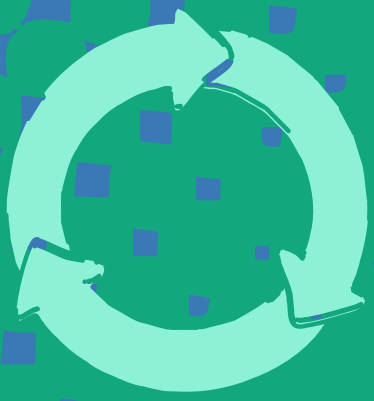

Long-Term Waste Management Strategy

Technical Memorandum 3:

Needs Assessment

DILLON CONSULTING

Region of Waterloo

ENGINEERING AND ENVIRONMENTAL SERVICES

Waste Management

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Glossary of Terms

Automated Collection means the method of collecting waste from carts using a fully-automated hydraulic collection system and does not include the manual emptying of containers or carts.

Bi-Weekly Collection means the collection of waste once every two weeks on the scheduled collection day.

Blue Box means the recycling container that is intended for the storage and collection of recyclables.

Blue Box Materials means materials designated under O. Reg. 391/21: BLUE BOX. This includes primary, convenience and transport packaging provided with a product, an ancillary product that is integrated into the packaging and a product such as a straw, cutlery or plate that is supplied with a food or beverage product. It also includes packaging-like and paper products.

Bulky Item and Appliance Collection means items that are generally too large to put into a garbage cart or container and includes but is not limited to stoves, refrigerators, water tanks, washers, dryers, freezers, dishwashers, furniture, mattresses, toilets, bathtubs, etc.

Cambridge Waste Management Centre means the location at 201 Savage Drive, Cambridge, where collectable waste is temporarily stored, transferred and/or processed.

Cart means the wheeled cart provided by the Region for the purposes of containing waste as identified for collection.

Cart-Based Collection means that collection of waste from carts through the use of waste collection vehicles.

Christmas Trees means natural Christmas trees that should be free of any decorations, tree bags or stands.

Collect or **Collection** or **Collected** or **Collecting** means all work, services and operations with respect to the collection and haulage of waste from collection points within the Region to the waste management sites used by the Region. This may or may not include to private sites, depending on the context.

Collectable Material means Blue Box Material, Christmas trees, green bin material, large metal items, yard waste material, bulky items and appliances and garbage.

Container means a container used to hold different waste streams.

Curbside Collection means a location where collectable materials are collected from, or near a curb by the Region (or contractor).

Energy from Waste refers to conventional incineration, gasification, plasma gasification and pyrolysis.

Extended Producer Responsibility (EPR): A policy approach where producers are responsible for the end-of-life management of their products. In this report, **EPR** is used inclusively, encompassing both collective producer responsibility and individual producer responsibility (IPR), where applicable.

Garbage means solid, residual waste which cannot be diverted from disposal.

Green Bin means biodegradable source-separated organics (SSO) such as food, fruit, meat, paper products such as tissues, potato bags, paper towels, other materials such as cat litter, pet waste, hair, pet hair and wood chips, and other compostable items as may be accepted by the Region from time-to-time.

Large Apartment Building means any apartment building, condominium complex, townhouse complex, co-operative complex or other similar complex that has seven or more self-contained units.

Non-Collectable Material means the non-collectable material as listed in the Region's By-law No 17-007.

Organics means the biodegradable material that includes food waste and yard waste collected by the Region.

Private Road means roads not assumed by the Region and services require approval.

Residential Dwelling Eligible for Collection (or Eligible Location) means single family dwellings, semi-detached houses, duplexes, street row houses or townhouses, designated townhouse complexes on private property with drive through access, residential properties with difficult access routes and selected businesses, or as directed by the Region.

Resource Recovery means the extraction of useful materials or other resources from things that might otherwise be waste, including through reuse, recycling, reintegration, regeneration or other activities.

Small Apartment Building means small apartment style buildings with three to six dwelling units, or as directed by the Region.

Waste means all discarded material, with the exception of non-collectable waste.

Waste Stream means any of streams such as garbage, recycling or organics separately as applicable and as defined.

Yard Waste means branches, leaves, hedge pruning's, plants, sod edgings, spring grass raking's, pinecones, pumpkins, fruits and vegetables from the yard, and grass clippings, or as approved by the Region.

Acronyms

Term	Definition
Abbotsford	City of Abbotsford
AD	Anaerobic Digestion
AI	Artificial Intelligence
AMO	Association of Municipalities of Ontario
BAU	Business-As-Usual
BC	British Columbia
BIA	Business Improvement Area
C&D	Construction and Demolition
CBEI	Consumption-Based Emissions Inventory
CEEI	Community Energy and Emissions Inventory
CEFA	Canadian Environmental Protection Act
CEI	Circular Economy and Innovation
CEPA	*Canadian Environmental Protection Act*
CFIL	Circular Food Innovation Lab
cfm	Cubic Feet Per Minute
Charlotte	City of Charlotte
CIC	Circular Innovation Council
CIF	Continuous Improvement Fund
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COIL	Circular Opportunity Innovation Launchpad
CorCAP	Corporate Climate Action Plan
CRC	Community Recycling Centre
CRRPs	Community Reduce and Reuse Programs
CSA	Canadian Standards Association
Dillon	Dillon Consulting Limited
Durham	Region of Durham
DYEC	Durham York Energy Centre
E-Waste	Electronic Waste
Edmonton	City of Edmonton
EfW	Energy from Waste
EMF	Ellen MacArthur Foundation
EPR	Extended Producer Responsibility
FEED	Front-End Engineering and Design
GHG	Greenhouse gas
GLA	Greater London Authority
Gothenburg	City of Gothenburg
GPS	Global Positioning System

Term	Definition
Guelph	City of Guelph
Halton	Regional Municipality of Halton
H	Hour
HH	Household
HHW	Household Hazardous Waste
HRM	Halifax Regional Municipality
IC&I	Industrial, Commercial & Institutional
ID	Identification
IMWG	Inter-Municipal Working Group
INFC	Infrastructure Canada's
IPR	Individual Producer Responsibility
KG	Kilogram
KPI	Key Performance Indicator
lbs	Pounds
LED	Light-Emitting Diode
LFG	Landfill gas
LTWMS	Long Term Waste Management Strategy
m	Metre
m^2	Square Metres
m^3	Cubic Metres
MECP	Ministry of the Environment, Conservation and Parks
Montréal	City of Montréal
MW	Megawatts
MWA	Municipal Waste Association
NAHMMA	North American Hazardous Materials Management Association
N_2O	Nitrous Oxide
NGOs	Non-Governmental Organizations
NIA	Neighbourhood Improvement Areas
NYSDEC	New York State Department of Environmental Conservation
NZWC	National Zero Waste Council
OCP	Official Community Plan
ODS	Ozone Depleting Substances
OFC	Ontario Food Collaborative
ONEIA	Ontario Environmental Industry Association
Pandemic	COVID-19 Pandemic
PAYT	Pay-As-You-Throw
Peel	Region of Peel
PERC	Peel Energy Recovery Centre
Port Moody	City of Port Moody
PV	Photovoltaic

Term	Definition
PVC	Polyvinyl Chloried
Regina	City of Regina
Region	Regional Municipality of Waterloo
RFID	Radio Frequency Identification
RFP	Request for Proposals
Richmond	City of Richmond
RNG	Renewable Natural Gas
Roadmap	Circular Economy Roadmap
RPRA	Resource Productivity and Recovery Authority
RPWCO	Regional Public Works Commissioners of Ontario
SaaS	Software as a Service
San Francisco	City of San Francisco
SBEI	Sector-Based Emissions Inventory
Seattle	City of Seattle
SSO	Source-Separated Organics
SUPs	Single-use Plastics
SUTI	Single-use and Takeaway Items
SWANA	Solid Waste Association of North America
SWMMP	Solid Waste Management Master Plan
SWMP	Solid Waste Management Plan
SWMS	Solid Waste Management Strategy
SWS	Solid Waste Strategy
SWOT	Strengths, Weaknesses, Opportunities and Threats
tCO_2e	Tonnes of Carbon Dioxide Equivalent
Toronto	City of Toronto
Townships	The Township of North Dumfries, the Township of Wilmot, the Township of Woolwich and the Township of Wellesley
Tri-Cities	The City of Kitchener, the City of Cambridge and the City of Waterloo
UK	United Kingdom
UN	United Nations
USA	United States of America
Vancouver	City of Vancouver
W2RO	Waste to Resource Ontario
WARM	Waste Reduction Model
Waste Plan	Long Term Waste Management Plan
WDF	Waste Diversion Fund
WIP	Waste-in-Place
WK	Week
WMP	Waste Management Plan
WMMP	Waste Management Master Plan
WRR Grant	Waste Reduction and Reuse Grant

Term	Definition
York	Regional Municipality of York
ZWETL	Zero Waste Economic Transformation Lab

Executive Summary

The Region of Waterloo (Region) is undertaking an update to its Long-Term Waste Management Strategy (LTWMS) to support its transition toward a circular economy, extend landfill capacity and align with climate goals. This memorandum presents an overview of the Region's waste management requirements, system needs and service gaps, drawing from current performance, legislative drivers, operational trends and emerging challenges.

Since the adoption of the 2013 Waste Management Master Plan, the Region has made notable progress, including lower per capita waste generation, strong diversion performance from the residential sector and expanded programs to support organics diversion. However, gaps persist, particularly in the large apartment building and Industrial, Commercial and Institutional (IC&I) sectors, where diversion rates remain low and contamination is common. While the Region is not responsible for collecting waste from these sectors, their performance impacts the overall system given the majority of the annual tonnage landfilled is from the IC&I sector. Collaboration across municipalities through the Inter-Municipal Working Group has stalled and challenges with consistent performance tracking and access to high-quality data limit the ability to make informed planning decisions. Supporting these sectors through policy tools, education and partnership opportunities will be important to drive improvement.

Preserving the Waterloo Landfill's remaining capacity is a priority, especially as population growth drives increasing disposal demands. Current projections suggest the landfill could reach capacity within 20 years, while the LTWMS covers a 25-year horizon. Long-term planning will require additional diversion strategies, residual waste treatment options and infrastructure investments that contribute to landfill preservation and alignment with the Regions climate change commitments.

A comprehensive jurisdictional review examined how leading Canadian and international jurisdictions are advancing waste reduction, diversion and circular economy goals. Jurisdictions were assessed across focus areas such as waste prevention, reuse and repair systems, organics diversion, residual waste treatment and climate-aligned performance measurement. The review identified several emerging trends with relevance to the Region, such as the integration of circular economy principles into strategic planning, the use of AI-enabled technologies to monitor contamination and optimize collection and expanded

community-based reuse networks. Jurisdictions are also moving toward more holistic performance frameworks that include greenhouse gas (GHG) emissions reductions, material circularity and behaviour change, moving beyond conventional diversion metrics. These findings offer practical, forward-looking examples that can be adapted to strengthen the Region's LTWMS and accelerate progress toward a more inclusive, climate-conscious and resource-efficient system.

The policy landscape continues to evolve, with provincial requirements such as extended producer responsibility (EPR), organics diversion targets and potential bans on landfill disposal of organics. These legislative drivers, alongside corporate sustainability commitments and broader climate targets, reinforce the need for a system-wide approach to waste management across all sectors.

To support long-term planning, the Region must also build on its current use of data, forecasting and modelling. Enhancing performance metrics, establishing planning thresholds and applying scenario modelling will help evaluate the system impacts of new initiatives and inform decision-making over time.

Together, these findings shape the next phase of the LTWMS. Technical Memorandum 3 provides a detailed understanding of the Region's baseline needs and strategic pressures, laying the groundwork for developing and evaluating future options that support a resilient, sustainable and affordable waste system aligned with community and environmental goals.

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Circular
Economy

1.0 Introduction and Background

In September 2024, the Region of Waterloo (Region), through the Waste Management Division of the Engineering and Environmental Services Department, initiated a review and update of its Long-Term Waste Management Strategy (LTWMS). The last long term waste plan, known as the Waste Management Master Plan (WMMP) was completed in 2013. Significant changes in planning, regulatory and technical environments, such as the provincial Blue Box transition to Extended Producer Responsibility (EPR), necessitate this new LTWMS.

The Region's population is expected to surpass one million people by 2051. This represents a population increase of approximately 67% from 2021.Therefore, there is a need to plan for investment in waste management infrastructure to support future growth and foster sustainability within existing systems and facilities.

This updated LTWMS will ensure the Region's long-term strategic waste management direction is sustainable, will include residual waste management options and will be consistent with the Region's corporate and strategic vision to guide decision making over the next 25 years. The LTWMS update will meet the following goals:

- Maximize reduction and reuse of waste;
- Maximize the recovery of waste and energy and optimize management of remaining residuals;
- Optimize operational advancements and improvements; and
- Foster a circular economy culture across Waterloo Region.

1.1 Purpose of this Document

Technical Memorandum 3 outlines the results of the Needs Assessment conducted to support the development of the Region's LTWMS over the next 25 years. This assessment was carried out through two primary activities:

- **Activity 1: Jurisdictional Scan**, which identified best practices, gaps and emerging opportunities not addressed in the 2013 WMMP; and
- **Activity 2: Determination of Requirements**, which defined the Region's future waste management needs.

The findings from this memorandum will directly inform the identification and evaluation of policy, program and technology options to be presented in Technical Memorandum 4.

1.2 Subsequent Documents

This document is the third of several documents which include the following:

Technical Memorandum 1: Current State of Waste Management System

Summary and update of the Region's existing waste management profile that provides insights into existing processes and identify gaps, enabling informed decision for future strategy improvements.

Technical Memorandum 2: Review of 2013 WMMP

Status update of the 2013 WMMP recommended options, including analysis of factors influencing the Waste Strategy implementation. This includes a review of the status of each recommendation, key learnings and internal and external factors that have accelerated or delayed the implementation of the recommended actions, up until 2024.

