From Landfills to Back into the Economy: Enhancing Waste Management Policy Design and Implementation to Achieve the City of Toronto's TransformTO Net Zero Goals

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Abstract

This study explores opportunities to enhance the waste management services administered and coordinated by the City of Toronto (hereafter "the City") for multi-unit residential buildings (MURBs) to achieve the TransformTO net zero objectives in time. Through a series of literature reviews and a jurisdictional scan focusing primarily on Vancouver's waste management system, it identifies five major challenges hindering progress: 1) insufficient interim checkpoints, 2) inconsistency across different pillars and stakeholders of the City's strategies, 3) gaps in the accessibility and availability of data for monitoring progress, 4) limitations to municipal legislative power resulting in the opting out of MURBs, and 5) lack of participation in effective waste diversion by residents.

The paper proposes four recommendations for the City of Toronto's Waste Management: 1) set attainable interim checkpoints to realize 2040 TransformTO goals; 2) enhance coordination within municipal waste management and with other jurisdictions; 3) monitor progress based on increased access to data on municipal waste; 4) diversify and expand engagements with residents for waste diversion.

Overview and Methodology

Waste, largely from landfills, accounts for roughly 7% of greenhouse gas (GHG) emissions in the City of Toronto (Deputy City Manager, Corporate Services, 2021). This research project employs literature review and jurisdictional scan as primary research methods. Through academic and grey literature, it identifies opportunities in the City of Toronto's waste management services to overcome challenges to the timely realization of TransformTO net zero goals measured by diverting 70% of waste from landfills by 2026 and encouraging sustainable consumption to build a circular economy with a zero waste future (2017a; 2017b).

The City processes approximately 900,000 tonnes of waste every year (2023a). With a growing population combined with the evolving nature of waste and limits to landfill operations, the City recognized the need to deliver effective policy programmes for waste management. As the City's 2022 combined diversion rate of residential waste was 52.5% (2023b), which was a 0.5% increase from 2021, Toronto is nearly 20% away from its 2026 TransformTO target (2017b).

The City's diversion rate in 2022 for multi-unit residential waste was 25.1%, which was strikingly lower than the 63.7% in single-family homes (2023b). This study thus focuses on improving waste management in MURBs with at least nine units.

Through a jurisdictional scan of how other municipal governments in Canada manage waste, this research draws lessons to provide policy recommendations adapted to the local context of the City of Toronto.

This research mainly focuses on Vancouver as a case study as it offers insights into increasing residential waste diversion in MURBs. This municipality has a large, dense population and waste management system comparable to Toronto. Both cities are dedicated to building a circular economy as they spearhead pan-Canadian municipal collaboration and discuss circularity (General Manager, Solid Waste Management Services, 2021). Hence, examining Vancouver's residential waste management in MURBs helps generate transferable best practices to enhance the City of Toronto's design and implementation of waste management policies.

This study seeks to answer the following research questions:

1. How can the City improve direct management of residential waste diversion in MURBs?
2. How can the City enhance indirect coordination of residential waste diversion in MURBs?

3. How can the City promote sustainable consumption and realize a zero waste future through engagements with the residents and property management teams of MURBs?

Background of the Waste Sector's TransformTO Goals

Waste diversion features the redirection of materials from landfills or other disposal facilities, as well as recycling and reuse (Pickering et al., 2020). The diversion rate of waste, namely the amount of waste diverted divided by the total number of garbage collected (City of Toronto, 2023b), serves as the main indicator of the effectiveness of decarbonizing solid waste management services. Composting and recycling are two main waste diversion methods used to treat the corresponding types of materials. Composting means decomposing organic waste into humus, which could nurture soil. Recycling refers to the reuse of eligible materials such as glass, paper, and plastics to direct them away from landfills (DiGiacomo et al., 2018).

