



# Assessing climate action progress of the City of Toronto

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TRANSFORMATIONAL  
CLIMATE ACTIONS BY  
CITIES

RESEARCH

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## ABSTRACT

The Canadian City of Toronto's progress is evaluated for the implementation of its climate action plan, TransformTO, and its effectiveness in reducing sectoral emissions. Following a brief history of climate action in Toronto, the key climate policies and programs are subjected to a content analysis and assessed using an aggregate evaluation framework composed of qualitative indicators commonly used to track municipal climate action. The results of this assessment reveal that the city has made steady progress in reducing emissions, surpassing its 2020 greenhouse gas emissions reduction target of 30% reduction below 1990 levels. However, Toronto is not on track to meet its 2030 target of a 65% emissions reduction from 1990 levels. Without transformational action across all sectors, it is unlikely to meet the 2030 and 2040 targets. The results are intended to strengthen implementation and evaluation efforts in Toronto. The discussion will be of interest to decision-makers and practitioners who seek to accelerate implementation of municipal climate action plans.

## POLICY RELEVANCE

This paper is intended to support and strengthen the City of Toronto's implementation of its climate action plan, TransformTO, and supporting Net Zero Strategies. Of potential relevance to policymakers in other Canadian cities is the role of ambitious top-down target-setting of the municipal organization and city at large for pursuing bold climate action, even in the face of significant constraints (e.g. provincial building code and energy grid, difficulties in accessing utilities energy use data). Policymakers may also draw insights from the Toronto context for leveraging staff and community commitment to climate action by involving them in planning and implementation of emissions reductions strategies. Useful recommendations are provided for overcoming modeling deficiencies and data limitations, while advancing transformative climate action through multi-sectoral partnerships, policies that support market transformation, the scale-up of low carbon programs and investments in low carbon infrastructure.

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## 1. INTRODUCTION

Governments around the world have acknowledged the existential threat posed by climate change and its associated impacts. To limit global warming to 1.5°C and avoid the worst consequences of climate change, the Intergovernmental Panel on Climate Change (IPCC) (2019) states that global carbon emissions must decline by 45% from 2010 levels by the year 2030 and reach net zero by 2050. To achieve these ambitious targets, bold climate action is needed, particularly from densely populated, high greenhouse gas (GHG) emissions-producing municipalities, where climate impacts are felt most acutely.

In Canada, there is broad and growing consensus among mainstream political parties that addressing climate change is important; however, there has not always been alignment or coordination across federal and provincial lines. This is partly a result of jurisdictional ambiguity around environmental issues and the inherent complexity of regulating them (Dessanti 2021). Similarly, a growing number of cities are working to address climate change, albeit unevenly. In evaluating climate action plans of 63 Canadian cities, Guyadeen *et al.* (2019) found plan implementation as well as monitoring and evaluation were the weakest aspects of most plans, and many of the largest cities' plans shared this deficiency. Yet as Jost *et al.* (2020) argue, (experience-based) evaluation of local climate action is needed to minimize uncertainty regarding progress and more accurately identify areas where climate action should be targeted. Evaluating implementation progress is thus crucial for achieving bold climate action targets and provides the impetus for this paper.

The purpose of this paper is to assess implementation progress in Canada's largest city, Toronto, and the extent to which it is achieving the climate action goals articulated in its climate action plan, TransformTO, and follow-on net zero community-wide strategies. A key aim is to identify lessons that may help the city achieve its climate action targets by providing them with detailed information regarding progress, as well as key barriers and enabling factors to further advance climate action and reduce GHG emissions. The intention is to inform better decision-making as well as identify opportunities for accelerated action.

The questions addressed are:

- What progress has Toronto made in implementing TransformTO and accompanying net zero strategies to date?
- To what extent have emissions reductions occurred in key sectors (*i.e.* buildings, transportation, energy, and waste)?
- How might the city accelerate implementation of TransformTO to achieve deeper emissions reductions?

The paper is structured as follows. After a brief description of the policy context shaping climate action in Toronto, the assessment approach and methods are presented. This is followed by a description of key climate action processes and outputs as well as implementation progress, and related outcomes (*i.e.* GHG emissions reductions) in major emissions-producing sectors. Progress is evaluated using the aggregate assessment framework, followed by a discussion of the results. Some final thoughts on the state of evaluating municipal climate action will conclude the paper, the nature of which are part of a quality assurance effort to help the city improve its climate action programs.

## 2. POLICY CONTEXT

In Canada, federal, provincial, and territorial policies create the broad framework for emissions reductions, with local governments (LGs), especially large municipalities such as Toronto, responsible for numerous policy areas crucial for addressing climate change (Burby 2003). These include public transit, transportation, infrastructure, land-use planning, housing, urban design, parks and forestry, and many others (Cappell *et al.* 2022). Although municipal policy affects

how people live and work and is vitally important for reducing emissions in the near and longer terms, provincial and, to some extent, federal governments impose jurisdictional limitations that constrain municipal climate action (City of Toronto 2000). For instance, the building code, vehicle registration, clean electricity standards and supply mix, and product stewardship programs are mandated by the province of Ontario. Such regulations, along with funding and oversight, influence the extent to which city emissions can be reduced in the buildings, transportation, energy, and waste sectors, respectively (Hoppe *et al.* 2016).

Accordingly, Toronto has had to take advantage of brief windows of opportunity when there has been alignment between the city, province, and federal climate agendas to swiftly advance progressive climate policy and action. Most recently, this occurred between 2014 and 2018 when progressive and climate-focused leaders John Tory, Kathleen Wynne, and Justin Trudeau held offices concurrently as Toronto Mayor, Ontario Premier and Canada's Prime Minister, respectively. This alignment created a set of enabling conditions for TransformTO, reflected in annual budgets and actions plans that underpin policy and are largely consistent with the net zero by 2040 target (C. Fernandez, personal conversation, 19 October 2022).