Technical Memorandum 4: Options Identification and Evaluation

Outline and evaluation of a range of potential waste management options including policies, programs and technologies to manage the Region's upstream and downstream waste impacts through waste reduction, reuse, recycling and recovery.

Technical Memorandum 5: LTWMS

Updated LTWMS for the next 25 years to 2051 (beyond the end of the current forecasted Landfill life) that builds upon the 2013 WMMP and identifies waste management bans, policies and programs to further reduce overall waste and maximize waste diversion for the Region. This includes a high-level implementation plan of the recommended preferred approaches.

Public Consultation Report

Throughout the development of the five technical memorandums, outreach will be conducted at appropriate stages with interested partners to gather feedback on reducing overall waste for the Region. This document will include an analysis of data, including a summary of key observations and trends from all interested partners consultations.

2.0 Jurisdictional Scan

Jurisdictions across Canada and internationally are actively engaged in efforts to extend landfill lifespans and foster a circular economy through various programs, policies and practices. A jurisdictional scan was conducted with the objective to identify and understand regional and international practices that have demonstrated success in reducing, reusing, recycling and recovering waste. The jurisdictional scan was developed with the goal to identify best practices of comparable municipal jurisdictions, including estimated costs and resourcing, where information was readily available. The scan considered how similar municipalities:

- Maximize reduction and reuse of waste;
- Maximize the recovery of waste and energy and optimal management of remaining residuals;
- Optimize and improve operations; and
- Foster a circular economy culture.

The scan considered all waste streams, customer types, options for energy and resource recovery, maximizing upstream diversion and carbon offsetting strategies. The selection of practices and jurisdictions for review was guided by a methodology developed in consultation with the Region and tailored to align with the Region's specific needs and interests. The insights gained from these practices can be instrumental in determining their applicability within the Region to address its waste management needs over the next 25 years.

2.1 Jurisdictional Scan Methodology and Approach

As a preliminary step, a list of approximately 30 jurisdictions were initially presented to the Region for consideration, accompanied by a rationale for each highlighting their potential as models for review due to their best practices, industry leadership and proven programs. Furthermore, seven focus areas were identified to categorize the practices of interest to the Region. These categories included:

- Reduction and Reuse of Waste;
- Recovery and Energy from Waste (EfW);

- Optimize and Improve Operations;
- Circular Economy;
- Carbon Offsetting;
- Public Engagement; and
- Data and Metrics.

Out of the 27 jurisdictions proposed, the Region selected 20 to proceed with for the jurisdictional scan. These selected jurisdictions are outlined in **Section 2.3**.

For each jurisdiction, a tailored questionnaire was developed to gather information on practices or programs of interest, associated costs and resources, metrics, strategies for circular economy, options for energy and resource recovery and carbon offsetting strategies. Contacts within each jurisdiction were identified and approached to complete the voluntary questionnaires. The responses, combined with additional desktop research and Dillon's internal information, informed the development of the best practices and emerging trends outlined in **Section 2.4**.

2.2 Jurisdictional Scan Limitations

The jurisdictional scan faced several limitations and challenges that can impact the comprehensiveness and accuracy of the findings. One primary limitation was the variability in responses received from each jurisdiction. In instances where jurisdictions did not respond to specific questions, it was assumed that the specific data or information requested was either unavailable or not applicable to the jurisdiction's particular operations and practices.

Additionally, the diversity of practices and policies across jurisdictions posed a challenge in allowing consistent comparisons to similar questions posed to jurisdictions. Variations in terminology, metrics and reporting standards required careful interpretation to support alignment with the questionnaire themes and intentions.

To mitigate these challenges, supplementary desktop research and Dillon's internal expertise were used to fill in data gaps and provide context where there were gaps in jurisdiction's responses. The limitations highlight the need for cautious interpretation of the results and underscore the importance of ongoing engagement with jurisdictions and regional partners to continue to understand and refine best practice findings and continuous improvements.

2.3 Selected Jurisdictions

The following 20 jurisdictions were selected by the Region for the jurisdictional scan. Their rationale and comparative demographic information (population and households) can be found in **Table 1**.

Table 1: Jurisdictions and Selection Rationale

Jurisdiction	Rationale for Selection	Population[1]	Approx. Number of Households[2]
City of Guelph (Guelph), Ontario	Circular economy program focusing on reuse, repair and recycling, and its advanced composting facility that supports local agriculture.	144,356	56,665
City of Toronto, (Toronto) Ontario	Long-term waste diversion strategy, extensive public education programs such as the 3R ambassador initiative and successful internal partnerships that advance circular economy goals.	2,794,356	1,160,890
Region of Durham (Durham), Ontario	Long-term plan emphasizing the 5Rs and adaptability to EPR, alongside its use of an EfW center and a third-party anaerobic digestion (AD) facility for organics.	696,922	250,559
Region of Peel (Peel), Ontario	Goal of 75% waste diversion by 2034, supported by extensive public education through school programs and virtual waste facility tours.	1,451,022	467,970
Regional Municipality of Halton (Halton), Ontario	Successful large apartment organics collection and a landfill gas-to-energy strategy, which helped achieve a 57% diversion rate while reducing carbon emissions.	596,637	214,322

[1] Statistics Canada, 2021, unless otherwise noted.
[2] Statistics Canada, 2021, unless otherwise noted.

Jurisdiction	Rationale for Selection	Population[1]	Approx. Number of Households[2]
Halifax Regional Municipality (HRM), Nova Scotia	Strategy of banning specific materials from landfills, creating products from scrap tires and setting ambitious targets to significantly reduce landfill tonnage and hazardous waste.	439,819	200,473
City of Montréal (Montréal), Quebec	Zero Waste Plan, which focuses on enhancing recycling and composting systems while actively promoting the reduction of single-use items through reuse and repair.	1,762,949	816,340
City of Regina (Regina), Saskatchewan	Focus on public engagement and operational efficiency, with initiatives such as a waste by-law for the Industrial, Commercial and Institutional (IC&I) sector and a "Green Routine" pilot that achieved 42% diversion.	266,404	99,134
City of Edmonton (Edmonton), Alberta	Comprehensive infrastructure, including Eco Stations and a Reuse Centre, combined with a zero waste framework, a single-use item by-law and EfW technology.	1,010,899	428,857
Metro Vancouver, British Columbia (BC)	Regional approach to standardizing recycling, its leadership in the National Zero Waste Council (NZWC) and its advanced biosolids-to-energy system.	2,642,825	1,043,320
City of Richmond (Richmond), BC	Comprehensive Climate Action Plan, which integrates waste reduction with targets for energy and transportation to lower its overall carbon footprint.	209,937	85,035
City of Vancouver (Vancouver), BC	"Zero Waste 2040" vision, supported by its Zero Waste Centre, and innovative community programs.	662,248	305,336
City of Abbotsford (Abbotsford), BC	Clear, data-driven approach, with specific targets to reduce solid waste and greenhouse gases (GHG), tracked by key performance indicators.	195,726	70,648

Jurisdiction	Rationale for Selection	Population[1]	Approx. Number of Households[2]
City of Port Moody (Port Moody), BC	By-law for Construction and Demolition (C&D) waste, which mandates high diversion rates and has proven successful in practice.	33,535	13,603
City of Charlotte (Charlotte), United States of America (USA)	Circular economy strategy built on five key business cases, including closed-loop textiles, food waste-to-feed and a materials innovation lab.	2023 911,311[3]	2023 361,100[4]
New York State, USA	10-year Solid Waste Management Plan (SWMP), which advances a circular economy through six focus areas, including market development and product stewardship.	2020 20,201,249[5]	2020 8,488,066[6]
City of San Francisco (San Francisco), USA	Achievement of over 80% waste diversion, driven by its landmark C&D Debris Recovery Ordinance and the Mandatory Recycling and Composting Ordinance, with a goal to achieve zero waste by 2030.	2023 808,988[7]	2023 415,803[8]
City of Seattle (Seattle), USA	Innovative garbage management system that incentivizes waste diversion and its award-winning Reuse Seattle program, which partners with businesses to replace single-use items with reusable containers.	2024 797,700[9]	2024 413,723[10]

[3] https://www.census.gov/quickfacts/fact/table/charlottecitynorthcarolina/HSD410223#HSD410223
[4] https://www.census.gov/quickfacts/fact/table/charlottecitynorthcarolina/HSD410223#HSD410223
[5] https://data.census.gov/profile/New_York?g=040XX00US36
[6] https://data.census.gov/profile/New_York?g=040XX00US36
[7] https://www.census.gov/quickfacts/fact/table/sanfranciscocitycalifornia/HSG010223#HSG010223
[8] https://sfplanning.org/sites/default/files/resources/2024-04/2023_Housing_Inventory.pdf
[9] https://www.arcgis.com/apps/dashboards/c8cfcb827e564623a6fa3af6360141fe
[10] https://www.arcgis.com/apps/dashboards/c8cfcb827e564623a6fa3af6360141fe

Jurisdiction	Rationale for Selection	Population[1]	Approx. Number of Households[2]
City of Gothenburg (Gothenburg), Sweden	Goal of near-zero climate impact by 2030, supported by a large EfW plant, innovative waste collection systems and city-run repair shops to promote reuse.	2025 581,822 [11]	2025 317,000 [12]
Greater London Authority (GLA), United Kingdom	Goal to be a zero-waste city with a 65% recycling target by 2030, supported by the organization ReLondon through programs focused on food waste and single-use plastics (SUPs).	2024 9,748,000[13]	2024 3,790,210[14]

[11] https://worldpopulationreview.com/cities/sweden/gothenburg
[12] https://irissmartcities.eu/hsb-goteborg-hsb-sweden/#:~:text=HSB%20housing%20stock%20amounts%20to,stock%20amounts%20to%2034.300%20units.
[13] https://www.macrotrends.net/global-metrics/cities/22860/london/population
[14] https://www.london.gov.uk/sites/default/files/2024-11/London%27s%20Housing%20Stock%20-%20Research%20Unit%20-%20November%202024.pdf

2.4 Best Practices and Emerging Trends

The jurisdictional scan explored best practices and emerging areas of interest. It aimed to identify proven and effective waste reduction and diversion strategies and initiatives that have either **not** been previously considered in the 2013 WMMP or are implemented in a different approach to the Region's approach. The intent of the scan was to provide best practice ideas for exploration by the Region of potential options for consideration. Options for the Region will be developed as the next step in "Technical Memorandum 4: Options Identification and Evaluation".

The following sections summarize by topic the findings from the jurisdictional scans. The ten topics are organized as follows:

1. Items for Reduction, Reuse and Diversion
2. Approaches and Technologies for Waste Monitoring.
3. Metrics and Key Performance Indicators for Waste Reduction.
4. Leading or Comparable Waste Plans.
5. Emerging Public Education and Engagement Techniques.
6. Circular Economy Culture
7. Barriers to Waste Reduction and Diversion Participation
8. Energy Generation and Methane Reduction
9. Carbon Accounting Programs
10. Provincial and Federal Waste Management Legislation and Policy

2.4.1 Items for Reduction, Reuse and Diversion

The Region is considering best practices from other jurisdictions for targeting items for reduction, reuse and diversion. The following sections outline items that have been targeted by other jurisdictions and the approaches that have been taken to reduce, reuse and divert these items from landfill.

2.4.1.1 Food and Organic Waste

As outlined in Technical Memorandum 1, the Region provides weekly green bin collection for single family dwellings and small apartment buildings (three to six units). The Region has an annual residential organic waste generation rate of 43 kilogram (kg) per capita. Reducing food waste generation and improving diversion of food and organic waste reduces GHG emissions and preserves landfill space.

The Region's Corporate Climate Action Plan (CorCAP) and Ontario's Food and Organic Waste Framework prioritize food waste reduction and organic management to reduce GHG emissions[15],[16]. Although it does not mandate new programs, the Food and Organic Waste Policy Statement set the provincial vision for the province to explore food waste reduction and management options through municipal organics programs.

2.4.1.1.1 Guelph, Ontario – IC&I Organics Reduction and Diversion

In 2021, Guelph partnered with the Circular Innovation Council (CIC) to launch the Commercial Food Rescue & Organic Waste Diversion pilot project, funded by Agriculture and Agri-Food Canada's Food Waste Reduction Challenge[17]. The pilot project provided food rescue and organic waste collection services to businesses and institutions at a subsidized rate (matching price of landfill disposal). The project was initiated after the completion of a Food and Food Waste Flow Study, which identified that the IC&I sector generated up to 60% more food waste than residential sources. The Food and Food Waste Flow Study was a material flow analysis baselining exercise completed through the Our Food Future Initiative, which mapped food and food waste flows in Guelph-Wellington[18]. This baseline exercise identified areas where significant waste was being generated and further assessments were conducted to support the targeting of interventions.

Between 2021 and 2023, the program rescued 29,330 kg of edible food and diverted 380 tonnes of organic waste from landfills to composting, preventing 4,130 tonnes of carbon dioxide equivalent (CO_2e) emissions[19]. In 2024, Sustainable Waterloo Region joined CIC to take over operations of the food rescue and diversion pilot and currently services businesses in Guelph, Centre Wellington and Arthur, with a future vision to expand the program's reach to more IC&I customers across Waterloo Region, Perth and Oxford Counties[20].

