by Emmanuel Jaris | Teesdale Place, Scarborough

Executive Summary

The climate crisis grows more urgent every year. The window to make significant and lasting change is disappearing. Action must happen immediately, and it must be at the scale and pace required to successfully fight this threat and create a future Toronto that benefits all.

In 2017, TransformTO was unanimously approved by City Council, demonstrating Toronto's commitment to a global call for action to limit global temperature rise in line with international goals. Since 2017, the Intergovernmental Panel on Climate Change (IPCC) has shown that to limit global temperature rise to below 1.5 degrees Celsius, cities globally need to achieve carbon neutrality by 2050 and halve global emissions of greenhouse gases (GHGs) by 2030.

City Council's 2019 declaration of a climate emergency shifts Toronto's focus to align with the IPCC's recommended pathway - net zero GHG emissions by 2050 or sooner.

This TransformTO Net Zero Strategy ("the Strategy") responds to the climate emergency by focusing on a new target of net zero GHG emissions community-wide by 2040. The Strategy outlines the rationale behind the net zero pathway and opportunities needed to successfully reach the net zero target. The Strategy presents a set of 2030 interim targets for community-wide emissions, as well as City of Toronto ("City") corporate targets to demonstrate leadership by example. It also presents thirty near-term actions that will be taken to put Toronto on the net zero pathway.

Technical modelling of Toronto's net zero pathway shows that in order to reach net zero GHG emissions by 2050 or sooner, Toronto must first achieve the 2030 City Council adopted goal of a 65 per cent emissions reduction from 1990 levels. Without aligning our action and implementation to this interim target, net zero by 2040 or 2050 will be out of reach.

KEY FINDINGS FROM THE NET ZERO TECHNICAL MODELLING WERE:

- **Fossil fuels**, primarily natural gas used in homes and buildings and gasoline used in cars, **need to be completely phased out by 2040.**
- **Taking early action now saves money in the long run.** Reducing emissions more quickly also means that the City can collect the financial benefits of the avoided carbon costs and avoided energy costs more quickly.

- To meet future energy needs, **electricity generation and distribution must be able to fill the gap** in order to ensure uninterrupted and reliable service.
- To achieve the net zero target, **Ontario's electricity grid needs to be carbon free.**
- **Efficiency measures in buildings** (e.g., thermal retrofits, smaller buildings) **and transportation** (e.g., avoiding trips by working at home, shifting to active modes and transit, reducing trip length through land-use planning) are required to reduce the requirement for new renewable electricity generation and generate cost savings which can be used to finance the actions.

Steady progress has been made to reduce emissions in recent years, and community-wide emissions have decreased since 1990. Toronto is on track to achieve its 2020 GHG emissions target of a 30 per cent reduction from 1990 levels. Despite population growth, community-wide emissions continue to decline while Toronto's gross domestic product (GDP) rises. The decrease in emissions in recent years can be attributed to a less carbon intensive electricity grid and lower transportation emissions from gasoline and diesel fuels. The 2019 GHG inventory shows that Toronto's emissions approach City Council's approved pathway of an 80 per cent reduction by 2050 from 1990 levels.

However, emissions have not decreased appreciably; the City's data shows that emissions have plateaued, indicating that acting incrementally will not be enough to put us on the net zero trajectory. Rapid action to scale up existing programs, additional authorities for the City of Toronto (City) to implement nimbly and effectively, significant levels of investment and coordinated action with other levels of government will all be needed to achieve City Council's ambition.

Achieving the targets in the Net Zero Strategy will not just be the work of the City government. The City Corporation can control only a small portion of Toronto's community-wide emissions directly - nearly 4 per cent according to recent GHG inventories. This Strategy emphasizes that in order to be successful, bold leadership and collaboration will be required from public and private stakeholders.

The City has already approved a number of ambitious plans and targets to reduce emissions from its own operations, including the Corporate Real Estate Management's Net Zero Carbon Plan earlier this year, the Sustainable Fleets Plan, and the TTC Green Bus Program. Implementation of these plans is underway and will go a long way to reduce emissions from City operations.

However, the City plays a clear role in defining the ways we build, travel and consume, and when policies are effectively implemented and programs are easily accessed to realize maximum uptake and engagement, the City can have a great impact on the community's emissions.

In order to meet the 2030 targets, the City must use its influence to regulate, advocate and facilitate rapid transformation in five critical steps:

- **Demonstrate carbon accountability locally and globally by establishing a carbon budget** – Leading by example, the City will establish a carbon budget to track climate actions against annual emission limits and drive accountability. The City's actions will be measured against these limits each year until net zero is achieved, with any gaps in action identified and solutions proposed so we stay on course.
- **Accelerate a rapid and significant reduction in natural gas use** – Toronto will take further action to limit the use of natural gas. Natural gas use for water and space heating represents over half of Toronto's total GHG emissions. In addition to new buildings eliminating natural gas use through the Toronto Green Standard v.4, the Net Zero Existing Buildings Strategy articulates ambitious targets to replace conventional heating systems with more efficient electric heat pumps while greening the provincial electricity grid.
- **Establish performance targets for existing buildings** – Toronto intends to establish mandatory emissions performance reporting, disclosure and emissions performance targets for buildings so we can better understand and limit emissions from our homes and buildings. These mandatory targets will be preceded by voluntary targets. Catalyzing the electrification of building heating systems, as a preferred alternative to the use of fossil-fuel heating systems, will be key.
- **Increase access to low carbon transportation options, including walking, biking, public transit and electric vehicles** – Increasing the use of active and public transportation reduces GHG emissions, energy use and congestion while promoting equity and health benefits. The City will also advance options to incentivize electric vehicle adoption and disincentivize the use of carbon-polluting gasoline and diesel vehicles, through supporting the transition to electric vehicles.
- **Increase local renewable energy to contribute to a resilient, carbon-free grid** – Toronto will work in step with Toronto Hydro to successfully support the growth and prosperity of the city through reliable, uninterrupted electric service provision. By increasing opportunities for local renewable generation to be located within the City's boundary, Toronto will be more resilient and will contribute to a decarbonised provincial electricity grid.

In order to be on the path to net zero, Toronto must meet the City Council's 2030 GHG reduction target. To stimulate and measure progress, the Strategy defines 2030 interim targets across all sectors, both community-wide and for the City's operations.

THE 2030 COMMUNITY-WIDE TARGETS PRESENTED IN THIS STRATEGY ARE:

- 65 per cent reduction in community-wide greenhouse gas emissions by 2030 from 1990 levels
- 100 per cent of new buildings are designed and built to be near zero greenhouse gas emissions
- Greenhouse gas emissions from existing buildings are cut in half, from 2008 levels
- 50 per cent of community-wide energy comes from renewable or low-carbon sources

- 25 per cent of commercial and industrial floor area is connected to low carbon thermal energy sources
- 75 per cent of school/work trips under 5km are walked, biked or by transit
- 30 per cent of registered vehicles in Toronto are electric
- Identify pathways to more sustainable consumption in City of Toronto operations and in Toronto's economy
- 70 per cent residential waste diversion from the City of Toronto's Integrated Waste Management System

THE 2030 TARGETS FOR THE CITY OF TORONTO CORPORATION TO SHOW LEADERSHIP BY EXAMPLE ARE:

- City of Toronto corporate greenhouse gas emissions are reduced by 65 per cent over 2008 base year
- All City Agency, Corporation and Division-owned new developments are designed and constructed to applicable Toronto Green Standard Version 4 standard achieving zero carbon emissions, beginning in 2022
- Greenhouse gas emissions from City-owned buildings are reduced by 60 per cent from 2008 levels; by 2040, City-owned buildings reach net zero greenhouse gas emissions
- All City-owned facilities have achieved zero waste
- Generate and utilize 1.5 Million Gigajoules of energy from biogas
- Approximately 107,700 tonnes CO₂e per year are reduced through Organics Processing with Renewable Energy and Landfill Gas Utilization
- 50 per cent of the City-owned fleet is transitioned to zero-emissions vehicles
- 50 per cent of the TTC bus fleet is zero-emissions
- Greenhouse gas emissions from food the City of Toronto procures are reduced by 25 per cent

THE STRATEGY ALSO SETS AN INTERIM TARGET FOR 2025:

- 45 per cent reduction in community-wide greenhouse gas emissions by 2025 from 1990 levels

The thirty actions to be taken immediately to put Toronto on the path to net zero are outlined below. These near-term actions are described in more detail in the Net Zero Strategy Short-Term Implementation Plan 2022-2025 which is included in this Strategy.

Actions for implementation 2022-2025	
100 per cent of new buildings are designed and built to be near zero greenhouse gas emissions, by 2030	
1	Ensure near zero emissions for all new construction

Actions for implementation 2022-2025	
2	Evaluate and limit impacts of embodied carbon in construction
Greenhouse gas emissions from existing buildings are cut in half, from 2008 levels, by 2030	
3	Advance Implementation of the Net Zero Existing Buildings Strategy. (Please refer to the Net Zero Existing Buildings Strategy , Adopted by City Council in July 2021 for a detailed short-term implementation plan.)
50 per cent of community-wide energy comes from renewable or low-carbon sources & 25 per cent of commercial and industrial floor area is connected to low carbon thermal energy sources, by 2030	
4	Work with industry experts to explore limiting the expansion of natural gas systems and reversing system growth, where feasible, and limiting installation of natural gas equipment
5	Support adoption and mainstreaming of net zero, resilient energy sources for new and existing developments
6	Address barriers and develop strategies to increase the deployment of renewable energy and storage technologies, including but not limited to solar, wind, biomass, geothermal, waste heat recovery and heat pumps
7	Actively support, advocate to and partner with Toronto Hydro, as well as the Provincial and Federal governments and agencies, to decarbonize the provincial electricity grid, promote energy conservation and enable local renewable energy generation
75 per cent of school/work trips under 5 km are walked, biked, or by transit, by 2030	
8	Expand biking and pedestrian infrastructure, including the rollout of cycling routes, bicycle parking and bike share at or near TTC stations
9	Increase existing bus and streetcar service levels to encourage shifts to low-carbon, sustainable transportation
10	Update and accelerate implementation of city-wide Transportation Demand Management Strategy

Actions for implementation 2022-2025

11	Develop tools to address emissions of greenhouse gases and air pollutants on an area or project level
----	---

30 per cent of registered vehicles in Toronto are electric, by 2030

12	Align the City's Electric Vehicle (EV) Strategy to the net zero goals and implement the EV Strategy A) Increase public EV charging infrastructure B) Increase EV charging at residential, commercial, institutional and industrial buildings C) Review the Electric Vehicle Strategy
----	---

13	Determine options to incentivize EV adoption and disincentivize use of gas and diesel vehicles
----	--

14	Encourage the adoption of electric commercial and freight vehicles, including EVs and e-bikes for last mile deliveries A) Encourage the use of e-bikes and EVs for last mile deliveries B) Encourage adoption of electric commercial and freight vehicles
----	---

Identify pathways to more sustainable consumption in City of Toronto operations and in Toronto's economy

15	Continue to pursue policy and programmatic interventions that help the City reach its aspirational goals of zero waste and a circular economy, and which identify pathways to more sustainable consumption in both municipal operations and in all sectors of the economy A) Develop a City-wide governance structure, strategy and policy framework to establish a path to make the City the first municipality in the Province of Ontario with a circular economy and to align with the Provincial goal as part of the Waste Free Ontario Act B) Conduct a consumption based emissions inventory and identify targets that would meaningfully reduce consumption based emissions C) Enable Torontonians to reduce waste and engage in sustainable consumption by implementing the Single Use and Takeaway Items Reduction Strategy
----	---

70 per cent residential waste diversion from the City of Toronto's Integrated Waste Management System

16	Continue implementation of the City's Long Term Waste Management Strategy which sets a goal of diverting 70 per cent of waste managed from City customers away from landfill, by focusing on waste reduction, reuse and recycling activities that promote resource conservation and reduce environmental impact
----	---

Actions for implementation 2022-2025	
	A) Continue outreach and engagement on waste reduction and diversion, with a focus on food and organic waste
Develop and implement strategies to improve greenspace infrastructure to build climate resilience	
17	Increase canopy cover and biodiversity and enhance greenspaces A) Achieve equitable distribution of the urban forest, increasing tree canopy and naturalized greenspace where it is most needed
Ensure equitable implementation and ongoing improvement of engagement and reporting	
18	Support resident-led climate action and engagement A) Support resident-led climate action engagement through Climate Action Grants B) Expand Neighbourhood Climate Action Champions Program
19	Work with Indigenous rights holders and urban Indigenous communities to share knowledge and learnings A) Develop and deliver Indigenous Climate Action Grants program
20	Develop and implement youth engagement strategy A) Design and launch a City-academic innovation hub to support youth-led climate initiatives and innovative student pilot projects
21	Design and launch a climate advisory group for 2022 and beyond to ensure implementation of the Net Zero Strategy is equitable and reflects the priorities and interests of the community
22	Develop equity indicators to be reported out as part of the TransformTO implementation status update
23	Encourage the growth of green industry to provide the products and services needed to enable a net zero city
24	Leverage Live Green Toronto to develop and implement a city-wide climate action awareness campaign

Actions for implementation 2022-2025

Lead by Example – Corporate emissions are reduced by 65 per cent over 2008 base year, by 2030

25	<p>Develop and apply a Climate Lens in decision-making</p> <ul style="list-style-type: none"> A) Implement a Climate Lens Program B) Report on climate risks to assets C) Enhance Sustainable Procurement D) Consider a carbon offset purchase policy and update the Carbon Credit Policy
26	<p>Design and implement a Toronto Carbon Budget</p>
27	<p>Ensure net zero City-owned buildings</p> <ul style="list-style-type: none"> A) Constructing new City-owned buildings to net zero by 2022 B) Pursuing a Net Zero Carbon Plan for existing City buildings
28	<p>Reduce emissions from City and Agency-owned vehicles</p> <ul style="list-style-type: none"> A) Update and implement the Sustainable City of Toronto Fleets Plan to support the transition of 20 per cent of City fleet to zero-emission by 2025 and 50 per cent by 2030. Starting in 2022, for any light duty vehicle being purchased by the City, the City will select only the electric version of this vehicle where operationally feasible. B) Implement the TTC Green Bus Program to achieve target of 20 per cent of TTC buses zero emission by 2025-2026
29	<p>Encourage City staff to adopt sustainable and climate positive practices at work and in their commute</p> <ul style="list-style-type: none"> A) Implement Live Green @ Work Strategy B) Encourage City staff to take transit, carpool, cycle or walk rather than drive alone to work, through the Smart Commute program
30	<p>Lead by example in managing waste and producing renewable energy from biogas at City facilities</p> <ul style="list-style-type: none"> A) Begin development of a third organics processing facility with renewable energy, targeting completion by 2028 B) Produce renewable natural gas from the Disco Road Organics Processing Facility, Dufferin Organics Processing Facility and the third organics processing facility (target completion by 2028) and landfill gas control and utilization systems at Green Lane and Keele Valley Landfills (target completion by 2026) C) Produce renewable natural gas from wastewater D) Divert waste from landfill in City-owned facilities

For the most part, the short-term actions do not require Toronto to pursue dramatically new climate actions - they require Toronto to do them faster and at a larger scale. Existing strategies and plans such as the Electric Vehicle Strategy, the Toronto Green Standard, the Net Zero Existing Buildings Strategy and the TTC Green Bus Program are examples of approved plans that identify detailed steps and considerations to get to net zero.

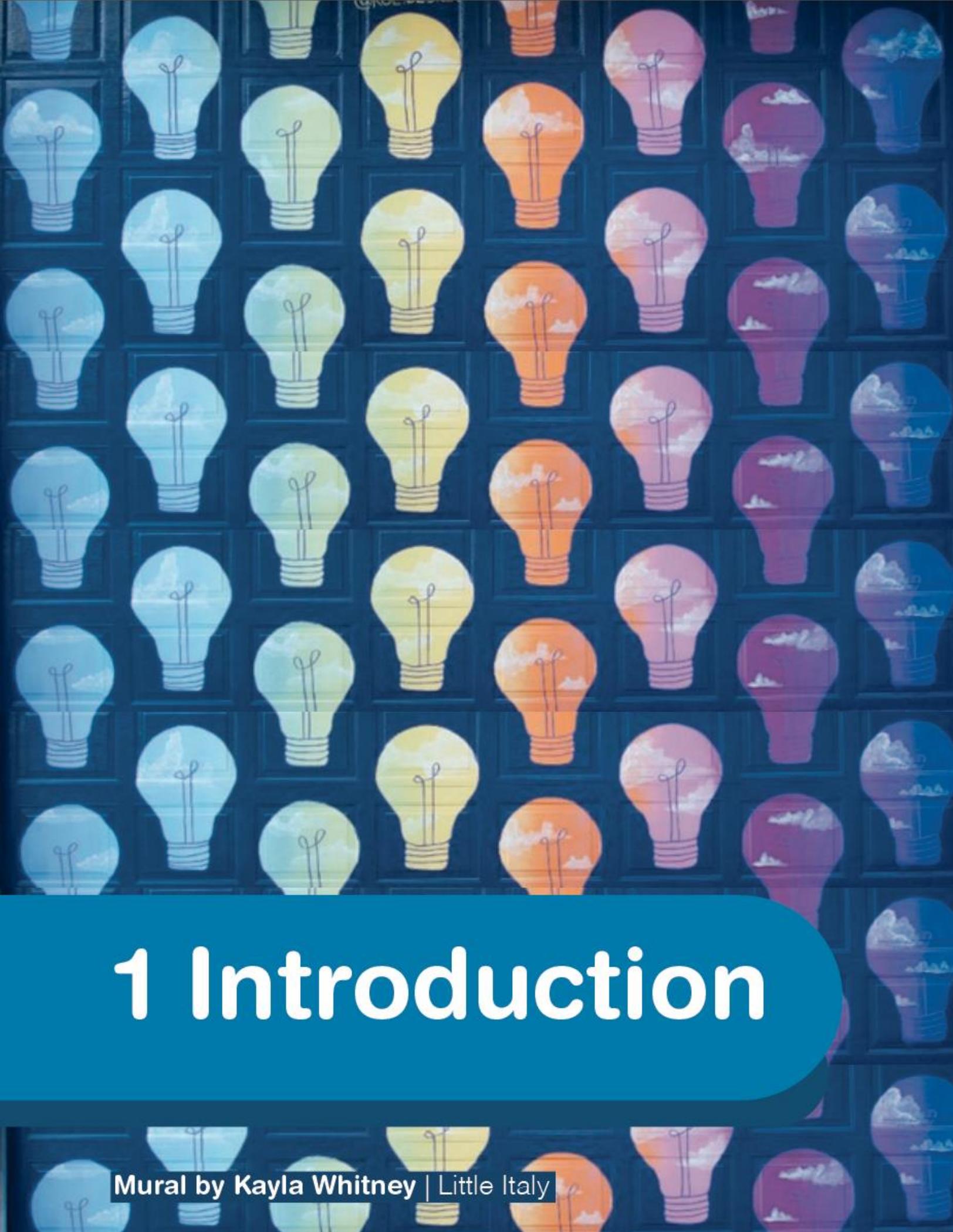
The 2030 greenhouse gas emission reduction targets and short term actions have been developed through extensive consultation across City divisions and agencies, and with stakeholders and the public. Since 2019, the City has engaged over 5,000 residents, businesses, and other stakeholders to understand key priorities, opportunities and challenges. Consultations in recent years, particularly in 2021, have highlighted the importance of responding to the climate crisis with urgency.

Many challenges outside of the City's control have been identified through consultation. Some of these challenges are identified and explored in the Strategy as keys to success, also called dependencies:

- Action must begin now and must focus on equity
- Action from all levels of government will also need to align and accelerate
- The electricity system needs to be carbon free
- The labour market must shift and local supply chains must be developed
- Innovative and adaptive delivery mechanisms must be adopted to scale up
- Impacts on material and land resources should be accounted for

Collaboratively addressing these dependencies in a timely manner is necessary so that Toronto can move ahead on the five critical steps identified in this Strategy in time to meet the 2030 targets. As time passes, opportunities to avoid “lock in” of carbon emissions from city systems are being missed. Achieving the targets set out in the Strategy will require new means of delivery. Decision-making will need to be re-oriented so that the net zero choice becomes the best choice now and in the future.

When we achieve the City's TransformTO Net Zero vision, Toronto will be a net zero-carbon city that benefits all. It will be an equitable city where everyone has access to affordable transportation and quality housing. It will be a prosperous city that is resilient to social, economic and environmental shocks and stresses. It will be a net zero GHG city with clean air and healthy communities. We will only achieve this success through a respectful approach to the land, water and air, collaboratively with the diverse communities across Toronto.



1 Introduction

Mural by Kayla Whitney | Little Italy

1. Introduction

Human-caused climate change is already contributing to many weather and climate extremes in every region across the globe,² causing immeasurable harm to people and ecosystems. Scientists indicate that there is a narrow time window to limit further warming. The City of Toronto has developed the TransformTO Net Zero Strategy (“the Strategy”) to address the climate emergency declared by City Council.³ The Strategy builds on and increases the ambition of [TransformTO](#), Toronto’s climate action strategy, to respond to the urgency of climate change.

The Strategy focuses on actions to achieve City Council’s ambitious 2030 greenhouse gas (GHG) emission-reduction target, and sets a course to reach net zero emissions by 2040. To get there, it identifies 2030 GHG reduction targets for each sector and short-term actions to put Toronto on a path to achieve these targets. These 2030 targets address GHG emissions from our homes and other buildings, transportation, waste, and all other sources in Toronto.

2030 EMISSION REDUCTION TARGETS

- 100 per cent of new buildings are designed and built to be near zero greenhouse gas emissions
- GHG emissions from existing buildings are cut in half, from 2008 levels
- 50 per cent of community-wide energy comes from renewable or low-carbon sources
- 25 per cent of commercial and industrial floor area is connected to low-carbon thermal
- 75 per cent of school/work trips under 5km are walked, cycled or by transit
- 30 per cent of registered vehicles in Toronto are electric
- Identify pathways to more sustainable consumption in City of Toronto operations and in Toronto's economy
- 70 per cent residential waste diversion from the City of Toronto’s Integrated Waste Management System

The Strategy envisions a future that nearly eliminates GHG emissions, using existing technologies. It also improves the lives of Torontonians by making a healthier, more active and more accessible city with new

² IPCC, 2021. Summary for Policymakers. In *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

³ In 2019, City Council voted unanimously to declare a climate emergency and accelerate efforts to reduce GHG emissions and adapt to climate change, adopting a stronger emissions reduction target of net zero by 2050 or sooner.

opportunities for jobs and businesses and greater resilience against extreme weather. In Toronto's net zero future, air pollution from gasoline and diesel vehicles and the combustion of fuels in homes is virtually eliminated.

The impacts of climate change are being felt in Toronto, and these impacts are creating a greater burden for some residents more than others. The challenge of preventing further climate change is great, and everyone plays a role: the private sector, the nonprofit sector, the community, and all levels of government including the City of Toronto.

This Strategy identifies the City's role in ensuring the ways we build, travel, and consume result in fewer emissions and enable us to reach the GHG-reduction targets. Achieving net zero is not simply a technology solution. The combination of attentive urban design, city planning, active transportation, and transit systems will need to work in step to cumulatively increase the efficiencies of the urban systems. The Strategy focuses on achieving the near term challenges of reaching our 2030 target through addressing five critical steps that will ensure rapid transformation:

1. Demonstrate carbon accountability locally and globally by establishing a carbon budget
2. Accelerate a rapid and significant reduction in natural gas use
3. Establish performance targets for existing buildings
4. Increase access to low carbon transportation options, including walking, biking, public transit and electric vehicles
5. Increase local renewable energy to contribute to a resilient, carbon-free grid

This Strategy outlines Toronto's planned approach to reach net zero. Additional materials, including technical modelling and public consultation reports, are available on the City's website at <http://www.toronto.ca/TransformTO>.

WHAT ARE GREENHOUSE GASES?

Greenhouse gases (GHGs) such as carbon dioxide (CO₂) and methane (CH₄) are necessary to keep our planet warm enough to sustain life. However, in excessive quantities, they block heat from escaping the earth's atmosphere, causing the earth to heat up and creating imbalances in the atmosphere which lead to more unstable and severe weather events. Increased GHG emissions from human activities, such as burning fossil fuels, are primarily responsible for climate change.

WHAT IS NET ZERO?

Basically, net zero means zero. Net zero emissions is achieved when we stop emitting GHGs from how we live, work, and travel. The goal is to get emissions as close to zero as possible, with any remaining human-driven emissions balanced by an equivalent amount of carbon removals. Carbon removals from the atmosphere can be achieved by restoring natural lands and soils, or through direct air capture and storage technologies.

For the City, net zero will be achieved by decarbonizing rapidly and thereby reducing GHG emissions from how people move around, how residents operate buildings, how goods are produced and manufactured,⁴ and how people consume materials and dispose of waste.

⁴ While consumption-based emissions (e.g. emissions from the manufacturing and transportation of items we use in our daily lives) are not addressed in this analysis, the City is seeking to better understand and reduce these emissions through additional projects.

2 Where we are now



Mural by Tishona Anand | Birch Cliff

2. Where We Are Now

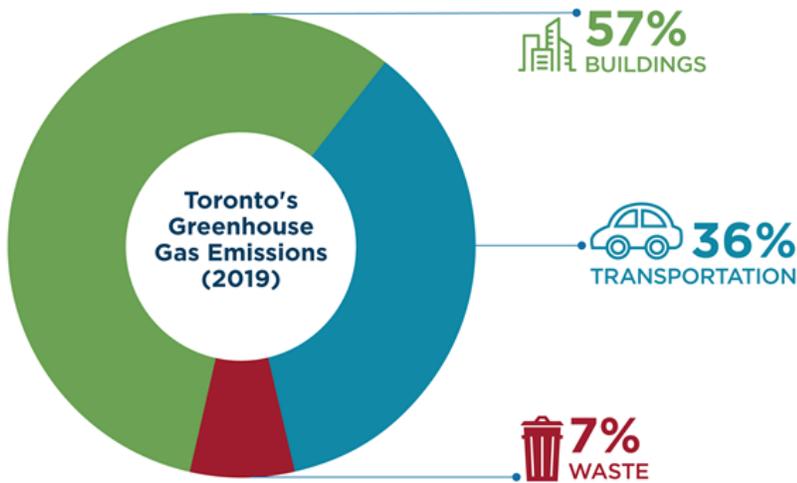
To understand where we need to get to as a city to achieve net zero, we need to know where we have been and where we are now.

2.1 Where are we now?

Those living in and around Toronto have felt the city and the region change over time. They've felt the winters get warmer and the weather get wilder. Toronto's population continues to grow rapidly, and with it the demand for transportation and housing. The cost of living has increased. These changes are taking place in the context of rapid global change in technology, employment, and awareness of environmental sustainability. All of these factors and many others influence how we as a society make decisions about our collective future.