### 3. AGGREGATE ASSESSMENT FRAMEWORK

To track the city's climate action progress thus far, an aggregate assessment framework was created by the authors. This uses criteria drawn from four prevalent assessment approaches for tracking municipal climate action progress: (1) the joint Climate Disclosure Project–International Council for Local Environmental Initiatives (CDP–ICLEI) tracking (CDP n.d.); (2) Federation of Canadian Municipalities Partners for Climate Protection (FCM–PCP)—Milestone 5 (PCP n.d.); (3) The C40 Participation Standards (C40 Cities 2021); and (4) Meeting the Climate Change Challenge (MC<sup>3</sup>) Local Government Climate Action Assessment Framework (henceforth the 'MC<sup>3</sup> Framework') (Dale n.d.; Dale *et al.* 2019).

The rationale for selecting these is that they share a common scale and analytical focus as this study, they are well known and well regarded by municipal actors in Canada, and in the case of the first three frameworks (Table 1) have been variously used by the city to measure and communicate climate action progress (C. Fernandez, personal conversation, 19 October 2022).

The MC<sup>3</sup> Framework was included in our aggregate framework for multiple reasons: it offers a qualitative depth that the other three frameworks do not provide; it is implementation focused, while the other frameworks are largely process and outputs oriented; it is grounded in real-world applicability having been applied to large, medium, and small-sized municipalities (albeit in a different Canadian province); and it is a piece of work to which one of this paper's authors contributed so the authors are well versed in it (Jost *et al.* 2020). We organized the criteria from each of these frameworks into categories (*i.e.* processes, outputs, outcomes), informed by our prior work developing and applying a multipronged, light-touch, utilization-focused evaluation framework that assessed the contributions of neighbourhood-scale climate action interventions (Slater & Robinson, 2020; Williams & Robertson 2020).

This aggregate framework is used to evaluate Toronto's climate action progress in terms of supportive processes and outputs of those processes (*e.g.* target setting, modelling, emissions inventories, stakeholder engagement, policies implementation plans, rebates and financial incentives, electric vehicle (EV) charging stations); and outcomes (GHG emissions reductions, institutional or behavioral change). Excluded are the evaluation of impact and lasting systems-wide change, as these are beyond the scope of the present paper and not supported by the evaluation frameworks discussed here or commonly used.

ASSESSMENT FRAMEWORK DESCRIPTION	CRITERIA <sup>a</sup>
<p><b>Climate Disclosure Project–International Council for Local Environmental Initiatives (CDP-ICLEI) Unified Reporting System</b></p> <p>The world’s leading climate reporting platform and progress accountability mechanism for cities. Cities are deemed to be ‘A-list cities’ if they meet all six criteria (<a href="https://www.cdp.net/en/articles/cities/cdp-and-iclei-introducing-streamlined-climate-reporting">https://www.cdp.net/en/articles/cities/cdp-and-iclei-introducing-streamlined-climate-reporting</a>)</p>	<ol style="list-style-type: none"> <li>1. Public disclosure of city-wide emissions inventory</li> <li>2. Emissions reduction target and a renewable energy target</li> <li>3. Published climate action plan</li> <li>4. Climate risk and vulnerability assessment</li> <li>5. Climate adaptation plan to demonstrate how it will tackle climate hazards</li> <li>6. <i>Demonstrate progress towards achieving its ambitious but realistic goals</i></li> </ol>
<p><b>Federation of Canadian Municipalities Partners for Climate Protection (FCM-PCP)—Milestone 5</b></p> <p>Provides municipalities with the opportunity to assess progress towards their emission reduction goals and to reassess the strategic direction of their local action plan (<a href="https://www.pcp-ppc.ca/program">https://www.pcp-ppc.ca/program</a>)</p>	<ol style="list-style-type: none"> <li>1. Update greenhouse gas (GHG) emissions inventory</li> <li>2. Document results achieved by notable projects and initiatives</li> <li>3. Report on stakeholder engagement and public participation</li> </ol>
<p><b>The C40 Participation Standards</b></p> <p>Guidelines for C40 membership, comprising cities from around the globe, and include three mandatory requirements (see Criteria) (<a href="https://www.c40.org/news/participation-standards-2017/">https://www.c40.org/news/participation-standards-2017/</a>)</p>	<ol style="list-style-type: none"> <li>1. Setting a target for reducing GHG emissions</li> <li>2. Developing a climate action plan with concrete initiatives to meet the target</li> <li>3. Actively sharing best-practice examples with other cities through the C40 networks</li> </ol>
<p><b>Meeting the Climate Change Challenge (MC<sup>3</sup>) Local Government Climate Action Assessment Framework—Implementation Section</b></p> <p>The framework was developed by practitioners and academics and tested in municipalities throughout British Columbia. It included a total of 34 action areas organized into six categories for measuring climate action (agenda setting/strategies, policy/plan formulation, implementation, feedback/evaluation, dissemination, GHG emissions). Local action/policy areas related to development path change were identified with assessment criteria underpinned by key concepts from social practice theories, sustainability transitions multilevel perspective and socio-ecological systems thinking. Indicators refer to the type/degree of change occurring: incremental (measures that marginally affect but maintain the status quo); reformative (later relabeled ‘transitional’) (measures the change features originating the problems, but without questioning the bases of the system); and ‘transformative’ (measures that originate a radical redefinition of institutional and individual norms and values, thus—as a difference from the previous—fundamentally changing the system) (Jost et al. 2020) (<a href="http://www.changingtheconversation.ca/assessment-framework-table-1">www.changingtheconversation.ca/assessment-framework-table-1</a>)</p>	<p>Implementation Action Areas (see Table 2 for specific actions):</p> <ol style="list-style-type: none"> <li>1. <i>Corporate climate action</i></li> <li>2. <i>Partnerships, strategic alliance</i></li> <li>3. <i>Local government (LG)-controlled service delivery</i></li> <li>4. <i>Rulemaking: LG climate regulations</i></li> <li>5. <i>Experimentation/innovation</i></li> <li>6. <i>Institutional arrangements</i></li> <li>7. <i>Institutional capacity</i></li> <li>8. <i>Horizontal linkages</i></li> <li>9. <i>Financial support</i></li> <li>10. <i>Vertical policy support</i></li> </ol>

**Table 1:** Aggregated assessment framework

Note: <sup>a</sup>Process and outputs indicators, with the latter shown in italics.