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[15] https://www.waterloo.ca/en/government/resources/Documents/Cityadministration/Corporate-Climate-Action-Plan.pdf
[16] https://www.ontario.ca/page/food-and-organic-waste-policy-statement
[17] https://guelph.ca/2025/03/city-of-guelph-receives-500000-from-federation-of-canadian-municipalities-fcm-to-support-circular-food-economy/
[18] https://guelph.ca/wp-content/uploads/Food-and-Food-Waste-Flow-Study-Report-WP1.pdf
[19] https://circularinnovation.ca/wp-content/uploads/2-Year-Pilot-Interim-Report-FINAL_2.pdf
[20] https://circularinnovation.ca/circular-innovation-council-and-sustainable-waterloo-region-partner-up-to-continue-solving-the-commercial-food-waste-problem-together/

2.4.1.1.2 Metro Vancouver, BC/ NZWC – Love Food Hate Waste Canada Campaign

The Love Food Hate Waste Canada is a food waste reduction campaign with a suite of resources (guides, tips for storage, meal planning and recipes) launched in 2018 by the NZWC (an initiative of Metro Vancouver) and joined by several municipalities across Canada. It was modelled after the Love Food Hate Waste campaign in the United Kingdon (UK), which aims to reduce food waste by promoting behavioural change. Toronto is an example of a participating partner that has drawn on NZWC's resources and incorporated food waste reduction into its LTWMS.

2.4.1.1.3 Toronto, Ontario –Food Waste Reductions Partnerships

Toronto partners with organizations to educate residents on reducing food waste, including the NZWC's "Love Food, Hate Waste" promotion and education campaign. It provides annual informative materials with tips on minimizing food waste[21]. Toronto is part of the Ontario Food Collaborative (OFC) Steering Committee, working with various partners (e.g., Agriculture and Agri-Food Canada, universities and other municipalities) to promote food literacy and waste prevention in Ontario[22]. Additionally, the City funds the Urban Harvest program, which collects surplus produce from residents to support local food banks and offers food canning workshops[23]. This initiative is part of the Toronto Community Reduce and Reuse Programs (CRRPs), promoting waste reduction in Toronto neighborhoods.

2.4.1.1.4 HRM, Nova Scotia – Organics Ban and Circular Food Hubs

In 1997, Nova Scotia banned landfill disposal of organics, leading HRM to pioneer organics diversion. In 1998, HRM launched a source-separated organics program with curbside green cart collection and introduced a clear bag policy to enforce the ban, reducing residential garbage by 25%[24].

HRM is collaborating with the NZWC, Circular Opportunity Innovation Launchpad, Halifax Partnership and Halifax Food Policy Alliance to develop food hubs in Nova Scotia that integrate circularity and prevent food loss and

[21] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-reduction/food-waste/
[22] https://ontariofoodcollaborative.ca/our-steering-committee/
[23] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-reduction/community-reduce-reuse-programs/
[24] https://halifaxpartnership.com/local-business-support/smartbusiness-services/innovation-outpost/circular-food-solution-challenge/

waste[25]. These circular food hubs aim to establish a foundation for a Canada-wide circular food system. The collaboration also launched a Circular Food Solution Challenge, offering up to $5,000 in funding for projects that address food waste and climate change[26]. Winning projects showcase a range of solutions, from Sodexo Canada creating frozen soups from leftovers for a community fridge to Vessel Meats developing a method to turn discarded animal bones into cooking charcoal.

2.4.1.1.5 Vancouver – Circular Food Innovation Lab

Vancouver's Circular Food Innovation Lab (CFIL) partnered with 18 local food businesses from April 2022 to February 2023 to reduce food waste[27]. Collaborating with the Vancouver Economic Commission and Emily Carr University, CFIL developed nine prototype solutions, resulting in the CFIL Prototype Collection, which is a report outlining promising tools and practices uncovered through the Lab[28].

The Lab's achievements included connecting businesses and government, revealing and altering food waste patterns and identifying roles for city governments in promoting circularity through policy and resource investment. Municipal governments can act as a convenor of organizations working to address food waste. Additionally, governments can develop policies that require or incentivize circular practices or directly invest in solutions.

The CFIL's next steps involve participants scaling interventions through formal practices and cultural shifts. Some businesses continue prototyping solutions. The city and its collaborators are forming a network to advance Vancouver's circular food economy, aiming to set new standards and transform food waste culture[29].

2.4.1.1.6 GLA, UK – ReLondon's Circular Food Projects

ReLondon, founded by the Mayor of London and London boroughs to enhance waste and resource management, focuses on food waste reduction and diversion as one of five key areas of transformation (additional information

[25] https://nzwc.ca/Documents/nzwc-future-of-circular-hubs-ns-report.pdf
[26] https://halifaxpartnership.com/local-business-support/smartbusiness-services/innovation-outpost/circular-food-solution-challenge/
[27] https://vancouver.ca/green-vancouver/circular-food-innovation-lab.aspx
[28] https://vancouver.ca/files/cov/circular-food-innovation-lab-prototypes.pdf
[29] https://vancouver.ca/files/cov/circular-food-innovation-lab-executive-summary.pdf

regarding ReLondon is outlined in **Section 2.4.6.1**). To tackle food waste, ReLondon has launched several initiatives:

- **Food Footprint**[30]: Researching food supply chains to identify waste reduction opportunities;
- **Food Flagship Initiative**[31]: Using Food Footprint data to pinpoint intervention hotspots, leading to 20 projects;
- **Circular Food Procurement**[32]: Collaborating with local borough Hackney and Sustain, a non-profit, to promote sustainable food practices in council services, including a working group, pledge and provision of a toolkit to local authorities; and
- **Food Connect:** Redistributing surplus food using zero-emission vehicles to support community food projects.

2.4.1.1.7 Summary – Food and Organic Waste

Based on the Region's experience with IC&I initiatives and the lessons from other jurisdictions, the following approaches could be taken to reduce and divert food and organic waste:

- Gather baseline data to support targeted interventions, such as through a material flow analysis;
- Support food redirection and diversion in the IC&I sector;
- Collaborate with other organizations to support education and outreach to residents and IC&I regarding the value of food and reducing avoidable food waste;
- Facilitating or supporting innovations in circular food businesses or initiatives; and
- Supporting food waste avoidance programs, supporting surplus food redirection and food preservation skills building.

2.4.1.2 C&D Waste

C&D disposal service demands have increased in the Region over the last decade, as more activity in this sector has been observed. The quantity of C&D waste accepted annually by the Region almost doubled from the 2013 to 2018 period to the 2019 to 2022 period. C&D can be brought to the Region's drop-off facilities; however, there are currently only diversion programs for drywall

[30] https://relondon.gov.uk/resources/report-londons-food-footprint
[31] https://relondon.gov.uk/resources/report-londons-food-footprint
[32] https://relondon.gov.uk/circular-food-procurement

and wooden pallets. Previously the Region offered a Paint Reuse program, which was suspended in 2015. As well, the Region offered a shingles diversion program that was cancelled due to lack of funding. The lessons learned from these historical programs are summarized in **Appendix A**. If the proposed LTWMS options suggest bringing back any of the historical programs the lessons learned will be a consideration as part of the evaluation.

Due to multiple factors, including their bulk and weight, C&D waste is difficult to manage in a landfill as it consumes a large amount of space for disposal. The waste management industry, including other municipalities, have more recently focused attention for this waste stream, including new policies, programs and diversion opportunities.

2.4.1.2.1 Guelph, Ontario – Construction, Renovation and Demolition Waste Management Guidebook

The Circular Opportunity Innovation Launchpad (COIL), an initiative by Guelph's Smart Cities Office, focuses on advancing circular economy solutions in the food, environment and C&D sectors[33]. Through various studies and pilots, COIL gathered insights to improve circularity in the C&D sector.

A key output is the 2023 Construction, Renovation and Demolition Waste Management Guidebook by AET Group Inc., offering strategies for reducing, reusing and recycling C&D materials[34]. It advises the public on diversion opportunities at Guelph's Waste Resource Innovation Centre and Habitat for Humanity ReStore, aiming to enhance C&D material separation and market distribution.

Key findings include:

- A townhouse project applying the Guidebook's strategies saved $65,000 in C&D disposal costs and increased material diversion;
- Source separation increases waste bin density, reducing costs and improving material handling efficiency, with source-separated bins weighing significantly more than C&D mixed load bins; and
- Source separation allows diversion of cardboard and drywall, saving fees and generates revenue from separated steel.

[33] https://coil.eco/zwetl/
[34] https://guelph.ca/living/environment/garbage-and-recycling/construction-renovation-and-demolition-waste-management-guidebook/

As the Construction, Renovation and Demolition Waste Management Guidebook is new, measurable outcomes are pending.

2.4.1.2.2 Toronto, Ontario – Renovation Waste Collection at Depots

Toronto currently accepts certain types of renovation waste at their public drop-off depots and transfer stations for a fee of $183/tonne[35]. The accepted materials are typically generated during a renovation, such as countertops, cabinets, insulation, roof shingles, etc. Whereas construction materials such as concrete and cinder blocks, are not accepted. The accepted materials are recycled through third-party vendors: TRY Recycling Inc. (porcelain), New West Gypsum Recycling Ltd. (drywall), Combined Metal Industries, RAM Iron & Metal Inc. and Triple M Metal (scrap metal), Gallop, Cascades, GFL Environmental Inc. (cardboard).

2.4.1.2.3 Metro Vancouver, BC – C&D Waste Reduction Toolkit and Calculator

Waste composition studies conducted by Metro Vancouver revealed that up to one-third of the region's landfill waste originates from C&D activities, with wood and plastic being the predominant components. Metro Vancouver developed a draft boilerplate by-law to support the municipalities in the development of their respective by-laws to address C&D waste.

To support the C&D sector in complying with these by-laws and enhancing recycling and reuse efforts, Metro Vancouver developed several tools:

- **C&D Waste Reduction Toolkit**[36]: This toolkit is designed for contractors, project managers and homeowners. It provides information on municipal requirements, hazardous material management, alternatives to traditional demolition and options for recycling and reusing building materials, as well as details on C&D recycling depots and service providers; and
- **Demolition Waste Generation Calculator**[37]: This tool calculates the required recycling rate for by-law compliance within each Metro Vancouver municipality based on the square footage of the residence and the municipality where the demolition occurs.

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[35] https://www.toronto.ca/services-payments/recycling-organics-garbage/drop-off-depots/fees-for-drop-off-depots/
[36] https://metrovancouver.org/services/solid-waste/construction-demolition-waste-reduction-toolkit
[37] https://metrovancouver.org/services/solid-waste/demolition-waste-generation-rates-calculator

2.4.1.2.4 Richmond, BC– Demolition By-law

Richmond's Demolition Waste and Recyclable Materials By-law (By-law No. 9516) mandates that 70% of materials from demolitions of single family dwellings and two-family dwellings (a building consisting of two dwelling units only and does not include a single family dwelling with a secondary suite) and accessory buildings must be recycled[38]. The application process involves a non-refundable fee of $288 and a refundable fee of $3.25 per square foot, which is returned upon submission of a waste disposal and recycling services plan, along with a compliance report verifying the achievement of the 70% recycling rate. A recent report suggests that Richmond should consider increasing the minimum recycling requirements to 100% for clean wood and 85% for other materials, as other municipalities in throughout Metro Vancouver are already meeting or surpassing these standards[39].

2.4.1.2.5 Vancouver, BC – Green Demolition By-law

Building materials make up 31% of Vancouver's garbage. In 2022, Vancouver disposed 95,000 tonnes of building materials as garbage (including 46,000 tonnes of wood). Most of this waste stream comes from C&D activities[40].

Vancouver's Green Demolition By-law (By-law No. 11023) requires a minimum recycling and reuse rate of:

- Pre-1950 single family homes — minimum recycling rate of 75%;
- Single-family homes with character status — minimum recycling rate of 90%; and
- Pre-1910 and heritage listed homes — requirement to salvage three tonnes of deconstructed wood[41].

The application process requires a non-refundable administrative fee of $449, and a refundable fee of $14,650, returned upon demonstration of compliance with the by-law.

Since the by-law was updated in 2019, Vancouver has successfully redirected approximately 40,000 tonnes of materials away from landfills, achieving an average diversion rate of 86% for homes built before the 1940s. By extending

[38] https://citycouncil.richmond.ca/__shared/assets/Bylaw951643787.pdf
[39] https://sustain.ubc.ca/sites/default/files/2024-057_Update%20to%20Demolition%20Bylaw%20City%20of%20Richmond_Jilani.pdf
[40] https://council.vancouver.ca/20241023/documents/pspc3.pdf
[41] https://council.vancouver.ca/20180516/documents/pspc2c.pdf

the scope to include homes built before the 1950s, it is anticipated that an additional 8,000 tonnes will be diverted each year[42].

2.4.1.2.6 Port Moody, BC– Deconstruction Waste Management By-law

Port Moody's Deconstruction Waste Management By-law (By-law No. 3381) seeks to regulate and reduce the waste from new construction and deconstruction projects that ends up in landfills[43]. The by-law requires deconstruction projects to obtain a Deconstruction Permit, which involves submitting a Hazardous Materials Report, a Waste Management Plan (WMP) and a Waste Management Fee. The specific fee amount is outlined in a separate document, Port Moody's Fees By-law (By-law No. 3435).

Upon project completion, contractors may receive a refund of the Waste Management Fee based on their recycling and reuse rates. A full refund is granted if 100% of clean wood and 85% of other recyclable materials are recycled or reused. A partial refund is available if at least 70% of recyclable construction materials are recycled or reused. The refund is determined after submitting a Compliance Report that verifies the recycling rate of the deconstructed materials. As of May 2025, approximately 85% of projects have obtained a 100% refund.

2.4.1.2.7 San Francisco, USA – C&D Debris Recovery Ordinance

In San Francisco, C&D waste constitutes a significant portion of the city's waste stream, typically accounting for approximately half, and occasionally up to 70% of total waste generation. C&D waste contributes approximately 25% to landfill disposal, equating to 150,000 to 200,000 USA tons (approximately 136,000 to 181,000 metric tonnes) annually. Following the City of San Jose's lead, San Francisco enacted the C&D Debris Recovery Ordinance (Ordinance No. 27-06), amending the Building, Health and Police Codes to support the city's goals to reduce landfilled C&D waste.