In policy recommendations aimed at bettering municipal waste management, scholars have identified that the City of Toronto would benefit from increasing waste composted and recycled in MURBs through activities such as designing and maintaining garbage rooms, adjusting price models, updating collection schedules, and shaping residents' behaviours (Dello, 2019; Ma, 2023).

With a shorter history than the measurement of residential waste diversion rate, the concepts of "circular economy" and "zero waste" gained popularity in the 2010s (Kopnina, 2018) after the publication of McDonough & Braungart's book *Cradle to Cradle* (2002). Municipal governments around the world are incorporating the vision for a future with zero waste and a circular economy into cities' policy frameworks as they become more aware of this ideal (Climate-KIC, 2019) focused on reimagining sustainable ways of producing and reusing products throughout their lifecycles.

Kalundborg, an industrial district in Denmark demonstrates a circular economy in practice where resources such as power, in the form of electricity, and wastes, are generated and reused. Since its establishment in 1972, companies in this area have changed, while the circular economy practices lived on and iterated to adapt and form new models (Kalundborg Symbiosis, 2024).

Overview of the City of Toronto's Solid Waste Management

There are two categories of strategies corresponding to the two major TransformTO goals in the waste sector. On the one hand, to enhance waste management, the City Council adopted the Long Term Waste Management Strategy in July 2016 (hereafter "the Waste Strategy") (2017a). The City indicated its plan to review this strategy as a key priority in 2023 (2023c). On the other hand, to facilitate a shift toward a circular economy, in 2021, the Toronto City Council approved a voluntary program aimed at reducing single-use products and adopted a bylaw of single-use and takeaway items applicable to retail businesses (City of Toronto, 2024).

The Solid Waste Management Services team at the City of Toronto collects, transports, processes, composts, and disposes of municipal waste, including some produced by the private sector (City of Toronto, 2018). The City diverted 377,825 tonnes of waste from landfills in total through a series of programs: Green Bin organics, Blue Bin recycling, Yard waste and Christmas trees, large appliance or scrap metal, Community Environment Day events, household hazardous waste, electronic waste, and activities completed by households such as backyard composting and grasscycling (2023b).

In terms of metrics, the City adopts the methodology for waste diversion reporting outlined in the Resource Productivity and Recovery Authority (RPRA) Datacall (2023b). This Datacall gathers data to determine the net cost and allocate funding associated with the provincial Blue Box program, which is dedicated to recycling materials such as paper, plastic, glass, and aluminum

across more than 240 municipalities and First Nation communities in Ontario (RPRA, 2024a, 2024b). The City calculates residential diversion rates of two types of residences, single-family and multi-unit, and breaks down the data by the material diverted (2023b).

Challenges in the City's Integrated Waste Management System

Challenges to improving outcomes of the City's waste management services across MURBs stem from five major gaps, namely 1) insufficient interim checkpoints, 2) inconsistency across different pillars and stakeholders of the City's strategies, 3) gaps in the accessibility and availability of data for monitoring progress, 4) limitations to municipal legislative power resulting in the opting out of MURBs, and 5) lack of participation in effective waste diversion by residents.

To start with, there is not yet a clear pathway for the City to gradually work towards milestones to achieve its TransformTO goals for residential waste diversion and circular economy other than it is working towards these ultimate net zero goals. In the Waste Strategy's Implementation Roadmap, the period between 2026 and 2040 was abbreviated, while initiatives before 2026 were largely independent projects interlinked steps (City of Toronto, 2017c). This gap urges the City to set interim goals because such vagueness severely undermines the City's ability to realize the vision of zero waste in City-owned facilities by 2030 (2017a).

Similarly, in the long term, the City still lacks concrete action plans detailing how it will work step-by-step towards a circular economy with minimized waste production. The Waste Strategy mentioned a "potential diversion of up to 8,000 tonnes/year [of waste] by Year 10 through testing of at least 16,000 tonnes/year of residual waste through mixed waste processing technologies" without listing any checkpoints before Year 10, which would be around 2027 and close to the 2030 timeline (2017d).