ACTION AREA	ACTIONS
<p><b>1. Corporate climate actions</b></p> <p>Assesses how local government (LG) plans, updates inventories, and undertakes actions to reduce corporate emissions</p>	<p><i>Incremental:</i> recycling, H<sub>2</sub>O conservation, and participation in Earth Hour, Car-Free Day, Bike to Work Week, carbon offsetting</p> <p><i>Transitional:</i> corporate green fleet, solar installations on city-owned properties, building retrofit projects and renewable energy</p> <p><i>Transformational:</i> comprehensive retrofit program</p>
<p><b>2. Partnerships, strategic alliance</b></p> <p>Measures the extent to which the LG engages in partnerships with other levels of government, researchers, civil society leaders and quasi-institutional organizations to advance climate goals</p>	<p><i>Incremental:</i> partnerships limited to existing regional cooperation models over issues such as water and waste management</p> <p><i>Transitional:</i> LG engaged in partnerships with other levels of government, civil society, or business to advance strategic climate action</p> <p><i>Transformational:</i> LG actively engaged in partnership models to take concrete climate actions and deliver more climate-friendly core services</p>

**Table 2:** Meeting the Climate Change Challenge (MC<sup>3</sup>) Assessment Framework Implementation Actions.

ACTION AREA	ACTIONS
<p><b>3. LG-controlled service delivery</b> Measures the degree to which the LG is flexible when it comes to adjusting and expanding its service-delivery model to enable climate-friendly community development</p>	<p><i>Incremental:</i> LG undertakes traditional delivery of water, waste, and other infrastructure services without special regard for climate imperatives <i>Transitional:</i> LG working to raise awareness of climate-friendly ways in which residents can engage with local services (e.g. water conservation, waste recycling, organics recycling, energy efficiency) <i>Transformational:</i> LG expands its role to enable delivery of climate-friendly services to residents</p>
<p><b>4. Rulemaking—LG climate regulations</b> Assesses degree to which the LG passes and enforces climate-friendly regulations</p>	<p><i>Incremental:</i> Handful of opt-in programs offered to residents and businesses (e.g. sustainability checklist, building energy labelling, solar-ready, etc.) <i>Transitional:</i> Stretch code embraced, E-efficiency requirements in development permit areas, minimum energy performance criteria for new zonings; green building/sustainability checklist mandatory for all new building permits <i>Transformational:</i> LG flexibility/autonomy over building codes; net-positive buildings and passive house for new/existing houses; mixed-use zoning, compact and transit-oriented development</p>
<p><b>5. Experimentation/innovation</b> Assesses the extent to which the LG encourages and facilitates experimentation and innovation around climate-friendly policies, practices, or technologies, both inside and outside the LG, and shares the results</p>	<p><i>Incremental:</i> encouraged within traditional business and technological arenas, but less so in climate domain <i>Transitional:</i> permits experimentation (inside and outside the LG) on climate-friendly policies, practices, and technologies, and advertises this modestly; modest to no financial incentives <i>Transformational:</i> LG incentivizing, promoting, and underwriting climate experimentation through partnerships; champions/protects niche experiments; disseminates successes</p>
<p><b>6. Institutional arrangements</b> Measures the degree of coordination and strategic alignment between LG departments on climate action</p>	<p><i>Incremental:</i> conflicting departmental priorities, incentives; single environment department responsible for climate issues; climate not considered beyond environmental department; lack of structures to coordinate the multiple internal department <i>Transitional:</i> central coordinating group responsible for climate action across all departments and for mainstreaming climate goals; or climate group within each climate-relevant department <i>Transformational:</i> department structures are aligned and mandates reflecting LG climate change areas, principles and priorities are embedded through the LG</p>
<p><b>7. Institutional capacity</b> Assesses the extent to which resources (financial and know-how) are distributed across the LG to develop integrated policy formulation, implementation, monitoring, and adjustment</p>	<p><i>Incremental:</i> uneven; climate issues the purview of sustainability professionals <i>Transitional:</i> limited internal expertise exists; little to no budget for external expertise; full-time sustainability or energy manager in place; no clear climate mandate for climate-relevant departments <i>Transformational:</i> climate policy capacity evenly distributed across LG departments; climate/sustainability goals embedded in all department plans; climate action steering group ensures climate/sustainability goals are adhered to</p>
<p><b>8. Horizontal linkages</b> Assesses the degree to which the LG participates in strategic alliances and partnerships to deliver comprehensive climate action</p>	<p><i>Incremental:</i> LG has few formal relations with sectoral organizations or agencies that could help with policy implementation <i>Transitional:</i> LG engaged in formal partnerships with sectoral actors (governmental, crown corporations, and non-governmental) to enhance policy formulation/implementation; lessons learned/best practice being shared via partners <i>Transformational:</i> LG well embedded in formal/non-formal sectoral partnership network and climate policies are jointly formulated and implemented via this network. Social learning occurring</p>
<p><b>9. Financial support</b> Measures the degree to which climate actions, both inside and outside of the LG, are financially supported</p>	<p><i>Incremental:</i> LG budget for climate action not part of LG base tax funding; funding from higher levels of government sporadic and often unaligned with LG priorities; LG tends to act when government funds become available <i>Transitional:</i> limited budget available (to leverage external climate funds) for climate initiatives in climate-relevant departments; LG very sensitive to provincial/federal funding, but this is rarely aligned with LG goals <i>Transformational:</i> climate action is a line item in all departmental base budgets and budgets for outside climate expertise available</p>
<p><b>10. Vertical policy support</b> Assesses the degree to which assistance is available to the LG from senior levels of government</p>	<p><i>Incremental:</i> senior government policy framework is missing or misaligned with LG priorities; senior government policy related to energy generation and supply contradicts local climate priorities <i>Transitional:</i> policy frameworks at provincial and federal levels incomplete; incentives rarely align due to jurisdictional conflicts, funding cycles. LG climate policies able to exist, but not thrive <i>Transformational:</i> appropriate devolution of authority with stable funding/capacity; an enabling policy framework exists resulting in linked-up policy across all levels of government; two-way learning possible</p>