This ordinance mandates that entities register with the Department of the Environment before transporting and processing debris, and those conducting full demolitions must submit a waste diversion plan. Under the ordinance, C&D debris from projects in San Francisco must be recycled or reused, prohibiting disposal in landfills, incinerators, or designated trash bins. Projects must

[42] https://sustain.ubc.ca/sites/default/files/2024-057_Update%20to%20Demolition%20Bylaw%20City%20of%20Richmond_Jilani.pdf
[43] https://www.portmoody.ca/common/Services/eDocs.ashx?docnumber=640730

demonstrate a successful recovery rate of at least 75% of C&D debris generated [44]. Contractors are required to submit debris off-haul weight tickets and/or receipts to the Department of the Environment where the information is input into San Francisco's recovery tracking software (Green Halo Systems).

2.4.1.2.8 Seattle, USA – Salvaged Lumber Warehouse

As the largest city and county seat of King County, Seattle is a significant contributor to the region's waste. Each year, approximately 60,000 US tons (about 55,000 metric tonnes) of wood waste are sent to landfills within the county. To promote wood material reuse, Seattle received a federal grant from the 2021 Bipartisan Infrastructure Law to support the National Recycling Strategy and foster a circular economy[45]. Seattle accepted proposals, closing in February 2025, to establish a Salvaged Wood Warehouse for collecting, processing, grading and distributing salvaged lumber. The grant dedicates funding from 2025 to 2030 for additional collection locations and end market development in coordination with a successful Salvaged Lumber Warehouse. This initiative is expected to facilitate the recycling of 150 USA tons (136 tonnes) of salvaged lumber annually.

2.4.1.2.9 Summary – C&D Waste

In summary, examples from selected jurisdictions for increasing the amount of C&D waste that is diverted from the landfill includes:

- Create a C&D Management Guidebook to inform residents/ home contractors of C&D diversion opportunities and approaches;
- Accept multiple C&D waste sorts at depots for reuse and recycling;
- Leveraging the ability to adopt by-laws necessitating a WMP and/or a deposit, or other financial incentive, for building and demolition permits; and
- Provide a physical facility/location to support C&D waste salvaging and reuse.

2.4.1.3 Textiles

To reduce textile waste in landfills, the Region encourages residents to donate usable textiles via its Waste Wiz App[46]. According to curbside waste composition audits, textile waste disposal decreased from 0.4 kg per

[44] https://www.sfenvironment.org/construction-demolition-requirements
[45] https://www.kuow.org/stories/seattle-gets-4m-to-create-circular-wood-economy
[46] https://www.regionofwaterloo.ca/en/living-here/the-waste-whiz.aspx#!rc-cpage=487067

household, per week during the 2012/2013 curbside waste composition audits to 0.2 kg per household, per week during the 2018/2019 waste composition audits. In 2019, the Region put out a request for quotation to implement once per month residential curbside collection for all textiles. This program was never implemented. The lessons learned from these historical programs are summarized in **Appendix A**. If the proposed LTWMS options suggest bringing back any of the historical programs the lessons learned will be a consideration as part of the evaluation.

2.4.1.3.1 Guelph, Ontario – Textile Donations Mapping and Guelph Tool Library

Guelph has created a Textile Donations Map[47] to guide residents to donation locations, including non-profit and for-profit thrift stores, consignment shops and textile donation bins throughout the city. These bins are managed by third parties; however, Guelph mandates registration and licensing, which must be visibly displayed on each bin. Additionally, Guelph educates the public on textile donation and resale, offering resources on their Waste Whiz App[48] to minimize textile waste entering the landfill. Promotion of the Textile Donations Map is incorporated into Guelph's annual communications plan.

Guelph's support of the Tool Library includes hosting repair cafes where volunteers help repair items for free. One of the major repair categories is clothing, with volunteers helping with mending and alterations. The Tool Library also runs a program called Stitch Together, which provides skills and community building around clothing mending. Further details of the Guelph Tool Library's programming are outlined in **Section 2.4.6.2.1**.

2.4.1.3.2 Toronto, Ontario – Sewing Repair Hubs

As outlined further in **Section 2.4.6.2.2**, Toronto's Community Reduce and Reuse Program hosts sewing repair hubs which provide workshop spaces for clothing and textile repair. By the end of 2024, more than 21,000 kg of clothing had been repaired.

2.4.1.3.3 Peel, Ontario – Textile Donation

Peel has six community recycling centres (CRCs) that allow textile donations at the Salvation Army Thrift Store Donor Welcome Centres[49].

[47] https://guelph.ca/living/environment/garbage-and-recycling/clothing-donation-locations/
[48] https://guelph.ca/living/environment/garbage-and-recycling/
[49] Locations, hours, and services - peelregion.ca

Peel piloted the placement of outdoor clothing donation drop boxes between 2018 and 2020 at 45 Peel Living and four private multi-residential facilities. The pilot project diverted 225 tonnes of textile waste and an expansion of the textile bin collection program across Mississauga, Brampton and Caledon and at regional locations was approved by Peel Council in 2020[50].

In 2024, Peel participated in the Partners in Project Green Recycling Collection Drive during Waste Reduction Week. Several municipalities and organizations participated in the collection drive, diverting over 7,000 kg of household textiles[51].

2.4.1.3.4 GLA, UK – ReLondon's Textiles Action Plan

ReLondon has conducted research on textile consumption and habits, leading to the creation of a Textiles Action Plan with the following nine initiatives to advance London's fashion and textiles industry toward a low-carbon circular economy[52]:

1. Circular economy hub for textiles;
2. Repair voucher scheme;
3. Educational program for schools;
4. Small business support;
5. Textiles map/directory;
6. Segregated textile collections;
7. Procurement framework for the public sector;
8. Pan-London campaign; and
9. Textile sorting and recycling infrastructure.

Developed in collaboration with partners such as the Ellen MacArthur Foundation (EMF) and the British Fashion Council, the plan fosters cooperation among government, industry, Non-Governmental Organizations (NGOs) and community organizations. To realize its vision, London boroughs and partner organizations aim to support and implement these initiatives, contingent on funding, to propel the industry toward circularity.

[50] Amendment to the Business Licensing By-Law 01-2006 to Permit Outdoor Clothing Donation Drop Boxes on Properties Zoned Residential, subject to Minor Variance Approval
[51] Recycling Collection Drive - Partners in Project Green
[52] https://relondon.gov.uk/wp-content/uploads/2025/03/London-Textiles-Action-Plan.pdf

2.4.1.3.5 Summary – Textiles

In summary, examples from selected jurisdictions for increasing diversion of textiles from landfill include:

- Offer educational resources and information on donation opportunities and locations; and
- Partner with other levels of government, industry, NGOs and community organizations to develop and carry out an action plan to target textiles.

2.4.1.4 Mattresses

As detailed in Technical Memorandum 1, the Region's contracted third-party provider collects bulky waste, such as mattresses, curbside every two weeks. Collection is limited to three items per single family home or legal duplex and ten items per small apartment building (three to six units). Residents can also drop off bulky items at a depot for $102 per metric tonne.

2.4.1.4.1 Guelph, Ontario – Mattress Recycling Program

In April 2025, Guelph launched a Mattress Recycling Program to minimize landfill waste by recycling materials from discarded mattresses[53]. Residents can drop off mattresses at the Waste Resource Innovation Centre for a $25 fee or opt for curbside pickup through the Large Item Pickup Program, costing $60 for one item and $27 for each additional item. These fees cover the recycling costs. Guelph anticipates diverting approximately 3,000 mattresses, or 65,000 kg of waste, from landfills annually through this program.

2.4.1.4.2 San Francisco, USA – Mattress Recycling Program

California's Mattress Stewardship Program supports reuse, recycling or proper disposal of used mattresses, box springs and futons. CalRecycle oversees the program, which is run by Mattress Recycling Council, the nonprofit stewardship organization created by mattress manufacturers, renovators and retailers[54]. The program began in 2015 and is funded by a recycling fee collected at the point of sale for each new mattress and box spring sold in California[55].

Recology, the third-party collections provider to San Francisco, offers a free Bulky Item Recycling pickup service for San Francisco residents, which

[53] https://guelph.ca/2025/03/keep-mattresses-out-of-the-landfill/
[54] https://mattressrecyclingcouncil.org/programs/california/
[55] https://calrecycle.ca.gov/mattresses/

includes mattress disposal[56]. Residents can schedule a curbside pickup for two bulky item recycling collections per year and mattresses are a typical item picked up during these collections.

2.4.1.4.3 Summary – Mattresses

In summary, examples from selected jurisdictions for increasing diversion of textiles and mattresses from the landfill include:

- Offer educational resources and information on donation opportunities and locations;
- Partner with other levels of government, industry, NGOs and community organizations to develop and carry out an action plan to target mattresses; and
- Providing residents opportunities to recycle items for a fee by using third party recyclers.

2.4.2 Approaches and Technologies for Waste Monitoring

Waste program data is essential for tracking of performance, trends, identifying priority areas and monitoring changes to the waste stream over time. Waste composition audits provide an understanding of waste generation and sorting practices by generators. Due to their resource intensive nature, municipalities vary in their approach to waste composition audits. The Region conducted curbside waste composition audits in 2012/2013, 2018/2019 and 2023/2024 (Technical Memorandum 1). At the time of writing this report the Region is conducting additional waste composition audits of inbound loads at the Waterloo Landfill to provide an understanding of materials received from the IC&I, large apartments, C&D sectors as well as self-hauled materials.

Advances in technology are allowing for the collection of data and program monitoring on a much larger scale due to advancements in automation. Some municipalities are using new or emerging technologies to gather more data about their waste programs.

[56] https://www.recology.com/recology-san-francisco/bulky-items/

2.4.2.1 Waste Composition Audits

Waste composition audits serve as a highly effective method for quantifying waste types, assessing sorting and diversion practices, and gaining insights into residents' comprehension of the waste management system. Despite being manual and resource-intensive, these audits are considered the best practice in waste monitoring. Jurisdictions may differ in their approach to conducting these audits, varying in frequency, size and scope to suit their specific needs and resources.

2.4.2.1.1 Guelph, Ontario – Waste Composition Audits and Inspections

Guelph aims to conduct comprehensive waste audits every two years by contracting a third-party waste auditing company. The waste audits involve single homes, small apartment and large apartment buildings that are repeated each season to capture fluctuations and variability over the course of the year.

Additionally, seasonal co-op students complete visual waste inspections several times per year. The students visit the same homes each week for 4 to 6 weeks on collection day and conduct visual inspections of each cart (all waste streams, including yard waste) placed at the curb and assess percent contamination based on what is visible in the cart. The program gathers data on set out rates, visual contamination and commonly missorted items. Residents also receive direct education and outreach as part of the program, including door-to-door outreach, sorting guides and receiving feedback on their sorting. Information gathered throughout the program helps to inform outreach and communications activities and evaluate improvements over time.

2.4.2.1.2 Durham, Ontario – Waste Composition Audits

Durham conducts waste composition audits to support their objective of reducing the quantity of waste disposed. Waste audits were completed in 2022 and 2023, including curbside set outs from 1,000 homes across the region and six large apartment buildings[57].

Auditing of waste composition provides information on the quantities of unavoidable and avoidable food waste, recyclable materials, durable goods, textiles, SUPs, etc. remaining in black bag garbage and avoidable food waste

[57] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Annual-Reports/2023-Region-of-Durham-Annual-Report---ACC.pdf

and compostable packaging in the green bin organics program, which helps inform future communication priorities.

2.4.2.2 Use of Technology for Waste Monitoring

Jurisdictions are adopting new technologies for monitoring waste disposal. Tools such as artificial intelligence (AI), cameras, sensors and mobile apps offer both qualitative and quantitative evaluations of waste. Some of these technologies are still in the development stages, meaning that they require validation using traditional monitoring methods such as audits or visual inspections. Since these technologies are still in development, the jurisdictional scan revealed only a few examples. To provide a more complete picture of these emerging waste monitoring technologies, additional insights have been incorporated from Dillon's internal knowledge library.

2.4.2.2.1 AI-Enabled Camera Solutions

One technology involves the use of AI-enabled cameras to detect curbside waste set out and contamination in waste streams. These cameras can be mounted on collection vehicles to monitor waste set out rates and verify missed collections. Many communities across Canada are using these including the Regional District of Central Okanagan, Alberni Clayoquot Regional District, Cities of Abbotsford, Lethbridge and Leduc.

For contamination monitoring, AI cameras are installed on fully automated side loaders, equipped with high-precision Global Positioning System (GPS) units and touchless computers. As trucks collect materials, the cameras read cart identification (IDs) and combined with GPS data, identify the collection address. The cameras inside the truck hopper analyze cart contents as they are unloaded into the truck, identifying contaminants from a predefined list. Technologies such as Prairie Robotics can assign each detected contaminant to a specific cart ID, providing accurate household assignment[58].

Within the Software as a Service (SaaS) system, administrators can review images from households where contamination is detected. Notifications, such as postcards or letters, can be sent to inform residents of infractions. The Prairie Robotics system also integrates with digital notification tools such as Recycle Coach and Routeware, enabling digital alerts. Other companies

[58] https://www.prairierobotics.com/

offering similar technologies include Lixo and Waste Vision[59],[60]. Multiple jurisdictions in Canada and the USA are currently using this type of technology and several are summarized in the following subsections.

2.4.2.2.1.1 Peel, Ontario – AI and Power BI to Monitor and Track Waste Metrics

Peel is working on pilot projects to collect information on set out rates and contamination from large apartment buildings [61]. Peel will be pilot testing the use of AI technology to support Peel's set-out studies, which are used to determine program participation rates and resident understanding of their programs. This pilot enables real-time data collection across Peel, reducing staff resources and time. It supports accurate, timely reporting for developing targeted communication campaigns and enforcement.