Secondly, due to inconsistent messaging, the TransformTO net zero objective attached to a diversion rate was called into question, which cast a shadow on the prospect of its timely realization. In January 2023, the City used language that contradicted its TransformTO goal of reaching a 70% residential waste diversion rate from its waste management system by 2030 (2023a). It preferred "performance-based metrics" to show the amount of waste produced, reused, and reduced, over "weight-based metrics such as diversion rates" because the latter do not allow a holistic assessment of performance or account for the iteration of packaging (2023a). This alerts the City to ensure consistent messaging and ongoing coordination across the Solid Waste Management Services Division overseeing the municipal waste management system, the Environment and Climate Division, and the Infrastructure and Environment Committee (2022-2026) leading on various fronts of the TransformTO Net Zero Strategy, as well as across relevant teams in the same division (City of Toronto, 2017d, 2024b).

The City's work to review and craft strategies to build long-term municipal capacity in waste management and circular economy appears disconnected. For instance, the City listed these initiatives as three separate items without indicating any relationships among key priorities for 2023 (2023a).

Corresponding actions thus turn out unclear and fragmented. As the City hopes to transform into a circular economy, the 2022-2025 short-term implementation plan of the TransformTO net zero goals listed the large numbers of plastic bags and single-use consumer products (City of Toronto, 2021a). In June 2022, the City launched a program to reduce single-use waste (2022). However, completely shifting the local economy towards zero waste requires more transformative changes to reimagine the production and consumption of products.

Thirdly, despite the desire to paint a comprehensive picture of material flowing across the waste system, detailed data needed to examine the effectiveness of the City's waste diversion are

inaccessible. The City focuses on the amount of waste collected and provides data on waste diversion rates, while it is difficult to access an up-to-date breakdown of data on waste sorting and collection. The official publication of Solid Waste Reports and Diversion Rates on the City's website only shows the numbers from 2022 and in aggregate calculations without breaking down into different stages throughout the waste diversion processes (2023a). The City also does not have data on private contracts handling waste collection and diversion in MURBs, nor can the Solid Waste Management Services Division "control – or even know – how [this portion of waste] is treated or where it ends up" (City of Toronto et al., 2021). These gaps in data availability prevent accurate evaluation of the waste management services.

The City's Waste Strategy mentions in section 14.2 that annual reporting for internal and external purposes is important for assessing performance. It stated that such reports could utilize data gathered and presented through provincial-level initiatives such as the Ontario Municipal Benchmarking Initiative (OMBI) and Waste Diversion Ontario (WDO) (City of Toronto, 2017d). It shows the potential of the City to collaborate with non-municipal partners to gather and exchange data and monitor progress regularly to enhance waste management services. There is room for harnessing more synergy from municipal-provincial partnerships since the province also aims to increase waste diversion and reduce waste to shift towards a circular economy (Government of Ontario, 2017).

Fourthly, because of provincial regulations, the City of Toronto does not have complete control over MURBs' opting out of programs in its municipal integrated waste management system. Within current legislative frameworks, the City can only leverage the existing bylaws and collaborate with the property management teams in MURBs regarding waste management services. Specifically, Ontario Regulation 103/94 (Source Separation Programs) requires that all MURBs offer residents "a source separation program for recyclables," which includes the City's Blue Box recycling program, while not necessarily for organics (City of Toronto et al., 2021).

Even though Municipal Code Chapter 844 (Residential Collection) requires participation in the Green Bin Organics Program, it only applies to "city-serviced" MURBs (City of Toronto et al., 2021). The City describes this as an "all or nothing" policy approach to its delivery of solid waste collection services (2021b). This leaves room for MURB's developers and property management teams to opt out of the municipal Green Bin Organics Program to lower costs. Consequently, some MURBs in Toronto do not participate in the City's diversion programs, especially for organics. Their waste systems only include garbage and recycling with data and administration of such waste collection and diversion unattainable by the City.