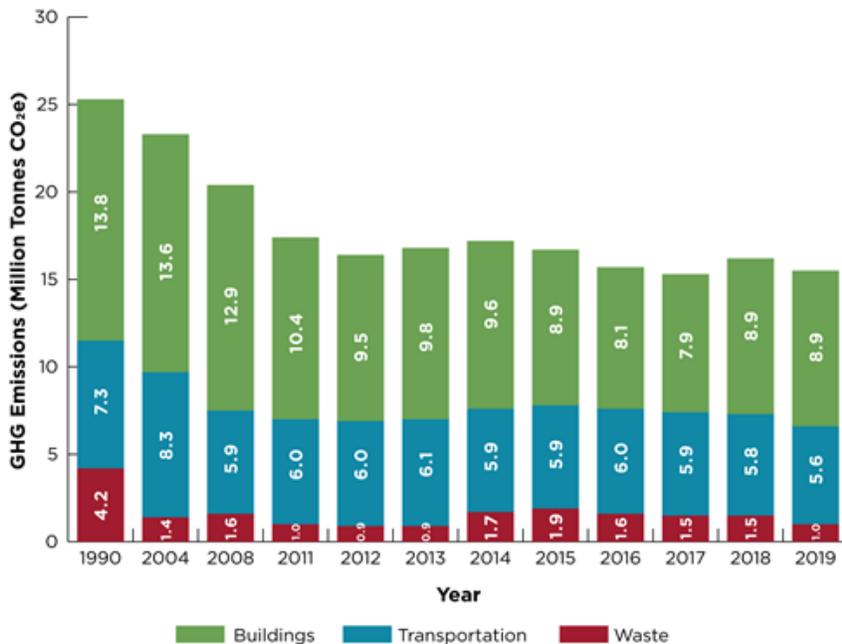
Each year, the City takes stock of its emissions in a GHG Inventory. The inventory tells a story about the total GHG emissions community-wide, and the major sources of those emissions. In 2019, the most recent year for which data are available, community-wide emissions were approximately 15.6 million tonnes (MT) of carbon dioxide equivalent (eCO₂). Buildings continue to be the largest source of GHG emissions in Toronto, followed by transportation and waste. In 2019, an estimated 57 percent of GHG emissions across the Toronto community come from buildings. These emissions stem primarily from burning natural gas to heat space and water. Approximately 36 per cent of emissions come from transportation, with almost all of this coming from burning gasoline in our personal cars. The remaining 7 per cent comes from waste, primarily from landfills.

Figure 1. Toronto's GHG emissions (2019).



In 2019, community-wide emissions decreased 3.9 per cent from 2018, when Toronto emitted 16.2 MT eCO₂ (Figure 2). This decrease was largely driven by a methodological change in counting waste emissions, specifically, refining the emissions estimate calculation methods for two City-owned landfills. The largest sources of emissions, buildings and transportation, remained largely the same in 2019. Transportation emissions decreased by 2.8 per cent from 2018, with most of those emissions continuing to be from gasoline used in passenger cars and trucks.

Figure 2. Toronto's GHG emissions by sector from 1990 to 2019.



City of Toronto Corporate Emissions

The City's 2019 corporate emissions, or local government emissions, decreased 3.7 per cent relative to 2018 but remained stable as a share of community-wide emissions at about 5 per cent. The largest sources of corporate emissions are buildings and transportation, particularly natural gas used in buildings, water supply and wastewater treatment, and diesel used by TTC buses. Further detail on the City's corporate GHG emissions is available in the Greenhouse Gas Emissions Inventory 2019 report on the City's website.

Consumption-based emissions

Consumption-based emissions are an emerging area of research and action. Cities like Toronto consume more than we produce, meaning we indirectly cause emissions elsewhere by purchasing goods and services from other areas of the world. Currently, lifecycle (or consumption-based) emissions from the products and services consumed by residents, businesses and institutions in Toronto are not included in the GHG inventory. Work to define and calculate these emissions is being planned, and a consumption-based inventory is anticipated to be completed and reported in 2023.

Lessons from the COVID-19 pandemic

It is possible that GHG emissions in Toronto decreased during the COVID-19 pandemic. Daily carbon dioxide emissions around the world are estimated to have fallen by about 17 per cent by early April 2020, relative to 2019 average levels. The experience of COVID-19 is that a rapid and massive shift in human behaviour can reduce GHG emissions but the pathway needs to be implemented thoughtfully to maximize co-benefits such as improved air quality, enhanced employment opportunities and new economic activity.

2.2 Development of the Net Zero Strategy

In 2017, Toronto City Council unanimously adopted TransformTO, Toronto's climate action strategy, and set the target of reducing GHG emissions by 80 per cent against 1990 levels by the year 2050. City Council adopted an interim target of reducing community-wide GHG emissions by 65 per cent by 2030 from 1990 levels, and a short-term target of reducing GHG emissions by 30 per cent by the year 2020. The vision of TransformTO is a low-carbon future that reduces emissions and achieves multiple community-wide

priorities including poverty reduction, good quality jobs, healthy communities, and increased resilience to extreme weather.

In October 2019, Toronto City Council declared a climate emergency, joining a global call to recognize the urgency of the climate crisis, and adopted a stronger emissions reduction target for Toronto: net zero by 2050 or sooner.

In April 2020, the City established the Toronto Office of Recovery and Rebuild (TORR) to engage with Torontonians on a city-wide approach for recovering and rebuilding from COVID-19. The results of TORR's work and extensive engagement was published in the COVID-19: Impacts and Opportunities report, which provided recommendations for the City of Toronto and its agencies and corporations to support the recovery and rebuild of communities, organizations, partners and businesses. This Net Zero Strategy includes consideration of the extensive work done by TORR and City staff across the organization to ensure the implementation of bold policies cross-corporately that enable an equitable low-carbon transition.

Development of this Net Zero Strategy began shortly after City Council approved the Climate Emergency Declaration in 2019 and included several rounds of stakeholder and public engagement over the past three years, an update of the TransformTO technical modelling to re-align with the more ambitious target of achieving net zero emissions by 2050 or sooner, and collaboration internally and externally to identify those climate actions that need to be implemented and accelerated in order to achieve the Council-approved 2030 target. The results of the modelling and engagement were used to identify a potential pathway for Toronto to achieve net zero emissions, based on a collection of bold climate actions and available technologies.

2.3 Guiding Principles

TransformTO is guided by the following principles. It aims to create benefits for the community by designing and implementing climate actions that:

Figure 3. Guiding Principles for Toronto's Net Zero Strategy.



2.4 Indigenous Worldview

This Strategy aims to include an Indigenous worldview through its implementation. This can be done in part by asking big questions, such as "are we good ancestors?", and "how are we honouring the land, water, and all our relations?" Through asking these questions, learning from Indigenous stories and expertise, and having respectful, ongoing engagement with local Indigenous Peoples, the City aims to address climate change as one part of advancing the reconciliation process.

Ways of marking progress and looking forward

This Strategy will seek to measure its progress and goals with an Indigenous lens. This means asking bigger questions that go beyond climate mitigation as the work will not stop once the City of Toronto achieves its 2030 targets. For instance, how can we honour the land, water, and all our relations when implementing the Strategy? We hope asking questions that embody seven generation thinking and an engagement plan that embodies a good mind will create a safe place for an exchange of knowledge between nations in this unified effort to address climate change.

There are huge limitations when heavily relying on Western ways of knowing, decision making, and problem solving. The Western worldview aims to be objective and is devoid of relationality which creates a limited vision for a net zero future.

There are many lessons to be learned from creatures big and small as our survival is linked to the appreciation and understanding of all our relatives who share the earth with us. The traditional stories of Indigenous Peoples across Turtle Island contain a multitude of lessons about the importance of gratitude and reciprocity.

This is one instance of how Indigenous knowledge and worldviews bring a way of looking at current realities that goes beyond quantitative data. This Strategy will move forward in a way that incorporates Western and Indigenous ways of knowing to create a resilient future without oil and gas. Luckily, we do not need to reimagine “net zero” cities as they have existed in the past and still do.

MURAL TITLE: THE POWER OF THE LAND

The Power of the Land mural description by lead artist Philip Cote:

The Anishinaabe peoples have occupied this land for thousands of years creating a Land-Based Pedagogy to communicate with the flora and fauna and beyond to the stars. The woodland designs are deeply connected to the creation story of the Anishinaabe as this design with all its black lines speaks about the beginning of the Universe. There is a wavelength that goes from the First Mans' mouth to the First Woman's mouth. This symbolizes Indigenous communication across time, like our land-based teachings. It represents how stories are embedded in the land and how our ancestors remind us of who we are, the animals, and plants continue to show how we are in a relationship to all life across this land called Canada.

- Philip Cote, MFA, Elder and Ancestral Knowledge Keeper



Mural by Philip Cote and Torossian

2.5 The Voice of the Community

In recent years, the City consulted extensively with the public, stakeholders and relevant City Divisions, Agencies and Corporations to receive input on key priorities and next steps the City and its partners should take to address climate change. Key findings from this engagement are summarized in the following reports available on the City's TransformTO website:

- *Equity and Engagement Report* (2016)
- *Indigenous Climate Action Report* (2018)
- *Final Report of Toronto's Reference Panel on Climate Action* (2019)
- *TransformTO Public Meeting Report* (2019)
- *TransformTO Getting TO Net Zero* public consultation summary (2021)

The City launched *TransformTO Getting TO Net Zero* public consultations in the summer of 2021 to support the development of the TransformTO Net Zero Strategy. The consultations featured web and social media content, a video, Net Zero backgrounder, Community Discussion Guide, public survey and an online idea board. Participants were asked to assist the City in prioritizing key climate actions in buildings, energy, transportation and waste, as identified in previous consultations. During this process from late June to early August, 2021, over 1,000 survey responses were received, 10 community discussions were held, and over 100 ideas were posted to the online idea board.

The results from this round of public consultation align well with the overall themes noted in the previous consultations, listed above. The highest priority actions continue to be building retrofits and fuel switching, support for the Toronto Green Standard sustainable design requirements, increased local renewable energy generation, enhancements to public and active transportation, improved waste management, increased tree canopy, and a greater emphasis on climate in decision making.

Similar to the previous TransformTO consultation results, participants continue to prioritize aggressive GHG reduction targets and implementation strategies that encourage immediate climate action. There continues to be considerable emphasis on ensuring that climate actions are equitable, particularly for seniors and equity-deserving communities. Participants of this round of consultation also urged the City to consider the impacts of the climate actions on affordability and the cost of living for Torontonians, particularly renters. Many participants shared concerns about the potential for landlords and building owners to significantly raise rents to make up the cost of retrofitting existing buildings. However, other participants noted they are

willing to embrace the higher cost of goods and services if the increase in price is due to meaningful and beneficial action on climate.

The key difference between the themes in this year's consultation results and the previous results is the sense of urgency. Responses received in 2021 are more action-oriented than in previous consultations. Participants strongly believe that the City's focus should be on implementing aggressive climate action and utilizing financial incentives and disincentives, rather than prioritizing education and outreach. However, participants still feel education and outreach are important tactics to continue.

Respondents continue to support the City's investment in infrastructure but feel that it shouldn't be limited to transit and active transportation. For example, many respondents advise the City to invest in green energy, low-carbon construction and to subsidize building retrofits and the maintenance of privately-owned mature trees. Participants also acknowledge the importance of city-wide involvement – including individuals, organizations and corporations – in developing and delivering on climate action to achieve the medium and long-term TransformTO targets.

Also in 2021, a Net Zero External Advisory Group comprised of 25 diverse stakeholder organizations, including youth organizations, provided input on draft elements of the Net Zero Strategy and equity considerations. Participants provided advice at a virtual meeting through discussion and a virtual whiteboard. In addition to providing sector-specific expert advice, participants emphasized the urgency of ambitious action to meet 2030 targets, the need for an equitable approach to implementation, and the need for collaboration, support, policies, and leadership by all levels of government and the private sector to enable net zero.

Climate-related consultation was also conducted by the Toronto Office of Recovery and Rebuild (TORR), and is identified in the *COVID-19: Impacts and Opportunities Report*. Through consultations conducted in the summer of 2020, the TORR report identified climate considerations that should be included in the post-pandemic recovery process, including a focus on resilience, equity, and building back better.

The feedback received from these consultations informed the development of the GHG emissions reduction targets and prioritization of actions in this Net Zero Strategy. It also informed the technical GHG modelling and identified opportunities to create health, economic, social, and resilience benefits.

Additional reports on public and stakeholder consultation are available on the City's website at <http://www.toronto.ca/TransformTO>.

2.6 Where do we want to go?

Toronto's future

When we achieve the TransformTO Net Zero vision together, Toronto will be a net zero-carbon city that benefits all. It will be an equitable city where everyone has access to affordable transportation and quality housing. It will be a prosperous city that is resilient to social, economic and environmental shocks and stresses. It will be a net zero GHG city with clean air and a healthy community. We will achieve this success through a respectful approach to the land, water, and air, collaboratively with the diverse communities across Toronto.

This Strategy sets out a path to achieve this vision. The Strategy focuses on achieving an ambitious 2030 GHG emission-reduction target, a critical step on the path to net zero by 2040. To guide Toronto along the path to net zero, the Strategy includes a series of interim targets as follows:

2030 OVERALL TARGET:

- 65 per cent reduction in community-wide greenhouse gas emissions by 2030 from 1990 levels

2030 TARGETS BY SECTOR:

- 100 per cent of new buildings are designed and built to be near zero greenhouse gas emissions
- Greenhouse gas emissions from existing buildings are cut in half, from 2008 levels
- 50 per cent of community-wide energy comes from renewable or low-carbon sources
- 25 per cent of commercial and industrial floor area is connected to low carbon thermal energy sources
- 75 per cent of school/work trips under 5km are walked, biked or by transit
- 30 per cent of registered vehicles in Toronto are electric
- Identify pathways to more sustainable consumption in City of Toronto operations and in Toronto's economy
- 70 per cent residential waste diversion from the City of Toronto's Integrated Waste Management System

2030 LEAD BY EXAMPLE TARGETS:

- City of Toronto corporate greenhouse gas emissions are reduced by 65 per cent over 2008 base year

- All City Agency, Corporation and Division-owned new developments are designed and constructed to applicable Toronto Green Standard Version 4 standard achieving zero carbon emissions, beginning in 2022
- Greenhouse gas emissions from City-owned buildings are reduced by 60 per cent from 2008 levels; by 2040, City-owned buildings reach net zero greenhouse gas emissions
- All City-owned facilities have achieved zero waste
- Generate and utilize 1.5 Million Gigajoules of energy from biogas
- Approximately 107,700 tonnes CO₂e per year are reduced through Organics Processing with Renewable Energy and Landfill Gas Utilization
- 50 per cent of the City-owned fleet is transitioned to zero-emissions vehicles
- 50 per cent of the TTC bus fleet is zero-emissions
- Greenhouse gas emissions from food the City of Toronto procures are reduced by 25 per cent

2025 TARGET:

- 45 per cent reduction in community-wide greenhouse gas emissions by 2025 from 1990 levels

The actions the City will take with its partners in the short term to put Toronto on track to reach these interim targets, and ultimately net zero carbon emissions, are outlined in the Short-Term Implementation Plan 2022-2025 which is included below in this Strategy. The Implementation Plan actions are also outlined sector-by-sector throughout the Strategy.

Following this path and reaching a net zero Toronto that benefits all will require immediate and sustained transformational action at a remarkable scale and pace. This will only be achieved through collaboration by all parties: all levels of government, the private sector and the community.

2.7 The COVID-19 Pandemic and Lessons for the Climate Emergency

COVID-19 brought a powerful reminder that the everyday stresses that Torontonians face are significantly exacerbated by external risks emerging from the natural world. Climate change has long been recognized as a disruptive force that could undermine Toronto's efforts to build prosperity, equity and well-being.

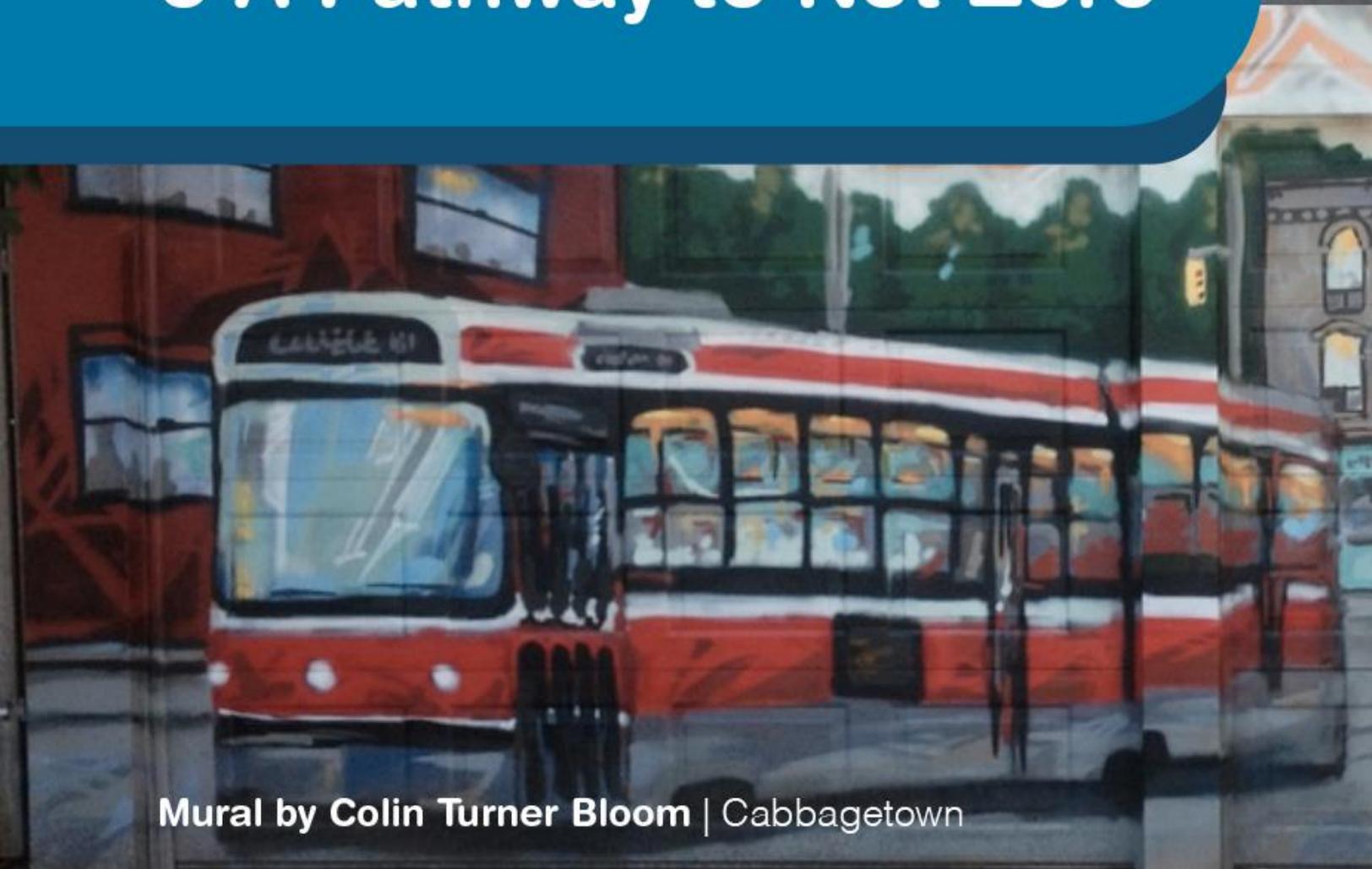
The pandemic has highlighted some of the unique opportunities and challenges associated with tackling a local, national and global emergency, such as the need for common objectives, dedicated resources, good data, and close collaboration among all levels of government, the private sector and the community. It has shown the scale of mobilization necessary, and what we as a society are capable of even under time frames unimaginable prior to the current pandemic. A similar scale and pace of response and collaboration are needed to address the challenges and opportunities we continue to face in the global fight against climate change.

The intersection of COVID-19 and climate change compounded stresses and risks for many people. COVID-19, like climate change, disproportionately impacts lower income residents. For instance, many people who were off work at home due to COVID-19 closures experienced the summer's extreme heat in apartments without air conditioning. The impact of extreme heat was amplified due to COVID-19 closures, and the unavailability of many cooling locations such as recreation centres, malls, and initially pools. Lower-income residents are less likely to have the type of employment and home environment that allowed work and income to continue from home and exposed them to elevated risks of COVID-19 transmission in their employment situations. The pandemic highlighted the need to consider compound stresses and to have a central focus on equity when addressing the climate emergency.

The Net Zero Strategy is consistent with the recommendations of the Toronto Office of Recovery and Rebuild. Both emphasize the need to move Toronto forward (to build back better) rather than simply returning to the pre-COVID-19 state.



3 A Pathway to Net Zero



Mural by Colin Turner Bloom | Cabbagetown

3. A Pathway to Net Zero

To understand how Toronto can reach net zero, the City undertook technical modelling to figure out what changes need to take place in our city, and how much of each major change is required to reach our goals. Financial costs and savings were assessed, and other benefits of GHG-reduction actions were explored.

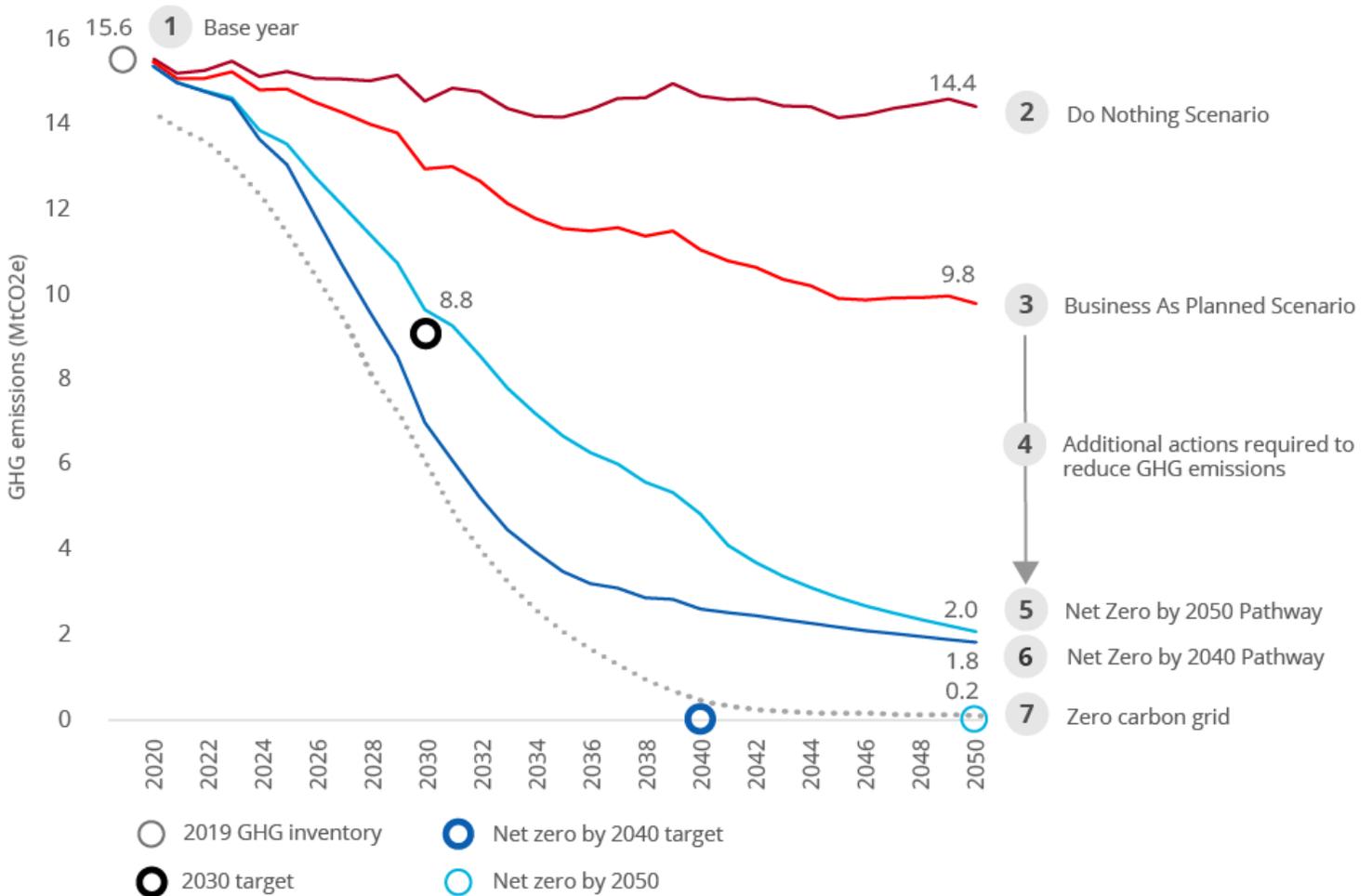
3.1 Technical Analysis

A model was used to explore pathways to net zero GHG emissions. The model uses demographic, building, transportation, waste, and energy data to calculate city-wide energy and emissions and to track how these change over time when specific policies or actions are implemented.⁵ The model also calculates financial impacts, including fuel costs, operations and maintenance costs, capital investments, and the price of carbon emissions. The modelling enabled us to understand the GHG impact of various activities, and the impact of taking or delaying action.

The modelling results provide a clear picture of several possible paths forward (Figure 4). Only the Net Zero by 2040 (NZ40) pathway provides a response to the climate emergency that is robust enough to meet or exceed the City's 2030 GHG target. To meet this target, GHG emissions need to decline by nearly 1 million tonnes of CO₂ per year over the next eight years. This is equivalent to electrifying 200,000 single-family homes (using heat pumps) every year. The modelled actions in the NZ40 pathway are outlined later in this report, providing a pathway for Toronto to achieve net zero emissions by 2040.

⁵ The modelling method and results are described in detail in the Net Zero Technical Modelling Report (Sustainability Solutions Group, 2021), available on the City's website at [TransformTO](#).

Figure 4. Overview of the net zero modelling process.



MODELLING PROCESS

The net zero modelling process followed a series of steps in which the following questions were asked:

- **STEP 1:** What are the current conditions? These are the conditions in the base year from which the analysis started.
- **STEP 2:** What happens if the City makes little to no additional effort or investment in climate action? This is the Do Nothing Scenario.
- **STEP 3:** What happens if the City implements current plans that are already approved? Approved projects considered include district energy expansion, transit expansion, personal vehicle and City fleet electrification and the Toronto Green Standard (TGS). This scenario shows the benefit of approved plans, and the future trajectory that Toronto would be on, given current approved plans

and authorities, without implementation of the Net Zero Strategy. This is the Business as Planned (BAP) scenario.

- **STEP 4:** What actions can reduce GHG emissions in Toronto?
- **STEP 5:** What happens if these actions are implemented? This is the Net Zero by 2050 Pathway (NZ50).
- **STEP 6:** What happens if these actions are implemented more quickly? This is the Net Zero by 2040 Pathway (NZ40).
- **STEP 7:** What GHG emissions remain after the actions are taken? Most of the remaining GHG emissions are the result of burning natural gas to generate electricity.

SOME KEY OBSERVATIONS FROM FIGURE 4 ARE:

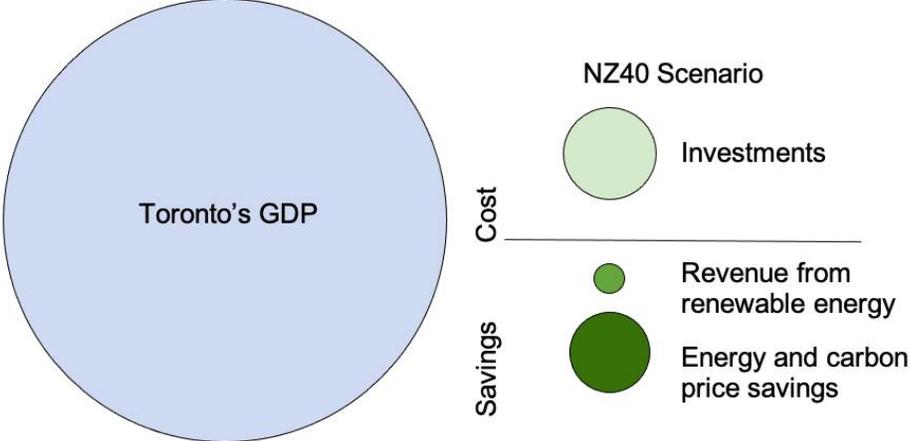
- No scenario will be able to reach net zero through actions alone; a remaining residual will need to be “zeroed” out by the purchase of carbon offsets, renewable energy credits or through carbon capture/storage technologies
- The BAP scenario, our current trajectory, will not achieve existing 2030 City Council adopted GHG target of 9 million tonnes of CO₂e
- Today, Toronto's emissions are approaching the 80 x 50 trajectory, City Council's existing target of an 80 per cent reduction by 2050 from 1990 levels. Significant additional, new actions and authorities, as outlined in the Net Zero Strategy, are needed to reduce Toronto's future emissions from the BAP scenario to meet the 2030 target and any of the low-carbon trajectories.
- Only the most ambitious net zero by 2040 pathway will put Toronto on a sufficient enough trajectory to reach Toronto's 2030 target of 9 million tonnes CO₂e emitted that year

3.2 Investing in a Net Zero Toronto

Implementation of the 2040 and 2050 Net Zero pathways requires investments in building retrofits, renewable energy, electric vehicles and other zero emissions technologies and infrastructure. These

investments result in energy savings (for example, homes use less energy) and revenue generation (selling power from electricity generation or district energy).⁶

Figure 5: Investments and savings relative to Toronto's projected GDP to scale, 2021-2050.