This section presents an overview of the study's research design, data collection, and data analysis. The case study of Toronto was studied in-depth to understand the phenomena relevant to local climate policy and climate actions (Yin 2017). Qualitative data used in this study were drawn from policy and program documents, city reports summarizing progress, including emissions inventories and online articles, using content analysis. Data were analyzed using an aggregated evaluation framework; a composite of four common approaches for assessing municipal climate action in Canada (frameworks created by CDP-ICLEI, FCM-PCP, C40 and MC<sup>3</sup>) (Tables 1 and 2).

The results of this assessment were further subjected to critical reflection and interpretation on the part of city staff in the Environment and Climate Division (ECD) and the Planning Department, who co-produced this paper with researchers at the University of Toronto. Co-production in community settings occurs when academics work with community practitioners, collectively possessing diverse backgrounds, knowledge, and skills, to frame problems and goals, as well as share ownership of knowledge-production processes and related products (Polk 2015).

### 4.1 STUDY LIMITATIONS

Several factors hamper the ability to fully evaluate implementation progress. Incomplete datasets, data-sharing complexities, and reliance on unreliable self-reporting limit data accessibility and accuracy, impeding the city's ability to effectively monitor climate action programs and initiatives (S. Dufield, personal communication, 9 June 2022). Attributing emissions reductions directly to individual climate-mitigation efforts is also challenging due to misalignment of temporal and spatial scales. This speaks to a need for greater data transparency to better monitor progress (or lack thereof), which has implications for our findings and will be addressed in the discussion section.

## 5. TORONTO CLIMATE ACTION PLANNING TO DATE

Toronto's climate action efforts began in 1988 when it hosted world leaders at the world conference on The Changing Atmosphere: Implications for Global Security, convening nations to discuss climate change (WMO & Government of Canada 1988). Following the conference, Toronto's City Council approved the establishment of the Toronto Atmospheric Fund (TAF) in 1991, an agency dedicated to financing and supporting initiatives that reduce carbon emissions and improve air quality in the Greater Toronto and Hamilton Area (City of Toronto 2020a).

In 2007, the city adopted the Climate Change, Clean Air and Sustainable Energy Action Plan (City of Toronto 2007a), which established GHG emissions reduction targets of a 30% reduction by 2020 and 80% by 2050 compared with 1990 levels (City of Toronto 2007b). Eight years later, the city launched TransformTO: Climate Action for a Healthy, Equitable and Prosperous Toronto; a new pathway to achieve the previously established GHG emissions reduction targets (City of Toronto 2019d). Short-term strategies were developed to help put Toronto on course to achieving long-term reduction targets. The strategies were grouped under five broader areas of action: (1) improving energy efficiency in existing buildings; (2) raising the sustainability performance of new buildings; (3) advancing sustainable transportation planning; (4) improving the efficient use of resources by implementing the Long-term Waste Management Strategy (City of Toronto 2016); and (5) conserving and improving energy efficiency related to the use of city-owned facilities and vehicles. Additionally, the city sought to collaborate with private sector and civil society stakeholders to support cross-organizational and cross-sector action. Finally, the city encouraged residents to contribute their ideas for a low carbon Toronto in 2050, with more than 2000 residents identifying ideas and actions that informed TransformTO (City of Toronto & TAF 2016).

Along with the short-term strategies adopted by the council in 2017, the city published technical modelling results identifying a viable pathway to achieve the 80% emissions reduction target by 2050 using readily available technology. Modelling indicated that compared with 2011 baseline conditions, to achieve the targets, the city would need to reduce carbon emissions from 19,672,500 to 3,911,000 tCO<sub>2</sub>e (City of Toronto 2017).

Following the declaration of a climate emergency in 2019, the city accelerated its TransformTO targets with a new aim to reach net zero by 2040 or sooner. To get there, the city also set an interim 2030 emissions reduction target, underpinned by a new Net Zero Strategy (2021) detailing a set of sector-specific goals and actions to get there (Table 3). The Net Zero Strategy builds on the city's TransformTO climate action plan, and features updated technical modelling, international best practices, and feedback captured at public consultations held between 2018 and 2021.

	<b>TRANSFORMTO: CLIMATE ACTION FOR A HEALTHY, EQUITABLE AND PROSPEROUS TORONTO, 2016</b>	<b>TRANSFORMTO NET ZERO STRATEGY, 2021</b>
Short-term GHG reduction target	30% by 2020 (reduced from 1990 levels)	45% by 2025 (reduced from 1990 levels)
Medium-term GHG reduction target	65% by 2030 (reduced from 1990 levels)	65% by 2030 (reduced from 1990 levels)
Long-term GHG reduction target	80% by 2050 (reduced from 1990 levels)	≈ 100% by 2040 (reduced from 1990 levels)
New buildings goal	100% of new buildings are near zero GHG emissions by 2030	100% of new buildings are near zero GHG emissions by 2030
Existing buildings goal	100% of existing buildings are retrofitted by 2050	GHG emissions from existing buildings are reduced by 50% from 2008 levels by 2030
Renewable energy goal	75% of energy comes from renewable or low carbon sources by 2050	50% of energy comes from renewable or low carbon sources by 2030
Thermal energy goal	30% of total floor space uses low carbon thermal energy by 2050	25% of commercial and industrial floor area is connected to low carbon thermal energy sources by 2030
Local transportation goal	75% of trips under 5 km are walked or cycled by 2050	75% of school and work trips under 5 km are walked, cycled or by transit by 2030
Low carbon transportation goal	100% of transportation uses low or zero carbon energy by 2050	30% of registered vehicles in Toronto are electric by 2030
Waste diversion goal	95% of waste is diverted in all sectors by 2050	70% residential waste diversion from the City of Toronto's Integrated Waste Management System by 2030

**Table 3:** Primary goals and targets for the original TransformTO strategy and the Net Zero Strategy

Note: GHG = greenhouse gas.