Last but not least, the City is struggling to engage with residents to encourage compliance with waste sorting guidelines. The City's Waste Strategy stated as a major risk that residents might not fully engage in efforts to achieve the TransformTO goal of 70% residential diversion rate without providing actionable mitigation measures (2017d). Contamination in waste collection processes, which proper sorting could help overcome, drastically increases the cost of processing waste for adequate diversion away from landfills (City of Toronto et al., 2021). The City's Blue Bin Recycling program is "often heavily contaminated with non-recyclable items" which include containers with food and liquid, black plastics, coffee cups, and pet waste (2017i). In Leung's (2022) study in Toronto, "almost all property managers" in multi-residential buildings reported contamination in their buildings' waste streams. They also recognize the cost it incurs for the City.

Findings from Jurisdictional Scan

The City of Vancouver is facing similar issues as Toronto and is experimenting with possible solutions. Metro Vancouver, a federation of local municipalities, runs solid waste

management (Metro Vancouver, n.d.-a). Vancouver echoes that waste management services need to set clear interim checkpoints, coordinate across relevant strategies and stakeholders of the waste management system, analyze data regularly to review progress and address gaps, leverage municipal legislative tools to increase compliance, and engage with residents to increase participation in adequate waste diversion.

Around the year of 2015, Metro Vancouver aimed at diverting 70% of its municipal waste from landfills (CBC News, 2023). Approved by the Council in 2011, as part of the Greenest City 2020 Action Plan (GCAP), Metro Vancouver previously set goals to achieve an 80% waste diversion rate by 2020 and zero waste by 2040 (City of Vancouver, n.d.-c; Shamess & Underwood, 2018). These initial goals were explicit with a definitive timeline and thus more ambitious than those under TransformTO. In 2017, Vancouver achieved 80% waste diversion rate in City-owned facilities (Shamess & Underwood, 2018).

However, stalling at around 64% waste diversion rate since 2015, Metro Vancouver cut back on the goal to a "more realistic" 65% (CBC News, 2023). Even though such a strategic move limits meaningful accomplishments, it demonstrates the effect of ongoing reviews of progress and a series of attempts to fulfill its commitment to decarbonization.

Paying attention to coordination, Vancouver allocated personnel to work on enhancing coherence and consistency in the municipal waste diversion programs. To implement a more comprehensive waste diversion program, the City of Vancouver hired a Corporate Zero Waste Officer to track the data and activities across recycling and composting waste streams for better understanding and improvements of these programs (n.d.). This shows an awareness in the municipal leadership of waste management regarding the role of waste diversion as an incremental step to bring transformative change toward a zero-waste future.

Metro Vancouver also crafted a strategic plan, with projections based on historic data at the municipal level and interim goals, detailing how it would achieve zero waste by 2040 (Shamess & Underwood, 2018). At the level of policy design, Metro Vancouver is coordinating across sectors, such as buildings, and partnering with stakeholders to harness synergy across society. It outlines city actions in three aspects: priority actions ensuring short-term implementation, transformative actions supporting long-term innovation, and the enhancement and expansion of municipal strategic interventions as appropriate (Shamess & Underwood, 2018).

Collecting up-to-date data and monitoring progress, Metro Vancouver is explicit about its accomplishments and challenges in the waste management system. Metro Vancouver displays annual waste diversion rates, starting from 2010, on its website (Metro Vancouver, n.d.-b). It works with private waste collection companies and industry associations handling waste management to inform effective policy design and implementation. For example, it convened an advisory committee, named "Solid Waste and Recycling Industry Advisory Committee," with representation from privately licensed collection companies and processing facilities in 2022 (Metro Vancouver, 2023). Municipal staff do not have direct access to data from privately contracted waste management services, however, Metro Vancouver obtains data from these private contractors and facilities to include in its annual reports (2021, 2023).

Compliance with correct waste sorting by residents is essential for increasing the rate of waste diversion in MURBs while keeping the rate of contamination down. This is a two-stage process in which cities need residents to first participate in waste sorting and then separate waste into different bins and chutes to funnel them toward their corresponding diversion programs.