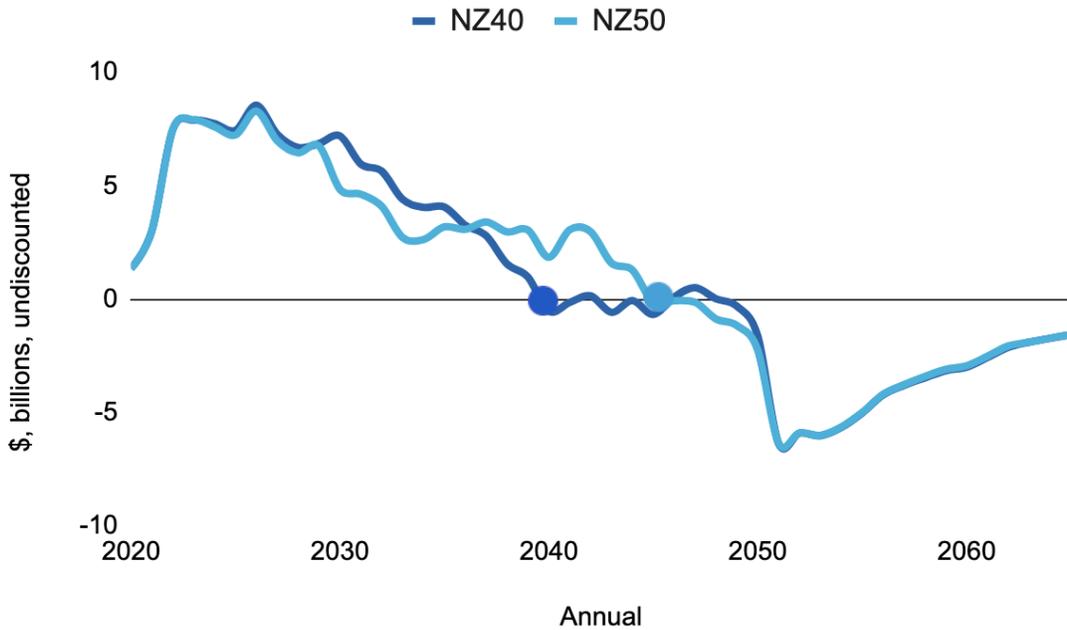


Investing in the future

When the annual investments and savings are summed up for each year, the result is a curve as illustrated in Figure 6. The annual investments in NZ40, setting aside financial returns, total approximately 5 per cent of Toronto's annual GDP for a decade, before declining to zero. After 2040, savings start to exceed costs on an annual basis.

⁶ The modelling method and results are described in detail in the Net Zero Technical Modelling Report (Sustainability Solutions Group, 2021), available on the City's website at [TransformTO](https://www.toronto.ca/transformto).

Figure 6. Net annual community-wide costs/savings (if the blue line is above 0, there is a net annual cost, and when the blue line goes below 0, there is a net annual saving).

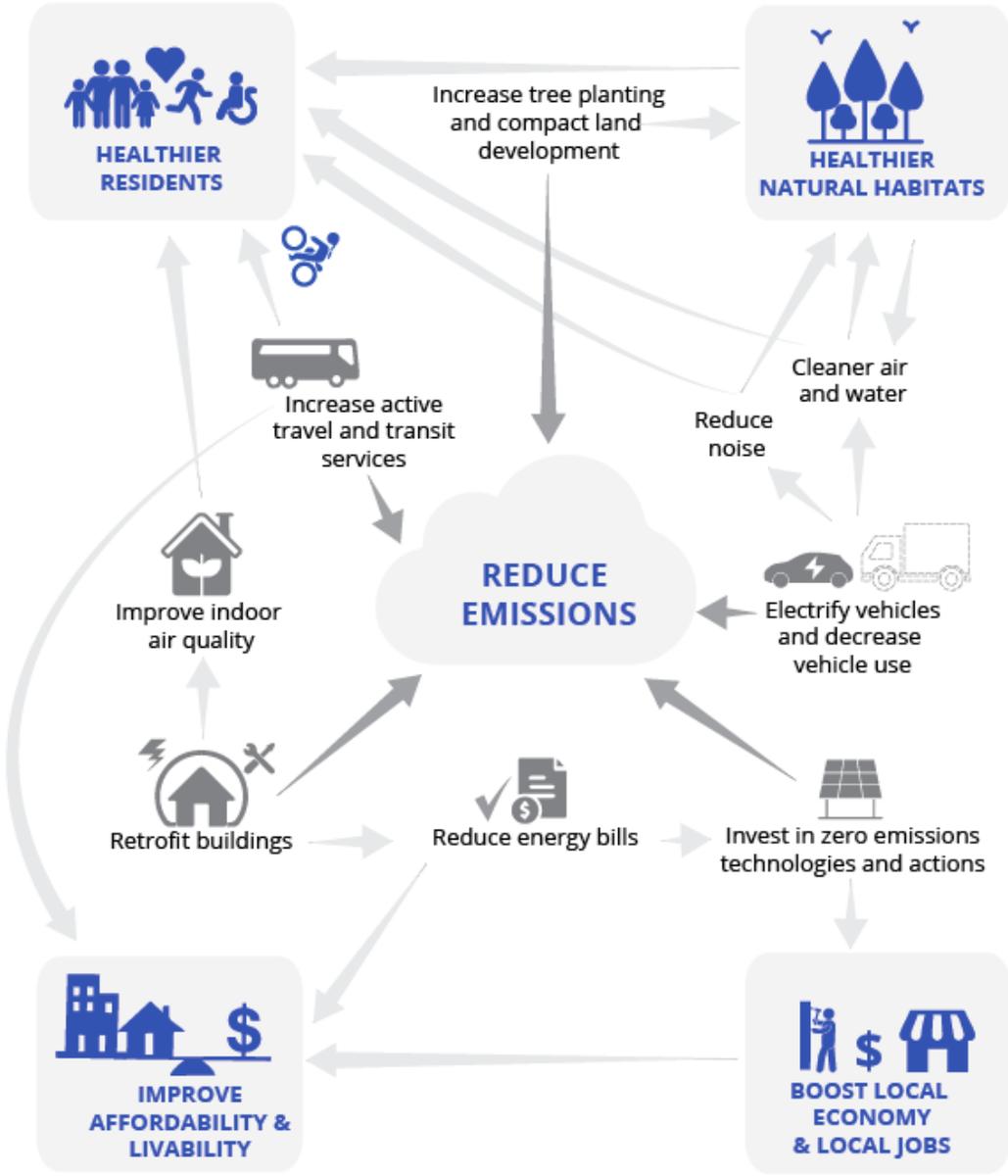


NZ40 costs less than NZ50

When all the costs and savings are added up the NZ40 pathway costs less than the NZ50 pathway. In other words, achieving net zero by 2040 does not imply a financial penalty over achieving net zero by 2050; rather, additional savings can be harvested. Reducing emissions more quickly means that the City can collect the financial benefits of the avoided carbon costs and avoided energy costs more quickly.

3.3 Benefits of Climate Action

Figure 7. Key actions and key benefits to reducing GHG emissions.



Multiple Benefits

Decarbonizing the city will require new investments that provide multiple benefits, such as improved well-being and quality of life, and new business and job opportunities. Many of the proposed actions not only achieve GHG emissions reductions, they synergistically support other City objectives, such as improved economic development, health and equity outcomes, and climate resilience.

The Outcomes of Climate Investments to Advance Equity

TransformTO is grounded in the idea that reducing GHG emissions is not only necessary to avoid the worst effects of climate change, but that climate actions can also achieve multiple community-wide objectives.

The impacts of climate change will be felt by all Torontonians, however not everyone will be impacted equally. Climate change is amplifying the vulnerability of some people including those with low incomes, Indigenous Peoples, 2SLGBTQ communities, undocumented individuals, immigrants and refugees, women, seniors, children, people with disabilities, and racialized people. People in these groups often have less power and access to resources and infrastructure, and poverty and marginalization leave people vulnerable to rising energy, food, and housing costs.

These circumstances limit one's ability to invest in preparing for the impacts of climate change, such as preparing one's home to withstand extreme heat, or flooding from extreme rain. These vulnerabilities also reduce one's ability to rebuild after a climate-related event, for instance a failed garden crop due to heat and drought, spoiled food after a power-outage due to extreme weather, or flood damage from extreme rain. Without supports, marginalized people also have fewer resources with which to participate in the transformation to a net zero future, such as investing in building upgrades and renewable energy.

The City is committed to designing climate actions to maximize their benefit to equity-deserving and vulnerable groups by applying an equity lens to program design. For instance, populations with a lower socio-economic status face intersecting barriers and disadvantages. Lower-income Torontonians tend to live in poorer-quality housing which reduces quality of life, costs more to heat, and has reduced access to cooling such as air conditioning, recreational facilities, and shady greenspace. These neighbourhoods are more likely to have lower levels of transit accessibility and active transportation infrastructure. As noted in the Toronto Poverty Reduction Strategy, poverty in Toronto is gendered, racialized, and geographically concentrated. Climate action presents opportunities to develop a more equal and inclusive city by improving building quality, increasing access to transportation infrastructure, creating economic benefits for equity-

deserving communities, reducing household costs, improving quality of life, and increasing access to daily needs including employment options.

In terms of the cost of living, the Net Zero technical modelling indicates that average household energy costs decrease in the Net Zero pathway. In 2050 in the Net Zero pathways, households will be more efficient and, on average, energy costs will be 70 per cent less per month (energy and transportation combined), compared to the Do Nothing Scenario. These savings can be used to finance the building retrofits and electric vehicles. Lower household energy expenditures are particularly meaningful for lower-income households where energy and transportation costs make up a larger proportion of expenses. During Net Zero Strategy implementation, care will need to be taken to ensure equitable distribution of benefits and costs, such as ensuring that the cost of housing improvements does not overburden renters, and that those in rental housing receive the benefits of lower energy costs.

Taking responsibility today for managing climate change will alleviate some of the pressure on future generations, another important aspect of an equitable approach. One method for reflecting the impact of climate change on society is the social cost of carbon (SCC). The SCC metric sums the quantifiable costs and benefits resulting from each tonne of carbon dioxide on society, and includes assumptions about the future, such as population size, economic growth, and the rate and impact of climate change. The Net Zero technical modelling determined that the cumulative Social Cost of Carbon of the Do Nothing Scenario for Toronto between 2020 and 2050 is \$94 billion. Implementing the Strategy to reach net zero by 2040 will reduce the Social Cost of Carbon to \$35 billion, significantly reducing the burden of climate change on future generations (see TransformTO Net Zero Technical Modelling Report for details).

Toronto is actively working to ensure our programs and policies address the disproportionate impacts of our changing climate on equity-deserving groups and future generations. Using the TransformTO guiding principles and following a framework for equitable design and implementation of climate actions and programs will help to ensure that the transition to a net-zero Toronto occurs in a way that enhances equity, maximizes public benefit, and minimizes harms.

Health

Torontonians care deeply about health and well-being. In 2018, a City of Toronto commissioned survey of residents found that 91 per cent believe climate change threatens our health and well-being and that everyone needs to take steps to reduce their GHG emissions. The COVID-19 pandemic has shown us that our environment impacts our health and well-being, from the air we breathe, to the places we live and work, to the transportation choices we make every day. Taking action to reduce GHG emissions in Toronto benefits our health in many ways.

Less Air Pollution through Fuel Switching

Burning fossil fuels to heat our buildings and run our vehicles emits GHGs that cause climate change. Burning fossil fuels also releases air pollutants, such as particulate matter, nitrogen oxides, carbon monoxide, and volatile organic compounds, and can create ground-level ozone, all of which adversely impact human health. Air pollution causes cardiovascular and respiratory health problems; affects birth outcomes and brain development and function; and is linked to cancer, chronic diseases including diabetes, and other illnesses. Toronto Public Health has estimated that air pollution in Toronto from all sources gives rise to 1,300 premature deaths and 3,550 hospitalizations annually.

Pursuing a Net Zero pathway will see a 99 per cent reduction in local fossil fuel combustion compared to the status quo. This reduction comes from switching vehicles and building heating systems to electric sources. The Net Zero pathway will dramatically reduce local sources of the GHGs that cause climate change and air pollutants that harm our health.

Air quality benefits alone could total \$750 million per year

The Net Zero pathway generates a broad range of societal benefits with direct and indirect financial benefits which are in addition to the financial analysis described in this report. For example, improved air quality as a result of electrifying transportation could deliver health benefits valued at nearly \$750 million per year.⁷ Improved indoor air quality in dwellings and office space as a result of building retrofits will reduce health care costs and absenteeism at work. Reduced air pollution from the combustion of fossil fuels (on roads, in houses, and in electricity generation) will reduce asthma and chronic obstructive pulmonary disease (COPD). Increased walking and cycling will reduce heart disease.

Net Zero Transportation

Motor vehicles are the greatest local source of air pollution emitted in Toronto. Toronto Public Health has estimated that air pollution from internal combustion engine (ICE) vehicles in Toronto is responsible for 280 premature deaths and 1,090 hospitalizations in the city each year, as well as greater numbers of less severe effects such as asthma symptom days.

Toronto currently has 1.1 million passenger vehicles and 121,000 commercial vehicles, most of which are powered by internal combustion engines (fossil fueled). With a rapidly growing population, these numbers

⁷ Calculated based on this study: Choma, E. F., Evans, J. S., Hammitt, J. K., Gómez-Ibáñez, J. A., & Spengler, J. D. (2020). Assessing the health impacts of electric vehicles through air pollution in the United States. *Environment International*, 144, 106015. For more information, the Net Zero Technical Modelling Report (Sustainability Solutions Group, 2021), available on the City's website at [TransformTO](#).

are predicted to continue increasing. In Toronto, modelled air quality is markedly worse in areas near major highways and arterial roads such as along Highway 401 and downtown. Research in cities indicates that in general adverse health impacts from air pollution rise with proximity to major roadways, creating an inequitable health burden for those who live, work, play and learn near major roads. This traffic-related air pollution and its health effects will be improved with increased active transportation, transit ridership, and switching to electric vehicles.

OTHER TRANSPORTATION-RELATED HEALTH BENEFITS OF THE NET ZERO STRATEGY INCLUDE:

- A completely electrified transportation system could benefit mental and physical health by substantially reducing noise pollution and associated annoyance and sleep disturbance.
- A modal shift to electrified public transit can improve cardiovascular and respiratory health by promoting walking to and from transit stops, decreasing personal vehicle use, and reducing associated tailpipe air pollutants.
- Expanded active transportation infrastructure promotes walking and cycling, which can improve cardiovascular health and reduce the occurrences of premature mortality, diabetes and cancers.
- Expanded and improved active transportation infrastructure can lead to mental health benefits from increased physical activity.

Healthy Buildings

Toronto Public Health indicates that the residential and commercial building sectors together are the second greatest contributor to health impacts of air pollution from sources in Toronto and are responsible for approximately 28 per cent of premature deaths and 20 per cent of hospitalizations arising from pollution emitted in Toronto. This is primarily from burning natural gas to heat homes and buildings and to heat water. As the City implements clean heating and switches to electric and renewable energy, society benefits from lower GHG emissions and air pollutant emissions.

Over 80 per cent of the floor space that will exist in 2050 has already been built. This means that to reach the City's net zero goals, upgrading existing buildings is even more important than new net zero buildings.

BUILDING-RELATED HEALTH BENEFITS OF IMPLEMENTING THE NET ZERO STRATEGY:

- Building energy retrofits can reduce outdoor air pollutants associated with natural gas and as a result, benefit physical health.
- Building retrofits can benefit the physical and mental health of residents by improving indoor air quality and reducing dampness and exposure to noise. People typically spend 90 per cent of their time indoors, so the condition of these spaces is important.

- Improvements to insulation of poorer quality homes can improve the physical and mental health of vulnerable populations by improving thermal comfort and reducing energy poverty.

Managing Extreme Heat

Both the duration and intensity of heat waves are projected to increase with climate change. By 2040-2050, Toronto will experience approximately 66 days per year with maximum temperatures above 30°C. Hot weather is associated with health impacts ranging from heat stroke to more serious effects, such as cardiovascular-related morbidity and mortality. Groups more at risk from extreme heat can include isolated adults and seniors, individuals who are experiencing homelessness or are under-housed, people with chronic illnesses, and infants and young children. Building practices that reduce the heat absorption of roofs and hardscape materials and enhance greenspace, can help to reduce urban heat. These strategies together with building retrofits that improve the building envelope, insulation and ventilation; and community resilience supports for vulnerable people; can reduce the risk of heat-related illness and death.

Greenspace

An important component of any climate action plan is the enhancement of green space, especially in areas of the city that lack significant parkland and tree canopy cover. Urban greenspace is linked to increasing active leisure, which has been found to improve cardiovascular and mental health and reduce obesity and cancer, and contribute to a sense of community and social cohesion. These benefits, plus removal of air pollutants by the tree canopy, will be enjoyed by residents as the tree canopy increases and greenspace is enhanced, particularly in areas currently lacking an equitable share of greenspace.

Climate Resilience

In June 2019, Toronto's Resilience Strategy was launched after two years of collaboration and input from residents and organizations across the city. One of the major goals of the Resilience Strategy is to institutionalize resilience into the City's decision-making and demonstrate leadership on resilience, including integrating climate resilience into TransformTO. In October 2019, City Council directed the integration of resilience into TransformTO (Report 2019.MM10.3). Implementation of the Net Zero Strategy will consider the four priority actions identified in the Resilience Strategy:

- **HOME RESILIENCE:** Support homeowners and renters to prepare their homes for shocks.
- **VERTICAL RESILIENCE:** Enable wide-scale change in apartment towers to improve resilience through the improvement or retrofit of apartment towers and units.
- **NEIGHBOURHOOD RESILIENCE:** Enhance the capacity of neighbourhoods to prepare for and recover from shocks through grassroots action and network building.

- **FLOOD RESILIENCE:** Centralize resources towards a city-wide flood planning and prioritization tool.

An important consideration in the implementation of this Net Zero Strategy is that increased reliance on electricity for transportation and heating of buildings could mean more vulnerability if the electricity supply is for any reason jeopardized. Key resilience strategies in the near and long term will need to focus on ensuring a continuous and reliable supply of electricity to homes, businesses and institutions. Reduction of electricity consumption and demand management to reduce pressure on the current grid capacity and distribution network, and the diversification of electricity generation through widespread local renewable energy and storage, will be critical to meet the increased demand for electricity forecasted in this Strategy.

City staff are working with electricity sector organizations such as the Independent Electricity System Operator and Toronto Hydro to better understand the risks and opportunities and plan accordingly. Collectively we need to understand what will be necessary to protect these and other related assets against extreme weather events.

BY IMPLEMENTING THE NET ZERO STRATEGY, NUMEROUS RESILIENCE IMPROVEMENTS FOR TORONTO WILL BE REALIZED:

- Safer buildings during extreme weather (flooding, extreme heat/cold), as older buildings are retrofitted.
- Homes that can keep the lights on during power outages, once outfitted with renewable energy and storage or connected to district energy systems.
- Decreased stress on water and wastewater systems, as a result of retrofits and more stringent efficiency standards for new buildings.
- Less urban heat island effect and flood stress, as a result of enhanced greenspace and tree canopy.
- More back-up power, from electric vehicles.

Prosperity

Climate change, climate resilience, and the economy are deeply connected. Recent events, including the COVID-19 pandemic and increasing incidents of extreme weather, have demonstrated the impacts that unexpected events can have on the economy. Conversely, the historic and current economic systems centred on resource extraction and continued fossil fuel use have had a catastrophic impact on our planet.

Climate action has already strengthened Toronto's economy. Toronto's green industries are one of the fastest growing sectors of Toronto's economy. The sectors' employment continues to grow at a rate twice

as fast as the overall employment in Toronto (3.9 per cent vs. 1.6 per cent annually between 2015 - 2019) and contributed an estimated \$6.55 billion to the local GDP in 2018.⁸

CLIMATE ACTION CAN GENERATE ECONOMIC BENEFITS IN THE FOLLOWING WAYS:

- Generating direct, indirect and induced jobs.
- Lowering household and business energy demand, thereby saving costs, freeing disposable income for re-investment in the economy and improving business competitiveness.
- Protecting households and businesses against energy price volatility.
- Generating overall economic output (GDP) and associated tax revenue.
- Mitigating future climate impacts that will be costly to society, and reducing the cost of adaptation by acting early.
- Improving public health, and therefore productivity, through improved indoor and outdoor air quality, reduced noise and improved building comfort.

Driving toward net zero emissions helps position Toronto's economy for the jobs and growth industries of today and tomorrow. The Canadian Institute for Climate Choices recently examined more than 60 possible pathways for Canada to reach net zero by 2050 and found that Canada's GDP grows substantially in all possible pathways, and that on average, Canadians' incomes will rise.

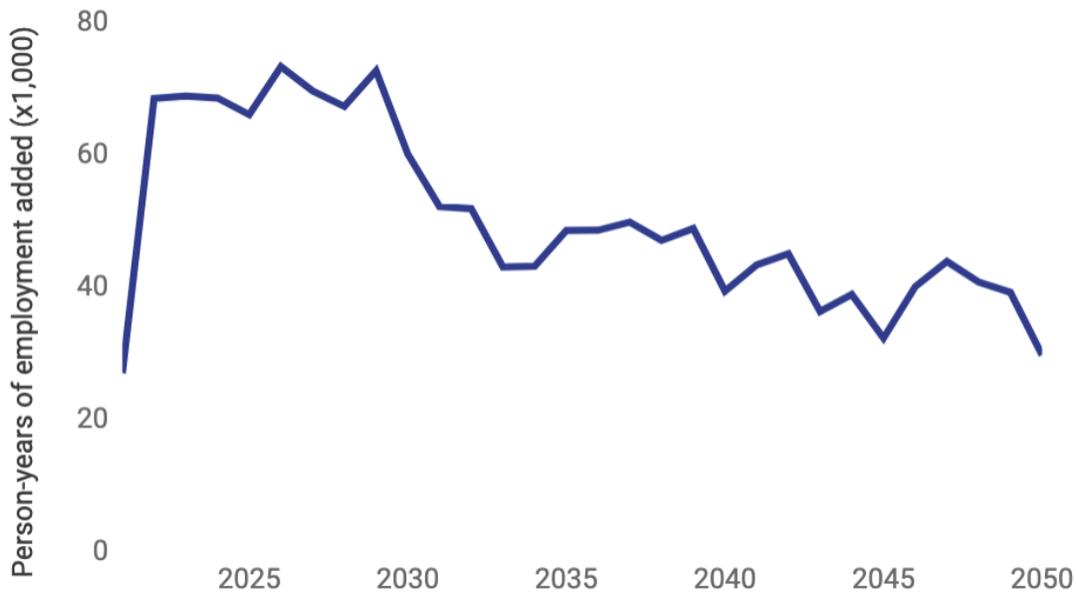
By 2030, green industries are projected to employ 639,200 Canadians across clean transportation (363,700), clean energy supply (111,100), clean buildings (110,600), grid infrastructure (29,900) and industry (24,000). The highest concentration of jobs would be located in Ontario (220,700).⁹

The modelling for Toronto shows that aggressive climate action (net zero by 2040) adds a net of 1.2 million person-years of employment over the Do Nothing scenario between 2020 and 2050—an average of 40,000 per year. Two of the largest sources of clean energy jobs are in the sectors that generate Toronto's largest amount of emissions (transportation and buildings). In other words, there are opportunities to advance multiple City and society objectives while simultaneously achieving deep GHG emissions reductions, creating a win-win-win scenario.

⁸ greentechtoronto, 2020. <https://torontogreenindustries.home.blog/2020/06/23/economic-data/>

⁹ Clean Energy Canada, 2021. [The New Reality](#).

Figure 8: Person-years of employment generated as a result of the investments in the Net Zero by 2040 pathway.



Achieving net zero emissions in Toronto depends largely on an energy transition from fossil fuels to non-polluting alternatives. For households, the energy transition will be experienced most directly in how we heat and cool homes, and how we move around the city. Household expenditures on energy—natural gas, electricity, gasoline, and diesel—are projected to decline in the Net Zero pathways. The Net Zero pathways involve shifting away from natural gas and gasoline to electricity, a more costly energy source. The increased cost, however, is offset by the increased efficiency of homes as required by building codes and the high efficiency of electric vehicle motors as compared to internal combustion engines. The carbon price also adds to the cost of using fossil fuels for heating and transport.

In the Net Zero pathways, an average household in 2050 spends less on fuel and electricity (household energy and transportation expenditures) than they would have in the Do Nothing scenario. Depending on the business, policy and financing strategies used in the implementation of the GHG reduction actions, these savings will be partly offset by the incremental capital expenditures required.

The Net Zero pathways show the share of Canadian households' income spent on energy services (home heating, electricity and transportation) can decrease by an average of 70 per cent, with an average reduction of nearly \$1,500 per household per year compared to the status quo. These savings can be used to finance the capital costs of retrofits and the incremental costs of electric vehicles.¹⁰

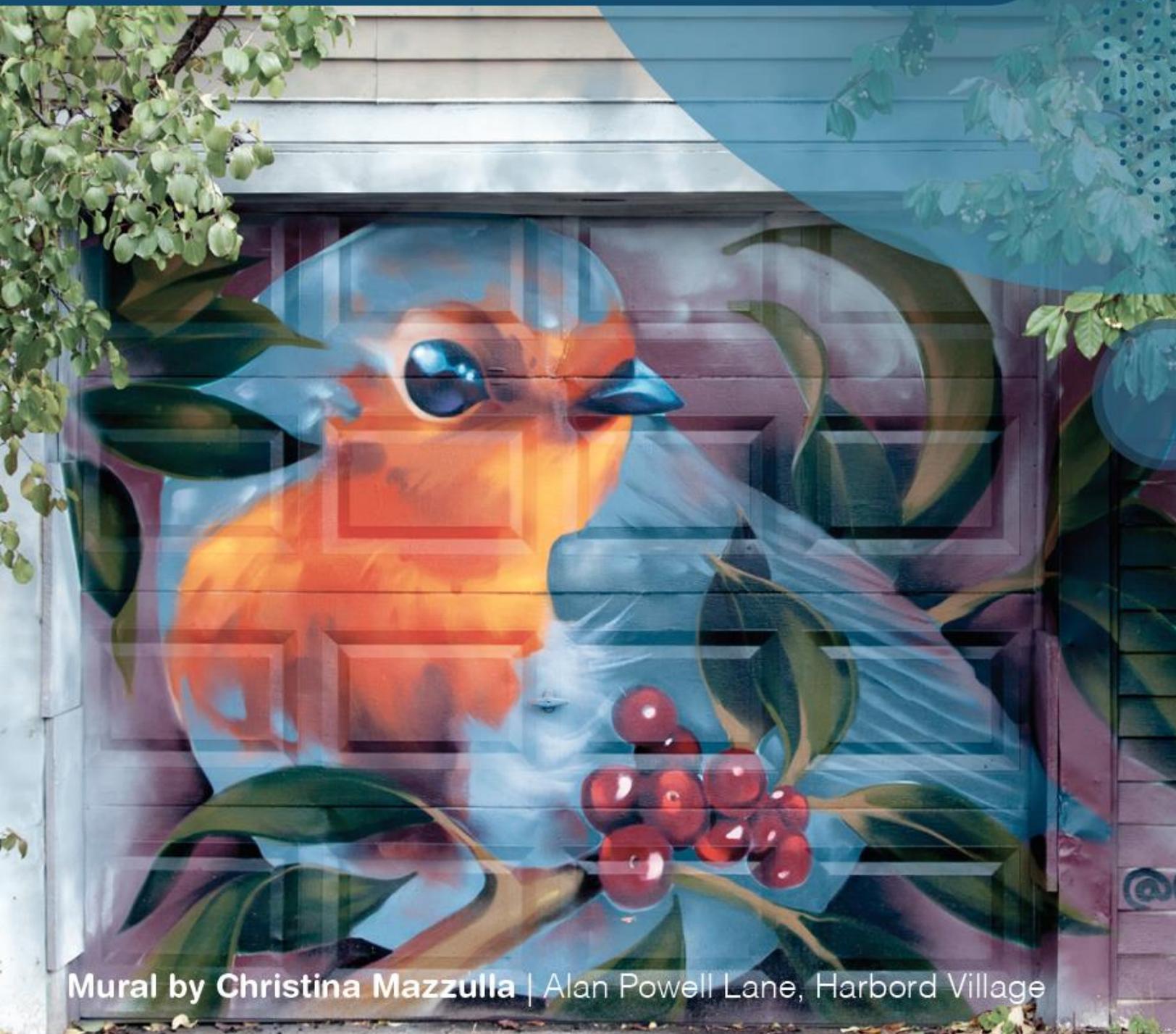
¹⁰ The modelling method and results are described in detail in the Net Zero Technical Modelling Report (Sustainability Solutions Group, 2021), available on the City's website at [TransformTO](https://www.toronto.ca/transformto).