Sources: City of Toronto (2019d, 2021g).

Complementary plans and strategies have been developed to enable the implementation of TransformTO by identifying steps for reducing GHG sector-based emissions. To reduce emissions from existing buildings, the Net Zero Existing Buildings Strategy (2021) was created, which identifies actions such as allocating funding to building owners for emissions retrofits, helping owners navigate the retrofit process and subsequent barriers, and supporting workforce development and training to meet the increased demand for retrofits (City of Toronto 2021d). The Toronto Green Standard (TGS) (updated in 2021) sets mandatory and voluntary sustainable performance measures for new buildings, across five categories: air, energy, water, ecology and waste. The standards have a strong landscape focus including requirements for bird-friendly design of buildings and on site and green infrastructure. Introduced in 2010, TGS is based on ever advancing tiers of sustainable performance and is updated every four years (City of Toronto 2021f). The first tier is mandatory for all building applications while the remaining tiers are voluntary. Every four years, previously voluntary tier 2 measures become mandatory tier 1 measures. The recently updated Version 4 of the TGS has three tiers of sustainable performance, the first of which is mandatory. To address travel-related emissions, the city has created the Electric Vehicle Strategy, which identifies actions to expand charging availability and explores incentives to reduce the cost of EV uptake (City of Toronto 2019a). The Pathway to Sustainable City of Toronto Fleets strategy identifies actions for transitioning to low carbon modes (City of Toronto 2019c). To address energy-sector emissions, the city uses community energy planning (CEP), a process that considers energy early in the land-use and infrastructure planning process and identifies opportunities to integrate local energy solutions at a building or neighbourhood scale. Examples include greening of homes, neighborhoods, and development and creation and use of district energy systems (DES) (City of Toronto n.d. a). Other planned actions include adding biodigesters to wastewater plants for renewable natural gas generation, developing 100% renewable DES, and scaling up wind, solar, and onsite battery storage, and hydrogen (City of Toronto 2021g).

The Long-term Waste Management Strategy (City of Toronto 2016) was developed to reduce the total amount of waste going to landfill. Most of Toronto's waste emissions are generated from landfills, while a small remaining portion is generated by the processing of compostable, yard waste, and wastewater (City of Toronto 2021c). The strategy leverages techniques such as textile collection and community composting alongside developing policies for construction waste and holding multi-unit residential buildings more accountable to work towards a higher waste diversion rate (City of Toronto 2016). Though adaptation actions are outside the scope of this paper, it is worth noting since it relates to a criterion in the CDP-ICLEI framework and our aggregated evaluation framework, that the city has also created a Climate Resilience Framework and Recommendations Report (City of Toronto 2019e) as a resource to support and inform the development of the City of Toronto's Resilience Strategy (RS).

Such plans have identified a suite of programs, initiatives, investments, grants, and partnership approaches for realizing their goals. These are discussed in the following section, along with (where known) their corresponding emissions reductions.

## 6. FROM PLANNING TO ACTION

### 6.1 REDUCING BUILDING EMISSIONS

The city's largest source of GHG emissions is the buildings sector as 57% of Toronto's carbon emissions came from buildings in 2019. To meet the emissions reduction target for existing buildings, tens of thousands of buildings built before 2016 will need to be retrofitted over the next two decades and all new buildings constructed after 2028 must meet a net-zero GHG emissions goal (City of Toronto 2021h).

#### 6.1.1 Existing buildings

The city has multiple programs to reduce emissions of existing buildings, the results of which are briefly discussed below. The Better Building Partnership (BBP) provides general expertise and funds to improve building performance. BetterHomesTO is a one-stop comprehensive, interactive website that informs single-family homeowners of retrofit best practices and available rebates (City of Toronto n.d. c). Privacy legislation prohibiting access to single-family home utilities' data makes it difficult to determine the efficacy of BetterHomesTO in directly reducing GHG emissions. The Energy Retrofit Loan Program drives emission reductions and energy efficiency. The High-Rise Retrofit Improvement Support Program provides financing at fixed competitive rates to residential apartments (three or more storeys) for improving energy and water consumption and has supported the retrofitting of 15 buildings (roughly 2200 units), reducing average emissions by 21% (City of Toronto 2019b). The Home Energy Loan Program (HELP) provides homeowners with financing of up to C\$125,000 to help cover the cost of efficiency upgrades, renewable energy installations, and fuel switching (City of Toronto 2021d). From 2014 to 2019, HELP supported the completion of 187 retrofit projects (42 in 2019 alone), reducing average emissions by 28%. Combined, these programs and the implementation of the Net Zero Existing Buildings Strategy are expected to increase local building retrofit economic activity by 87% over the next 30 years, and nearly double annual investment in existing buildings (City of Toronto 2021d).

#### 6.1.2 New buildings

TGS is the primary municipal regulatory tool used to encourage the construction of new low carbon and eventually zero carbon buildings. Its implementation dates for the set GHG emissions limits have been accelerated to 2025 and 2028 so that buildings constructed on or after 2030 are near zero emissions. That means, 100% of new buildings subject to planning approvals will be designed to be net zero ready starting 2028. City-owned buildings are required to be net zero emissions now. Tier 2 and above projects are verified during construction. In theory, this ensures new building performance is progressively increased over time. However, because TGS is applied at a relatively early stage (planning), with little monitoring or follow-up at later stages, there is a question as to whether building performance indeed meets the standard.