Effective separation of organic and recycling waste at this early stage of waste collection reduces the burden of sorting in later stages closer to waste diversion. It establishes a strong base

for increasing the numerator of waste diverted measured in residential waste diversion. Thus, shaping the individual behaviour of residents is key. Stakeholders working on waste management need to understand and address factors influencing individual decisions to participate in waste sorting. Through a study with 2621 residents in Niagara, Canada, Pickering et al. (2020) found that environmental benefits motivate residents to participate in organic-waste-diversion-programs (OWDP), while "smell, inconvenience, and cost" hinder their participation. Another study conducted at UBC (Labahn, 2019) further emphasized the importance of sanitary conditions to prevent the overflowing of liquid and solid waste in garbage rooms.

Convenience is thus instrumental to improving residential waste diversion rates for organics and recyclables in MURBs, as researchers found in Vancouver (DiGiacomo et al., 2018; Richter et al., 2017). Through several experiments manipulating conditions determining convenience on the campus of the University of British Columbia (UBC), DiGiacomo et al. (2018) concluded that better availability of garbage bins on each floor and shorter distances between individuals' residences and waste collection locations led to significant improvements in residents' participation in waste diversion programs for both composting and recycling.

Education for residents is crucial for increasing participation and accuracy of residents' sorting of waste (Ma, 2023). Regarding the channels for disseminating educational messages, Soma et al. (2020) found that engaging in game-style educational activities led to better educational and behavioural outcomes measured by waste diversion completed by members of the local communities. They concluded that the gamification of educational materials is more effective than either handing out pamphlets or community engagement workshops on waste diversion (Soma et al., 2020). Additionally, studies from Vancouver and Toronto (Dello, 2019; Labahn, 2019) recommended the use of clear and legible signage in the garbage rooms based on its effectiveness in shaping residents' behaviours for proper waste diversion, low cost, and easy implementation.

The City of Vancouver operates a mobile application named "VanCollect" to help residents navigate through waste collection and diversion. Embedded in VanCollect, Waste Wizard allows searches for how to dispose of a particular item, including the location of waste collection near the resident and the corresponding waste diversion program. The app received a high rating of 4.8 based on 56 reviews on iOS (City of Vancouver, n.d.-a). These educational engagements with city residents help increase the waste diversion rate, advance recycling and reuse, and lower the number and frequency of disruptions causing malfunctions of the garbage chute system in MURBs.

Policy Recommendations for the City of Toronto's Waste Management

Setting attainable interim goals, enhancing coordination within municipal waste management and with provincial and federal stakeholders, monitoring progress via data from waste collection to diversion, as well as increasing city residents' participation in sorting and ensuring accurate sorting at the waste collection stage are key to increasing waste diversion rates and improving the quality of waste diversion programs operated and coordinated by the City. In the long term, developing pro-environmental habits helps residents shift towards mindsets and practices of a circular economy. This research proposes four policy recommendations for the City to better its waste management services for the timely realization of its TransformTO goals.

Recommendation #1: Set attainable interim checkpoints to realize 2040 TransformTO Goals

Without a clear pathway featuring sequential steps followed by actions, the City would not improve its waste management to meet its net zero goals in time. The City would benefit from setting more interim checkpoints to build a clear pathway toward its TransformTO net zero goals.

At the very least, the City needs to conduct and publish the results from reviews every five years, which was outlined in the current Implementation Roadmap of its Waste Strategy (2017c).

As the City's team studies long-term waste management options and estimates the future of waste generation, collection, and diversion to ensure adequate capacity, it would benefit from communicating with the teams gathering and analyzing data, those engaging with stakeholders at the federal and provincial levels and running educational workshops to engage residents and property management teams of MURBs.