Similarly, after the capital costs are paid back, local businesses will see a 32 per cent decrease in fuel costs to heat and cool their buildings due to efficiency improvements from building envelope retrofits and from replacing heating and cooling systems with heat pumps. This frees up money for other purposes such as improving business competitiveness or for reinvestment in the economy. Reduced household costs for energy and transportation also represent opportunities for residents to spend money locally, resulting in more resilient neighbourhoods. Other benefits to the local economy are seen from changing travel patterns and modes in the Net Zero pathways, resulting in more visits to and spending at local shops.

The economic transition away from fossil fuels is stimulated in part by the price on carbon. In the Net Zero technical modelling, the carbon price is projected to climb to \$170/tCO_{2e} by 2030. This has the impact of increasing the cost of gasoline and natural gas relative to electricity. As a result, gasoline will be more expensive than electricity on a per-unit-of-energy basis by 2028. This benefit is compounded by the fact that electric vehicles can go further per unit of energy than gasoline vehicles. Similarly, heat pumps are three times more efficient than natural gas heating, and home heating with an electric heat pump becomes more affordable than heating with natural gas in 2027.

The Net Zero pathway reduces transportation costs for households and increases accessibility to destinations as transit is expanded, which is particularly beneficial for households for which transportation costs are a larger share of their disposable income. Energy costs are also reduced for households that pay for energy, either directly or indirectly as renters, but these benefits may not occur in the first or second decade, depending on how the retrofits are financed. Because the pathways involve investments, the mechanisms for financing the pathways could generate disproportionate returns for investors, which could exacerbate inequality.

4 Net Zero Targets and Actions



Mural by Christina Mazzulla | Alan Powell Lane, Harbord Village

4. Net Zero Targets & Actions

This Strategy focuses on achieving the City's ambitious 2030 overall target and setting a course for net zero GHG emissions community-wide by 2040. The Strategy also includes an 2025 interim target to emphasize the work that needs to be done immediately to get Toronto onto the net zero pathway.

2030 OVERALL TARGET:

- 65 per cent reduction in community-wide greenhouse gas emissions by 2030 from 1990 levels

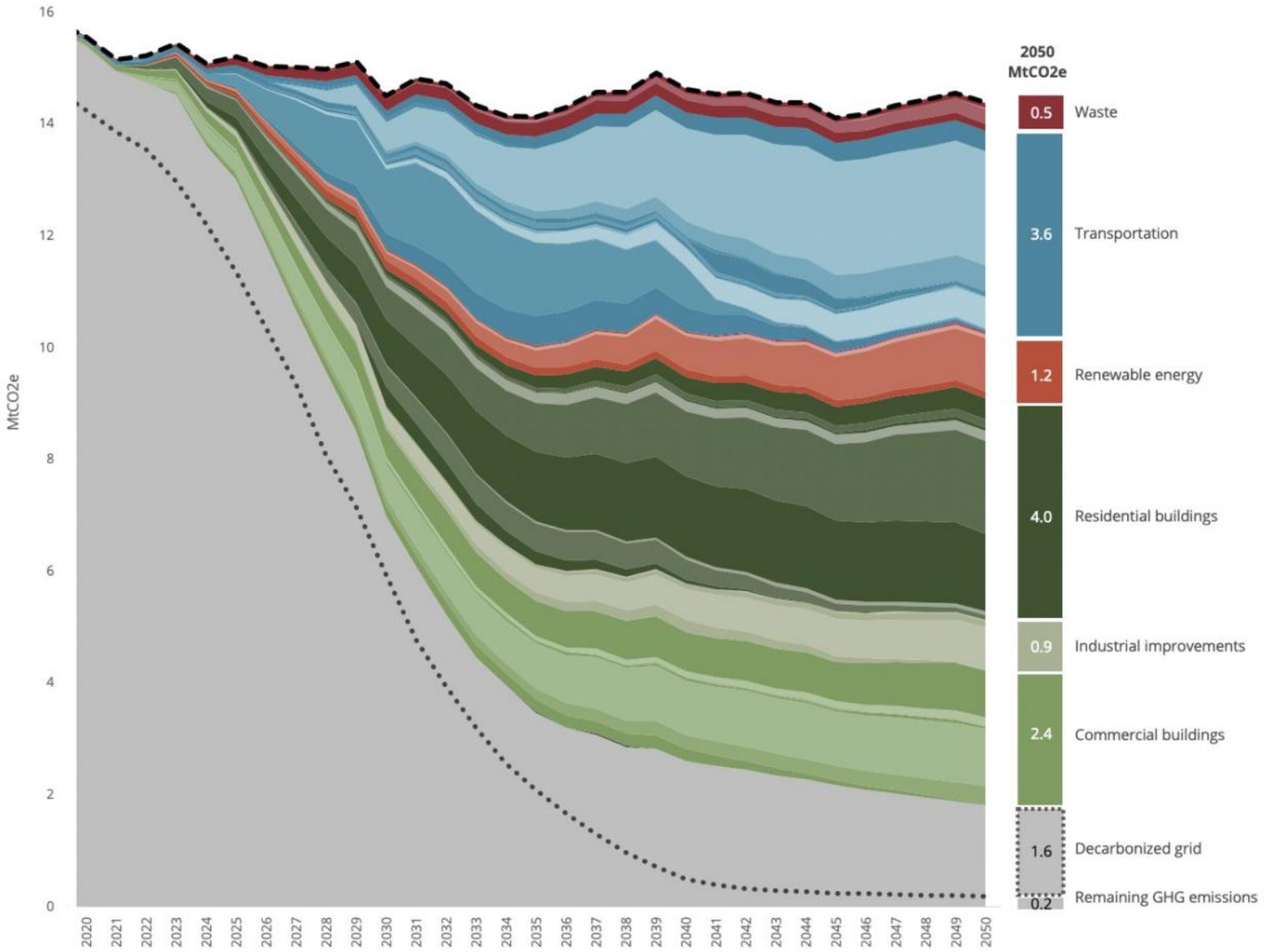
2025 TARGET:

- 45 per cent reduction in community-wide greenhouse gas emissions by 2025 from 1990 levels

The Strategy identifies 2030 emission reduction targets for each major source sector, such as buildings and transportation, and short-term actions to put Toronto on the path to net zero GHG emissions. Reaching these interim goals and net zero by 2040 will require bold action across all sectors, and cooperation and commitment from all levels of government, the private sector, and the community.

The Net Zero Strategy technical modelling shows one of several possible paths to achieve net zero GHG emissions. The technical analysis and modelling show that we can achieve net zero GHG emissions by 2040 by addressing all sectors at once (Figure 9). The following pages provide an overview for each sector. More detail on the technical modelling is available in the Net Zero Technical Modelling Report, available on the City's [TransformTO](#) web page.

Figure 9. Net Zero by 2040 Pathway Wedge Summary: The relative impacts of the key actions modelled.



4.1 Buildings

Benefits of climate action: HEALTH, EQUITY, RESILIENCE, PROSPERITY

According to Toronto's most recent Greenhouse Gas Inventory, 57 per cent of local GHG emissions come from the energy used in our buildings. Buildings are a source of GHGs when using fossil fuels for heating, cooking and other end-uses, and during manufacturing and construction. Natural gas for heating continues to be the largest source of emissions, accounting for approximately 50 per cent of all GHG emissions in Toronto.

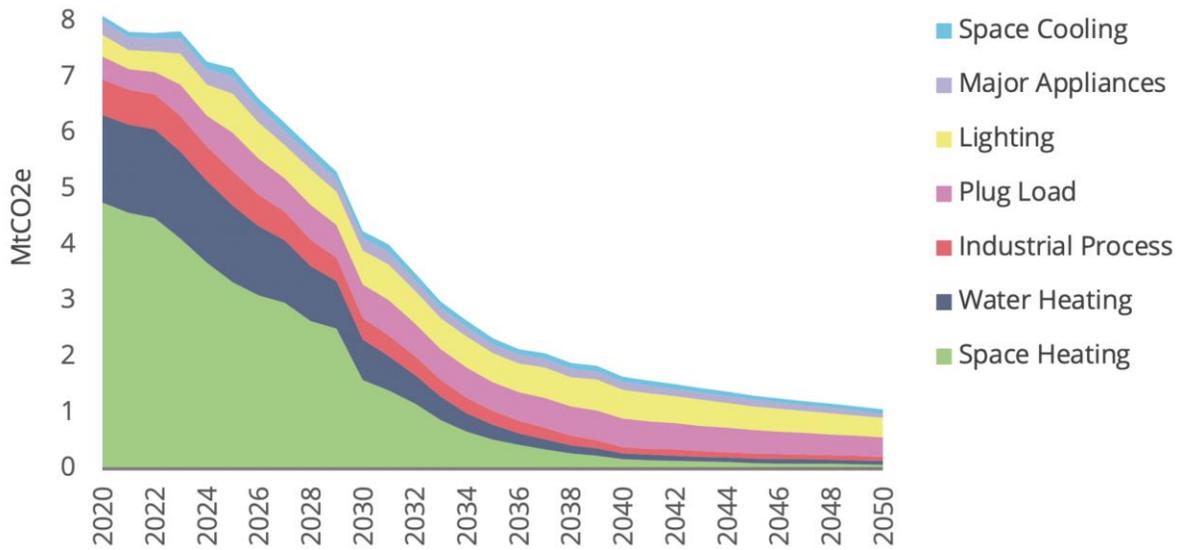
To achieve our net zero goal, we need to make a number of changes in our buildings, increasing energy efficiency and shifting from natural gas to clean and renewable electricity.

Modelled Pathway & Emissions Impact

The modelling demonstrates the scale of activity needed to transform buildings and reach net zero by 2040.¹¹ The modelled pathway to net zero by 2040 involves new homes and commercial buildings being net zero GHG emissions in the near term. New buildings are constructed with near-zero emissions and use low-carbon materials. Existing homes and commercial buildings need to be retrofitted (renovated) for energy savings by 2050 to reduce their energy consumption and switch to low-carbon energy sources. For instance, we need to switch from natural gas furnaces to heat pumps for space heating in our homes and other buildings. In the modelled pathway, the use of natural gas in buildings is phased out by 2040. On this pathway, all of these activities need to be taken together in order to achieve our goal (Figure 10).

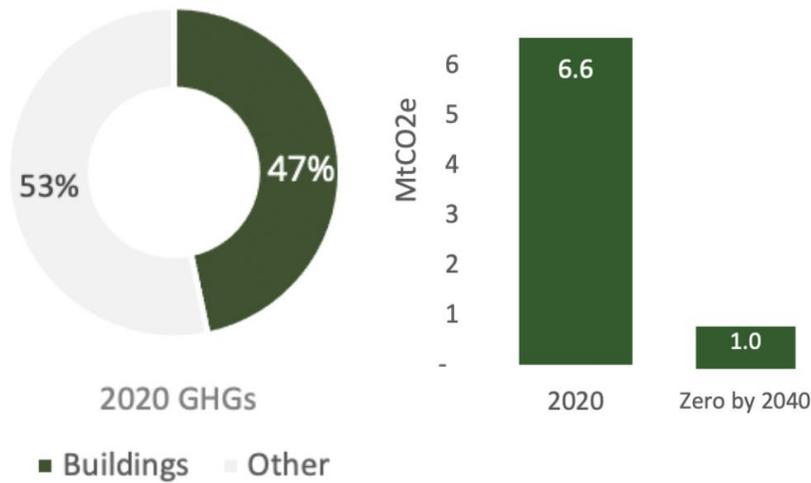
¹¹ The modelling method and results are described in detail in the Net Zero Technical Modelling Report (Sustainability Solutions Group, 2021), available on the City's website at [TransformTO](#).

Figure 10. Emissions from buildings under the Net Zero by 2040 pathway.



Implementing the modelled actions, above, would mean 134 MtCO₂e fewer emissions emitted in Toronto between 2020 and 2050, and an 87 per cent reduction in emissions from buildings over that time (Figure 11). Nearly 90 per cent of these reductions come from electrification of space and water heating.

Figure 11. GHG emissions from buildings.



2030 Interim Targets & Actions

Meeting our longer-term net zero GHG goal will depend on Toronto’s ability to get on that path by meeting 2030 targets.

THE NET ZERO STRATEGY SETS THE FOLLOWING 2030 TARGETS FOR BUILDINGS:

- By 2030, 100 per cent of new buildings are designed and built to be near zero GHG emissions
- By 2030, GHG emissions from existing buildings are cut in half, from 2008 levels

Achieving these 2030 targets and net zero emissions will take leadership and involvement from all levels of government, the private sector, and the community. The City of Toronto’s short-term actions to achieve these targets includes those outlined in the table, below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
1	Ensure near zero emissions for all new construction	Buildings are the greatest source of GHG emissions in Toronto. Net zero buildings are critical to achieving a net zero Toronto. Building emissions primarily come from burning natural gas to heat space and water.				
2	Evaluate and limit impacts of embodied carbon in construction	All materials and construction methods have an impact on our city. Using low-carbon materials, such as wood, and using low-carbon construction techniques, will reduce our impacts on the environment.				
3	Advance Implementation of the Net Zero Existing Buildings Strategy. (Please refer to the Net Zero Existing Buildings Strategy , adopted by City Council in July 2021, for a detailed short-term implementation plan.)	Buildings are the greatest source of GHG emissions in Toronto, accounting for about 57 per cent of total community-wide emissions (based on the 2019 GHG inventory). Natural gas accounts for 92 per cent of emissions from buildings. Residential natural gas use alone accounts for 54 per cent of building emissions. These statistics highlight the need to reduce natural gas use in buildings to meet future emissions targets.				

Discussion

Buildings are the largest source of GHG emissions in the city, accounting for 57 per cent of emissions. Natural gas for heating continues to be the largest single source of emissions, accounting for approximately 50 per cent of all GHG emissions in Toronto.

To meet our 2030 reduction targets, we need to focus on ensuring new construction has near-zero emissions and uses low-carbon materials. We also need to make a number of changes in our buildings by increasing energy efficiency and occupant comfort and shifting from natural gas to clean and renewable electricity. The City's Toronto Green Standard Zero Emissions Buildings Framework sets us on a path from today's building practices to a near-zero emissions level of performance by the year 2030.

In the coming years, we will require more skilled workers with the knowledge to build net zero buildings and transform existing buildings through deep retrofits and fuel switching. We will also need lower carbon materials and new, faster ways of delivering these skills, materials and services on a large scale.

Taking action in the buildings sector means making sure no-one is left behind and housing is affordable and healthy. It is evident that retrofitting to net zero will require considerable upfront costs. The main challenge in the residential sector is to prevent or minimize these costs being passed down to tenants and occupants, which could exacerbate housing affordability challenges in Toronto. These affordability challenges are often felt most by Toronto's equity-deserving groups. Consideration should also be given to affordability concerns in the commercial buildings sector, where local business owners may face increased costs of building upgrades that will impact their bottom line. Transforming Toronto's buildings will need to be done in a way that ensures people can afford to live in their homes and local small businesses can thrive.

New Development and the Toronto Green Standard

Every new building that is constructed today will contribute to Toronto's climate future. Buildings built today will contribute to Toronto's emissions for their entire lifespan. Builders and owners can avoid costly retrofits by ensuring buildings that are constructed today are built to the highest possible performance standards.

For new construction buildings in the community, Council has recently adopted new energy performance measures in Toronto Green Standard Version 4 that will commence on May 1, 2022 and keep Toronto on a pathway to high performance low emissions new construction by 2030 based on absolute performance targets related to GHG emission limits, energy use intensity and thermal energy demand intensity.

This latest version of the Toronto Green Standard advances requirements for building energy and GHG reduction and electric vehicle parking, and introduces tracking of embodied emissions in building materials used in construction. It addresses resilience through enhanced green infrastructure to manage stormwater

runoff, reduce urban heat island impacts and promote biodiversity, including extensive and higher performance green roofs, bioswales, rain gardens, native pollinator species plantings and a new requirement for "green streets" (roads or streets that incorporate green infrastructure).

Embodied Carbon in Construction

Embodied carbon has become an area of focus in mitigating climate change with some leading jurisdictions and the federal government moving towards setting performance targets and requirements. As buildings' operational energy performance requirements become more evolved over time, the "upfront" energy and emissions of extraction and processing building materials become more prominent within the buildings' overall emissions profile from "cradle" (materials sourcing) to "grave" (decommissioning and demolition).

Studies indicate that embodied emissions in construction materials can account for up to 80 per cent of a large building's total emissions from extraction to decommissioning. Due to the emerging nature of this work, more data is needed on local projects to understand the benchmark level of emissions from typical Toronto region buildings in order to set performance targets.

A new requirement has been added in the latest Toronto Green Standard update that requires Tier 2 and 3 projects to conduct a materials emissions assessment of the upfront embodied carbon of structural and envelope components, and to calculate the embodied carbon and the carbon sequestration within landscape designs. These requirements recognize the importance of the carbon footprint of building materials.

The City is also undertaking a number of studies on embodied carbon funded by The Atmospheric Fund to assess embodied construction materials impacts. These studies will establish benchmarks by building type, in order to share with other Greater Toronto and Hamilton Area (GTHA) municipalities and to set specific targets for performance within the Toronto Green Standard.

Existing Buildings

CRITICAL STEP TO REACH THE 2030 GHG REDUCTION TARGET:

Establish performance targets for existing buildings – Toronto intends to establish mandatory emissions performance reporting, disclosure, and emissions performance targets for buildings so we can better understand and limit emissions from our homes and buildings. These mandatory targets will be preceded by voluntary targets. Catalyzing the electrification of building heating systems, as a preferred alternative to the use of fossil-fuel heating systems, will be key.

In order to meet the council-adopted 2030 GHG reduction targets, emissions from buildings need to be dramatically reduced in the next eight years.

Retrofitting existing buildings to net zero poses a significant challenge due to the diversity of buildings by age, size, system and type. To achieve the target of reducing GHG emissions by half, over 2008 levels, Toronto will need a massive scaling up of deep retrofits and fuel switching in the coming years.

Recognizing that existing buildings are the single largest source of emissions in Toronto, the City has been focused on finding ways to accelerate action in this sector in the past few years. Immediate action and investment in early adoption is required.

In July 2021, City Council passed the Net Zero Existing Buildings Strategy (ExB Strategy), which sets out a plan to decarbonize all existing residential, commercial, and institutional buildings by 2050. Accelerating this work to 2040 will entail significant challenges and require resources and a transformational level of support and collaboration from other levels of government and other sectors.

The ExB Strategy was informed by technical modelling, extensive stakeholder engagement, and a review of energy and emissions reduction policies and best practices in other jurisdictions.

KEY INSIGHTS INCLUDE:

- Emissions reductions of over 80 per cent across Toronto's existing buildings are possible by 2050 through deep retrofits.
- Offsets, renewable energy credits, and other means for achieving emissions reductions will be necessary to some extent, as modelling shows that reaching net zero emissions is not technically nor financially feasible from building retrofits alone.
- Voluntary measures are not enough to catalyze transformative action toward net zero emissions; mandatory requirements are necessary.
- Fuel switching and a clean electricity grid are the two most significant technical requirements for achieving net zero emissions.
- The cost of the needed retrofit actions represent a significant net investment for building owners and these measures do not pay back on their own.
- Financial supports will be needed to enable market transformation.
- The City does not have all of the authorities needed to unilaterally implement the ExB Strategy in full. Dialogue with the province will be necessary.

The ExB Strategy takes the approach of first introducing voluntary programs and policies in the near-term, followed by a transition to mandatory requirements in the medium to long-term. Lessons learned from the operation of voluntary programs, along with detailed discussions with partner City Divisions and further stakeholder engagement, will inform the specific design details and implementation plans for any mandatory requirements. A key aspect of this work includes analysis of equity and affordability impacts and development of implementation strategies that mitigate negative impacts and enable positive ones for equity-deserving groups.

The following are the nine key actions from the Existing Buildings Strategy:

Purpose	Existing Buildings Strategy Actions
Set requirements to assess building performance and create a path to net zero	<ol style="list-style-type: none"> 1. Require annual emissions performance reporting and public disclosure for all existing buildings 2. Establish emissions performance targets 3. Require energy and emissions audits and tune-ups
Provide support and resources to make retrofits easier and more affordable	<ol style="list-style-type: none"> 4. Provide integrated retrofit support 5. Expand and enhance retrofit financing 6. Support permitting and approvals processes for deep retrofits
Lay the groundwork for market transformation	<ol style="list-style-type: none"> 7. Build awareness and capacity of home and building owners for emissions reduction strategies and supports 8. Support workforce development and training 9. Advocate and partner with other levels of government

For more information on the ExB Strategy implementation plan, please refer to the [Net Zero Existing Buildings Strategy Staff Report](#).

Keys to Success

To reach net zero, all of the buildings in Toronto must be retrofitted by 2040. As an example to imagine the scale of this effort, if these deep retrofits were divided evenly over the next 18 years, this would require in the range of 31,000 deep retrofits per year within Toronto. The challenge is that deep retrofits are not commonplace today. Toronto is currently not on course to reach this target, and technical work on the Net Zero Existing Buildings Strategy identified significant barriers to reaching this goal, barriers that the City of Toronto cannot overcome on its own. Getting on track and meeting this target will take transformative work at a scale seen few times in history. It will require resources, policy changes, new City authorities, deep collaboration by other levels of government, and transformative change in the private sector.

Reaching a net zero future in Toronto depends on collaboration and some key factors required for success (also called “dependencies”). Meeting the targets for buildings will require skilled workers with the knowledge to build net zero buildings and transform existing buildings through retrofits and fuel switching. It will also rely on net zero materials and new, faster ways of delivering these skills, materials and services on a large scale. Success also means making sure no-one is left behind. As such, success will also depend on

how well we collaborate with equity-deserving communities and include those most impacted by climate change.

A Note on Land Use

Land use planning plays a significant role in determining a city's GHG emissions. In 2021, City Planning launched consultation on Our Plan Toronto: the review and update of the City's Official Plan policies. Environment, climate change, sustainability and the need for a healthy and resilient community were repeatedly identified in the consultation as key challenges for the city's future.

The current Official Plan policies set a solid foundation for advancing the City's climate change goals. It envisions a city with “a healthy natural environment including clean air, soil, energy and water; infrastructure and socio-economic systems that are resilient to disruptions and climate change; and a connected system of natural features and ecological functions that support biodiversity and contribute to civic life”. The policies state that “City building activities will be environmentally friendly based on ... minimizing pollution; protecting and restoring the natural ecosystem and supporting biodiversity; protecting and enhancing the urban forest; reducing solid waste; reducing energy use; reducing GHG emissions and reliance on fossil fuels; reducing risk associated with hazard; and promoting green infrastructure”. In addition, policies encourage sustainable design and construction through green roofs, advanced energy conservation, and stormwater management. They enable securing of sustainable design features through the Toronto Green Standard and require submission of an Energy Strategy as part of a complete application.

Part of the review and update is to ensure that the Official Plan policies are in conformity with required policies in the Growth Plan. These include the identification and protection of key hydrologic features and areas, addressing climate change (reducing dependence on cars; addressing risk to infrastructure and management of stormwater in extreme weather); conservation of water, including efficient use and reuse; conservation of energy for existing buildings and planned developments including opportunities for district energy; improvements to air quality, including reducing emissions; integrated waste management, including promotion of building conservation and adaptive reuse; and the development of soil reuse strategies and best practices.

The draft policies will be consulted on in early 2022 and be presented to Council for adoption late spring 2022.

4.2 Energy

Benefits of climate action: HEALTH, EQUITY, RESILIENCE, PROSPERITY

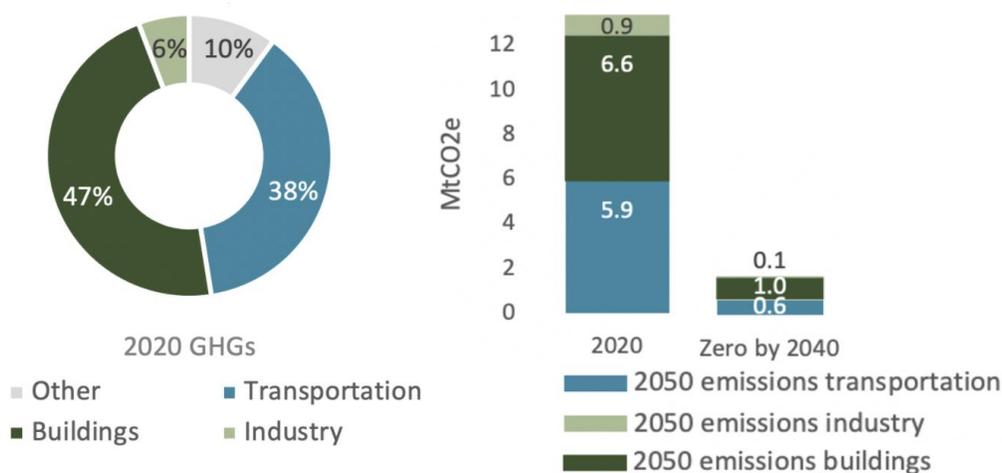
To achieve our net zero GHG target, we need to move to cleaner energy sources and use energy more efficiently.

Modelled Pathway & Emissions Impact

The modelling demonstrates the scale of work that will be required to meet our target. The NZ40 pathway includes expanding local renewable energy generation. By 2040, many homes, buildings, and parking lots have solar energy systems installed, and wind turbines provide additional renewable energy. Battery storage is installed in homes and businesses to store energy locally. In this modelled pathway, low-carbon district energy systems (multiple buildings connected to a central energy supply) are expanded and are powered by renewable energy. Additional modelling investigated the impact of implementing zero-carbon provincial energy policies and making electricity in Ontario clean by 2040. The results showed that if this were to be done alongside the NZ40 pathway actions, Toronto would be able to reach its net zero by 2040 target.

Implementing these modelled actions for energy would result in a cumulative emissions reduction from 2020 to 2050 of 18 MtCO_{2e} (Figure 12).

Figure 12. GHG emissions from energy.