So far, TGS has resulted in 169,000 tonnes of avoided carbon dioxide (CO<sub>2</sub>e) emissions annually, equivalent to removing more than 42,000 vehicles from roads each year (City of Toronto 2021b). Yet the portion of new buildings meeting this standard must grow significantly, as must the tracking of emissions at the building occupancy stage. TGS version 1-4 will contribute to offsetting 5.4 MtCO<sub>2</sub>e cumulative avoided emissions by 2050. TGS version 5 and 6 will contribute to over 25 MtCO<sub>2</sub>e cumulative avoided by 2050. Overall, approximately 10% of developments target Tier 2 or higher levels of performance (TAF, 2021).

## 6.2 REDUCING TRANSPORTATION EMISSIONS

The transportation sector is the second largest source of GHG emissions in Toronto, and in 2019 it generated 36% of overall emissions. While electrifying personal vehicles is seen as essential for meeting the emissions reduction targets for this sector, as of 2018, only 0.6% of vehicles registered in the city were EVs (City of Toronto 2019a). To further that share, the city has focused on expanding the availability of charging infrastructure, with 17 on-street EV chargers installed in 2020 in three Toronto neighborhoods and plans for a larger scale roll-out of EV charging infrastructure to follow (City of Toronto 2021e). Additionally, Version 4 of the TGS requires new developments to provide 25% of parking spaces with energized outlets and rough-in conduits to the remaining parking spaces to permit the future installation of charging equipment (City of Toronto 2021f). While it is unclear whether these actions will sufficiently incentivize prospective EV consumers, EV registration is growing. In 2016, there were only 1600 EVs in Toronto; as of 2020, there were 10,643 EVs registered in Toronto: a huge leap (City of Toronto 2022b).

The city has made progress in electrifying transit by investing in low carbon or zero emissions vehicles for its fleet. The city-owned Toronto Transit Commission (TTC) Green Bus Program is a primary example. From 2016 to 2020, the TTC purchased 728 clean diesel buses, 255 hybrid diesel-electric buses, and 60 electric buses and charging infrastructure, which cumulatively will reduce fleet emissions by 41% compared with the TTC's 1990 levels (TTC 2020). Going forward, the TTC will only procure hybrid and zero-emissions vehicles and, in 2025, will only add zero-emissions buses to the fleet (TTC 2020). Outside of transit, the city has attempted to expand the percentage of green city-owned vehicles across its operations. As of 2019, 25% of city-owned vehicles are classified as green vehicles, 10% of which are electric or plug-in hybrid vehicles (City of Toronto 2019c).

The city has also worked to improve low carbon mobility by enhancing active transportation infrastructure. Expanding the cycling network to accommodate and incentivize higher ridership has been a major focus. From 2019 to 2021, 65 km of new bikeways were developed throughout the city and a further 47 km of existing bikeways in the network were upgraded (City of Toronto 2021a). These infrastructure upgrades and extensions seem to have had a positive impact on cycling uptake in Toronto. Despite an initial drop in ridership at the beginning of the COVID-19 pandemic, cycling volumes have since:

remained at 90–105% of pre-COVID volumes during the weekdays and rose to 120–150% of pre-COVID volumes during the weekends.

(City of Toronto 2021a: 6)

## 6.3 REDUCING ENERGY SECTOR EMISSIONS

To meet its 2030 and 2040 emissions reductions targets in the energy sector, the city must increase local renewable energy to contribute to a resilient, carbon-free grid. Ultimately, meeting this and other emissions-reduction targets depend on fully decarbonizing the provincial electricity supply (the source of most of Toronto's energy), which is projected to become more GHG intensive per unit of electricity generated with the coming retirement of nuclear energy generation and planned increases in energy generation from natural gas.

Regarding energy-sector emissions reductions within its control, the city is making slow but steady progress. As of 2019, 25% of community energy is derived from low carbon sources and 17% from renewable sources with the aim of reaching 50% by 2030. For example, the city has installed 100 solar installations on its facilities and achieved 24 MW of solar capacity (City of Toronto n.d. a). As of 2019, the percentage of floor space connected to low carbon thermal energy is 2% with the aim of achieving 25% by 2030 (City of Toronto n.d. a). DES provide cooling to over 80 buildings, and the redeveloped thermal network in the Regent Park neighbourhood eventually serving 50 buildings will help, as will taking further action to limit the use of natural gas (achieved through building-sector actions).

Achieving and evaluating progress in this sector is challenged by jurisdictional limitations, lack of access to utilities data, as well as reliance on voluntary self-reporting by building and energy managers. The accuracy of this information is anticipated to increase, however, as coordination and partnership with system owners and energy developers grows.

## 6.4 REDUCING WASTE EMISSIONS

As of 2019, waste accounts for 7% of the municipality’s total emissions, with most GHG emissions coming from landfills, and a smaller portion from wastewater treatment processes (City of Toronto 2021c). Waste reduction efforts over the last decade have been guided by the city’s Long-term Waste Management Strategy (City of Toronto 2016), which identifies strategies for increasing waste diversion such as education, improving the user-friendliness of waste management, and holding multi-residential buildings more accountable (City of Toronto 2016). To date, these efforts have had limited success, perhaps because of their reliance on individual behavior change (e.g. awareness-raising programs targeting residential recycling), rather than systems-wide approaches for reducing materials (e.g. producer pay and product stewardship programs). Accordingly, this sector shows the least amount of progress with respect to emissions reductions. In 2016, the residential waste diversion rate was 52%, and by 2017 it had increased to 53% (City of Toronto 2020b). In 2019 and 2020, the residential waste diversion rate remained at 53% (City of Toronto n.d. b).

## 7. EVALUATING PROGRESS

### 7.1 EVALUATING PROCESSES AND OUTPUTS

The city has met the process and outputs-oriented criteria of the CDP-ICLEI, FCM-PCP—Milestone 5, and C40 Participation Standards assessment frameworks, which partially inform our aggregate evaluation framework. The results are summarized in Table 4.