Additionally, Peel is piloting the use of AI to collect information on contamination rates in large apartment buildings recycling using cameras mounted inside front-end bins.

2.4.2.2.1.2 Regina, Saskatchewan – SortSmart Education Program

As described in **Section 2.4.5.2**, Regina's SortSmart Education program uses AI-enabled camera technology to detect contamination in recycling and food and yard waste streams[62]. Regina is currently using the program as an education and engagement program for its residents; however, the data can also be used to monitor contamination in waste streams over time.

2.4.2.2.1.3 Abbotsford, BC– AI to Measure Contamination and Provide Feedback

As described in **Section 2.4.5.2**, Abbotsford uses Prairie Robotics' AI-enabled cameras to detect contamination at the curbside. The program is more cost effective than manual curbside inspections; however, manual inspections are required for escalated enforcement for recycling contamination.

[59] https://en.lixo.tech/
[60] https://wastevision.ai/
[61] https://peelregion.ca/sites/default/files/2024-09/2023%20budget%20business%20plan%20-%20waste-management.pdf
[62] https://www.regina.ca/home-property/recycling-garbage/recycling/cartsmart-education/

2.4.2.2.1.4 Metro Vancouver, BC – Camera Based Sensors to Detect Banned Items and Fullness

In 2022, Metro Vancouver investigated the use of AI camera-based sensors, to improve waste collection[63]. The project involved installing 20 sensors in the City of Burnaby's large apartment collection bins over three months to monitor banned items from disposal (bulky items, wire, hosing, rope and cable >1 metre (m), electronics, foam packaging, construction and yard waste) and fullness levels. The goal of the project was to evaluate the ability of AI camera-based bin sensors to provide users with useful information to improve collection programs and identify materials banned from disposal. To answer this, visual audits of dumpsters and analysis and reviews of bin sensors were completed.

The results showed a 43% success rate in identifying banned items and an 88% correlation with human auditors on fullness levels. Findings suggest that while AI requires more training, the visuals are helpful and fullness monitoring is accurate.

2.4.2.2.2 Mobile Apps

To avoid duplicating work or losing field data, many municipalities use mobile apps to track information collected from curbside audits. Mobile apps provided by Routeware[64], Prairie Robotics[65] and ArcGIS Survey 123[66] allow staff to conduct lid-flip audits on the street and collect information and photographs in the field from a mobile app that sends the information to a centralized database in their SaaS dashboard. Other options such as Zabble incorporate the use of AI technology into the mobile app helping to speed up the process of identifying contaminants and helping to reduce human error[67].

2.4.2.2.3 Radio Frequency Identification Tags

The use of Radio Frequency Identification (RFID) tags on waste carts, was an emerging technology that now comes standardized in waste carts (including the Region's black and green cart as part of the 2026 curbside collection changes), providing jurisdictions with the ability for:

[63] https://swananorthernlights.org/wp-content/uploads/2022/04/2B-Maria-Lo-Klaryssa-Lawrie-Smart-Camera-Pilot-SWANA-Northern-Lights-2022.pdf
[64] https://routeware.com/
[65] https://www.prairierobotics.com/
[66] https://survey123.arcgis.com/
[67] https://www.zabbleinc.com/

1. **Identification and Tracking**: Each RFID tag contains a unique identifier. This allows waste management companies to track individual carts, so that they are serviced correctly and returned to the right location.
2. **Route Optimization**: By tracking the location and status of waste carts, companies can optimize collection routes. This leads to more efficient operations, reducing fuel consumption and time spent on the road.
3. **Service Verification**: RFID tags can be used to verify that a waste cart has been serviced. When a collection truck equipped with an RFID reader passes by, it automatically scans the tags, recording the time and location of service. This helps in maintaining accurate records and resolving disputes about missed collections.
4. **Inventory Management**: RFID technology helps in managing the inventory of waste carts. It allows companies to keep track of the number of carts in use, those that need maintenance and those that are lost or stolen.
5. **Data Collection and Analysis**: The data collected from RFID tags can be analyzed to gain insights into waste generation patterns, helping municipalities and companies to plan better waste management strategies and policies.
6. **Billing and Accountability**: RFID tags can be used to implement pay-as-you-throw (PAYT) systems, where residents are billed based on the amount of waste they generate. This encourages waste reduction and recycling.
7. **Maintenance and Asset Management**: RFID tags help in scheduling and tracking the maintenance of waste carts, confirming they are in good condition and extending their lifespan.

Overall, the use of RFID tags in waste carts enhances operational efficiency, improves customer service and supports sustainable waste management practices.

2.4.2.2.4 Summary – Approaches and Technologies for Waste Monitoring

In summary, examples from selected jurisdictions for approaches and technologies for waste monitoring:

- Perform regular waste composition audits, including single family and small apartment building streams;
- Use AI-enabled cameras to identify set out rates and contamination at the curbside;
- Use cameras or sensor technology to detect bin fullness (especially useful for large apartment buildings or IC&I applications);
- Use mobile apps to collect, store and analyze waste data; and

- Use RFID to monitor waste carts which supports a variety of optimization opportunities.

2.4.3 Metrics and Key Performance Indicators for Waste Reduction

Historically, the Region measured waste management performance using the residential waste diversion rate (the percentage of waste diverted from landfill), as calculated by the Resource Productivity and Recovery Authority (RPRA). This metric allowed the Region to establish a baseline for performance and benchmark progress against other Ontario municipalities. Due to the recent Blue Box transition to the EPR framework, the Region, nor other Ontario municipalities no longer have Blue Box data reports, making it difficult to calculate the contribution to diversion. Ontario municipalities have adopted new metrics to assess overall waste system performance.

Across Canada, jurisdictions are using program-specific indicators, such as participation rates, capture rates, survey feedback and social media engagement to evaluate diversion programs. Some metrics must be further supported by waste composition data. For example, green bin organic waste contamination rates track non-organic materials in organics collection. These metrics provide insights into program success and support decisions on program expansion.

2.4.3.1 Toronto, Ontario –Circular Economy Baselining and Forthcoming Circular Economy Roadmap

Toronto's primary waste performance indicator is the residential diversion rate, reported separately for single family dwellings, small and large apartment buildings, with material-specific breakdowns (e.g., organics, yard waste, mattresses, etc.).

Toronto is also advancing circular economy goals, aiming to become Ontario's first circular city. Current efforts focus on four sectors: community engagement, waste, construction and food. Preliminary goals and indicators were outlined in Baselining for a Circular Toronto (2022), aligned with the United Nations Sustainable Development Goals and Results Based

Accountability model[68]. Final metrics will be confirmed with the completion of their Circular Economy Roadmap (Roadmap) within two years of the completion of the report. Examples of proposed numerical indicators include:

- **Community**: Materials repaired, tool libraries per neighbourhood and number of donation-based initiatives;
- **Food**: Food waste generated citywide; organics participation across IC&I and residential sectors;
- **Waste**: IC&I waste audits; GHG emissions from waste; organic waste recovery rates; and
- **Construction**: C&D waste volumes; circular procurement in projects; reuse of demolition materials.

2.4.3.2 Durham, Ontario – System and Program Metrics

Durham tracks a range of annual waste management metrics, reported through its Waste Management Annual reports. Key indicators include:

- Diversion rate, as calculated by RPRA, ended in 2022 (measured as a percentage)[69];
- Waste generation rate (measured in kilograms per capita)[70];
- Green bin organic waste generation rate (measured in kilograms per capita)[71];
- Green bin organic waste diversion (measured as a percentage)[72];
- Total residential waste managed (measured in tonnes)[73];

[68] https://www.toronto.ca/city-government/accountability-operations-customer-service/city-administration/city-managers-office/policy-excellence/
[69] https://www.durhamyorkwaste.ca/en/education-and-resources/resources/Documents/2022%20Waste%20Diversion%20Reports/20231031_LTR_DurhamRegion-MECP_DYEC_Durham_Region_2022_Annual_Waste_Diversion_Report_Submission_ACC.pdf
[70] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Annual-Reports/2023-Region-of-Durham-Annual-Report---ACC.pdf
[71] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Annual-Reports/2023-Region-of-Durham-Annual-Report---ACC.pdf
[72] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_Action_Plan_FINAL_Jan-31-2022-AODA.pdf
[73] https://www.durhamyorkwaste.ca/en/education-and-resources/resources/Documents/2022%20Waste%20Diversion%20Reports/20231031_LTR_DurhamRegion-MECP_DYEC_Durham_Region_2022_Annual_Waste_Diversion_Report_Submission_ACC.pdf

- Quantity of Blue Box recyclables in garbage (measured as a percentage)[74];
- Quantity of textiles in garbage (measured as a percentage)[75];
- Battery and electronic waste diverted (measured in tonnes); and
- Program participation (e.g., number of mobile app subscribers).

Durham also conducts regular waste composition audits to inform baseline data.

2.4.3.3 Peel, Ontario – System Metrics, AI and Educational Campaigns

Peel tracks key waste metrics to monitor program performance. Diversion rates have remained steady between 47 and 50%. Since the Blue Box transition, Peel began tracking overall and stream-specific household waste generation (garbage, recycling and organics) quarterly, with annual reporting. Recycling and organics capture rates are measured annually, while garbage composition is assessed quarterly to identify misplaced recyclables and organics. Power BI summary dashboards are used to monitor metrics and support decision-making. AI has been piloted in curbside collection to evaluate participation and contamination in large apartment building recycling. Education campaigns are evaluated using marketing Key Performance Indicators (KPIs), including ad reach, digital engagement, web traffic and social media sentiment.

2.4.3.4 Halton, Ontario – Overall and Program-Specific Metrics

Halton's Solid Waste Management Strategy (SWMS) defines a number of strategic actions intended to enhance diversion, enhance service and accessibility, maintain financial and environmental sustainability, support partnerships, outreach, and public engagement and promote a circular

[74] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_Action_Plan_FINAL_Jan-31-2022-AODA.pdf
[75] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_Action_Plan_FINAL_Jan-31-2022-AODA.pdf

economy. The SWMS introduces KPIs including diversion rates, per capita statistics (e.g., waste disposed, diverted and generated), GHG emissions (in kg of CO_2e), impact to landfill lifespan, cost per tonne and cost per household for waste management services and resident satisfaction/participation.

Halton's diversion rate has plateaued around 58 to 60% in recent years. Per capita disposal rates are also used to assess the tonnage of waste going to the landfill annually. In 2023 the per capita disposal rate was 145 kg per person. Other metrics (e.g., total tonnes, contamination rates, participation rates and capture rates) are used to monitor diversion from specific programs, such as textiles diversion or organic waste collection.

2.4.3.5 HRM, Nova Scotia – System Metrics and Climate Change

HRM tracks diversion rates, per capita disposal rates and total waste disposed by sector. Quarterly waste audits assess organics in the garbage stream. Key long-term targets guiding performance include:

- Reduce disposal from 400 kg/capita in 2023 to 300 kg/capita by 2030 (provincial target);
- Cut waste generation by 30% by 2050 (versus 2016 baseline);
- Align with HalifACT climate goals:
    - 75% emission reduction by 2030; and
    - Net-zero emissions by 2050.

Additional metrics include:

- **GHG & Energy:** Emissions from waste and energy recovery;
- **Education:** Program participation (surveys), number of outreach activities; and
- **Enforcement:** Offence tickets, illegal dumping and waste discrepancies.

HRM is also currently developing circular economy indicators.

2.4.3.6 Montréal, Quebec – Circular Economy Roadmap

Montréal recently released their 2024 to 2030 Montréal Roadmap. The Roadmap outlines priority action targets, municipal tools to support implementation, key areas of focus and sectors where circular practices will

be accelerated. The priority focus areas include bio-food, construction, renovation and demolition, textiles, plastics and mobility, and logistics.

Montréal uses the Circular Economy index[76] to measure the progress of circular initiatives. The Circularity Metric, or Secondary Material Inputs, refers to the share of secondary materials out of the total consumption of an economy. It accounts for all materials that were formerly waste, but are cycled back into use, including recycled materials from both the technical (such as recycled cement and metals) and recycled biological inputs (such as paper and wood). Montréal's Circular Economy index is currently estimated at 3%, with a target of 6% by 2030 and 17% by 2050. Other indicators calculated include renewable material inputs (21%), recyclable inputs (30%), fossil fuel inputs (10%) and net additions to stock (36%). A methodology document has been delivered; however, it is not available in the public domain.

2.4.3.7 Regina, Saskatchewan – Waste Diversion Rate

Regina currently tracks residential waste diversion rates and waste generated to determine if there is a reduction year over year. A residential waste diversion goal of 65% has been set for the city[77]. Waste composition data is monitored annually.

2.4.3.8 Edmonton, Alberta – Waste Diversion Rate

Edmonton tracks residential waste diversion rates with a goal set to achieve 70% diversion by 2025 and an overall 90% diversion rate from single family households. Their services will include a communal three-stream collection whereby they are expanding three-stream collection (organics, recycling and residual garbage) to the multi-unit residential areas over multiple years planned to be transitioned by the end of 2027.

[76] https://www.circularity-gap.world/montreal
[77] https://www.regina.ca/export/sites/Regina.ca/home-property/recycling-garbage/.galleries/pdfs/Waste-Plan-Regina_2023_FINAL_LR.pdf

2.4.3.9 Metro Vancouver, BC – Integrated Solid Waste and Resource Management Plan

Metro Vancouver's Integrated Solid Waste and Resource Management Plan (2011, currently under review for an update) sets four key goals, each with associated performance metrics:

1. Minimize Waste Generation:
   - Total waste generated (all sectors);
   - Number of new product stewardship programs with a target of greater than two, every three years (e.g., mattresses and box spring foundations, hybrid and electric vehicle batteries, packaging and paper products, beyond residential sources, namely the IC&I sector); and
   - Reduction in waste generated.
2. Maximize Reuse, Recycling and Material Recovery:
   - Overall and per capita diversion rates;
   - Recycling tonnages and materials recovered; and
   - Total waste disposed.
3. Recover Energy After Recycling:
   - Energy recovered from waste and its beneficial use;
   - Energy outputs from non-recyclables via recycling/stewardship; and
   - GHG emissions from waste-to-energy facilities.
4. Landfill Remaining Waste Only:
   - Total waste disposed and disposed per capita.