2030 Interim Targets & Actions

THE NET ZERO STRATEGY SETS THE FOLLOWING 2030 TARGETS FOR ENERGY:

- By 2030, 50 per cent of community-wide energy comes from renewable or low-carbon sources
- By 2030, 25 per cent of commercial and industrial floor area is connected to low carbon thermal energy sources

Achieving these 2030 targets and net zero emissions will require transformational effort from all parties. The City of Toronto’s short-term actions to achieve these targets are summarized below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
4	Work with industry experts to explore limiting the expansion of natural gas systems and reversing system growth, where feasible, and limiting installation of natural gas equipment	Achieving net zero depends on quickly moving away from natural gas for space and water heating in buildings. Natural gas for buildings is the greatest source of GHG in Toronto.				
5	Support adoption and mainstreaming of net zero, resilient energy sources for new and existing developments	Renewable thermal energy systems remove natural gas from the energy system, reduce annual maintenance costs and increase resilience of the energy system through energy supply security. Low-carbon back-up power enables buildings to be available to provide essential services and act as community hubs during power outages due to extreme weather or other causes.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
6	Address barriers and develop strategies to increase the deployment of renewable energy and storage technologies, including but not limited to solar, wind, biomass, geothermal, waste heat recovery and heat pumps	Decarbonizing buildings is only possible if there is a supply of renewable energy. The City has a supporting role in increasing supply and a key role in facilitating local access to that energy. Resilient solar (solar + storage) allows buildings to operate during power outages due to extreme weather and become resilience hubs that provide essential services to the community.				
7	Actively support, advocate to and partner with Toronto Hydro, as well as the Provincial and Federal governments and agencies, to decarbonize the provincial electricity grid, promote energy conservation and enable local renewable energy generation	The City of Toronto cannot move Toronto to net zero on its own. Necessary collaboration will include re-evaluating current limits to the City of Toronto's authorities, and the roles various organizations can play in moving Toronto to net zero. Achieving net zero through the electrification of buildings and transportation relies on zero carbon, renewable electricity.				

Discussion

Reaching net zero requires reducing energy consumption, electrifying the consumption that remains, and ensuring that the electricity available from the provincial grid and locally is zero carbon. This will involve expanding local renewable energy generation in Toronto along with energy storage. The benefits of this approach go beyond limiting climate change - local renewable energy generation will increase resilience to power outages from extreme weather and other causes.

Electrification and decarbonizing the provincial electricity grid

As a city, we use a lot of energy – particularly in our buildings. But we currently generate very little of our own energy in Toronto, as most energy comes from the provincial electricity grid.

Toronto's plans for reaching net zero focus on electrification of heating and transportation because key technologies (heat pumps and electric vehicles) are available and extremely efficient. These efficient, electric technologies have zero GHG emissions if the electricity that powers them has zero emissions. Ensuring a

zero-carbon, resilient electricity supply will require a zero-carbon provincial electricity grid as well as expanded local renewable energy generation and storage. It is equally important to reduce overall energy consumption in our daily lives by reducing the amount of energy required for our buildings and transportation, to ensure demand for zero-carbon energy does not outstrip supply.

Ontario's electricity system is relatively clean in comparison to other provinces, but is projected to become more GHG intensive per unit of electricity generated due to the upcoming retirement of nuclear energy generation and planned increases in energy generation from natural gas¹². This means that GHG emissions per unit of electricity generated is expected to climb in the near future. This trend has wide-ranging implications for Toronto's ability to rapidly reduce GHG emissions and has significant implications for reaching a net zero future.

Achieving a low-carbon future is strongly dependent on decarbonizing the Provincial electricity supply. In order to meet our 2030 GHG reduction targets and achieve net zero emissions, the City requires clean electricity. Currently, there are no commitments to ensure that the provincial electricity grid in Ontario will become zero emissions by 2050 or sooner. If the provincial grid is not decarbonized, Toronto would need to generate 100 per cent renewable energy to meet expected electricity requirements.

Natural gas

CRITICAL STEP TO REACH THE 2030 GHG REDUCTION TARGET:

Accelerate a rapid and significant reduction in natural gas use – Toronto will take further action to limit the use of natural gas. Natural gas use for water and space heating represents over half of Toronto's total greenhouse gas emissions. In addition to new buildings eliminating natural gas use through the Toronto Green Standard v.4, the Net Zero Existing Buildings Strategy articulates ambitious targets to replace conventional heating systems with more efficient electric heat pumps while greening the provincial electricity grid.

Natural gas for heating in buildings continues to be the largest source of emissions, accounting for approximately 50 per cent of all GHG emissions in Toronto. In the net zero pathway, natural gas is phased out by installing electric heat pumps and appliances. In 2021, City Council adopted strategies for new construction and existing buildings to make progress towards fuel switching to electricity and renewable energy by 2030.

In order to meet its 2030 emission-reduction targets, the City needs to send clear signals to the market and the community immediately. To minimize costs, the phase out of natural gas connections and equipment can coincide as much as possible with the end of useful life and planned replacement of equipment. For

¹² IESO (2020). Annual Planning Outlook- Ontario's electricity system needs: 2022-2040.

example, if a natural gas boiler at the end of its useful life is replaced with a heat pump, the associated cost is significantly lower than if the natural gas boiler is replaced prior to the end of its useful life. In the net zero 2040 pathway, no new natural gas furnaces will be installed after 2030, as it takes at least 10 years for the stock of equipment to turn over.

Natural gas is primarily composed of methane, known as a near-term climate forcer. Methane escapes during natural gas production, processing, transmission, distribution and storage (“fugitive emissions”) and these escapes increase the warming impact of natural gas consumption. Phasing out natural gas usage will eliminate both the fugitive emissions and combustion emissions.

Renewable energy and storage

CRITICAL STEP TO REACH THE 2030 GHG REDUCTION TARGET:

Increase local renewable energy to contribute to a resilient, carbon-free grid – Toronto will work in step with Toronto Hydro to successfully support the growth and prosperity of the city through reliable, uninterrupted electric service provision. By increasing opportunities for local renewable generation to be located within the City's boundary, Toronto will be more resilient and will contribute to a decarbonised provincial electricity grid.

A key component of the Net Zero strategy for energy is expanding local renewable energy and energy storage. The City will work with Toronto Hydro, the Province, and other partners to enable local, renewable generation through technologies such as solar, wind, biomass, geothermal, waste heat recovery, and heat pumps.

This will entail addressing barriers and developing strategies to increase deployment of renewable energy and storage technologies. Permitting and connection processes were identified as key opportunities to reduce installers’ and therefore, customers’ permitting costs and timelines for installation for both small-scale residential and large-scale commercial installations. Affordability was identified as a barrier that needs to be addressed in order to rapidly expand distributed renewable energy generation in Toronto. While the cost of solar generation has declined over the years, the payback period is still relatively long, which deters further uptake particularly for residential projects, highlighting the need for financial incentives.

These challenges and opportunities illustrate the need for coordination and problem-solving with Toronto's local utility. This work will include direct focus on promoting and accelerating local adoption of renewable energy generation through a review of regulatory options, potential incentives and permitting and connection processes, as well as other identified restrictions.

Driving equity in renewable energy deployment is an important consideration during program design. Low- and mid-income households spend a higher proportion of household income on energy, compared to

higher-income households, and renewable energy is capital intensive. Designing business models with equity in mind will allow for renewable energy to reach more people, strengthen the grid, and help accomplish renewable energy goals. Community Solar is an example of a project where multiple participants can own or lease a portion of a solar project, including renters and others who may not be able to install solar directly. Subscribers/participants are credited through a (virtual) net metering mechanism. This is an example of a valuable and innovative approach, which requires collaboration with the City's partners, specifically a provincial commitment to continue to expand Virtual Net Metering.

In addition to addressing climate change, the renewable energy sector brings multiple benefits including jobs creation. It is estimated that every megawatt (MW) of solar generated creates 25 to 35 jobs in the solar sector. Local, distributed renewable energy generation plus energy storage provides value during normal operation of the electricity grid and during power outages. During electricity grid outages, resilient renewable energy systems such as "solar plus storage" provide critical emergency power that can help people in need and ease demand on emergency fuel supplies. Community organizations with solar plus storage can also become resiliency hubs.

A foundational aspect of the net zero pathway is configuring the electricity grid so that it can accommodate electrification of heating and transportation, increased renewable energy and decentralised energy generation and energy storage. This transformation will require integrated planning with Toronto Hydro and provincial regulatory partners.

Keys to Success

Achieving Toronto's net zero goal requires decarbonizing the Provincial electricity system. The emissions intensity (amount of GHG emitted per unit electricity) of Ontario's electricity grid is projected to increase. For Toronto to get to net zero, the grid needs to be carbon free. Failing this, the city can only rely on the "net" part of the target and will need to purchase carbon offsets or renewable energy certificates, both of which add significant cost to becoming net zero. Ensuring that electricity generation does not produce carbon pollution also addresses the scale of the global challenge.

At a local level, while it is important to decarbonize the grid (reducing the carbon or GHG emissions of Ontario's electricity supply), the electricity system needs to be able to adapt to new demands as heating and transportation are electrified. Focusing on conservation first can reduce electricity consumption and is the most inexpensive way to provide additional electricity capacity; however, additional work will be necessary to fully understand how to enable large-scale electrification of transportation and buildings and manage peaks in electricity demand.

THE POWER OF ELECTRIFICATION

Most low carbon pathways focus on electrification of heating and transportation because key technologies are available and efficient (heat pumps and electric vehicles) and the pathway to greening the grid is relatively straightforward.

4.3 Transportation

Benefits of climate action: HEALTH, EQUITY, RESILIENCE, PROSPERITY

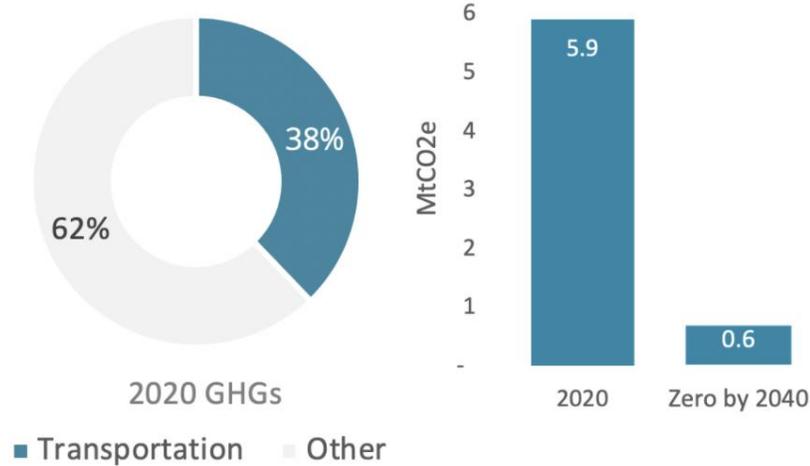
Transportation is responsible for 36 percent of local GHG emissions in Toronto. Fossil fuels power our cars, trucks, ships, trains and planes, resulting in GHG emissions. Most (73 percent) of the transportation emissions come from our personal vehicles (e.g. cars, vans, SUVs and light trucks used by individuals or households). To achieve net zero GHG, we need to reduce vehicular trips as much as possible by mode switching to walking, cycling or transit and then electrify vehicles.

Modelled Pathway & Emissions Impact

In the modelled net zero 2040 pathway all personal and commercial vehicles are electrified by 2040, and rail and air-travel GHG emissions are eliminated by 2050. Transit is free, and tolls are paid by fossil-fueled vehicles to help subsidize transit costs. Transit service is more frequent, and there are exclusive bus lanes on key routes. In this pathway 75 per cent of trips under 2 km are walked, and 75 per cent of trips under 5 km shift to bikes and e-bikes by 2040. Many people telecommute, eliminating some of their trips. Implemented as a package, these activities would provide transportation alternatives to enable transportation to reach net zero.

Implementing the modelled actions above would result in a cumulative emission reduction from 2020 to 2050 of 86 MtCO_{2e}, and a decrease of emissions from transportation by nearly 90 per cent over that time (Figure 13). Nearly all of these reductions come from electrifying personal use, commercial and transit vehicles. Switching to electric vehicles dramatically reduces energy consumption used for transportation. In the modelled pathway, gasoline and diesel are phased out by 2038, so that the remaining emissions after 2040 are the result of natural gas combustion in the provincial electricity grid.

Figure 13. GHG emissions from transportation.



2030 Interim Targets & Actions

THE NET ZERO STRATEGY SETS THE FOLLOWING 2030 TARGETS FOR TRANSPORTATION:

- By 2030, 75 per cent of school/work trips under 5km are walked, biked or by transit
- By 2030, 30 per cent of registered vehicles in Toronto are electric

The City of Toronto’s short-term actions to achieve these targets are summarized, below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
8	Expand biking and pedestrian infrastructure, including the rollout of cycling routes, bicycle parking and bike share at or near TTC stations	Gas and diesel vehicles are a major source of GHG in Toronto. Active transportation and low-carbon transit reduce GHG emissions and benefit health by reducing air pollution and increasing physical activity.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
9	Increase existing bus and streetcar service levels to encourage shifts to low-carbon, sustainable transportation	Increased transit service will improve access to employment, healthcare and community services, encourage shifts away from single-occupancy vehicles and improve transit equity.				
10	Update and accelerate implementation of city-wide Transportation Demand Management Strategy	Transportation Demand Management eases traffic congestion and reduces transportation emissions of GHGs and air pollutants through transportation alternatives, ride sharing, teleworking and other approaches.				
11	Develop tools to address emissions of greenhouse gases and air pollutants on an area or project level	Many cities successfully assess potential GHG and air pollutant emissions from an area as a whole, rather than from each source in isolation using these tools.				
12	Align the City's Electric Vehicle (EV) Strategy to the net zero goals and implement the EV Strategy	Internal combustion engine (ICE) vehicles are a major source of GHG in Toronto. Quickly transitioning these vehicles to electric vehicles, and shifting our electricity supply to net zero, renewable sources, are critical to achieve a net zero Toronto. Switching from fossil-fueled to electric vehicles also reduces air and noise pollution and decreases vehicle energy costs.				
	A) Increase public EV charging infrastructure	In addition to active transportation and transit, electric vehicles are a key part of reaching net zero GHG emissions in Toronto. Public EV charging infrastructure alleviates range anxiety and provides charging options for people who need charging on the go or don't have charging at home. It can also support cargo and logistics, operational fleets, vehicles for hire and car sharing.				
	B) Increase EV charging at residential, commercial, institutional and industrial buildings	Sufficient EV charging where people live, work, and play is necessary for widespread adoption of EVs. Together with walking, cycling and transit, electrification of transportation is an important part of the pathway to a net zero Toronto.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
	C) Review the Electric Vehicle Strategy	EV technology, adoption and infrastructure change rapidly. Reviewing the EV strategy keeps our shared approach current and relevant.				
13	Determine options to incentivize EV adoption and disincentivize use of gas and diesel vehicles	Incentives are needed to accelerate the shift from gasoline and diesel vehicles to electric vehicles, transit, walking and cycling to reduce GHG emissions. Relative to fossil-fuelled vehicles, electric vehicles have a low lifetime cost due to reduced fuel/energy costs as well as reduced maintenance. Financial incentives help people address the initial higher purchase price for an EV.				
14	Encourage the adoption of electric commercial and freight vehicles, including EVs and e-bikes for last-mile deliveries	Reducing emissions from freight transportation also improves health and equity. Vulnerable populations are more often located near major freight routes and disproportionately experience traffic-related air pollution health impacts.				
	A) Encourage the use of e-bikes and EVs for last mile deliveries	E-bikes including e-cargo bikes, and electric vehicles, reduce neighbourhood GHG and air pollutant emissions caused by the "last mile" of delivery. E-cargo bikes also provide a more affordable transportation option for small businesses and individuals.				
	B) Encourage adoption of electric commercial and freight vehicles	Heavy commercial and freight vehicles are predominantly fueled by diesel, a significant source of GHG and air pollutant emissions in Toronto. Air pollution and health impacts from transportation are inequitably distributed, with higher levels near major roadways. Switching to electric vehicles reduces emissions and helps protect health.				

Discussion

Transportation is the second largest source of GHG emissions in Toronto, accounting for 36 per cent of total emissions. To meet our 2030 reduction targets and ultimately achieve net zero, we need to focus on encouraging active transportation and public transit use while facilitating a rapid transition from internal combustion vehicles to electric vehicles. This will mean that most short trips (under 5km) are walked, cycled, or by transit. For remaining longer trips, the focus will be on taking transit and switching to electric vehicles.

CRITICAL STEP TO REACH THE 2030 GHG REDUCTION TARGET:

Increase access to low carbon transportation options, including walking, biking, public transit and electric vehicles – Increasing the use of active and public transportation reduces greenhouse gas emissions, energy use and congestion while promoting equity and health benefits. The City will also advance options to incentivize electric vehicle adoption and disincentivize the use of carbon-polluting gas and diesel vehicles, and support the transition to EVs.

Active Transportation, Public Transit, Transportation Demand Management and Telework

A shift towards transit and active modes, and a reduction in overall travel, alongside a shift to EVs, will significantly reduce GHG emissions. This will be accomplished through a number of initiatives, including transportation demand management planning, transit service and infrastructure expansion, improved active transportation infrastructure, and ongoing telework.

The expansion of public transportation will play a key role in getting to net zero. Transit is a more efficient use of energy, and also has added co-benefits relating to reduced congestion and improved mobility, including in equity-deserving areas. Increasing service on existing transit routes and expanding the use of priority transit measures, including dedicated road space for transit, will attract more transit riders and will reduce the associated GHG emissions associated with personal transportation in the city. In addition, the transition away from diesel-powered buses to electric buses will further reduce emissions and improve air quality.

Access to public transit is enhanced by investments in cycling infrastructure at, near, and to/from transit stations. The first and last mile of transit trips that are often taken by private vehicles can be supplemented by active transportation where bike parking and bike share are provided near stations. Similarly, cycling infrastructure and Bike Share stations are needed on roadways and destinations across the city to improve

the access and convenience of cycling. The benefits of these improvements are enhanced when Bike Share stations are connected directly to electricity so that they can charge e-bikes.

Active transportation has the same co-benefits as transit, with the added benefit of increased physical activity. The City must continue the rollout of the Cycling Network Plan and Vision Zero Road Safety Plan to improve access to safe active transportation infrastructure, and continue to expand the Bike Share Toronto system. Data show that among the most significant factors in encouraging people to cycle is accessible and protected cycling infrastructure (bike lanes) that connects people with their destinations.

Transportation Demand Management (TDM) planning will play an important role as the City continues to grow, by promoting a wider range of transportation options for residents. Engaging with communities, employers and local organizations will enable the City to increase the understanding and uptake of lower carbon transportation options.

Electric Mobility

Transitioning to electric vehicles is critical for achieving net zero GHG emissions. In 2020, Council approved an Electric Vehicle Strategy (EV Strategy) for Toronto. In order to align the EV Strategy with the net zero goal, the level of ambition set out in the EV Strategy is being raised to target 30 per cent of vehicles registered in Toronto being electric by 2030.

The City will explore ways to incentivize EV adoption and disincentivize gas and diesel vehicles. Strategies being deployed by other cities include congestion charges, EV-only lanes or parking, parking charges for gas and diesel vehicles, and fossil-fuel free zones to encourage the uptake of EVs and discourage the use of gas and diesel vehicles. To ensure that incentives for EVs do not result in a net increase in personal vehicles, incentives for EVs should be offset by disincentives for fossil fuel-powered vehicles. Similarly, consideration for equity deserving groups, including low-income residents, seniors, and persons with disabilities, will be made in an effort to positively impact these communities. Toronto will explore these and other options, evaluate equity impacts and report back to City Council in 2023 with recommendations on opportunities to encourage EV adoption.

The EV transition will require consistent partnerships in the GTHA and at higher levels of government.

Personal vehicles

The EV Strategy focuses on passenger light-duty vehicles, with ten actions in four areas of opportunity that the City can pursue to enable the market-based transition to EVs.

In surveys of Toronto and GTHA residents on electric mobility, cost was identified as the biggest barrier to EV adoption. The City of Toronto can take a leadership role in advocating to the Ontario government to provide EV purchase incentives, and to the federal government to maintain and perhaps expand its current

incentive program. The City can also explore providing its own purchase incentives, as an interim measure until sufficient provincial and/or federal incentives are available and/or as a top-up to future provincial incentives.

The transition to electric vehicles depends on whether sufficient EV charging infrastructure is available. The EV Strategy has interim objectives for public EV charging:

- By 2025, 220 Level 3 (also called DCFC, Direct Current Fast Charging) ports and 3,000 Level 2 ports are installed in public locations; and
- By 2030, 650 Level 3 ports and 10,000 Level 2 ports are installed in public locations.

While the 2025 objective is likely sufficient, the 2030 objective may not be sufficient to meet the demand from 30 per cent of registered personal vehicles. The City has a key role in providing public charging infrastructure in Toronto, including on-street parking spaces, in Green P lots, and at City facilities. The City can also support and encourage other organizations to provide public EV charging.

Because most EV charging occurs at home and at work, new and existing residential and commercial buildings will need to have EV charging infrastructure, ramping up over time to meet the charging needs of a rapidly increasing number of EVs.

The EV Strategy identifies other challenges to EV adoption, including range anxiety (fear that an EV will run out of energy before it can reach a charging station), the need to adapt to a new technology, and limited information about EVs. To help increase awareness and understanding of EVs, the City will undertake communications and outreach activities, on its own and in collaboration with partners, such as Plug n' Drive and the Clean Air Partnership.

The transition to EVs will have significant co-benefits. The health of Toronto residents will benefit from air quality improvements (EVs have no tailpipe emissions), reduced noise pollution (EVs are quiet), and reduced urban heat island effect (EVs emit only 20 per cent of the heat emitted by internal combustion engine vehicles). Due to the lower total cost of ownership of EVs, EV owners will have additional disposable income to spend in the local economy. EVs can help support the optimal use of electricity generation by leveraging vehicle-grid integration technologies. A strong commitment to zero emission vehicles will signal that Toronto is a prime destination for innovative businesses.

To ensure that the benefits of EVs are enjoyed by all Toronto residents, the City can play a role in ensuring that there is equitable access to incentives for EVs and EV infrastructure and that information about EVs is accessible to everyone. The City can also support and encourage provision of EV charging infrastructure so that EVs are a viable option for all residents. Finally, the transition to EVs should be done with a community safety lens in mind, to keep streets and publicly accessible charging areas safe for all residents.

Commercial vehicles

To help ensure that Toronto is on track for 100 percent net zero emission transportation, actions include working toward 35 per cent of commercial vehicles in Toronto being electric by 2030. The City's Freight and Goods Management Strategy (FGMS) identifies actions to encourage the adoption of zero and low-emission freight vehicles. This includes working with industry and senior levels of government to overcome barriers such as refueling infrastructure and vehicle cost, and working with public and private sector partners to improve acquisition and utilization of zero- and low-emission freight vehicles. It also includes exploring the potential to introduce city-wide electric vehicle charge station hubs supporting freight and goods movement vehicles.

The use of EVs, e-bikes, cargo e-bikes, and autonomous delivery vehicles for last-mile deliveries can reduce GHG emissions, improve air quality, reduce noise pollution, and lower the urban heat island effect, and may be faster and more cost-effective for delivery companies. Additionally, by replacing conventional delivery vehicles, alternative options can help alleviate traffic congestion and free up curbspace. The FGMS includes actions to promote the use of cargo bicycles, including determining required regulatory changes, identifying infrastructure needs and safety considerations and conducting a pilot program in partnership with courier companies.

Keys to Success

Success in achieving net zero transportation, through active transportation, transit and electrification, requires planning with equity as a priority. Different regions and communities of the city have different transportation needs that must be kept in mind to ensure no-one is left behind.

Electrifying transportation will be a central part of transforming the way we move. Success in electrifying is dependent upon having a zero carbon electricity grid, as well as the skilled labour, materials, and rapid delivery required to provide for electric vehicles and charging.

THE INERTIA OF A SYSTEM

There is a delay between when zero carbon actions are implemented and when society is actually decarbonised. For example, people typically hold on to vehicles for 10 years or so before purchasing a new vehicle. If 100 per cent of vehicles sold are electric in 2030, it is not until 2040 before all gasoline and diesel vehicles are phased out.

4.4 Sustainable Consumption & Waste

Benefits of climate action: HEALTH, EQUITY, RESILIENCE, PROSPERITY

Waste accounts for 7 per cent of GHG emissions in the GHG inventory. Most GHG emissions from waste come from landfills, with a small portion from wastewater treatment processes. Consumption emissions from the products and services consumed by residents, businesses and institutions in Toronto are not included in the City's calculations of its emissions.

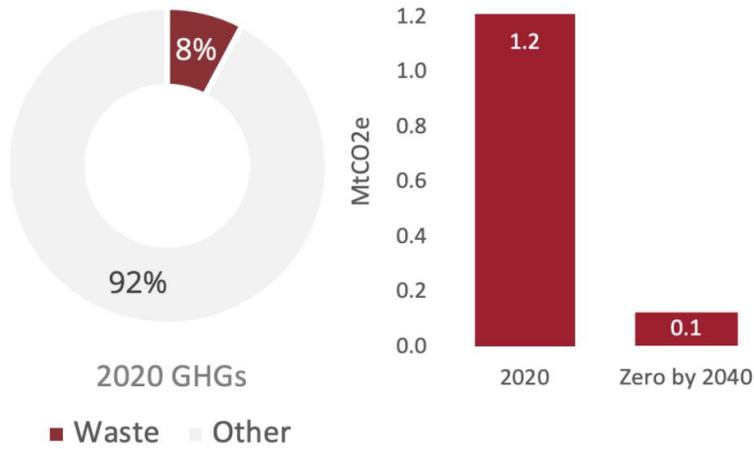
To achieve a net zero, we need to focus on advancing toward a zero-waste, circular economy.

Modelled Pathway & Emissions Impact

The modelled pathway to net zero by 2040 involves increasing waste diversion to 95 per cent by 2050. The pathway also includes eliminating organic “green bin” waste from entering landfills by 2025, and generating renewable natural gas from wastewater.

Implementing the modelled actions above would result in a cumulative emissions reduction from 2020 to 2050 of 10 MtCO₂e, and a 90 per cent reduction in waste emissions over that time (Figure 14).

Figure 14. GHG emissions from waste, water, and wastewater.



2030 Interim targets & Actions

THE NET ZERO STRATEGY SETS THE FOLLOWING 2030 TARGET FOR WASTE:

- By 2030, Identify pathways to more sustainable consumption in City of Toronto operations and in Toronto's economy
- By 2030, 70 per cent residential waste diversion from the City of Toronto's Integrated Waste Management System

The City of Toronto's planned short-term actions to achieve this target are summarized below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
15	Continue to pursue policy and programmatic interventions that help the City reach its aspirational goals of zero waste and a circular economy, and which identify pathways to more sustainable consumption in both municipal operations and in all sectors of the economy	Cities are well-positioned to play a critical role in achieving climate neutrality and moving to more sustainable consumption models. Accelerating Toronto's circular city transition will contribute to the City's climate action goals and will play a key role in building a resilient, inclusive, green, and prosperous future for residents and businesses.				
	A) Develop a City-wide governance structure, strategy and policy framework to establish a path to make the City the first municipality in the Province of Ontario with a circular economy and to align with the Provincial goal as part of the Waste Free Ontario Act	Circular economy strategies consider sustainable resource consumption and material efficiency for their potential impacts on climate change, environmental degradation, and social outcomes. Continued relationship building and partnerships will be important to accelerate the City of Toronto's progress toward its aspirational circular economy outcomes and climate action targets.				
	B) Conduct a consumption based emissions inventory and identify targets that would meaningfully reduce consumption based emissions	Understanding and reducing GHGs released during the manufacture and transport of articles and services we use helps address Toronto residents' true climate impact.				
	C) Enable Torontonians to reduce waste and engage in sustainable consumption by implementing the Single Use and Takeaway Items Reduction Strategy	It is estimated that approximately 400 million single-use plastic bags, 85 million foam takeaway containers and cups, and 39 million single-use hot and cold drink cups are generated annually by single family households in Toronto. Through consultation, the City identified strong public support for the implementation of mandatory measures (e.g. bylaws) restricting single-use and takeaway items.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
16	Continue implementation of the City's Long Term Waste Management Strategy which sets a goal of diverting 70 per cent of waste managed from City customers away from landfill, by focusing on waste reduction, reuse and recycling activities that promote resource conservation and reduce environmental impact	<p>There are challenges with achieving this target including the transition of the City's Blue Bin Recycling program to extended producer responsibility (EPR). Currently, the direct impact of diversion on the reduction of greenhouse gas emissions is not known.</p> <p>Also, weight-based metrics such as diversion do not take into account the evolving nature of packaging and limit the amount of control SWMS has to make an impact on the measure. The Long Term Waste Management Strategy 5-year review is upcoming, and may result in changes to performance measurement and implementation strategies.</p>				
	A) Continue outreach and engagement on waste reduction and diversion, with a focus on food and organic waste	Outreach and engagement are critical to helping residents have the knowledge, opportunities, and passion for reducing waste. Organic (food) waste in particular creates powerful GHG emissions when it reaches the landfill so is a key area for engagement.				