Recommendation #2: Enhance Coordination in Municipal Waste Management and Beyond

It is important to ensure that the messaging around TransformTO net zero goals for the municipal waste sector and the City's Waste Strategy are consistent. Specifically, streamlining the measurements and metrics used to assess program effectiveness. Supposed that the City continues to shift towards adopting performance-based metrics, it is crucial to define what they mean, what criteria they include, and how measurements are operationalized.

As the City explores performance-based metrics, differentiating waste collection across building types helps it map out a more holistic flow of waste. Appropriate benchmarking for solid waste in MURBs is missing from the City's current Waste Strategy (2017a). Ghajarkhosravi et al. (2021) suggested that the proper benchmark for solid waste normalized by the number of units across MURBs in Toronto is between 1.58 and 17.4 cubic yards per unit (yd^3/unit).

There needs to be more comprehensive coordination, which would improve the consistency and quality of service, between different pillars of the City's initiatives, from reducing "single-use and takeaway items" to developing "a Circular Economy Road Map for Toronto" (2023a). Instead of having to create new units for coordination purposes, this would translate into more frequent communication and alignment between existing teams within and across divisions at the municipal government. For example, the City can leverage existing collaboration channels via the Cross-Divisional Circular Economy Working Group which consists of eleven City Divisions and is chaired by staff of the Solid Waste Management Services Division (General Manager, Solid Waste Management Services, 2021).

Recommendation #3: Monitor Progress based on Increased Access to Data on Municipal Waste

While the City can choose to prioritize improving waste management in City-owned facilities and City-serviced MURBs, it needs to work to address the lack of access to data from privately contracted waste collection and diversion services to create a circular economy in Toronto. There will never be a complete circularity in Toronto if parts of the local waste handling continue to stay out of the circle and the equation.

The City needs to accelerate its conduct and release of results from the first five-year review of the Waste Strategy. Assessments regarding accomplishments and gaps in the City's integrated waste management system concerning the TransformTO goals would inform interim checkpoints and subsequent steps to fully realize these net zero goals by the proposed timeline. Once there is official recognition and agreement from stakeholders on a set of performance-based metrics for waste diversion, it would be helpful to have these data regularly collected, analyzed, and assessed. To allow monitoring from the public, the City can consider publishing these data, at least annually, on its website.

Recognizing that the City has limited capacity to coordinate with other municipalities in the Greater Toronto Area (GTA) and the provincial and federal levels of government, the municipal waste management system would benefit from continuing with such efforts because of the potential to address legislative changes in favour of City's provisions regarding MURBs,

exchanges of detailed and up-to-date data on waste collection and diversion, and resources allocated for building a circular economy and zero waste future in Canadian cities.

Recommendation #4: Diversify and Expand Engagements with Residents for Waste Diversion

As the City's Waste Strategy highlights, its success hinges on widespread and effective participation from customers, which refers to city residents in MURBs in this case (2017a). The municipal government would thus benefit from leveraging educational resources in creative formats and via diversified dissemination channels, as well as expanding engagements for residents to increase waste diversion in MURBs. This approach would be among the most feasible, especially financially, since it addresses the issue without incurring a significant rise in the net operating cost of recycling solid waste, which the City of Toronto was concerned about in its 2016 performance review of waste management services (2018).

Even though the City does not control the design of MURBs' waste collection systems, it can encourage property management teams to enhance the convenience and hygiene of rooms where residents dispose of and sort waste. In cooperation with property managers of MURBs, it can engage with residents using these chutes and bins to increase their participation in waste sorting and reduce contamination rates by enhancing the accuracy of their sorting.

Handing out infographics to residents online and via mail is helpful, although these dissemination channels are often insufficient to shape behaviours. Digital services would diversify communication channels and increase the effectiveness of disseminating messages. Using digital platforms, such as the TOWaste mobile application, the City can build upon existing technology to raise awareness among MURB residents about the importance of participating in waste sorting and provide detailed examples for their reference. TOWaste currently only serves residents who live in houses with less than nine units (City of Toronto, 2018). However, its design of user-friendly interfaces and digital infrastructure with map and postal codes embedded, suggest great potential to unleash through upgrades and regular maintenance. This app helps engage with MURB residents in addition to mailing pamphlets to their physical inboxes. To justify expenditure towards TOWaste, it would contribute to both the collection and transfer and education categories of the City's budget allocation for waste management if it displays both collection schedules and educational resources (City of Toronto, 2023a).