Metro Vancouver also supplements its data with reports from EPR programs, reuse/repair organizations, municipal surveys and unlicensed facilities.

2.4.3.10 Richmond, BC – System Metrics, Customer Service and Enforcement

Richmond tracks residential diversion rates, tonnes and composition of diverted materials and vehicle visits to the Recycling Depot. Customer service and outreach metrics include call volumes, outreach events and attendance, mobile app downloads and engagement and top-searched materials, which are used to measure the success and reach of specific outreach campaigns and educational initiatives. Enforcement of proper sorting, illegal dumping and

proper waste set-out under the Solid Waste and Recycling Regulation (By-law No. 6803) is monitored through the number of illegal dumping cases and bin inspections.

2.4.3.11 Vancouver, BC – Zero Waste Disposed by 2040

Vancouver monitors the total waste disposed at the landfill or incinerator by both residents and the commercial sector, as well as the reduction in the amount of waste disposed. Metro Vancouver regional data is used and scaled to represent Vancouver's share by population for the large apartment building, commercial and construction sector. These metrics are intended to support Vancouver's goal of zero waste disposed to the landfill and incinerator by 2040[78].

2.4.3.12 Abbotsford, BC – Contamination Remediation Plan and GHG Emissions Targets

Abbotsford tracks residential diversion rates to support the Fraser Valley Regional District's 90% diversion target by 2025. Contamination is monitored through annual curbside audits, aligned with the Abbotsford's Contamination Remediation Plan[79]. A 25% reduction in recycling contamination is currently targeted between April and December 2025.

The City's Official Community Plan (OCP) is being updated. The 2016 OCP set GHG reduction targets for solid waste at 20% by 2025 and 40% by 2040. A new Community Energy and Emissions Inventory in 2025 will inform updated targets.

2.4.3.13 New York State, USA – Recycling Rates

New York State currently tracks recycling rates and per capita disposal rates to monitor program performance. This data is used to measure progress against the strategic goals outlined in its SWMP and to inform future state and local waste reduction policies. The New York SWMP outlines key objectives including waste reduction, organic waste diversion from landfills and a reduction of 85% in landfilling and combustion by 2050.

[78] https://council.vancouver.ca/20180516/documents/pspc2a.pdf
[79] https://www.abbotsford.ca/CRP

2.4.3.14 Seattle, USA – Weight-Based Metrics

Historically, Seattle uses sector-specific waste tonnages (e.g., single family, small and large apartment buildings, self-haul and commercial) and waste composition data (audits) to assess waste management performance. However, Seattle has moved towards capturing weight-based metrics to capture waste reduction more effectively, such as per capita generation rates and per capita disposal rates. Seattle will also begin monitoring capture rates for recycling, C&D diversion rates and annual tonnages of food waste disposed in the garbage stream. New targets associated with the new metrics will be published in Seattle's 2024 Annual Waste Prevention and Recycling Reports in October 2025.

2.4.3.15 Summary – Metrics and KPIs

Municipalities across Canada and internationally are modernizing how they measure waste system performance, with some jurisdictions moving beyond the traditional diversion rate due to limited access to Blue Box data under Ontario's EPR transition. New performance indicators include:

- Participation and capture rates for diversion programs (e.g., organics, recycling);
- Waste generation and disposal rates (per capita and total tonnes);
- Contamination levels in streams such as organics and recycling streams;
- GHG emissions from waste and energy recovery; and
- Education and outreach metrics, such as event attendance and social media engagement.

Leading practices show a shift toward integrated metrics that align with climate goals, circular economy principles and sector-specific targets. Cities such as Toronto and Montréal are incorporating circularity indicators, while regions such as Peel and Durham use real-time data dashboards and AI to track performance and contamination. Municipalities such as HRM and Vancouver link waste KPIs directly to GHG and circular economy targets. For the Region, there is an opportunity to build on this approach by establishing a business-as-usual (BAU) emissions baseline for methane generation at the landfill and estimating potential reductions if the plan's recommended actions are implemented. This would create a clearer connection between waste

system improvements and broader climate objectives, supporting future reporting and integration with corporate emissions reduction strategies.

Regularly conducted waste audits, digital tools and public participation data now support more granular, responsive decision-making, with a growing focus on program effectiveness, behaviour change and climate impact.

2.4.4 Leading or Comparable Waste Plans

The waste plans and strategies in the following subsections have been identified as best practices due to the inclusion of reduction, reuse and circular economy objectives. In reviewing these examples, the Region may better understand how other jurisdictions have established Council-approved plans that take an approach that prioritizes extending landfill life by minimizing the quantity of waste generated and establishing circular economy, reuse and diversion opportunities. The following waste plans and strategies have similar visions and guiding principles and understand the importance of taking a strategic and long-term view when planning waste management programs, services, infrastructure and resources.

2.4.4.1 Guelph, Ontario – Solid Waste Management Master Plan (2021 to 2041)

In 2022, Guelph City Council adopted the 2021 Solid Waste Management Master Plan (SWMMP). This SWMMP was developed as an update of Guelph's 2014 SWMMP, with the intention to explore new and innovative ways of supporting the community's needs in the context of future population growth. The SWMMP provides a 20-year waste forecast (i.e., to 2041) and recommended actions to implement in the short, medium and long-term. Overall, the SWMMP overview aims to build on Guelph's leadership in "waste minimization and diversion for a sustainable, service-focused and economically viable future-ready community"[80].

The SWMMP update provided 29 recommendations, which were clustered into the following 11 categories:

- Support the Circular Economy;

[80] https://guelph.ca/plans-and-strategies/solid-waste-management-master-plan/

- Future State (including Blue Box EPR);
- Single-use Items;
- Downtown Services Review;
- IC&I Waste Programs and Services (and approve applicable changes to the Waste Management By-law);
- Promotion and Education;
- Reuse;
- Recycling;
- Data Gathering;
- Education and Enforcement; and
- Funding Waste Management Services and Programs.

2.4.4.1.1 Circular Economy in the SWMMP Update

The most distinguishing aspect of the SWMMP Update was the introduction of recommended actions to move towards a circular economy. In adopting the SWMMP Update, Guelph prioritized a circular economy framework to advance its long-term goals for waste reduction and resource efficiency[81]. Notably, Guelph's Our Food Future[82] initiative was awarded $10 million from the Federal Government through Infrastructure Canada's (INFC) Smart Cities Challenge. While not directly managed through Guelph's waste management department, it set an ambitious goal for Guelph/Wellington to be Canada's first technology-enabled circular food economy.

Furthermore, in 2021, the Smart Cities Office launched COIL, which built on the work of Our Food Future. COIL functioned to accelerate circular businesses in the food and environment sectors and launched a series of larger scale challenges and demonstration projects.

As well, in 2022, COIL launched Zero Waste Economic Transformation Lab (ZWETL). While ZWETL was also administered independently from the Solid Waste Management department, it advanced the circular economy in the region with a focus on various material-streams, using new approaches and models to generate innovation, infrastructure and sustainable secondary markets necessary for recovery, recycling and reuse[83].

[81] https://guelph.ca/wp-content/uploads/Guelph-2021-SWMMP-Executive-Summary.pdf
[82] https://foodfuture.ca/
[83] https://guelph.ca/wp-content/uploads/Canadas-Smart-Cities-Challenge-Q1-2023.pdf

The Smart Cities Office closed after the funding from the Smart Cities Challenges was expended in December 2023; Guelph's circular economy initiatives now continue within the Solid Waste Department. Staff are currently working on an initiative to implement a circular procurement program across city departments. A forthcoming Sustainable City Plan and Circular Economy Roadmap development are two additional initiatives that have stemmed from the introduction of circular economy in the SWMMP Update.

2.4.4.2 Toronto, Ontario – LTWMS (2016 to 2026)

Toronto's LTWMS was developed over two years and was adopted by Council in 2016. The process involved extensive research on the current waste management system and anticipated future needs and comprehensive public consultation and engagement activities, including a wide range of interested partners from industry and business representatives to members of equity-deserving groups.

Notably, the LTWMS recommends waste reduction, reuse, recycling, recovery and residual disposal policies and programs, following the 'waste hierarchy' that prioritizes the former before the latter. As well, Toronto evaluated its options for actions based on a triple-bottom line approach that considers cost-effectiveness, social acceptability and environmental sustainability over a long-term horizon. The LTWMS vision statement is:

> "Together we will reduce the amount of waste we generate, reuse what we can and recycle and recover the remaining resources to reinvest back into the economy. We will embrace a waste management system that is user-friendly, with programs and facilities that balance the needs of the community and the environment with long term financial sustainability. Together, we will ensure a safe, clean, beautiful and healthy city for the future[84]."

More specifically, the following three targets, to achieve in the first 10 years of the LTWMS included:

- Achieve 70% diversion of residential waste managed by Toronto by Year 10 of the LTWMS (2026). This includes waste from single family

[84] https://www.toronto.ca/wp-content/uploads/2017/10/9803-Final-Long-Term-Waste-Management-Strategy.pdf

residences and large apartment buildings serviced by Toronto and translates to additional diversion of about 150,000 tonnes by Year 10;
- Achieve70% diversion of materials collected (green bin, Blue Box, garbage) from IC&I customers that receive Toronto collection services by Year 10 of the Waste Strategy (2026); and
- The overall target is diversion of 200,000 tonnes by Year 10 of the LTWMS. This may be achieved through diversion of an additional 50,000 tonnes from sources currently not serviced by Toronto (through implementation of mandatory waste diversion by-laws for all large apartment buildings, regardless of service provider and additional service to small IC&I establishments)[85].

Overall, the LTWMS set a course for Toronto to focus on reduction and reuse, and to increase diversion to the extent possible. Through the development of the LTWMS, Toronto adopted the goal to achieve zero waste over the longer term. Information on the circular economy initiatives that emerged from the LTWMS is provided in **Section 2.4.6.1** and information on CRRPs that emerged from the LTWMS is provided in **Section 2.4.6.2**.

In June 2023, Toronto City Council directed Solid Waste Management Services to update the LTWMS. This direction stemmed from Solid Waste Management Services Division's recognition that Toronto's Green Lane Landfill is expected to approach its capacity by 2035 and that additional planning is required for the management of its residual waste[86]. As the city's population grows, Toronto had been considering its long-term disposal options, which is a key driver for the strategy update currently being developed.

2.4.4.3 Durham, Ontario – Long-Term Waste Management Plan (2022 to 2040)

Durham adopted their 2022 to 2040 Long-term Waste Management Plan (Waste Plan) which is focused on maximizing the diversion of materials from waste and recovering waste as resources. The Waste Plan aims to optimize Durham's existing and planned disposal and processing infrastructure and

[85] https://www.toronto.ca/wp-content/uploads/2017/10/9803-Final-Long-Term-Waste-Management-Strategy.pdf
[86] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-strategy/

minimize the need for disposal[87]. The Durham York Energy Centre (DYEC), processes approximately 140,000 tonnes per year of residential garbage, which is mostly generated by Durham residents, although the Regional Municipality of York (York) contributes to the waste tonnage[88].

The Waste Plan replaces the previous Waste Plan that considered the management of waste from 1999 to 2020. The Waste Plan set short-term targets and actions to be implemented from 2022 to 2026 and is expected to be updated at five-year intervals. The Waste Plan includes the following five key objectives:

1. Engage with residents to build an understanding and awareness of the 5Rs (Rethink, Reduce, Reuse, Recycle, Recover) and the region's waste management programs and services;
2. Reduce the quantity of waste we create;
3. Increase diversion of waste from disposal and support the circular economy;
4. Support Durham's GHG reduction and climate change mitigation efforts.
5. Protect or improve water, land and air quality in the region[89].

Circular economy principles are integrated into their comprehensive Waste Plan and associated actions. Waste management programs are designed to provide easy and convenient options for residents to reduce and reuse to avoid creating garbage. Curbside options for diverting food and organic waste, yard waste, batteries, electronics, metal and porcelain all provide convenient recycling options for residents. Additional diversion opportunities for tires, electronics, Household Hazardous Waste (HHW) and Blue Box Materials are provided at Durham's waste management facilities.

In cooperation with local municipalities, Durham promotes Rethink and Reduce initiatives, including the promotion of Curbside Giveaway Days in the spring and fall each year to encourage residents to shop at the curb[90].

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[87] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_LTWMP_FINAL_Jan-31-2022-AODA.pdf
[88] https://www.durhamyorkwaste.ca/en/index.aspx
[89] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_Action_Plan_FINAL_Jan-31-2022-AODA.pdf
[90] https://www.durham.ca/en/living-here/special-events-in-waste-management.aspx

To support initiatives under its Waste Plan, Durham partners with a number of other municipalities and organizations. For example, a recent partnership with CIC includes Durham resources on the Share Reuse Repair Hub. Municipal and industry associations, described in **Section 2.4.10.2** are also important supports for staff to continue learning while implementing the Waste Plan's actions.

2.4.4.4 HRM, Nova Scotia – Solid Waste Strategy (2025 to 2030)

HRM is updating its Solid Waste Strategy (SWS) for the five-year period 2025 to 2030. The draft strategy aims to work towards Nova Scotia's target of reducing per capita waste disposal to 300 kg per person by 2030. As well, it seeks to align the solid waste system with HRM's Council's action plan to achieve a net-zero economy by 2050 – the HalifACT climate action plan.