Discussion

To achieve a net zero GHG society, we need to focus on advancing toward a zero-waste, circular economy and continue implementation of the City's Long Term Waste Management Strategy. A circular economy is a model of design, production, and consumption that keeps resources in use for as long as possible in order to reduce waste and human impact on the environment. With a focus on product longevity, renewability, reuse, and repair, circular economy strategies consider resource consumption and material efficiency for their potential impacts on climate change, the environment and social outcomes. In a circular economy, economic and human activity supports the health of natural systems and contributes to thriving, sustainable communities.

The Long Term Waste Management Strategy includes reduction, reuse and recycling activities, including a food waste reduction strategy, a textile collection and reuse strategy, supporting other reduction and reuse

programs, exploring new technologies, and creating a Circular Economy and Innovation unit within Solid Waste Management Services (SWMS) help Toronto reach its goal of becoming the first circular city in Ontario. In 2021, the unit completed Baseline for a Circular Toronto, one of the first studies in Canada to baseline a city's existing levels of circularity. Findings from the project, as well as other research, proof of concept pilots, and stakeholder feedback, are being used to inform the development of a Circular Economy Road Map for Toronto. Once finalized, Toronto's Circular Economy Road Map will inform policy and program changes to advance the City's aspirational circular economy goals.

SWMS will be conducting a review of the Long Term Waste Management Strategy, which may result in changes to targets, performance measurement, and implementation strategies related to waste diversion. The policy and market context for waste management in Ontario has changed substantially since the Strategy was adopted in 2016. The composition of waste streams continues to evolve in response to consumer demand and purchasing choices, as well as changes to producer packaging design choices. More stringent market quality specifications have impacted both access to recycling markets and the market value of recyclables. Most significantly, the Province of Ontario released several regulations under the *Resource Recovery and Circular Economy Act, 2016* that transitions the responsibility of end-of-life management of products and packaging from municipal governments to producers (also known as Extended Producer Responsibility or EPR). The transition of the City's Blue Bin Recycling program to EPR will impact the City's integrated waste management system, including how the waste diversion rate is calculated and how to measure system performance.

These points underscore the challenges to achieving the residential waste diversion target. Weight-based metrics such as diversion do not take into account the evolving nature of packaging and limit the amount of control that SWMS has to make an impact on the issue. Additionally, the direct impact of diversion on the reduction of GHG emissions is not known. Research into the current state of Toronto's circular economy has also identified significant data gaps and limitations that pose a barrier to generating a comprehensive understanding of material and waste systems in Toronto (i.e. waste that is not managed by the City of Toronto's Integrated Waste Management System). Given this, the Long Term Waste Management Strategy identifies waste management planning as an ongoing process that requires flexibility and includes reviews at regular intervals. Upcoming projects such as the Long Term Waste Management Strategy review and the Circular Economy Road Map will be essential initiatives to further understand, quantify, and identify pathways to sustainable consumption and waste management in Toronto.

Finally, consumption-based emissions are an emerging area of research and actions. Cities like Toronto consume more than we produce, meaning we indirectly cause emissions elsewhere by purchasing goods and services from producer areas of the world. A partnership with C40 resulted in a preliminary analysis of consumption-based emissions in Toronto which identified significant opportunities to address consumption-based emissions associated with the construction industry and food. City staff will conduct a consumption-based emissions study in 2022 and use the findings to determine an appropriate reduction target.

Keys to Success

Success in this area will depend on the collaboration between all levels of government, the private sector and the community. It will require a new mindset and processes that prioritize waste reduction and view waste as a valuable resource. It will require considering the environmental, social and economic implications of how we use resources and manage our waste.

4.5 Natural systems

Benefits of climate action: HEALTH, EQUITY, RESILIENCE

Getting to net zero also requires consideration of opportunities to remove carbon from the atmosphere. Greenspaces, including street trees and trees in parks and ravines, contribute to climate resilience, provide natural carbon removal, and help to create a liveable and healthy city. Greenspaces and trees provide many health and resilience benefits such as helping to manage extreme heat and rain, and providing recreational and mental health benefits.

Modelled Pathway & Emissions Impact

The modelled pathway includes increasing tree canopy cover city-wide to 40 per cent.

Increasing tree canopy cover in the city results in a cumulative reduction of 0.2 MtCO₂e from 2020 to 2050. The many benefits provided by tree cover were not quantified in the modelling study.

Targets & Actions

The City aims to develop and implement strategies to improve greenspace infrastructure to build climate resilience. The City has an existing target of 40 per cent tree canopy cover city-wide. The City of Toronto's short-term actions to achieve this target are summarized below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
17	Increase canopy cover and biodiversity and enhance greenspaces	Toronto's urban forest is a vital city asset that contributes to quality of life and healthy communities. The city's tree population helps to filter air pollution and save energy by helping to cool neighbourhoods and buildings in the summer. Trees also sequester carbon as they grow. Equitable access to greenspaces, including trees, parks and ravines, and their benefits is important to creating a healthy, livable city.				
	A) Achieve equitable distribution of the urban forest, increasing tree canopy and naturalized greenspace where it is most needed	A well-managed urban forest is vital to quality of life and supports climate resilience, disaster risk reduction, ecosystems conservation, food security, poverty alleviation and improved quality of life. Equitable distribution of the city's tree canopy brings with it a more equitable distribution of the services and benefits provided by trees and greenspace.				

Discussion

Getting to net zero requires consideration of opportunities to remove carbon from the atmosphere. Greenspaces, including trees, parks and ravines, provide natural carbon removal and help create a liveable and healthy city.

To achieve net zero, a number of nature-based solutions will be implemented. The following strategic goals, set out in the City's Strategic Forest Management Plan, contribute to climate resilience and will help toward achieving the net zero target:

- Increase tree canopy cover, biodiversity and enhance greenspaces
- Achieve equitable distribution of the urban forest, increasing tree canopy and naturalized greenspace where it is most needed
- Expand and improve the park system
- Improve the ecological health of ravines

The City has a target of 40 per cent tree canopy cover by 2050. The 2018 Tree Canopy Study found that Toronto's canopy cover increased from 26.6 to 28 per cent in 2008 to 28.4 - 31 per cent in 2018. This represents an increase of 1.3 million trees over 10 years, resulting in an urban forest with an estimated 11.5 million trees. Toronto's trees are estimated to provide ecosystem services worth more than \$55 million annually. The city's street trees are a significant contributor to the provision of ecosystem services while providing co-benefits at the pedestrian level, such as shade and physical and mental health benefits. These ecosystem services and benefits of the urban forest include energy savings, carbon sequestration, pollution removal and avoided water runoff.

The urban forest is made up of all the trees along the public road allowance, trees in parks and ravines, and trees in private backyards. Together, they provide significant physical and mental health benefits to all Toronto residents. While Toronto's canopy cover and greenspaces are not equally distributed, the City will continue to work with external partners to expand the urban forest through protection, maintenance and planting, on both public and private lands.

Expanding the park system creates opportunities to support the tree canopy goals and expands and improves access to green spaces. Protecting the ravine system by maintaining and improving the ecological health of ravines will improve ecological function and resilience.

Biodiversity is also essential to the health, livability and resilience of our city. Cities have an important role to play in protecting and enhancing biodiversity through habitat creation and restoring the natural environment with native plants, trees and shrubs.

Keys to Success

Success in meeting the City's ambitious tree canopy target will depend on collaboration between City divisions, private landowners and community members to establish and maintain healthy trees and greenspaces. Focusing efforts on areas of the city where greenspace and trees are needed most will increase access to the benefits of the urban forest for more Torontonians.

4.6 Engagement & Equitable Implementation

Benefits of climate action: HEALTH, EQUITY, RESILIENCE, PROSPERITY

Getting to net zero requires informed decision-making and community-wide involvement. In addition to targeting the largest sources of GHG emissions and enhancing greenspaces in our city, we need to focus on making climate-informed decisions and engaging with our local community – including with Indigenous communities, equity-deserving groups, and youth.

Actions

The City aims to ensure equitable implementation and ongoing improvement of engagement and reporting. The City’s activities over the short-term are summarized, below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
18	Support resident-led climate action and engagement	Engaging and enabling the community to lead on climate issues is central to achieving a net zero GHG Toronto.				
	A) Support resident-led climate action engagement through Climate Action Grants	Funded projects will increase awareness and engagement on climate action at the local level. They also strengthen the efforts and capacity of local community agencies, grassroots groups and resident leaders.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
	B) Expand Neighbourhood Climate Action Champions Program	Neighbourhood Climate Action Champions inspire, motivate and encourage other residents to undertake community-focused actions to support TransformTO and reach net zero GHG emissions.				
19	Work with Indigenous rights holders and urban Indigenous communities to share knowledge and learnings	Meaningfully working with members of Toronto's Indigenous communities, and including an Indigenous worldview in the Net Zero Strategy, are important to our ongoing relationship with Indigenous communities on climate issues and the successful implementation of the Strategy.				
	A) Develop and deliver Indigenous Climate Action Grants program	Supporting local level Indigenous climate action projects is essential, and current funding models need adaptation to ensure accessibility to Indigenous communities.				
20	Develop and implement youth engagement strategy	Youth involvement is critical to the design and implementation of the Net Zero Strategy. Meaningfully including youth voices is important from an equity perspective, and the Strategy also benefits from this group's innovative thinking.				
	A) Design and launch a City-academic innovation hub to support youth-led climate initiatives and innovative student pilot projects	Supporting youth climate action projects is essential to inspire current and future climate action.				
21	Design and launch a climate advisory group for 2022 and beyond to ensure implementation of the Net Zero Strategy is equitable and reflects the priorities and interests of the community	Receiving advice from diverse sources is critical to the design and implementation of a robust Net Zero Strategy that reflects the priorities of residents and stakeholders.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
22	Develop equity indicators to be reported out as part of the TransformTO implementation status update	Ensuring equitable implementation is an important goal of Net Zero Strategy. Measuring and reporting on indicators is an effective way to stimulate and track progress.				
23	Encourage the growth of green industry to provide the products and services needed to enable a net zero city	Developing green industry can create economic benefits to the region and provide the materials and services needed to enable a net zero city. An industry's growth is generally controlled by six key drivers: Advocacy; Collaboration Building; Market Development; Marketing; Policies and Regulations; and Workforce Development.				
24	Leverage City's Live Green Toronto program to develop and implement a city-wide climate action awareness campaign	Communication is key to creating understanding, enthusiasm and participation in moving our city to net zero.				

Discussion

Local Climate Action Leadership & Partnerships

Since the approval of TransformTO in 2017, the City has been developing and delivering programs to support community leadership and engagement in climate action. Residents in Toronto have a long history of climate leadership and strong commitment to delivering climate action in their communities. Deeper engagement and long-term support is needed to develop long-lasting partnerships and trust between communities that are dedicated to furthering climate action in Toronto.

The City will continue to develop more thorough long-term collaborations between the City and key sectors that are traditionally underrepresented in climate action engagement (e.g. equity-deserving communities, Indigenous communities, local development agencies, etc.) which will enable broader engagement of Torontonians in climate action.

Dedicating more resources to expanding existing community programs and developing new innovative partnerships with academic institutions, equity-deserving groups, Indigenous communities, and youth will provide new opportunities and ideas for climate action engagement.

In the short term, the City will focus on enhancing existing successful programs such as the Climate Action Grants program and the Neighbourhood Climate Action Champions program. These programs will be expanded to reach broader demographics and further promote local leadership and innovation.

The City will continue working with local organizations such as Community Hubs to support community-led work in climate action. The City will also explore additional new partnerships with academic institutions, Indigenous groups and youth to increase awareness of required actions and enable local leadership.

Toronto residents know that climate action is needed. Over 90 per cent of people agree that climate change is a threat and agree that everyone needs to reduce their emissions. However, almost half of residents surveyed say that they don't know what they can do to address climate change. To help residents better understand what they can do, Live Green Toronto will continue to engage residents and will launch a city-wide climate action awareness campaign.

Advisory Committee

An Advisory Group can play a valuable role in the TransformTO Net Zero Strategy. Receiving advice from diverse sources will be important in the design and implementation of a robust Net Zero Strategy, ensuring that the implementation of the Strategy is equitable and reflects the priorities, interests and values of the broader community.

In 2020, the City of Toronto conducted an evaluation of best practices for establishing an advisory committee or peer review group that could be incorporated to strengthen the development and implementation of TransformTO. Examples were analyzed from municipalities and corporations, and through a comparative analysis of the structure, responsibilities, authorities, and review process of these groups were identified to provide potential considerations for the City of Toronto.

Once the Strategy has been approved by City Council, an Advisory Group will be established, based in part on the background research conducted and implementation priorities, to focus on an external advisory capacity that will provide guidance in ongoing implementation.

Youth Engagement

Engagement with and empowerment of youth, including youth from equity-deserving neighbourhoods, will form an important part of implementing the Net Zero Strategy. This will be accomplished by developing a Youth Climate Action Strategy that will build on existing initiatives, such as the ongoing collaboration with the Toronto District School Board (TDSB) that focuses on:

- Sharing resources on best practices in climate action and community / youth engagement, in the form of a detailed toolkit; and
- A pilot program that is providing micro-grants to support student-led climate actions that benefit schools and surrounding communities.

This work will also build upon an existing partnership with Youth Challenge International that is supporting the development and implementation of youth-led community climate action projects, along with youth mentorship in climate action engagement, which has a focus on equity-deserving groups through the Climate Action Fund.

The Neighbourhood Climate Action Champions program also includes a number of youth participants and youth-focused climate engagement projects.

Reconciliation and Implementation

To effectively address climate change and advance the process of reconciliation, the City of Toronto will meaningfully engage Indigenous Peoples in an ongoing partnership that upholds Indigenous rights, knowledge and their approaches to climate change to avoid the pitfalls of failed climate strategies. Thus, the Net Zero Strategy will do the following to effectively address the climate crisis:

- Develop a plan for meaningful, in-depth, respectful and ongoing engagement with local Indigenous Peoples to foster and improve government-to-government relationships
- Ensure economic development and employment are developed with and for Indigenous Peoples to ensure a just economic transition
- Ensure Indigenous representation throughout Transform TO implementation, such as advisory committees and local community engagement
- Explore ways to measure and communicate progress that speak to broader questions through an Indigenous lens such as "How will the city look in seven generations?", "Are we good ancestors?" and "How are we honouring the land, water and all our relations?"
- Amplify the voices of those who are disproportionately impacted by climate change and create opportunities for them in decision making
- Support the continued efforts of water protectors and land defenders while creating opportunities to give land back/land ownership back to Indigenous Peoples

From internal discussions between Indigenous City employees and the Toronto Office of Recovery and Rebuild engagement report, participants noticed the lack of meaningful engagement and co-development with Indigenous Peoples as a concern in the creation of the Net Zero Strategy. This is a potential barrier for future engagement with Indigenous communities as the lack of trust and respect discourages people from rejoining the conversation.

By 2025, the City of Toronto will involve Indigenous Advisory Circles to implement actions and help integrate Indigenous knowledge throughout the Strategy. The inclusion of elders, knowledge keepers, land defenders, rights holders and treaty partners at the decision making table will drive meaningful climate action rather than presenting false solutions that do not address the root cause of climate change. The diverse Indigenous representation (2SLGBTQIA+, Afro-Indigenous, Métis, and Inuit) in advisory groups will ensure their voices are deeply represented and ensure the benefits of our climate actions are felt by communities that have been hit hardest by social and economic injustices.

There are voices missing in this Strategy as a result of short timelines for meaningful engagement with First Nations, Métis and Inuit members of the diverse urban Indigenous community of Tkaronto. To address this barrier, the City of Toronto will seek to build a meaningful, in-depth, respectful, and ongoing relationship with local Indigenous People that honours the City's commitments to reconciliation in accordance with the Indigenous Affairs Office. The City will also develop a separate engagement approach with Urban Indigenous communities to ensure diverse voices are represented in the implementation of the Net Zero Strategy. This Strategy recognizes meaningful engagement with Urban Indigenous communities cannot be replaced solely by land acknowledgments, integration of pan-Indigenous worldview, or Indigenous representation in advisory circles. The Strategy should act as a living document to grow and adapt as needed in the future to ensure new and better ways of thinking about our environment are included.

Green Economy and Green Industries

The Green Economy is the greening of all parts of society to reduce the impact of human activity on the environment. Sustainably sourced coffee, bike couriers and banks that practise sustainability are all part of the green economy. The City of Toronto uses an internationally accepted definition of the green sectors, or green industries, which includes companies that provide products and services to businesses and individuals that are part of the green economy.

The City breaks the green industries into five distinct sub-sectors: Bio-economy (e.g. urban sawmills), clean energy (e.g. solar installers), green buildings, resource management (e.g. recycling and clean water) and sustainable transportation (e.g. electric vehicles). Each sector in turn is composed of multiple unique supply chains or clusters such as the bike cluster and the urban wood cluster. These five distinct sectors have unique issues that impact their growth. EVs have growth challenges different from those faced by solar installers or recycling companies. While there are opportunities to find similarities in barriers and opportunities between green sectors, many of the actions to support their growth need to be done on a sector by sector basis.

Toronto's green industries are among the fastest growing sectors of Toronto's economy. The sectors' employment continues to grow twice as fast as overall employment in Toronto (3.9 per cent vs. 1.6 per cent annually between 2015-2019) and contributed an estimated \$6.55 billion to the local GDP in 2018.¹³

Transitioning to a green low- or zero-carbon economy is expected to have four categories of impacts on labour markets: additional jobs will be created in emerging sectors, some employment will be shifted (e.g. from fossil fuels to renewables), certain jobs will be reduced or eliminated (e.g. internal combustion engine vehicle mechanics), and many existing jobs will be transformed and redefined. Technical modelling shows that pursuing the Net Zero pathways will add an additional 1.2 million person-years of employment over what is expected. This amounts to approximately 40,000 to 50,000 jobs annually with the majority in building retrofits and infrastructure investments.

Businesses base their business expansion decisions on product market forecasts. Job creation and the hiring of new employees are a result of increased sales (both projected and actual). Governments can provide more certainty to industry, and speed up the job creation process, by working with industry to develop product sales forecasts. The City of Vancouver's Green Buildings Market Research for example has identified \$3.3 billion of market opportunity through to 2032 for specific technologies. This has created the certainty that companies need to invest in expansion and to attract companies to Vancouver to be part of the rapidly expanding local supply chain.

The City of Toronto can provide that certainty to Toronto's green industries by undertaking a similar market forecast study of key growth areas of the Net Zero Strategy. City staff will work with Toronto's green industries to undertake market research of key products and services required to achieve the goals of the Strategy and to provide a report back to City Council.

The City will also develop green industry growth roadmaps for each green sector in partnership with Toronto's green industries and report back to Executive Committee. The roadmaps will include recommendations and needed actions in all key industry drivers to accelerate the growth of Toronto's green sectors. This will include a workforce development plan (a low-carbon job strategy) and will recommend proposals to other orders of government that align with the industry growth strategy.

City staff will lead consultation with the local green industries on the opportunities to develop a green industries cluster management organization or organizations, and identify the preferred form of the organization(s) and the necessary steps to achieve its creation and report back to Council.

¹³ greentechtoronto, 2020. <https://torontogreenindustries.home.blog/2020/06/23/economic-data/>

Keys to Success

Deeper engagement and long-term support is needed to develop long-lasting partnerships and trust between the community and the City and foster equity. Developing long-term collaborations between the City and traditionally underrepresented groups (e.g. equity-deserving communities, Indigenous communities, local development agencies, etc.) will enable broader engagement of Torontonians in climate action. Working with local green industries will help enable Toronto to have the goods, services, skills and jobs required to meet the Strategy's goals.

4.7 Leading by Example

Benefits of climate action: HEALTH, EQUITY, RESILIENCE, PROSPERITY

One role that the City can play is showing leadership by providing an example of what can be done now, demonstrating success, and sharing lessons learned. The City can lead by example in all sectors. This means quickly moving the City's own buildings, vehicles, waste, decision-making processes, and other practices along the path to net zero.

Electrifying City-owned and managed buildings and vehicles, along with expanding renewable energy, will be key. In the modelled pathway, transit is fully electrified by 2040. The City's fleet of vehicles is also fully electrified. Showing leadership as a City also means introducing a system of climate governance to update the City's decision-making processes to address the climate emergency.

2030 Interim Targets & Actions

THE NET ZERO STRATEGY INCLUDES THE FOLLOWING LEAD BY EXAMPLE TARGETS FOR 2030:

- City of Toronto corporate greenhouse gas emissions are reduced by 65 per cent over 2008 base year
- All City Agency, Corporation and Division-owned new developments are designed and constructed to applicable Toronto Green Standard Version 4 standard achieving zero carbon emissions, beginning in 2022

- Greenhouse gas emissions from City-owned buildings are reduced by 60 per cent from 2008 levels; by 2040, City-owned buildings reach net zero greenhouse gas emissions
- All City-owned facilities have achieved zero waste
- Generate and utilize 1.5 Million Gigajoules of energy from biogas
- Approximately 107,700 tonnes CO2e per year are reduced through Organics Processing with Renewable Energy and Landfill Gas Utilization
- 50 per cent of the City-owned fleet is transitioned to zero-emissions vehicles
- 50 per cent of the TTC bus fleet is zero-emissions
- Greenhouse gas emissions from food the City of Toronto procures are reduced by 25 per cent

The City's short-term actions to move toward these targets are summarized, below. A more detailed description of planned actions is available in the Short-Term Implementation Plan 2022-2025, attached to this Strategy.

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
25	Develop and apply a Climate Lens in decision-making	Applying a climate lens to decision-making ensures that climate impacts, opportunities, risks and potential benefits and savings are systematically considered.				
	A) Implement a Climate Lens Program	A climate lens evaluates and considers the climate implications of all major City of Toronto decisions, guiding the City toward sound, long-term decision-making and GHG reduction goals.				
	B) Report on climate risks to assets	Identifying and disclosing climate-related risks to assets enables the City to minimize risk, inform more efficient, long-term decision-making and enhance accountability to meeting targets.				
	C) Enhance Sustainable Procurement	The City's purchasing power is one way that the City can make environmentally sustainable and equitable investments for today and the future.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
	D) Consider a carbon offset purchase policy and update the Carbon Credit Policy	The use of carbon offsets can make or break an effective net zero strategy. Toronto's Net Zero Strategy will reduce local emissions before considering purchasing offset credits. An offset purchase policy will be developed with the spirit and intent of reaching net zero.				
26	Design and implement a Toronto Carbon Budget	A carbon budget is the current best practice for cities that are serious about ensuring transparency and accountability in their climate action work.				
27	Ensure net zero City-owned buildings	Buildings are the largest source of GHG emissions in Toronto. The Net Zero Carbon Plan demonstrates the City leading by example to achieve net zero emissions in both new and existing City buildings.				
	A) Constructing new City-owned buildings to net zero on a go forward basis	Design and construction of net zero emissions buildings supports the City's systematic approach to achieving City Council's emission reduction targets.				
	B) Pursuing a Net Zero Carbon Plan for existing City-owned buildings	The City can most significantly reduce GHG emissions through fuel switching in its existing buildings. The move away from carbon-intensive equipment is a cost-avoidance action that reduces both operating expenditures and emissions. The City may be able to achieve 50 per cent reduction in GHG emissions through the application of the Net Zero Carbon Plan for existing City buildings.				
28	Reduce emissions from City and Agency-owned vehicles	Transportation is a significant source of GHG and air pollutant emissions in Toronto. The City has a role to play in rapidly demonstrating success in moving toward net zero transportation.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
	A) Update and implement the Sustainable City of Toronto Fleets Plan to support the transition of 20 per cent of City fleet to zero-emission by 2025 and 50 per cent by 2030. Starting in 2022, for any light duty vehicle being purchased by the City, the City will select only the electric version of this vehicle where operationally feasible.	As the largest municipal fleet in Canada, City of Toronto fleets play an important leadership role in advancing technologies that aim to significantly reduce environmental impacts, and improve vehicle efficiency, reliability, and safety, while reducing life-cycle costs and associated impacts.				
	B) Implement the TTC Green Bus Program to achieve target of 20 per cent of TTC buses zero emission by 2025-2026	Zero-emission buses replace diesel buses, reducing the demand for diesel fuel, reducing emissions of GHGs and air pollution. Transportation is the greatest source of air pollution in Toronto.				
29	Encourage City staff to adopt sustainable and climate positive practices at work and in their commutes	The City of Toronto is the largest employer in Toronto, and as such can introduce many people to sustainable practices and enable staff to lead while at work and at home.				
	A) Implement Live Green @ Work Strategy	City of Toronto employees provide service to the public and businesses across the city. City employees can act as climate leaders at work and at home.				
	B) Encourage City staff to take transit, carpool, cycle or walk rather than drive alone to work, through the Smart Commute program	Low- or zero-carbon commuting choices reduce emissions of GHGs and air pollutants and also help to alleviate congestion. Walking and cycling improve health through physical activity.				
30	Lead by example in managing waste and producing renewable energy from biogas at City facilities	Renewable energy reduces the demand for other forms of energy. It is important for the City to lead by example in managing waste.				

	Actions for implementation 2022-2025	Why it matters	Benefits			
			Health	Equity	Resilience	Prosperity
	A) Begin development of a third organics processing facility with renewable energy, targeting completion by 2028	Decarbonization of City operations is a critical way that the City can lead by example in the work toward net zero. The City operates one of the most progressive and sustainable waste management systems in North America. Ongoing innovation in our operations can serve as an industry standard for waste management.				
	B) Produce renewable natural gas from the Disco Road Organics Processing Facility, Dufferin Organics Processing Facility and the third organics processing facility (target completion by 2028) and landfill gas control and utilization systems at Green Lane and Keele Valley Landfills (target completion by 2026).	Renewable energy produced from biogas reduces the demand for other forms of energy.				
	C) Produce renewable natural gas from wastewater	Renewable energy produced from biogas reduces the demand for other forms of energy.				
	D) Divert waste from landfill in City-owned facilities	It is important for the City to set a community-wide example in increasing diversion of waste from landfill. Landfill emissions (particularly organics) generate methane, which has a higher global warming potential than carbon dioxide. Recycled materials also save resources and reduce energy and water use.				

Discussion

The City of Toronto is taking a lead by reducing GHG emissions from its own operations. In addition to a series of community-wide emission reduction targets, TransformTO set a series of City of Toronto corporate leadership targets. Toronto is already a leader in green operations and has many sustainable operating

practices. In the Net Zero Strategy the City has committed to accelerating these targets to ensure that City buildings, workplaces, vehicles, energy, waste management, decision-making process and other practices contribute to reducing emissions and mitigating the impacts of climate change. These ambitious targets were adopted with an accelerated timeline to demonstrate a commitment to “walking the talk” and clearly signal to other organizations that Toronto is a leader in climate action.