✓	Public disclosure of city-wide emissions inventory (i.e. Toronto’s 2019 Greenhouse Gas Emissions Inventory) (City of Toronto 2021c)
✓	An emissions reduction target and a renewable energy target (i.e. net zero by 2040 target and 50% of energy from renewables or low carbon sources by 2030 targets) (City of Toronto 2019d)
✓	Published climate action plan with concrete initiatives to meet the target (i.e. TransformTO and Net Zero Strategy) (City of Toronto 2019d, 2021d)
✓	A climate risk and vulnerability assessment (i.e. Climate Resilience Framework and Recommendations Report) (City of Toronto 2019e)
✓	A climate adaptation plan to demonstrate how it will tackle climate hazards (i.e. Resilience Strategy) (City of Toronto 2019f)
✓	Document results achieved by notable projects and initiatives (i.e. TransformTO 2019 Implementation Update) (City of Toronto 2019d)
✓	Report on stakeholder engagement and public participation (i.e. the staff report Our Plan Toronto Final Environment and Climate Change Official Plan Policy Updates (2022a) details stakeholder engagement, including efforts to engage equity-denied groups, youth, and Indigenous individuals) (City of Toronto 2022)
✓	Actively sharing best practice examples with other cities (i.e. the city’s partnership with C40 and participation in its community of practice) (C40 Cities 2017)

**Table 4:** Evaluation result: Toronto’s climate action processes and outputs.

While these climate action steps are crucial, they say little about outcomes: actual GHG emissions reductions and progress toward emission reductions targets. This low bar for municipal climate action evaluation is worth noting; a deficit the authors aim to partially remedy here by adding the MC<sup>3</sup> assessment framework criteria for implementation to the aggregate evaluation framework as discussed below.

## 7.2 EVALUATING OUTCOMES

Despite the success of some policies and programs, carbon emissions have remained relatively flat for seven years. While the city successfully reduced GHG emissions by 38% between 1990 and 2019 (City of Toronto 2021c), surpassing the TransformTO 2020 goal of a 30% reduction in GHG emissions compared with 1990 levels, the largest contributor to this reduction was not a city-led action but rather the elimination of coal power generation from the Ontario electricity generation mix (TAF 2021). The economic slowdown prompted by the pandemic also contributed to Toronto achieving the 2020 goal. Yet, the reality is that ‘emissions have not decreased appreciably in recent years’ (City of Toronto 2021c: 3) and Toronto is not currently on track to meet its 2030 target of a 65% emissions reduction from 1990 levels, nor are current efforts likely to meet the 2030 and 2040 targets.

A high degree of uncertainty, however, appends such predictions. Indeed, directly attributing GHG emissions reductions to specific city policy directives and programs faces challenges such as a lack of data, in many instances conditioned by privacy legislation and limited jurisdictional scope (e.g. access to single-family home utilities usage data are highly constrained); capacity limitations for monitoring and evaluating (e.g. actual performance of buildings meeting the TGS standard is largely unknown); and complexity, with many of the factors influencing effectiveness of city-led climate action (e.g. political, cultural, economic factors all shape uptake of rebates and other incentives for instance) outside the city’s purview.

In the absence of mechanisms for directly attributing GHG emissions reductions to specific city-led interventions, we used the criteria of the MC<sup>3</sup> Assessment Framework (Table 2). As evidenced in the preceding section, most of the city’s actions are demonstrative of MC<sup>3</sup>’s ‘reformative/transitional’ category, having progressed past ‘incremental’ actions such as public awareness campaigns, basic ‘green’ services (e.g. recycling) or nominal efforts to partner or innovate. Notable examples of ‘reformative/transitional’ actions include greening the corporate fleet, undertaking building retrofits and renewable energy projects, adoption of a stretch code (i.e. TGS) and expanding and deepening cross-sector partnerships. The city is also to some extent undertaking actions deemed ‘transformational,’ such as advancing compact and transit-oriented development, supporting community engagement initiatives that amplify and scale the climate action efforts of community groups (e.g. the Neighbourhood Climate Action Champion—SNAP); and deepening partnerships to support climate-friendly service delivery (e.g. with Toronto Hydro, TTC, Enwave, Toronto Region Conservation Authority, and universities). As of late, the city has been exploring how it might leverage its power to shift markets, communicating policy directionality to private sector actors (e.g. developers and building industry actors) so industry can start preparing immediately by allocating more budget to achieve actions, hiring more staff, and implementing carbon budgeting to accelerate climate action within the organization and city at large (C. Fernandez, personal conversation, 19 October 2022).

## 8. DISCUSSION

The results of our evaluation indicate that the City of Toronto is performing well according to commonly used metrics for tracking municipal climate action progress in Canada—despite the lack of progress in reducing emissions in the waste sector. In particular, Toronto’s ambitious approach to target-setting (Stevens & Senbel 2020) is noteworthy because it included roles by council, which set targets in a top-down way informed by what up-to-date climate science demands rather than what is politically feasible; by staff members (e.g. in ECD) who spent years advocating for strong targets and corresponding actions to drive down emissions and increase resilience to climate impacts; and by the public whose involvement in the student strikes and citizen deputations

contributed to the declaration of a climate emergency in 2019 and accelerated targets and goals (C. Fernandez, personal conversation, 19 October 2022).

Following the target-setting, staff were charged with identifying pathways and actions for meeting those targets (another criterion of many assessment frameworks), for which they enlisted the help of consultants and the Modeling Advisory Group (MAG), comprised of 35 volunteer members representing multiple sectors within the community and multiple City of Toronto divisions and agencies. Together, they identified a suite of low carbon actions to meet the TransformTO targets that were each modelled for GHG emissions reduction potential and analysed for potential co-benefits (e.g. population health, equity, accessibility, etc.) and co-harms (e.g. potential energy poverty) (City of Toronto 2017: 1).

An unintended, yet highly beneficial, outcome of involving multiple departments in the modeling exercise was the cross-divisional/inter-department relationship-building that occurred. The early involvement of departments such as transportation services and planning with bigger budgets and arguably more power than the ECD not only supported the model's proof of concept but also fostered buy-in for and implementation of the climate actions that emerged. With hindsight, it appears that this relationship-building within the city was a crucial mechanism for embedded climate action in multiple departments' plans, budgets, and operations (C. Fernandez, personal conversation, 19 October 2022).