Key objectives of the SWS are to:

- Maximize the reduction, reuse and recycling of waste resources;
- Enhance the environmental sustainability of waste programs;
- Ensure the fiscal sustainability of waste services;
- Foster public stewardship and conservation; and
- Develop a more efficient, circular and environmentally responsible waste management system.

Key themes in the SWS include legislative changes, including planning for the continuation of recycling collection while ceasing to process Blue Box type recyclables under the provinces new transition to EPR. As well, staff may play a role in advocating for additional EPR programs (e.g., for sharps), standardization of design requirements for waste storage rooms in large apartments and requirements for deconstruction or waste salvaging.

As the SWS work progresses, consideration is expected to be given to options such as the conversion of landfill gas (LFG) to renewable electricity, the introduction of clear collection bags for IC&I customers and improvements to large apartment buildings. Transitioning to cart-based collection for garbage and organics waste is also expected[91] and support and promotion of

[91] https://cdn.halifax.ca/sites/default/files/documents/city-hall/standing-committees/240613essc1311pres.pdf

organizations/events that support circular economy solutions (clothing swaps, reusables, mending workshops, etc.)

Through collaborations with Halifax Partnership and Volta (an AI startup), HRM provides resources such as performance coaching, domain-specific advisors and funding opportunities to CleanTech startups focused on sustainability and circular economy solutions[92]. Recognizing that securing resources is a significant challenge, HRM seeks external grants to support its waste strategy and CleanTech initiatives. Through funding from sources such as Divert NS and provincial climate action programs.

Capacity building and sharing of information is through membership/ participation, consultations (CIC, Circular Economy Leadership Canada, Canadian Circular Cities and Regions Initiative, Environment and Climate Change Canada, Nova Scotia Environment and Climate Change, NZWC, etc.)

2.4.4.5 Edmonton, Alberta – Future of Waste (2019)

In 2019, Edmonton Council adopted its 25-year Waste Strategy (Waste Strategy) which aims to reduce the quantity of waste to landfill and maintain stable rates charged for waste services. The Waste Strategy focused on waste prevention and waste reduction and encourages a circular economy culture. Its objective was to balance environmental outcomes with financial management of providing waste services.

Waste Services prioritizes waste prevention and reduction initiatives across all sectors. In May 2021, the Waste Reduction Roadmap[93] was approved and is a commitment of the 25-year Waste Strategy. The Waste Reduction Roadmap describes programs and activities designed to reduce the quantity of waste that is both generated and disposed of in Edmonton. The goal is to reduce the quantity of waste generated per person in Edmonton by 20% over the course of the 25-year Waste Strategy, with 0% growth in residential waste generation per person from 2021 to 2024.

Edmonton's focus will be on creating change by:

- Supporting Edmontonians in making the behavioural and operational shifts necessary to reduce waste;

[92] https://halifaxpartnership.com/sites/default/uploads/Research-Strategy-Section/Economic-Strategy-October-31-23-HRM-Info-Report.pdf
[93] https://www.edmonton.ca/sites/default/files/public-files/WRRoadmap.pdf

- Removing barriers to zero waste innovation and circular economy initiatives; and
- Increasing awareness of and participation in waste reduction programs.

Waste Services is currently developing the next Waste Reduction Roadmap, or Roadmap '30, which will identify new actions to help increase waste reduction between 2026 to 2030[94].

2.4.4.6 New York State, USA – SWMMP: Building the Circular Economy Through Sustainable Materials Management (2023 to 2032)

The New York State SWMMP is a 10-year plan covering 2023 to 2032, that builds on the 2010 Beyond Waste Plan. The Beyond Waste Plan had been adopted to shift how waste was managed in New York State: rather than focusing on "end-of-the-pipe" waste management techniques, it set out to look "upstream" and adopt an integrated approach to sustainably manage materials, paying attention to the State's economy. Objectives also included reducing the demand for energy, reducing dependence on disposal, minimizing the emission of GHGs and creating green jobs.

The 2023 to 2032 SWMMP aims to reduce waste and advance the state's transition to a circular economy, while building public understanding of waste management and encouraging the public to take responsibility for their waste. As the New York State Department of Environmental Conservation (NYSDEC) is responsible for waste streams produced by residents, business and other organizations across New York State, the SWMMP contemplates the future management of municipal solid waste (i.e., residential, commercial and institutional waste), C&D waste (including all construction materials from new building construction, demolition, road construction and construction excavation materials), non-hazardous industrial waste and biosolids[95].

New York State achieved a recycling rate of 43% in 2018 and its disposal rate was 4.09 pounds (lbs)/person/day in 2018 (1.86 kg/ person/ day)[96]. The

[94] https://www.edmonton.ca/programs_services/garbage_waste/future-of-waste
[95] https://dec.ny.gov/sites/default/files/2024-05/finalsswmp20232.pdf
[96] https://dec.ny.gov/sites/default/files/2024-05/finalsswmp20232.pdf

SWMMP aims to reduce landfilling and combustion by 85% by 2050 and to work towards the following visions statements:

- Circular economy is realized;
- Collaboration and innovation are commonplace;
- "Waste" is a concept of the past;
- Climate change mitigation is fully implemented;
- Shared responsibility is a given;
- Equitable, inclusive and accessible waste reduction and reuse efforts are widespread; and
- Responsible and resilient markets thrive[97].

The SWMMP sets six focus areas with goals and action items to move the circular economy and materials management industry forward in New York State:

- Waste reduction and reuse;
- Recycling and recycling market development and resiliency;
- Product stewardship and EPR;
- Organics reduction and recycling;
- Toxics reduction in products; and
- Advanced design and operation of solid waste management facilities and related activities[98].

2.4.4.7 Summary - Leading or Comparable Waste Plans

In summary, the selected jurisdictions for leading and comparable waste plans and strategies provide a clear roadmap for developing a forward-thinking WMP. Jurisdictions such as:

- Guelph, SWMP;
- Toronto, LTWMS;
- Durham, Waste Plan;
- HRM, SWS;
- Edmonton, Future of Waste; and
- New York State, SWMMP.

[97] https://dec.ny.gov/sites/default/files/2024-05/finalsswmp20232.pdf
[98] https://dec.ny.gov/environmental-protection/waste-management

The review of these plans focused on their strategic inclusion of reduction, reuse and circular economy principles. The common goals and key areas of investigation from these plans were:

1. A commitment to the principles of a circular economy, viewing waste as a resource;
2. The establishment of waste diversion targets, with some jurisdictions aiming for zero waste futures;
3. A strong emphasis on the 5Rs (Rethink, Reduce, Reuse, Recycle, Recover) to minimize the amount of waste sent to landfills;
4. Strategies to enhance and expand programs for organics and recycling, including for the large apartment building and IC&I sectors; and
5. The implementation of EPR policies to shift the responsibility of waste management to producers.

2.4.5 Emerging Public Education and Engagement Techniques

Effective public education and engagement are important for successful municipal waste management and achieving waste reduction and diversion targets. The Region currently offers educational resources on its website, including information on waste collection, drop-off, waste reduction, reuse tips, events and the Waste Whiz app for sorting and collection guidance.

Outreach efforts include Waste Discovery Day, online and community presentations, in person and virtual tours for school groups, workshops and waste worksheets. Technical Memorandum 1 recommends enhancing community engagement and education to focus on waste recovery, proper disposal and increased diversion. Recognizing this, many jurisdictions are adopting innovative techniques to improve public engagement in waste management.

2.4.5.1 Partnerships with Community Groups / Delivery Partners

Many jurisdictions collaborate with community groups or delivery agents to enhance public education and engagement in waste management. Partnering

with third-party organizations optimizes resources, prevents duplication and bolsters existing community efforts.

2.4.5.1.1 Guelph, Ontario – Guelph Tool Library

Guelph collaborates with the Guelph Tool Library, a local non-profit, to plan, market and operate Repair Cafes and RepurposeFest[99, 100]. These events focus on diverting waste through reuse and repair, participation in alternative recycling programs and raising awareness about waste reduction and diversion. Guelph has supported these initiatives by sponsoring Tool Library events to expand their reach. Guelph also frequently funds initiatives through the solid waste outreach budget. Additionally, the Tool Library has previously received funding from Guelph's competitive Community Grants program[101]. Guelph is looking to provide more substantial funding in 2025 to support the Guelph Tool Library through execution of the SWMMP recommendation, Community Sharing and Repair.

2.4.5.1.2 Toronto, Ontario – Various Community Organizations

Toronto supports CRRPs to promote waste reduction, reuse, sharing and repairing, in line with its LTWMS and Toronto Strong Neighbourhood Strategy [102]. CRRPs run community hubs that educate residents, facilitate sharing and repairing and offer skills training and job opportunities. Toronto's Solid Waste Management Services partnered with non-profits through an Expression of Interest process to operate CRRPs based on community needs. Hub locations and programs, such as bicycle and textile repair, were developed with targeted investments in neighborhood improvement areas. Solid Waste Management Services funds these organizations for program management, including volunteer recruitment and event coordination and promotes reuse sites on its website for residents to donate usable items.

2.4.5.1.3 Peel, Ontario – Ecosource

Peel utilizes Ecosource, a third-party vendor, to deliver waste education workshops to elementary and middle schools. Developed by Peel staff, these Virtual Waste Workshops offer live, interactive learning with engaging visual

[99] https://guelphtoollibrary.org/repair-cafe/
[100] https://guelphtoollibrary.org/projects/re-purpose-fest/
[101] https://guelph.ca/city-hall/budget-and-finance/grant-applications/annual-grant-program/2024-community-grant-allocations/
[102] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-reduction/community-reduce-reuse-programs/

tools[103]. The program, including posters, sorting guides and waste management activities, has achieved high teacher satisfaction and increased student knowledge, with 98% of teachers rating their experience four out of five or higher for the 2023 to 2024 school year. On average, 76% of students improved their waste knowledge and 89% successfully answered key questions post-workshop.

Ecosource and Peel won the Gold Award in the Community Engagement and Outreach Program category at the 2021 Municipal Waste Association's (MWA) Promotions and Education Awards for their impactful community engagement approach. The program's success is attributed to partnerships with experienced educators and alignment with school curricula, ensuring teacher and school board participation. Peel also collaborates with EcoSchools to promote the program. The 2023 waste education program's costs totalled $415,500.

2.4.5.2 Technology Approaches

Jurisdictions are increasingly leveraging technology for education and outreach across various topics. These tools enable engagement in digital spaces and expand reach through automation. Currently, the Region utilizes the Waste Whiz app to deliver waste sorting and operational information to residents. There are growing opportunities to further engage with residents through technological advancements.

2.4.5.2.1 Regina, Saskatchewan – SortSmart Education Program

Regina's SortSmart Initiative utilizes AI-equipped cameras on two recycling collection trucks and one food and yard waste collection truck for single family dwellings[104]. These cameras capture images as materials are dumped, analyzing them for contamination, such as non-recyclables in recycling carts or plastics in food and yard waste carts. This technology enables rapid and efficient contamination assessment. The system generates personalized postcards for residents, detailing contamination issues and providing sorting guidance. The postcards feature messaging designed to effectively encourage

[103] https://ecosource.ca/waste-education/
[104] https://www.regina.ca/home-property/recycling-garbage/recycling/cartsmart-education/

behaviour change. A previous 12-week pilot of this program in Regina resulted in a 41.5% improvement in recycling[105].

2.4.5.2.2 Abbotsford, BC– Use of Artificial Intelligence for Targeted Feedback

Abbotsford employs Prairie Robotics' AI software to continuously monitor curbside waste contamination. Cameras mounted on waste collection vehicles, combined with AI, collect data on contamination in waste carts. This method is more cost-effective than manual inspections, though manual checks are still necessary for escalated enforcement of recycling contamination. As an early adopter of this technology, Abbotsford has developed a comprehensive monitoring, education and enforcement program. It is one of the few municipalities in the region to implement significant enforcement measures, including issuing tickets for contamination issues.

2.4.5.2.3 Peel, Ontario – Virtual Facility Tours

Peel offers a 360-degree virtual tour of its Integrated Waste Management and Curing Facilities on its website, allowing the public to learn virtually about waste sorting and processing[106]. Virtual tours of Peel's water and wastewater systems are also available. To support educational use, additional resources are available, including curriculum connections, a teacher guide and student handouts. In 2023, the virtual waste facility tours received the MWA's Gold Award for Promotion and Education in the Community Engagement and Outreach Program category[107].

2.4.5.3 Engagement Approach

Jurisdictions are refining their engagement strategies using insights from psychology, behavioural science and economics. Innovative public engagement methods enhance knowledge and participation in waste reduction and diversion programs. These innovations are crucial for effectively reaching residents with busy lives.

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[105] https://www.prairierobotics.ca/blogs/part-3-how-prairie-robotics-empowers-customized-recycling-education
[106] https://pub-peelregion.escribemeetings.com/filestream.ashx?DocumentId=29296
[107] https://cdn.ymaws.com/municipalwaste.ca/resource/resmgr/2023_spring_workshop/attendee_hub/speaker_presentation_files/pande_awards_2023_v1-compres.pdf

2.4.5.3.1 Guelph, Ontario - Behavioural Insights Gold Star Program

In 2023, Guelph launched a pilot Gold Star Program to acknowledge and positively reinforce residents for effective waste sorting[108]. Developed in collaboration with a third-party vendor, the program involved behavioural insights workshops for staff to aid in its creation. The initiative was an extension of the annual curbside inspection program, where staff inspected waste carts weekly for four weeks. The program aimed to identify and address barriers to proper waste sorting using proven behavioural insights. Guelph staff conducted curbside waste audits and residents who demonstrated effective waste sorting received a Gold Star sticker placed directly on their waste cart. These residents were also entered into a prize draw. The program, developed with input from the Solid Waste and Communications departments, received a Bronze Award in the 2024 MWA's "Surprise Us" category[109]. The use of behavioural insights to identify and develop a targeted program is an innovative approach that is increasingly being used by different levels of government.