Climate Governance

Strong, overarching “Climate Governance” fills the gap between ambitious GHG reduction and climate adaptation goals on the one hand, and robust policy roadmaps on the other hand. It provides an opportunity to ensure transparency, accountability and informed decision-making. Effective Climate Governance systems are now hallmarks of jurisdictions showing climate leadership.

The City of Toronto does not currently institutionalize climate change mitigation and adaptation considerations into decision-making processes. Doing so requires standardization of practices, integrating coordinated oversight and building climate literacy across the corporation.

CLIMATE LENS

The City makes important decisions every day, for instance when it decides to remodel a road, construct a new building, update its vehicle fleet, and improve services. There are key opportunities for the City to look at these decisions with a “climate lens”. The City is developing a climate lens program to give staff the resources, tools and support to undertake meaningful GHG emissions and climate risk assessments on their initiatives, enabling climate-informed decision-making.

The Climate Lens will spur an organizational culture shift at the City by facilitating the mainstreaming of climate considerations into operations and capital project planning. The Climate Lens program will aim to achieve the following objectives and outcomes: (1) Integrate climate considerations into strategic decision-making; (2) Build staff climate competency and leadership; (3) Increase climate accountability; (4) Increase transparency through reporting; and (5) Monitor climate performance.

The Climate Lens program will initially focus on new/enhanced operating programs and capital projects to ensure future investments are aligned with the City's GHG reduction goals and climate risk adaptation needs. The Climate Lens program resources will also be utilized to assess the GHG impacts of and climate opportunities and risks associated with all existing City assets as part of the asset management planning process pursuant to the Asset Management Planning for Municipal Infrastructure Regulation, O. Reg. 588/17, and Toronto's Corporate Asset Management Policy (section 8.1.6 (iv)). This will be done in alignment with the regulated deadline for asset management planning, which is currently 2024.

MANAGING CARBON LIKE MONEY: THE CARBON BUDGET

Critical step to reach the 2030 GHG reduction target:

Demonstrate carbon accountability locally and globally by establishing a carbon budget – Leading by example, the City will establish a carbon budget to track climate actions against annual emission limits and drive accountability. The City's actions will be measured against these limits each year until net zero is achieved, with any gaps in action identified and solutions proposed so we stay on course.

The historical practice of carbon management has been to identify GHG emissions reduction targets for specific years, such as targets set for 2030 and 2050. The more recent best practice however, indicates that every tonne of GHG matters and, therefore, focuses on the trajectory of GHG emissions annually.

A Toronto Carbon Budget would take the approach every municipality already uses to track, review, manage and control financial expenditures and apply it to GHG emissions. It allows decision makers to think of carbon in the same way as money, setting a budget and tracking annual expenditures against that budget, except in this case it is a carbon budget. A carbon budget for the City would set out annual emission reduction limits; identify and quantify governmental actions that reduce GHG emissions (everything from procurements of electric buses to by-laws regulating emissions from buildings); and project whether upcoming annual emission limits will be respected. For each emission reducing action the carbon budget would clearly state the costs and the City divisions and/or agencies accountable for implementation and reporting. Ideally the City's carbon budget would be reported in parallel with the fiscal budget, thereby increasing public awareness of climate action in Toronto which supports accountability. Finally, by highlighting gaps in Toronto's climate action on an annual basis, the City can make timely course corrections to ensure its GHG reduction targets do not slip out of reach. This latter point is critical as significant emission reductions are needed year-after-year to achieve net zero emissions by 2040. The modelled NZ40 pathway sets a cumulative emissions target, or "budget" of 178 MtCO_{2e}. If the city were to continue with its current emissions rate, this budget would be used up in 12 years.

A Toronto Carbon Budget would also align with the City's financial budgets to determine the financial impacts of achieving or failing to achieve the annual GHG emission limit or other relevant key performance metrics. It encourages decision makers to monitor the City's overall progress in achieving its climate objectives, assess and manage organization-wide and community-wide risks, and establish accountability.

Buildings

In July 2021, City Council received Corporate Real Estate Management's [Net Zero Carbon Plan](#). This Plan provides a road map to achieve net zero emissions in City buildings through fuel switching and efficiency retrofits, lower-carbon new builds, strategic divestment, on-site renewables and storage, training and

education, enhanced use of building performance data and carbon offsets and off-site renewables. Work is underway, with detailed plans to be developed in 2022 as part of integrating the Plan into the capital planning process. Implementation of the Net Zero Carbon Plan will reduce GHG emissions from City-owned buildings by at least 80 per cent by 2040.

For City-owned new developments, the Toronto Green Standard Version 4 will require net zero emissions in 2022, in keeping with the City's commitment to lead by example.

Transportation

CITY FLEET AND ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

As the largest municipal fleet in Canada, and one of the largest in North America, City of Toronto fleets play an important leadership role in advancing technologies that aim to significantly reduce environmental impacts, and improve vehicle efficiency, reliability, and safety while reducing life-cycle costs and associated impacts.

The Pathway to Sustainable City of Toronto Fleets Plan set aims to transition 45 per cent of City-owned vehicles to low-carbon vehicles by 2030. Technical modelling and an accelerated approach to addressing the climate emergency has meant that City of Toronto fleets will now aim to transition 50 per cent of City-owned vehicles to zero-emission vehicles by 2030.

One of the cornerstones of the accelerated plan is the Fleet Electrification Strategy, which outlines actions required to expand and maximize the use of EVs in City operations. Accelerating the transition of City Fleets to EVs requires a major expansion of the City's corporate EV charging infrastructure, which is currently underway. The City's corporate EV charging network will also help with the broader promotion and adoption of EVs in Toronto by providing EV charging for City staff and, where feasible, members of the public.

SMART COMMUTE & WORK FROM HOME

Smart Commute programs and services assist staff in greening their commutes by making it easier to take transit, carpool, cycle or walk rather than drive alone to work. The City's Smart Commute team works with staff volunteers and the Smart Commute Champions Network to help promote sustainable commuting at City worksites to create a network of sustainable transportation enthusiasts through events, guest speakers and seminars. The Smart Commute program also includes an Emergency Ride Home initiative, and staff are currently working on a Smart Commute online tool to assist staff in planning their commutes. The City is currently working on a study to determine the climate impacts of working from home.

Continuing telework and institutionalizing it will help to reduce commuter trips, thereby reducing energy use, emissions and congestion. Through the City's ModernTO (Workplace Modernization) program, Toronto aims to be at the forefront of efforts to modernize office work, commuting and telework. ModernTO, and

equivalent initiatives in the private and not-for-profit sectors, will bring additional benefits to the city including smaller environmental impacts, reduced commute times, reduced GHG emissions associated with commuting and improved work-life balance for employees.

LIVE GREEN @ WORK

The Live Green @ Work strategy outlines how organizational citizenship behaviours directed toward the environment (OCB-Es) can be advanced at the City of Toronto through employee engagement. OCB-Es are voluntary environmental behaviours demonstrated at work. Through these behaviours, staff can help the City achieve environmental goals, while also contributing to health and well-being in the workplace.

TRANSIT

The Toronto Transit Commission (TTC) has made a commitment to be 50 per cent zero emissions by 2028-2032 and 100 per cent zero emissions by 2040. An interim target is for 20 per cent of TTC buses to be zero emission by 2025-2026. The TTC is currently operating 60 battery-electric buses, the largest zero emissions fleet in North America, and will be purchasing another 300 electric buses between 2023 and 2025.

When the entire TTC fleet is zero emissions in 2040, GHG emissions will be reduced by approximately 250,000 tonnes of CO₂ per year and local air quality will be improved due to the elimination of diesel emissions from buses. Bus reliability and availability will increase by an estimated 25 per cent, and the total life cycle cost of zero-emissions buses is estimated to be lower than any currently available fossil fuel alternative.

Continuing investments to expand public transit infrastructure will contribute to the modal shift to public transit needed to meet the Strategy's 2030 targets and achieve net zero. The City and Province continue to advance transit expansion as part of several intergovernmental agreements, including the most recent Toronto-Ontario Transit Partnership Preliminary Agreement. These light rail, heavy rail and subway projects will expand access to higher-order transit across the city and are all at various stages of planning, development, and construction. The City also continues to advance design and seek intergovernmental funding for its transit priority projects, namely the Eglinton East LRT and the Waterfront Transit Network.

Waste

The City has several initiatives to manage waste from its own facilities and produce renewable natural gas from biogas. The City is currently working at both the Dufferin and Disco Road organics processing facilities to produce renewable natural gas (RNG) from Green Bin Organic waste, which will be injected into the natural gas grid for City use. Through the Citywide Greenhouse Gas Reduction Strategy ([Report 2020.IE14.7](#)), the RNG produced will be blended with the natural gas that the City buys through the Natural Gas Purchasing Program to create a low-carbon fuel blend that will be used across the organization to power vehicles and heat City-owned facilities, allowing for a reduction in GHG emissions City-wide. The City will not

start using the gas until the beginning of 2022 to ensure production capacity has stabilized. Until then, the gas will be stored in the grid.

The City is also reviewing potential biogas and landfill gas upgrading opportunities at other City waste facilities including the Green Lane and Keele Valley landfills and a future third organics processing facility. All five sites combined would have the potential to produce enough gas to fulfill the City's entire natural gas needs annually (and have a surplus, excluding City Agency, Boards and Commissions).

Other initiatives include producing renewable natural gas from wastewater biogas and diverting waste generated at City facilities from landfill.

Keys to Success

The keys to the City's success in meeting Lead by Example targets will be leadership and a sustained focus on climate-informed decision-making. Meeting these targets will also rely on having a net zero carbon electricity grid to power electrified vehicles and buildings. Success will require the availability of skilled labour familiar with net zero buildings as well as a supply of net zero-appropriate materials.



5 Looking Forward

Street art by Julia Prazja | Pelmo Park - Humberlea

5. Looking Forward

5.1 Summary of Challenges & Keys to Success (Dependencies)

The City of Toronto cannot achieve net zero alone. In fact, with current authorities (powers) and systems in place, the City only directly controls a small portion of our community-wide emissions. The technical modelling demonstrates that achieving net zero by 2040 is technically feasible, but dependent upon significant acceleration of climate actions and well-coordinated efforts at local, regional, national and global levels. There are several challenges and keys to success (also called dependencies) that need to be addressed in order to realize a net zero future:

- 1. Action must begin now and must focus on equity:** Achieving the 2030 GHG target requires that all existing climate actions continue and for additional bold action to begin as soon as possible. A focus on equity in program and policy design and delivery will maximize participation of all Toronto residents so that benefits can be realized sooner and last longer.
- 2. Action from all levels of government will also need to align and accelerate:** Provincial and federal policy and resources are required to enable Toronto's ability to realize a net zero future. Aligned action will also amplify local efforts so that financial returns are realized sooner and GHG emissions reductions start earlier.
- 3. The electricity system needs to be carbon free:** The emissions intensity (amount of GHG emitted per unit electricity) of Ontario's electricity grid is projected to increase. For Toronto to get to net zero, the grid needs to be carbon free. Failing this, the city can only rely on the "net" part of the target and will need to purchase carbon offsets or renewable energy certificates, both of which add

significant cost to becoming net zero. Ensuring that electricity generation does not produce carbon pollution also addresses the scale of the global challenge.

At a local level, while it is important to decarbonize the grid (reducing the carbon or GHG emissions of Ontario's electricity supply), the electricity system needs to be able to adapt to new demands as heating and transportation are electrified. Focusing on conservation first can reduce electricity consumption and is the most inexpensive way to provide additional electricity capacity; however, additional work will be necessary to fully understand how to enable large-scale electrification of transportation and buildings and manage peaks in electricity demand.

- 4. The labour market must shift and local supply chains must be developed:** The labour market must shift and new critical supply chains need to be developed to bring down costs. The skills mix and capacity of the labour force will need to scale up rapidly and new robust supply chains for new technologies, such as heat pumps and electric vehicles, will need to be in place in order to deliver the actions required to achieve net zero.

- 5. Innovative and adaptive delivery mechanisms must be adopted to scale up:** Although all actions presented in the Strategy are technologically feasible, conventional delivery mechanisms are likely too slow and costly to deliver the rapid transformation envisioned to achieve the 2030 target. City processes will need to be nimble, as already demonstrated in the quick implementation of new programs in response to the COVID-19 pandemic. ActiveTO is one of those programs where dedicated road space facilitated active transportation for essential trips and physical activity keeping residents safe and healthy during the pandemic in 2020. ActiveTO demonstrated a quick response to support a crisis by "instituting priority bus lanes, improved cycling infrastructure, expansion of bike share and weekend recreational street closures, among others."

Similarly, quick action will need to be applied to the volume of building retrofits needed to reach Toronto's proposed targets. The current model of retrofitting one house at a time will need to be replaced by a bulk retrofit program where many houses are improved at once. To do this, municipal processes and programs will need to adapt and be aligned in order to address barriers that households might face. For instance, a household wishing to undertake a retrofit or use an electric vehicle should not face any barriers in terms of information or action that might result from conflicting municipal, provincial or utility policies.

- 6. Impacts on material and land resources should be accounted for:** The economy will need to produce large numbers of electric vehicles and deliver building retrofits and renewable energy in short order. Supplying or manufacturing these resources creates demand for concrete, wood, insulation, batteries, and land. The environmental, social, and economic implications will need to be carefully considered to ensure this does not result in additional GHG emissions and negative

impacts to the environment. Indigenous worldviews and circular economy principles are required to minimize impacts on resources and ensure principles of global sustainability are maintained.

5.2 Implementation & Next Steps

The Net Zero Strategy provides a pathway to reach net zero GHG emissions for Toronto. The Strategy also provides solutions that can stimulate the economy, such as investments in infrastructure, building retrofits, electric mobility, and new energy technologies, providing opportunities and benefits for the residents of Toronto.

Decarbonizing Toronto will require leadership from all levels of government and the private sector, as well as active participation from the community. It will require rapidly scaling up many programs and policies that the City and other governments already have underway, as well as new action by all parties.

Many of the planned emission reduction actions also support achieving other City objectives, such as improved economic development and health outcomes. Holding equity as a central focus while designing and implementing the Net Zero Strategy will enable under-represented and equity-deserving groups to be more involved and better off. Thoughtful implementation of the Strategy will create quality jobs, improve air quality and health, and strengthen our resilience to extreme weather.

The impacts and costs of climate change will be determined by how quickly action is taken and by how deeply GHG emissions are reduced leading up to 2030. Delay in taking action to address climate change increases the disruption to the economy and infrastructure. Each year that new investments are made in carbon-intensive infrastructure and technologies, we are locking in an expectation of long-term returns. Undoing these investments is costly. Delay also results in increased damages from extreme weather events.

Achieving net zero GHG requires investments in building retrofits, solar panels, transit service, electric vehicles and other zero emissions technologies and infrastructure. These investments result in energy savings (for example, homes use less energy) and revenues (selling power from electricity generation or district energy). The analysis of modelled pathways indicates that initially investments exceed savings, but by 2040 savings start to exceed revenues on an annual basis, as the investments start to pay back. Achieving net zero by 2040 allows more savings than the net zero by 2050 pathway. Reducing emissions more quickly

also means that the City can collect the financial benefits of the avoided carbon costs and avoided energy costs more quickly.

The City’s net zero GHG vision represents a transformation of the energy system, the built environment, and some of our behaviours, in line with cities around the world that are leading on climate. It will require a coordinated mobilization of the City and society at large for which there are few precedents. The Net Zero Strategy demonstrates that the technology is available, the financials are viable, and the broader societal benefits are extensive. Meeting the ambitious 2030 target on the path to net zero is the City’s opportunity to continue to be a climate leader, to do our part to address the climate emergency and to create a future Toronto that benefits all.

Glossary

Term	Definition
Baseline	the starting point to measure changes in the amount of emissions produced over time
Carbon-free grid	an electricity grid where the power that is generated and distributed comes from only renewable sources
Carbon sequestration	the process of capturing and storing carbon from the atmosphere through natural or anthropogenic methods
Consumption-based emissions	emissions from the volume of goods consumed by a population
CO₂e (Carbon dioxide equivalents)	a single unit of measurement that allows for the impact of releasing different greenhouse gases into the atmosphere to be evaluated on a common basis. Carbon dioxide equivalents are calculated using Global Warming Potential factors that represent the impact of each greenhouse gas type (such as methane (CH ₄) and nitrous oxide (N ₂ O)) relative to that of carbon dioxide
Decarbonize	to eliminate the release of GHGs into the atmosphere from a process or system. This includes swapping out any fossil fuel sources for renewable energy
GHGs (Greenhouse gases)	compound gases that trap heat and emit longwave radiation in the atmosphere causing the greenhouse effect

Heat pump	a highly efficient heating and cooling system that transfers thermal energy from the ground or air to warm a building during winter and cool it during the summer
Mt (Megatonne)	1,000,000 tonnes
Near zero buildings	a building that is designed to be highly energy efficient but still uses a small amount of non-renewable sources. A building constructed to Toronto Green Standard Version 4 Tier 3 is considered a near-zero emissions building
Net zero	a balance between the amount of greenhouse gases released and the amount taken out of the atmosphere
Net zero building	a building that is highly energy-efficient and produces on-site, or procures, carbon-free and or renewable energy in an amount sufficient to offset the annual carbon emissions associated with its operations, or simply eliminates carbon emissions altogether
Renewable energy	a naturally-occurring energy source that is not finite or exhaustible. It includes sources such as sunlight, wind, and geothermal heat
ZEV (Zero Emissions Vehicle)	a vehicle that does not produce tailpipe emissions or other pollutants from the onboard source of power