Despite the evidence and attestation by ECD staff that such processes (e.g. goal-setting, engagement, modelling, reporting) and outputs (e.g. the creation of climate plans and emissions inventories) have catalyzed and continue to drive climate action in Toronto, there remains a need to assess the outcomes of such efforts with respect to mitigating GHG emissions, indicators for which are missing from most assessment frameworks. Our analysis of outcomes, using MC<sup>3</sup>'s implementation criteria, revealed that most of the city's actions are reformative/transitional. This means they are tracking toward a low carbon future; however, the pace and scale of action must be increased/deepened (i.e. be transformational) to meet the targets.

Despite decent implementation progress, the likelihood of not meeting the net zero by 2040 target nor the interim 2030 goals loom large. When asked what the implications are of not meeting the target, city staff and co-authors responded that regardless of whether or not the target is reached, there is an escalating cost (i.e. the price of 1 tonne of carbon will increase from C\$50 to C\$170 by 2030) and reputational risk to inaction that cannot be ignored (C. Fernandez, personal conversation, 19 October 2022). With the eyes of the financial community on Canada's 'economic engine' and most populous city, Toronto needs to continue to advance climate actions. The good-faith measures the city has taken (e.g. ensuring climate actions are adequately supported through annual budgets, hiring staff with climate expertise, creating advisory groups to oversee modelling and other aspects of climate planning, etc.) all shore up credibility and political capital, helping to mitigate the potential setbacks to future climate/environmental programs in the event of a missed target. Finally, the evaluation results point to 'transformational' actions that Toronto could adopt to accelerate emissions reductions, such as adopting net positive approaches (e.g. building or retrofitting to restorative/passive housing standards). Addressing the embodied carbon of building materials is another emerging area that the city must address to curb emissions.

Such actions would have to overcome budgetary constraints, capacity limitations, jurisdictional scope issues, and other factors outside its control. A lack of provincial regulations mandating low carbon buildings (e.g. through the building code) is an oft-cited example of how efforts to improve building performance are frustrated by jurisdictional limitations. Plans to retire the Pickering Nuclear Generating Station in 2025 and anticipated use of natural gas to fill the void created (a potential increase of 5 MtCO<sub>2</sub>e per year from 2025 onwards) (OPG 2020) is another factor that could seriously offset the city's progress in reducing emissions. A lack of skilled workforce (e.g. for low carbon building and retrofitting) and geopolitical factors that affect the price of energy and commodities and disrupt supply chains are other influencing factors.

Yet not all the factors outside the city's purview are negative. The recent mandate of the federal government to ensure that new light-duty vehicle sales will be 100% electric by 2035 (Transport Canada 2021), along with significant allocations to purchasing incentives (C\$1.7 billion), charging

stations (C\$400 million) (Transport Canada 2021) are examples of beneficial factors that will support the city's climate action efforts. The price of carbon, recently raised to C\$50/t and set to increase to C\$95/t in 2025 and C\$170/t in 2030, is another external driver of climate action in Toronto. Likewise, the plans of Toronto Hydro—a holding company that distributes electricity and engages in demand management in the city—to invest up to C\$10 billion through to 2050 for increased energy efficiency is a boon projected to support 75% of Toronto's Net Zero Strategy (Toronto Hydro 2021).

Some internal limitations constraining progress include limited staff capacity, further strained under the pandemic, and budgetary limitations (e.g. for incentivizing TGS to a greater degree). Interestingly, technology, or lack thereof, is one factor that is not deemed to constrain climate action to a great degree, with the city's modelling suggesting that current technology is sufficient to meet its climate targets and achieve its net zero goals (J. Robinson, personal conversation, 4 June 2022; C. Fernandez, personal conversation, 19 October 2022).

These external and internal factors lend context to the city's implementation progress to date, and shape its sense of agency, capacity, and opportunities for achieving bold climate action moving forward. To further advance mitigation efforts, the city should advocate for greater authority to set building energy efficiency above the (weak) Ontario Building Code, along the lines of British Columbia's Step Code. Similarly, the city should strengthen partnerships with electricity and natural gas utilities to access energy use data for monitoring implementation progress and to strengthen climate action commitments.

Finally, it is important to note that the city cannot advance effective climate action alone. Deepening implementation and adopting transformational actions will require the leadership and support of all sectors, with the private sector playing a prominent role in defining the opportunity space, training workers, and investing in and scaling solutions (C. Fernandez, personal conversation, 19 October 2022).

## 9. CONCLUSIONS

Toronto has made steady progress in implementing its climate plan TransformTO, with reductions in transportation sector emissions showing the greatest progress, and waste-related emissions, the least. Although Toronto's most recent greenhouse gas inventory (2019) shows that emissions are tracking on the trajectory of an 80% reduction by 2050, from 1990 levels, much of the decrease, the pandemic notwithstanding, is attributable to a less carbon-intensive electricity grid and lower transportation emissions from gasoline and diesel fuels (City of Toronto 2021c), rather than direct action by the city per se. Moreover, the climate actions planned by the city, though necessary, are likely not sufficient to meet the 2030 and 2040 targets, without the decarbonization of the provincial grid and total phase out of natural gas as well as significant support by other sectors. These are external factors over which the city has little control. Nonetheless, the city is striving to effect change by rapidly scaling up existing programs through targeted investments and partnerships with private sector actors and community groups, investing in low carbon district energy and infrastructure projects, adopting carbon budgeting, and continuing to reduce emissions from its operations and the city at large. Petitioning the province for greater authority to regulate energy efficiency in buildings, fostering partnerships with utilities for accessing energy use data, and increasing progress monitoring and reporting protocols would help to accelerate implementation progress and emissions reductions.

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JV: literature review, document scans, early draft; KS and JR: evaluation, discussion and revisions; CF: validating evaluation, revisions; and SD and LK: identification of data sources, research design, review

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