According to the City's website, Waste Wizard is embedded in the TOwaste app to guide proper waste sorting wherever the resident is (2017f). There is no separate tab for Waste Wizard. Rather, it is the search bar on the landing page, which can be easily missed (City of Toronto, 2018). While it currently contains detailed and accurate information about how to dispose of the waste which users search for, displaying this set of information in a categorized format would increase the interactive elements for users to retain knowledge better and apply accurate sorting in practice. Featuring categories of searches and showing catalogues of waste are both great examples.

Empirical observations about residents' lack of awareness of its existence, low rating of fewer than three stars based on 149 reviews on iOS, and difficulty in accessing general information highlight the need to maintain this app and enhance user experience (City of Toronto, 2018). The TOwaste app can become an interactive educational program beyond a search tool. It would improve the experience with waste management services for both the City and its MURB residents.

Conclusion: Key Takeaways & Suggestions for Further Research

The City of Toronto's two net zero goals for the waste sector under the TransformTO framework feature the increase of diversion rate and the shift towards a circular economy. This research identified five major roadblocks to raising the residential waste diversion rate in MURBs,

which are: 1) the absence of realistic gaps towards a zero waste future in the municipality's long-term strategy leading up to 2040, 2) inconsistency across strategies and stakeholders related to the municipal waste management system, 3) gaps in the availability and accessibility of data for monitoring progress, 4) limitations to municipal legislative power resulting in the opting out of MURBs, 5) insufficient participation in proper waste diversion by residents.

To address these challenges, this research suggests that the City would benefit from: 1) setting attainable interim checkpoints to realize its TransformTO net zero goals by 2040, 2) enhancing coordination within the municipal waste management system and with other stakeholders from different jurisdictions, 3) monitoring progress based on increased access to data on the flow and streams of municipal waste, and 4) diversifying and expanding engagements with residents to encourage participation and improve accuracy in waste diversion.

Reflecting on the constraints of this research project, there are a few suggestions for future research. Since this study did not conduct interviews due to constraints on time and capacity, further research would benefit from up-to-date insights from property managers in MURBs and policymakers on teams related to the Solid Waste Management Services division at the City of Toronto (City of Toronto, 2017c). Based on the specialization of teams within this division, Collections and Litter Operations, as well as Transfer Station and Landfill Operations can inform gaps and potential improvements in waste collection procedures. Insights about the format and substance of coordination via the City's Cross-Divisional Circular Economy Working Group would be helpful.

Meanwhile, conversing with policymakers working on Policy Planning and Outreach can help leverage regulatory power to design and implement waste management policy in the City of Toronto more effectively (2017c). According to the telephone directory of the Policy Planning and Outreach team, conversing with people from Circular Economy & Innovation would improve researchers' understanding of challenges and opportunities for the City in its transition towards a circular economy.

To gain insights into the educational initiatives to engage city residents, since there is no team specializing in the design, administration, and promotion of educational programmes, the most relevant team would be Stakeholder & Community Outreach on the Policy Planning and Outreach team at the City's Solid Waste Management Services division (2017e). Collaborations with the Unit for Research, Innovation & a Circular Economy would further promote partnerships with communities across the City of Toronto to promote and educate residents about waste diversion and pro-environmental behaviours to build a circular economy (2017d).

Researchers might also engage in discourse analysis to analyze the dialogues about circularity among Canadian municipalities aimed at achieving zero waste. They can join webinars online, regardless of geographic location, to ask questions and hear from stakeholders working on the policy and operations of waste management across Canada.

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