TransformTO Net Zero Strategy Short-term Implementation Plan 2022- 2025

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
2030 target: 100 per cent of new buildings are designed and built to be near zero greenhouse gas emissions								
1	Ensure near zero emissions for all new construction	CP, EED	New construction activities 2022-2025 include: i. Implement the Toronto Green Standard, which requires net zero emissions for new development applications in 2030. ii. Review options to advance higher levels of uptake of Tier 2 and 3 buildings to facilitate transformation to net zero earlier than 2030.	Buildings are the largest source of GHG emissions in Toronto. Net zero buildings are critical to achieving a net zero Toronto. Building emissions primarily come from burning natural gas to heat space and water.				
2	Evaluate and limit impacts of embodied carbon in construction	EED, CP	More information is needed to understand what kinds of materials and construction techniques should be used for Toronto. The City will study the impacts and set embodied carbon limits for building materials and construction practices in new buildings.	All materials and construction methods have an impact on our city. Using low-carbon materials, such as wood, and using low-carbon construction techniques, will reduce our impacts on the environment.				
2030 target: Greenhouse gas emissions from existing buildings are cut in half, from 2008 levels								
3	Advance Implementation of the Net Zero Existing Buildings Strategy.	EED, TB, MLS, CP, SDFA	The Net Zero Existing Buildings (ExB) Strategy presents nine recommended actions for the City to undertake, identifies key design and implementation considerations for each action, and presents the	Buildings are the largest source of GHG emissions in Toronto, accounting for about 57 per cent of total				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	(Refer to the Net Zero Existing Buildings Strategy , adopted by City Council in July 2021, for a detailed short-term implementation plan.)		potential impacts on emissions, costs and co-benefits. The ExB Strategy takes the approach of introducing voluntary programs and policies in the near-term, followed by a transition to mandatory requirements in the medium to long-term. A detailed short-term implementation plan has been adopted, which can be accessed on the City's website .	community-wide emissions (based on the 2019 GHG inventory). Natural gas accounts for 92 per cent of emissions from buildings. Residential natural gas use alone accounts for 54 per cent of building emissions. These statistics highlight the need to reduce natural gas use in buildings to meet future emissions targets.				
2030 targets: <ul style="list-style-type: none"> • 50 per cent of community-wide energy comes from renewable or low-carbon sources • 25 per cent of commercial and industrial floor area is connected to low carbon thermal energy sources 								
4	Work with industry experts to explore limiting the expansion of natural gas systems and reversing system growth, where feasible, and limiting installation	EED	Over 2022-2025 staff will explore tools to phase out natural gas installation and connections, including but not limited to: i. Develop a framework with City divisions and industry experts to limit the expansion of natural gas systems and reverse system growth, where feasible, and limit installation of natural gas equipment, and report back	Achieving net zero depends on quickly moving away from natural gas for space and water heating in buildings. Natural gas for buildings is the largest source of GHG in Toronto.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	of natural gas equipment		<ul style="list-style-type: none"> by Q2 2022 on recommended tools to limit use of natural gas. ii. Expand district heating systems into communities. iii. District energy heating system ready processes. iv. Neighborhood impact assessments. 					
5	Support adoption and mainstreaming of net zero, resilient energy sources for new and existing developments	EED, CP	<p>Activities in 2022-2025 include:</p> <ul style="list-style-type: none"> i. Plan for net zero emissions districts and large developments, including secondary and precinct plan areas, academic and healthcare campuses, commercial real estate portfolios, brownfield sites, and civic clusters. ii. Support various City Divisions and Energy Developers in developing renewable thermal energy projects where City-owned assets are involved, including sewer heat recovery, lake-based exchange, and geothermal projects. iii. Provide power engineering services for low-carbon backup power systems at designated emergency reception centres, and support the Office of Emergency Management in planning for new emergency reception centres. 	<p>Renewable thermal energy systems remove natural gas from the energy system, reduce annual maintenance costs, and increase resilience of the energy system through energy supply security.</p> <p>Low-carbon back-up power enables buildings to be available to provide essential services and act as community hubs during power outages due to extreme weather or other causes.</p>				
6	Address barriers and develop strategies to	EED	Activities to increase renewable energy over 2022-2025 include:	Decarbonizing buildings is only possible if there is a				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	increase the deployment of renewable energy and storage technologies, including but not limited to solar, wind, biomass, geothermal, waste heat recovery and heat pumps		<p>i. Environment and Energy and other relevant parties to develop a Renewable Energy Taskforce to address barriers and develop strategies for increasing renewable energy development including;</p> <ul style="list-style-type: none"> - Investigate opportunities to encourage wider adoption of renewable energy through regulatory and incentives structures such as rebates, low-interest financing and credits; - Work with Toronto Hydro to enhance the Distributed Energy Resource interconnection process for renewable energy; - Review the building permitting process related to renewable energy and storage and explore opportunities for streamlining; - Review zoning requirements and identify restrictions that prohibit renewable energy development including solar photovoltaic, and assess opportunities for improvement; <p>ii. Environment and Energy to report back in 2023 with findings from this work and identify specific budget requests, authorities and actions required for increasing renewable energy development, including but not limited to solar, heat pumps, geothermal, waste heat recovery and storage.</p>	<p>supply of renewable energy. The City has a supporting role in increasing supply and a key role in facilitating local access to that energy.</p> <p>Resilient solar (solar plus storage) allows buildings to operate during power outages due to extreme weather and become resilience hubs that provide essential services to the community.</p>				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
7	Actively support, advocate to and partner with Toronto Hydro, as well as the Provincial and Federal governments and agencies, to decarbonize the provincial electricity grid, promote energy conservation and enable local renewable energy generation	CMO, EED, TH	Activities include: i. Continue to advocate to the Government of Ontario the critical importance of lowering GHG emissions from the electricity grid in order to reach net zero targets, and work with the Province and other partners in this regard. ii. Collaborate with and advocate to all levels of government and related agencies and utilities to bring about the changes in energy consumption and generation that are needed to reach net zero.	The City of Toronto cannot move Toronto to net zero on its own. Necessary collaboration will include re-evaluating current limits to the City of Toronto's authorities, and the roles various organizations can play in moving Toronto to net zero. Achieving net zero through the electrification of buildings and transportation relies on zero carbon, renewable electricity.				
2030 target: 75 per cent of school/work trips under 5 km are walked, biked, or by transit								
8	Expand biking and pedestrian infrastructure, including the rollout of cycling routes, bicycle parking and bike share at or near TTC stations	TSD, TTC, BST	The City will continue to expand active and multi-modal transportation infrastructure, building on progress made in accelerating ActiveTO, expanding Bike Share Toronto (including the pedal assist e-bike pilot program), and other initiatives.	Gas and diesel vehicles are a major source of GHG in Toronto. Active transportation and low-carbon transit reduce GHG emissions and benefit health by reducing air pollution and increasing physical activity.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
9	Increase existing bus and streetcar service levels to encourage shifts to low-carbon, sustainable transportation	TTC, TSD, CP	The TTC's 5-Year Service Plan and 10-Year Outlook aim to move people more efficiently on transit using enhanced service levels and priority bus lanes to improve reliability, speed and capacity on some of the busiest transit routes in the city.	Increased transit service will improve access to employment, healthcare and community services, encourage shifts away from single-occupancy vehicles and improve transit equity.				
10	Update and accelerate implementation of city-wide Transportation Demand Management Strategy	TSD, EED, CP, EDC	<p>Activities 2022-2025 include:</p> <p>i. The City will update, accelerate implementation, and measure the impact of the city-wide Transportation Demand Management (TDM) Strategy.</p> <p>ii. Pilot targeted residential TDM engagement in several of Toronto's communities to support the uptake of sustainable transportation and low-carbon commuting options.</p> <p>iii. Lead community outreach and engagement campaigns to support the uptake of more sustainable modes of transportation/ commuting (including, but not limited to, promoting public uptake of active transportation, transit, carpooling and telework).</p> <p>iv. Work with Toronto-based employers and businesses to implement TDM and other sustainable transportation best practices as a part of COVID-19 recovery and rebuild process.</p>	Transportation Demand Management eases traffic congestion and reduces transportation emissions of GHGs and air pollutants through transportation alternatives, ride sharing, teleworking and other approaches.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			v. Convene a Transportation Demand Management leaders table, which would include relevant City of Toronto divisions and agencies and would promote uptake of TDM best-practices.					
11	Develop tools to address emissions of greenhouse gases and air pollutants on an area or project level	TSD, CP, EED	The City will develop a framework to address emission reductions of greenhouse gases and air pollutants on an area or project level, including guidance documents and technical modelling, and report back in 2023 with a framework to be implemented in 2024.	Many cities successfully assess potential GHG and air pollutant emissions from an area as a whole, rather than from each source in isolation, using these tools.				
2030 target: 30 per cent of registered vehicles in Toronto are electric								
12	Align the City's Electric Vehicle (EV) Strategy to the net zero goals and implement the EV Strategy	EED, TSD, TPA, TH, CP, FS, MLS, SDFA, CREM, EDC	The City, along with its partners, will implement the City's Electric Vehicle Strategy and align it to the Net Zero Strategy goals. Activities planned for 2022-2025 include: i. Relevant Divisions and Agencies will report to City Council in 2023 with options for how the City of Toronto can support and encourage provision of the home and workplace EV charging infrastructure needed to accommodate growth in EV ownership to 5 per cent of registered personal vehicles in 2025 and 30 per cent in 2030.	Internal combustion engine (ICE) vehicles are a major source of GHG in Toronto. Quickly transitioning these vehicles to electric vehicles, and shifting our electricity supply to net zero, renewable sources, are critical to achieve a net zero Toronto. Switching from fossil fueled to electric vehicles also reduces air and				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			ii. Relevant Divisions and Agencies will report to City Council in 2023 with a strategy to meet the 2025 targets in the EV Strategy for public EV charging infrastructure and ensure that sufficient public EV charging infrastructure will be in place to accommodate growth in EV ownership to 30 per cent of registered personal vehicles in 2030.	noise pollution and decreases vehicle energy costs.				
	A) Increase public EV charging infrastructure	TSD, TPA, TH, CP, EED, FS, CREM	<p>The City will develop a strategy and plans to meet the 2025 targets in the EV Strategy for public charging infrastructure (220 Level 3 DCFC ports and 3,000 Level 2 ports are installed in public locations) and to ensure that sufficient public charging infrastructure will be in place to accommodate growth in EV ownership to 30 per cent of registered personal vehicles by 2030. Next steps 2022-2025:</p> <ul style="list-style-type: none"> i. Identify high priority public charging areas. ii. Explore potential partnerships to support development of public charging infrastructure. iii. Apply for funding (e.g. ZEVIP) and secure match funding. 	In addition to active transportation and transit, electric vehicles are a key part of reaching net zero GHG emissions in Toronto. Public EV charging infrastructure alleviates range anxiety and provides charging options to people who need charging on the go or don't have charging at home. It can also support cargo and logistics, operational fleets, vehicles for hire and car sharing.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	B) Increase EV charging at residential, commercial, institutional and industrial buildings	CP, EED, SDFA, TH	<p>2022-2025 activities to increase EV charging include:</p> <ul style="list-style-type: none"> i. Mandate EV ready requirements for all new developments to ensure that buildings in Toronto will have sufficient EV charging infrastructure to accommodate growth in EV ownership to 30 per cent of registered personal vehicles and 35 per cent of commercial vehicles by 2030 and 100 per cent of all vehicles by 2050. ii. Provide incentives for charging infrastructure in home, public, workplace and fleet settings, as feasible and as needed to improve equity and spur EV adoption. iii. Expand financing options for charging infrastructure installation on private property, as feasible and as needed to improve equity and spur EV adoption. iv. Explore the feasibility of Toronto Hydro offering rebates for Electric Vehicle charging in residential properties during off-peak hours. v. Work with Toronto Hydro and the provincial regulator to remove barriers to the installation of EV charging by changing the regulations related to new electrical connections or requests for additional capacity. vi. Develop policies, regulations and/or programs to support provision of EV charging infrastructure in existing homes and workplaces. 	Sufficient EV charging where people live, work and play is necessary for widespread adoption of EVs. Together with walking, cycling and transit, electrification of transportation is an important part of the pathway to a net zero Toronto.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	C) Review the Electric Vehicle Strategy	EED, TSD, TPA, TH, CP, FS, MLS, SDFA, CREM, EDC	The City will conduct a comprehensive review of the Electric Vehicle Strategy in 2024-2025.	EV technology, adoption and infrastructure change rapidly. Reviewing the EV strategy will keep our shared approach current and relevant.				
13	Determine options to incentivize EV adoption and disincentivize use of gas and diesel vehicles	EED, TSD, TPA, CP	The City will determine options to incentivize EV adoption and disincentivize use of gas and diesel vehicles. Incentives and disincentives may be financial and/or non-financial. Activities 2022-2025 include: i. Advocate to other levels of government to provide/expand purchase incentives for new EVs. Advocate to both levels of government to provide incentives for purchase of used EVs. Advocate for additional taxes/fees on new internal combustion engine vehicles and use money collected to fund rebates for low-cost EVs, additional EV infrastructure and/or transit/active infrastructure (particularly in low income areas). Next steps: - Form a working group to determine the priority of preferred actions by the provincial and federal governments.	Incentives are needed to accelerate the shift from gasoline and diesel vehicles to electric vehicles, transit, walking and cycling and reduce GHG emissions. Relative to fossil fuelled vehicles, electric vehicles have a low lifetime cost due to reduced fuel/energy costs as well as reduced maintenance. Financial incentives help people overcome the initial higher purchase price for an EV.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			<ul style="list-style-type: none"> - Advocate for governments to pursue EV enabling activities or policies. ii. Explore providing purchase incentives, including potential funding sources and equity considerations and measures to mitigate the potential for increasing auto ownership rates. Incentives for EVs should be offset by disincentives for internal combustion engine vehicles. iii. Explore other incentives such as those related to parking. 					
14	Encourage the adoption of electric commercial and freight vehicles, including EVs and e-bikes for last-mile deliveries	TSD, CP, TPA, TH, EED, FS	The City will explore opportunities and develop policies to encourage the use of EVs and e-bikes for commercial and freight transportation.	Reducing emissions from freight transportation also improves health and equity. Vulnerable populations are more often located near major freight routes and disproportionately experience traffic-related air pollution health impacts.				
	A) Encourage the use of e-bikes and EVs for last-mile deliveries	TSD, CP	Activities: <ul style="list-style-type: none"> i. In consultation with the freight industry, develop policies to encourage and facilitate use of e-bikes, 	E-bikes including e-cargo bikes, and electric vehicles, reduce neighbourhood GHG and air pollutant emissions				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			<p>cargo e-bikes and electric vehicles for last-mile deliveries.</p> <p>ii. Explore opportunities to facilitate provision of charging infrastructure and parking for e-bikes, cargo e-bikes and electric vehicles used for last-mile deliveries.</p>	caused by the "last mile" of delivery. E-cargo bikes also provide a more affordable transportation option for small businesses and individuals.				
	B) Encourage adoption of electric commercial and freight vehicles	EED	<p>Activities:</p> <p>i. Explore opportunities to encourage and support adoption of electric vehicles for commercial and freight use, including light-duty, medium-duty, and heavy-duty vehicles.</p> <p>ii. Explore opportunities to encourage increased availability of electric light-duty, medium-duty and heavy-duty commercial and freight vehicles in the GTHA.</p>	Heavy commercial and freight vehicles are predominantly fueled by diesel, a significant source of GHG and air pollutant emissions in Toronto. Air pollution and health impacts from transportation are inequitably distributed, with higher levels near major roadways. Switching to electric vehicles reduces emissions and helps protect health.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
2030 target: Identify pathways to more sustainable consumption in City of Toronto operations and in Toronto's economy								
15	Continue to pursue policy and programmatic interventions that help the City reach its aspirational goals of zero waste and a circular economy, and which identify pathways to more sustainable consumption in both municipal operations and in all sectors of the economy	SWMS, other City divisions	The City will identify and implement new policies and operational changes across City divisions, and enter into strategic partnerships where possible, to reduce waste, maximize resources and support positive environmental outcomes through circular and sustainable consumption.	Cities are well-positioned to play a critical role in achieving climate neutrality and moving to more sustainable consumption models. Accelerating Toronto's circular city transition will contribute to the City's climate action goals and will play a key role in building a resilient, inclusive, green, and prosperous future for residents and businesses.				
	A) Develop a City-wide governance structure, strategy and policy framework to establish a path to make the City the first municipality in the Province of Ontario	SWMS, other City divisions	SWMS, with involvement and leadership from other City Divisions, will develop a Circular Economy Road Map for Toronto that will help guide the City in becoming the first municipality in the province with a circular economy. Once finalized, Toronto's Circular Economy Road Map will inform policy and program	Circular economy strategies consider sustainable resource consumption and material efficiency for their potential impacts on climate change, environmental degradation, and social				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	with a circular economy and to align with the Provincial goal as part of the Waste Free Ontario Act		changes to advance the City's aspirational circular economy goals.	outcomes. Continued relationship building and partnerships will be important to accelerate the City of Toronto's progress toward its aspirational circular economy outcomes and climate action targets.				
	B) Conduct a consumption based emissions inventory and identify targets that would meaningfully reduce consumption based emissions	EED	The City will: i. Conduct a consumption based emissions inventory. ii. Set short- and long-term community-wide consumption emission reduction targets. iii. Report back by Q2 2023.	Understanding and reducing GHGs released during the manufacture and transport of articles and services we use helps address Toronto residents' true climate impact.				
	C) Enable Torontonians to reduce waste and engage in sustainable consumption by implementing the Single Use and	SWMS, other City divisions	The City will: i. Implement a voluntary measures program that enables and encourages businesses to reduce waste in their operations. ii. Introduce mandatory measures to reduce and prevent the generation of single-use and takeaway items in Toronto.	It is estimated that approximately 400 million single-use plastic bags, 85 million foam takeaway containers and cups, and 39 million single-use hot and cold drink cups are				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	Takeaway Items Reduction Strategy			generated annually by single family households in Toronto. Through consultation, the City identified strong public support for the implementation of mandatory measures (e.g. bylaws) restricting single-use and takeaway items.				
2030 target: 70 per cent residential waste diversion from the City of Toronto's Integrated Waste Management System								
16	Continue implementation of the City's Long Term Waste Management Strategy which sets a goal of diverting 70 per cent of waste managed from City customers away from landfill, by focusing on waste reduction, reuse and recycling activities that	SWMS	<p>Reduction, reuse and recycling activities include a food waste reduction strategy, textile collection and reuse strategy, supporting other reduction and reuse programs, exploring new technologies and creating a Circular Economy and innovation unit within SWMS help Toronto reach its goal of becoming the first circular city in Ontario.</p> <p>Within the scope of the Long Term Waste Management Strategy, opportunities to explore waste reduction outside of the integrated waste management system are identified and actioned where within the scope of</p>	There are challenges with achieving this target including the transition of the City's Blue Bin Recycling program to extended producer responsibility (EPR). Currently, the direct impact of diversion on the reduction of greenhouse gas emissions is not known.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	promote resource conservation and reduce environmental impact		control of SWMS, for example, the Community Reduce and Reuse Programs and public communications for waste related information.	Also, weight-based metrics such as diversion do not take into account the evolving nature of packaging and limit the amount of control SWMS has to make an impact on the measure. The Long Term Waste Management Strategy 5-year review is upcoming, and may result in changes to performance measurement and implementation strategies.				
	A) Continue outreach and engagement on waste reduction and diversion, with a focus on food and organic waste	SWMS, EED	The City will continue to enable food and organic waste reduction and diversion among City waste customers through implementation of strategic action roadmaps such as the Long Term Waste Management Strategy.	Outreach and engagement are critical to helping residents have the knowledge, opportunities, and passion for reducing waste. Organic (food) waste in particular creates powerful GHG emissions when it reaches the landfill so is a key area for engagement.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
Develop and implement strategies to improve greenspace infrastructure to build climate resilience								
17	Increase canopy cover and biodiversity and enhance greenspaces	PFR	Over 2022-2025 the City will continue to increase tree canopy cover including prioritizing tree planting programs on both public and private lands to help achieve a more equitable distribution of canopy cover across the city. In collaboration with multiple City divisions, the implementation of the Strategic Forest Management Plan, Parkland Strategy, Ravine Strategy and Version 4 of the Toronto Green Standard will continue to contribute to canopy, biodiversity and greenspace goals.	Toronto's urban forest is a vital city asset that contributes to quality of life and healthy communities. The city's tree population helps to filter air pollution and save energy by helping to cool neighbourhoods and buildings in the summer. Trees also sequester carbon as they grow. Equitable access to greenspaces, including trees, parks and ravines, and their benefits is important to creating a healthy, livable city.				
	A) Achieve equitable distribution of the urban forest, increasing tree canopy and naturalized	PFR	In collaboration with other City divisions, Parks, Forestry and Recreation will continue to protect existing trees and increase tree canopy cover where it is currently lacking, creating more equitable distribution of the valuable services and benefits the urban forest provides.	A well-managed urban forest is vital to quality of life and supports climate resilience, disaster risk reduction, ecosystems conservation, food security, poverty				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	greenspace where it is most needed			alleviation, and improved quality of life. Equitable distribution of the City's tree canopy brings with it a more equitable distribution of the services and benefits provided by trees and greenspace.				
Ensure equitable implementation and ongoing improvement of engagement and reporting								
18	Support resident-led climate action and engagement	EED	Over 2022-2025, the City will continue to implement city-wide climate action engagement under the Live Green Toronto banner. Outreach will be focused on those most impacted by climate change and equity deserving groups to lead and implement local climate action.	Engaging and enabling the community to lead on climate issues is central to achieving a net zero GHG Toronto.				
	A) Support resident-led climate action engagement through Climate Action Grants	EED	Over 2022-2025, the City will scale up and design new grant programs including those directed to Indigenous communities and youth.	Funded projects will increase awareness and engagement on climate action at the local level. They also strengthen the efforts and capacity of local community agencies, grassroots groups and resident leaders.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	B) Expand Neighbourhood Climate Action Champions Program	EED	Over 2022-2025, the City will continue to implement city-wide climate action engagement, specifically continue and scale-up the Neighbourhood Champions program through 2030.	Neighbourhood Climate Action Champions inspire, motivate and encourage residents to undertake community-focused actions to support TransformTO and reduce emissions to net zero.				
19	Work with Indigenous rights holders and urban Indigenous communities to share knowledge and learnings	EED, IAO	The City will develop a plan for meaningful, in-depth, respectful, and ongoing engagement with local Indigenous communities to provide feedback on City's Strategy implementation. 2022-2025 activities include a climate action grants program as well as: i. Ensure TransformTO policies, programs and services are developed with and for Indigenous communities to ensure a just economic transition. ii. Ensure opportunities for Indigenous representation in TransformTO engagement and advisory processes. iii. Explore ways to measure and communicate progress that speaks to broader questions such as "Are we good ancestors?" or "How are we honouring the land, water, and all our relations?" iv. Implement Reconciliation Action Plan.	Meaningfully working with members of Toronto's Indigenous communities, and including an Indigenous worldview in the Net Zero Strategy, are important to our ongoing relationship with Indigenous communities on climate issues and the successful implementation of the Strategy.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			v. Connect with Indigenous Affairs Office and Placemaking Advisory Circle on future placemaking and place-keeping initiatives.					
	A) Develop and deliver Indigenous Climate Action Grants program	EED	Over 2022-2025, EED will work with the Indigenous Affairs Office to design and deliver a new grant program dedicated specifically to local Indigenous climate action.	Supporting local level Indigenous climate action projects is essential, and current funding models need adaptation to ensure accessibility to Indigenous communities.				
20	Develop and implement youth engagement strategy	EED	Over 2022-2025 the City will develop and implement a youth engagement strategy, launch an academic innovation hub, and continue to involve youth in developing and implementing the Net Zero Strategy.	Youth involvement is critical to the design and implementation of the Net Zero Strategy. Meaningfully including youth voices is important from an equity perspective, and the Strategy also benefits from this group's innovative thinking.				
	A) Design and launch a City-academic innovation hub to support youth-led	EED	Over 2022-2025, the City will design and establish an innovation hub where City staff, youth, students, faculty, and community will work together to design innovative local projects.	Supporting youth climate action projects is essential to inspire current and future climate action.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	climate initiatives and innovative student pilot projects							
21	Design and launch a climate advisory group for 2022 and beyond to ensure implementation of the Net Zero Strategy is equitable and reflects the priorities and interests of the community	EED	The Net Zero Advisory Group will be updated and refreshed as the City moves from design of the Net Zero Strategy in 2021 to implementation over 2022-2025.	Receiving advice from diverse sources is critical to the design and implementation of a robust Net Zero Strategy that reflects the priorities of residents and stakeholders.				
22	Develop equity indicators to be reported on as part of the TransformTO implementation status update	EED	Staff will be developing equity indicators where possible and reporting on them regularly.	Ensuring equitable implementation is an important goal of Net Zero Strategy. Measuring and reporting on indicators is an effective way to stimulate and track progress.				
23	Encourage the growth of green industry to provide the products	EDC	The City and partners will encourage the growth of the green industries to enable net zero. 2022-2025 activities:	Developing green industry can create economic benefits to the region and provide the materials and services				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	and services needed to enable a net zero city		<p>i. Work with Toronto's green industries to undertake market research of key products and services required to achieve the Net Zero Strategy targets and goals and to provide a report to Council by Q3 2024.</p> <p>ii. Develop green industry growth roadmaps for each green sector, including a workforce development plan (a low-carbon job strategy), in partnership with Toronto's green industries and report back to Executive Committee – 2023 through 2024.</p> <p>iii. Consult with the local green industries on the opportunities to develop green industries cluster management organizations and identify the preferred form of the organization or organizations and the necessary steps to achieve implementation – by 2023. (The proposed timelines for these actions are contingent upon additional funding).</p>	needed to enable a net zero city. An industry's growth is generally controlled by six key drivers: Advocacy; Collaboration Building; Market Development; Marketing; Policies and Regulations; and Workforce Development.				
24	Leverage Live Green Toronto to develop and implement a city-wide climate action awareness campaign	EED	Over 2022-2025 the City will develop and implement a city-wide climate action awareness campaign.	Communication is key to creating understanding, enthusiasm and participation in moving our city to net zero.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
2030 target: Lead by Example – Corporate emissions are reduced by 65 per cent over 2008 base year								
25	Develop and apply a Climate Lens in decision-making	EED, CFO	The City will continue to advance a climate lens systematically including climate priorities, opportunities and risks in decision making. Activities over 2022-2025 are outlined below.	Applying a climate lens to decision-making ensures that climate impacts, opportunities, risks and potential benefits and savings are systematically considered.				
	A) Implement a Climate Lens Program	EED, CFO	A Climate Lens Program integrates climate considerations in all new operating programs and capital projects and builds staff competency to assess both climate change mitigation and adaptation impacts. The City will: - Apply climate lens to all new operating and capital projects by 2022. - Apply climate lens to all existing programs, services, and assets by 2024.	A climate lens evaluates and considers the climate implications of all major City of Toronto decisions, guiding the City toward sound, long-term decision-making and GHG reduction goals.				
	B) Report on climate risks to assets	EED, CFO, AS	The CFO to report on all major climate risks associated with existing programs, services and assets, identified via the Climate Lens Program, to Council by 2024, and Council to direct the appropriate Divisions/Agencies to address risks in future capital planning. The CFO is to also provide ongoing annual updates on the City's	Identifying and disclosing climate-related risks to assets enables the City to minimize risk, inform more efficient, long-term decision-making and enhance				

Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
				Health	Equity	Resilience	Prosperity
		climate risks as part of its annual consolidated financial statements.	accountability to meeting targets.				
2030 target: Lead by Example in Procurement – Greenhouse gas emissions from food the City of Toronto procures are reduced by 25 per cent							
C) Enhance Sustainable Procurement	PMMD	<p>Align procurement policies with the following climate lens objectives:</p> <ol style="list-style-type: none"> 1. Integrate climate considerations into strategic decision-making 2. Build staff climate competency and leadership 3. Increase climate accountability 4. Increase transparency through reporting 5. Monitor climate performance <p>This action targets reporting in Q2 2022 and implementation into 2023.</p> <p>Enhancing sustainable procurement will also include working toward reducing emissions from food by 25 per cent by 2030 relative to a 2015 base year as per the City's Cool Food Pledge, and in alignment with the City's C40 Good Food Cities Declaration. Staff will report back on the status of corporate food-related emissions and recommended actions through Net Zero's status update on implementation in Q2 2025.</p>	The City's purchasing power is one way that the City can make environmentally sustainable and equitable investments for today and the future.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	D) Consider a carbon offset purchase policy and update the Carbon Credit Policy	CMO	Consider a carbon offset purchase policy and review the Carbon Credit Policy in a way that prioritizes achieving local emission reductions	The use of carbon offsets can make or break an effective net zero strategy. Toronto's Net Zero Strategy will reduce local emissions before considering purchasing offset credits. An offset purchase policy will be developed with the spirit and intent of reaching net zero.				
26	Design and implement a Toronto Carbon Budget	EED, CFO	Design a Toronto Carbon Budget and associated key performance metrics, which aligns with the City's financial budgets, to manage corporate and community GHG emissions within an absolute limit.	A carbon budget is the current best practice for cities that are serious about ensuring transparency and accountability in their climate action work.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
2030 targets: Lead by Example in Buildings								
<ul style="list-style-type: none"> All City Agency, Corporation and Division-owned new developments are designed and constructed to applicable Toronto Green Standard Version 4 standard achieving zero carbon emissions, beginning in 2022 Greenhouse gas emissions from City-owned buildings are reduced by 60 per cent from 2008 levels; by 2040, City-owned buildings reach net zero greenhouse gas emissions 								
27	Ensure net zero City-owned buildings	CREM, CP	Transitioning City-owned buildings to be net zero buildings.	Buildings are the largest source of GHG emissions in Toronto. The Net Zero Carbon Plan demonstrates the City leading by example to achieve net zero emissions in both new and existing City buildings.				
	A) Constructing new City-owned buildings to net zero on a go forward basis	CREM, CP	Update construction processes and design standards to include a requirement to construct new City buildings to Toronto Green Standard Version 4 Tier 4, to identify a net zero target in the design/construction procurement process and to identify planned facility construction projects for compliance.	Design and construction of net zero emissions buildings supports the City's systematic approach to achieving City Council's emission reduction targets.				
	B) Pursuing a Net Zero Carbon Plan for existing City buildings	CREM	In July 2021, City Council adopted CREM's Net Zero Carbon Plan. This Plan provides a road map to achieve net zero emissions in City buildings first and foremost	The City can most significantly reduce GHG emissions through fuel				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			through changes to facility utilities consumption. It offers seven initiatives to reach this goal, including, fuel switching and efficiency retrofits, lower-carbon new builds, strategic divestment, on-site renewables and storage, training and education, enhanced use of building performance data and carbon offsets and off-site renewables. The Plan focuses on making the right investments into City buildings in order to meet the targets set by City Council. The Plan would be delivered by CREM in collaboration with other City Divisions and Agencies. Work is underway to integrate the Plan into the capital planning process, with the expectation that the Plan will be incorporated into the 2023 budget process.	switching in its existing buildings. The move away from carbon-intensive equipment is a cost-avoidance action that reduces both operating expenditures and emissions. The City may be able to achieve 50 per cent reduction in GHG emissions through the application of the Net Zero Carbon Plan for existing City buildings.				
2030 targets: Lead by Example in Transportation <ul style="list-style-type: none"> • 50 per cent of the City-owned fleet is transitioned to zero-emissions vehicles • 50 per cent of the TTC bus fleet is zero-emissions 								
28	Reduce emissions from City and Agency-owned vehicles	FS, TTC	Over 2022-2025 the City will continue to reduce GHG and air pollutant emissions from City-owned and operated vehicles, fuels and practices.	Transportation is a significant source of GHG and air pollutant emissions in Toronto. The City of Toronto has a role to play in rapidly demonstrating				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
				success in moving toward net zero transportation.				
	A) Update and implement the Sustainable City of Toronto Fleets Plan to support the transition of 20 per cent of City fleet to zero-emission by 2025 and 50 per cent by 2030. Starting in 2022, for any light duty vehicle being purchased by the City, the City will select only the electric version of this vehicle where operationally feasible.	FS	Activities include: i. Accelerate transition of City Fleets to sustainable, climate resilient, carbon-neutral operations by 2040. ii. Expand City's corporate EV charging infrastructure (1,200 charge ports by 2025, and 2,400 charge ports by 2030). iii. Identify needs and opportunities for providing EV charging for City staff and members of the public. iv. Develop associated policies, operational procedures, training and instructional material, and promotional material.	As the largest municipal fleet in Canada, City of Toronto fleets play an important leadership role in advancing technologies that aim to significantly reduce environmental impacts, and improve vehicle efficiency, reliability, and safety, while reducing life-cycle costs and associated impacts.				
	B) Implement the TTC Green Bus Program to achieve target of 20 per cent of TTC buses zero emission by 2025-2026	TTC	Implement TTC Green Bus Program.	Zero-emission buses replace diesel buses, reducing the demand for diesel fuel, reducing emissions of GHGs and air pollution.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
				Transportation is the largest source of air pollution in Toronto.				
29	Encourage City staff to adopt sustainable and climate positive practices at work and in their commutes	EED	Over 2022-2025 the City will encourage staff to adopt sustainable, low-carbon practices by implementing the Live Green @ Work Strategy alongside the Smart Commute Toronto program.	The City of Toronto is the largest employer in Toronto, and as such can introduce many people to sustainable practices and enable staff to lead while at work and at home.				
	A) Implement Live Green @ Work Strategy	EED	The Live Green @ Work Strategy: Staff engagement and organizational citizenship behaviour directed toward the environment encourage City employees to engage with climate action. This activity is important to the City as a green employer.	City of Toronto employees provide service to the public and businesses across the city. City employees can act as climate leaders at work and at home.				
	B) Encourage City staff to take transit, carpool, cycle or walk rather than drive alone to	EED	Update the online tool that assists staff in finding sustainable commute options (transit routes, cycling routes, carpool matching).	Low- or zero-carbon commuting choices reduce emissions of GHGs and air pollutants and also help				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
	work, through the Smart Commute program		Conduct a commuter survey for City staff to identify current commuting practices and opportunities for assisting staff in reducing the carbon footprint of their commutes.	alleviate congestion. Walking and cycling improve health through physical activity.				

2030 targets: Lead by Example in Managing Waste

- **Generate and utilize 1.5 Million Gigajoules of energy from biogas**
- **Approximately 107,700 tonnes CO2e per year are reduced through Organics Processing with Renewable Energy and Landfill Gas Utilization**
- **All City-owned facilities have achieved zero waste**

30	Lead by example in managing waste and producing renewable energy from biogas at City facilities	SWMS, TW, CREM	The City will build on existing programs to lead by example in managing waste and producing renewable energy from biogas at City facilities, as described below.	Renewable energy reduces the demand for other forms of energy. It is important for the City to lead by example in managing waste.				
	A) Begin development of a third organics processing facility with renewable energy, targeting completion by 2028	SWMS	SWMS will build a third organics processing facility (OPF) with renewable energy. Diversion of organics from landfill and processing through the facility will contribute to a reduction in GHG emissions. In addition, Landfill gas control and utilization from Green Lane and Keele Valley landfills will contribute to this target.	Decarbonization of City operations is a critical way that the City can lead by example in the work toward net zero. The City operates one of the most progressive				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
				and sustainable waste management systems in North America. Ongoing innovation in our operations can serve as an industry standard for waste management.				
	B) Produce renewable natural gas from the Disco Road Organics Processing Facility, Dufferin Organics Processing Facility and the third organics processing facility (target completion by 2028) and landfill gas control and utilization systems at Green Lane and Keele Valley Landfills (target completion by 2026).	SWMS	<p>SWMS will continue to capture biogas for beneficial use.</p> <p>The City has implemented renewable natural gas (RNG) processing at the Dufferin organics processing facility, and is currently working at the Disco Road organics processing facility to produce RNG from Green Bin organic waste, which will be injected into the natural gas grid for City use. The RNG produced will be blended with the natural gas that the City buys to create a low-carbon fuel blend that will be used across the organization to power vehicles and heat City-owned facilities, allowing for a reduction in GHG emissions Citywide.</p> <p>The City has also identified potential biogas and landfill gas upgrading opportunities at other City waste</p>	Renewable energy produced from biogas reduces the demand for other forms of energy.				

	Actions for implementation 2022-2025	Divisions & Agencies Lead is listed first. Legend* below.	Description of action	Why it matters	Benefits			
					Health	Equity	Resilience	Prosperity
			facilities including the Green Lane and Keele Valley landfills and a future third organics processing facility.					
	C) Produce renewable natural gas from wastewater	TW	Toronto Water will continue to make better use of biogas through production of renewable energy at its facilities.	Renewable energy produced from biogas reduces the demand for other forms of energy.				
	D) Divert waste from landfill in City-owned facilities	CREM, SWMS	Waste generated at City-owned facilities is diverted from landfill, reducing associated GHG emissions.	It is important for the City to set a community-wide example in increasing diversion of waste from landfill. Landfill emissions (particularly organics) generate methane, which has a higher global warming potential than carbon dioxide. Recycled materials also save resources and reduce energy and water use.				

***Divisions & Agencies:**
AS – Accounting Services
BST – Bike Share Toronto

CFO – Chief Financial Officer & Treasurer's Office
CMO – City Manager's Office
CP – City Planning
CREM – Corporate Real Estate Management
EED – Environment & Energy
EDC – Economic Development & Culture
FP – Financial Planning
FS – Fleet Services Division
IAO – Indigenous Affairs Office
MLS – Municipal Licensing & Standards
PFR – Parks, Forestry & Recreation
PMMD – Purchasing & Materials Management
SDFA – Social Development, Finance & Administration
SWMS – Solid Waste Management Services
TH – Toronto Hydro
TSD – Transportation Services
TTC – Toronto Transit Commission
TW – Toronto Water