2.4.5.3.2 Richmond, BC – Iterative Engagement Approach

Richmond's public engagement strategy for waste management and the circular economy emphasizes capacity and consensus building. As part of developing the Richmond's Circular Strategy[110], public engagement was sought to generate ideas and raise awareness about waste reduction. In 2021, Richmond launched the Rethink Waste campaign, encouraging residents to contribute ideas for reducing waste. Participants in the Rethink Waste Think Tank generated 160 grassroots ideas, which were shared in the Community Ideas Hub on Richmond's website.

The engagement process used straightforward language and iterative methods to gauge changing perceptions and refine messaging. This approach facilitated consensus building, important for achieving community buy-in, especially when public opinions vary widely.

2.4.5.3.3 Metro Vancouver, BC – Consistent Communication Materials

Metro Vancouver's communication program offers a powerful model for achieving regional consistency in waste education. The program is directed by Metro Vancouver and provides a centralized hub of resources intended for

[108] https://reimaginefood.ca/residential-waste-sorting/
[109] https://municipalwaste.ca/page/2024SpringWorkshopPEAwardsWinners
[110] https://www.richmond.ca/__shared/assets/circularcitystrategy202366556.pdf

use across all member municipalities and public settings. At its core is a comprehensive library of free, professionally designed campaign materials and standardized recycling resources[111]. These toolkits are rich with practical assets, including high-resolution, printable signage for creating clear sorting stations, customizable templates, multilingual guides and engaging social media assets and videos for digital outreach[112]. Available year-round for ongoing education and specific campaigns, the program's ultimate purpose is to create a single, clear and consistent message about waste reduction and proper sorting. This cohesive regional branding reduces public confusion and minimizes contamination, with its success driven by its adoption by municipal partners.

2.4.5.3.4 Metro Vancouver, BC - Collaborative Engagement Program

Metro Vancouver's Collaborative Engagement initiative provides funding of up to $5,000 and resources to non-profit organizations[113]. The program's goal is to connect with communities typically underrepresented in regional planning, including youth, seniors, Urban Indigenous Peoples and equity-denied groups[114].

Organizations use the funding and a provided toolkit, which includes templates for a survey, workshop and post-engagement report, to conduct engagement activities directly with their communities on Metro Vancouver's behalf[115]. The primary purpose of this work is to gather feedback and ideas specifically for the idea generation phase of the upcoming SWMP update. This approach allows the development of future waste strategies to be more inclusive and informed by a diverse range of public and community interests.

2.4.5.4 Targeted IC&I / Large Apartment Building Engagement

Since 2010, the Region has undertaken two IC&I food waste initiatives and has supported several IC&I waste reduction initiatives which were cancelled

[111] https://metrovancouver.org/services/solid-waste/recycling-signage-and-resources
[112] https://metrovancouver.org/services/solid-waste/campaign-materials
[113] https://metrovancouver.org/services/solid-waste/collaborative-engagement-program
[114] https://metrovancouver.org/services/solid-waste/Documents/idea-generation-comprehensive-engagement-toolkit.pdf
[115] https://metrovancouver.org/services/solid-waste/Documents/idea-generation-comprehensive-engagement-toolkit.pdf

primarily due to lack of resources. The lessons learned from these historical programs are summarized in **Appendix A**. If the proposed LTWMS options suggest bringing back any of the historical programs the lessons learned will be a consideration as part of the evaluation. Addressing waste reduction and diversion in large apartment building and the IC&I sector presents distinct challenges. Jurisdictions are focusing on these sectors to reduce waste generation and increase diversion efforts.

Even in regions that do not collect waste from IC&I or large apartment buildings, or only from specific IC&I sources such as downtown or business improvement areas, targeted education and engagement are important. These efforts not only reach residents frequenting IC&I locations or living in large apartment buildings but also support broader waste enforcement initiatives such as municipal by-laws also targeting both the IC&I and large apartment buildings (e.g., Regina).

2.4.5.4.1 Toronto, Ontario – 3R Ambassador Program

Toronto's 3Rs Ambassador Program engages volunteers in large apartment buildings, such as apartments, condos and co-ops, to promote the principles of reduce, reuse and recycle[116]. Recruited online by Toronto, ambassadors receive training, networking opportunities and volunteer hours. This program supports the Toronto's LTWMS[117]. Ambassadors can customize initiatives to fit their building's needs and collaborate with building management to obtain necessary permissions. The program's long-term goal is to have at least one 3Rs Ambassador in every apartment, condo and co-op building in the city.

2.4.5.4.2 Halton, Ontario – Multi-Residential Organic Waste Collection

Halton provides organic waste collection services to 388 multi-residential properties, defined as buildings with 6+ units, within its jurisdiction. Regional and municipal facilities, places of worship, and some IC&I properties are eligible; however, the program is mainly focused on the multi-residential sector. During the initial program roll-out, Halton employed a number of strategies and techniques to maximize the quantity of organic waste captured from this sector. This included offering complimentary compostable bags to units (and re-delivering, if needed), providing educational flyers, hosting information sessions aimed towards residents, leveraging social media and

[116] https://www.toronto.ca/services-payments/recycling-organics-garbage/apartments-condos-co-ops/3rs-ambassador-program/
[117] https://www.toronto.ca/services-payments/recycling-organics-garbage/apartments-condos-co-ops/3rs-ambassador-program/

digital tools to promote programs and hosting educational booths at community events. Halton highlighted the importance of gaining "buy-in" from property owners by conducting multiple site visits and meeting with building staff onsite to address comments or concerns, providing contact information for Halton staff, and providing complimentary materials (e.g., compostable liners, sample bottle of enzyme cleaner to spray carts, etc.). Halton also provided educational materials in eight different language translations and offered complimentary wheeled carts, kitchen catcher containers and sample liners to vulnerable populations and equity-deserving groups. Program success was measured through attendance from educational sessions, increases in program participation and capture rate, and decreases in the contamination rate. Following program implementation, Halton staff noted the following lessons learned:

- Communicate with building staff early and frequently. If possible, have dedicated staff;
- Use by-law as motivation for non-willing participants to implement program;
- Include requirements in Design Guidelines to support more accessible organics collection;
- Deliver information and kits to units as Halton staff were unable to rely on building staff;
- Provide materials/collection free of charge; and
- Develop accommodation strategies (e.g., provide smaller carts for tight spaces in old buildings or latching for carts if stored outside).

2.4.5.4.3 Edmonton, Alberta – Waste Reduction Network

Edmonton operates the Waste Reduction Network, which aims to connect the IC&I sector with one another to support waste reduction and diversion efforts and contribute to policy planning for IC&I waste management[118]. This network is open to a wide range of businesses and organizations, including but not limited to non-profits, retail, hospitality, construction, food services, manufacturing and educational institutions. Members benefit from a virtual network for peer-to-peer connection and learning, participation in four to six meetings per year, access to resources that support sustainability and circular economy reporting and promotion of their waste reduction events or tours. Organizations interested in joining can generally express their interest

[118] https://www.edmonton.ca/programs_services/garbage_waste/waste-reduction

through Edmonton's waste reduction contact channels or by attending public network events, as the network focuses on fostering broad engagement and collaboration rather than a formal application process with a fixed membership count.

2.4.5.4.4 Richmond, BC – Business Recycling Resources Program

The Business Recycling Resources Program in Richmond is designed to assist businesses in enhancing their recycling efforts and waste management practices[119]. It offers free support, including customized coaching, training workshops and an online toolkit, to help businesses understand and reduce their waste, improve recycling rates and comply with relevant regulations. The program aims to increase the commercial recycling rate, which currently lags residential rates, by providing resources to develop effective Recycling and Waste Reduction Plans, minimize contamination and potentially feature successful businesses as examples. Businesses can access these resources through various channels, including online and direct contact with Richmond staff.

2.4.5.4.5 Vancouver, BC – Zero Waste Ambassador Program

Vancouver's Zero Waste Ambassador Program engages and trains volunteers who live in small and large apartment buildings (e.g., apartments, condos, co-ops, rowhouses and townhouse complexes) to engage with fellow residents in their building in waste reduction and diversion initiatives[120]. The program provides training workshops, engagement tools and support to the volunteers to help improve diversion in their building and facilitate the goals of the Vancouver's Zero Waste 2040 Plan.

2.4.5.4.6 San Francisco, USA – Green Business Program

The San Francisco Green Business Program, part of the California Green Business Network, acknowledges businesses, non-profits and institutions in San Francisco that adhere to high environmental standards[121]. Managed by San Francisco Environment in collaboration with the San Francisco Public Utilities Commission and the San Francisco Department of Public Health, the program offers financial incentives to businesses to promote sustainability.

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[119] https://www.richmond.ca/__shared/assets/BRR_Program_Overview72904.pdf
[120] https://vancouver.ca/people-programs/zero-waste-ambassador-program.aspx
[121] https://greenbusinessca.org/

Eligible businesses can receive pre-bates and rebates up to $1,000 for green purchases or upgrades, including compostable or reusable foodware, Light-Emitting Diode (LED) lighting, ventilation improvements, water-efficient fixtures, renewable energy, eco-friendly cleaning products, ENERGY STAR® equipment and recycled paper products. These incentives are available on a first-come, first-served basis for newly recognized Entry-Level or Certified San Francisco Green Businesses. San Francisco Green Businesses are businesses, non-profit organizations and institutions within the City and County of San Francisco that meet high environmental standards across areas such as waste reduction, water and energy conservation, pollution prevention and sustainable transportation. By achieving this recognition, business can save money, attract customers and conserve resources.

2.4.5.4.7 BC Housing, BC – Tenant Engagement Toolkits

BC Housing's waste education program offers a toolkit model to engage residents in multi-unit housing[122]. The initiative is directed by housing providers and unfolds directly within their residential buildings, providing guidance that's relevant to tenants' daily lives. The program's core is a comprehensive engagement strategy using community-based social marketing principles. Practical toolkits that empower social housing providers and facilitators to plan, promote and execute waste diversion initiatives are provided[123]. These toolkits contain various resources, including step-by-step guides for hosting workshops, printable posters and tip sheets for communication and ready-made activities designed to make learning about sorting waste interactive and effective[124]. Designed for ongoing, year-round implementation, the program's purpose is to increase waste diversion and reduce contamination by removing barriers through this hands-on support. This on-site, resource-driven approach builds a culture of environmental responsibility, offering a scalable framework to improve waste outcomes in a traditionally hard-to-reach sector.

[122] https://www.bchousing.org/projects-partners/guides-toolkits/tenant-toolkits
[123] https://www.bchousing.org/publications/Tenant-Engagement-Sustainability-Guide-Waste-Reduction-Diversion.pdf
[124] https://www.bchousing.org/publications/Tenant-Engagement-Sustainability-Facilitators-Handbook-Waste-Reduction-Diversion.pdf

2.4.5.5 Summary – Emerging Public Education and Engagement Techniques

Examples from selected jurisdictions of emerging public education and engagement techniques include:

- Support or partner with organizations already working in waste reduction and diversion in the community, or those better equipped to carry out programming;
- Use technology to provide automated feedback to residents about sorting compliance;
- Provide virtual tours and resources to help community members understand waste operations;
- Use emerging engagement techniques such as behavioural insights and iterative engagement;
- Target engagement and support for those living in large apartment buildings; and
- Provide targeted education, networking and support to the IC&I sector.

2.4.6 Circular Economy Culture

A broad consensus from the jurisdictions selected supports transitioning from the traditional linear "take-make-dispose" model to a circular economy. This shift necessitates changes in traditional approaches to waste management and cultural and behavioural changes in valuing resources and managing materials. For the Region, this circular economy framework will be a central focus of the LTWMS, guiding future waste management practices.

A circular economy framework is best integrated across department responsibilities. For example, procurement specifications and management extending beyond a waste management department is needed to achieve the benefits of a circular economy approach. Community buy-in and participation are also supportive for this transition. Jurisdictions can adopt various strategies to facilitate the circular economy transition and cultural shift, and the Region already demonstrates a commitment to reuse through initiatives at its Waste Management Centres, including voluntary programs for materials such as pallets and drywall, as well as events and education that encourage residents to reduce and properly manage waste. These existing efforts directly contribute to the Region's move towards circular practices.

2.4.6.1 Circular Economy Strategic Planning

Many municipal jurisdictions have established circular economy principles, strategies, plans, policies and frameworks; either as a component of or a separate complementary strategy to their waste plans. Strategic long-term planning can help guide a jurisdiction in its approach and implementation towards a zero-waste culture and circular economy transition over time.

2.4.6.1.1 Toronto, Ontario – Strategy for a Circular Toronto

Under the LTWMS, Toronto established the Circular Economy and Innovation (CEI) team, initially known as the Unit for Research, Innovation and a Circular Economy. The CEI team focuses on research, cross-corporate initiatives such as circular procurement and developing a circular economy framework. Recognizing the importance of cross-corporate work and its alignment with environmental and climate goals, the CEI team was transferred from the Solid Waste Management Services Division to the Environment and Climate Division in 2024[125]. Currently, an inter-divisional initiative is underway to develop a 10-year Circular Economy Road Map, identifying actions for the city, industry and community to enhance circularity. Toronto's circular economy efforts are also integrated with its environmental, climate and resilience strategies.

Phase 1 of the Road Map, conducted from April to September 2024, focused on validating Toronto's circular economy vision, goals and indicators through community and industry engagement. This phase involved online surveys and workshops with residents, experts, City staff and the Community Advisory Committee. These initial findings are publicly available in the Circular Economy Road Map Phase 1 Report[126].

Prior to the Circular Economy Road Map launch, in 2022, Toronto completed the Baselining for a Circular Toronto project, which assessed the current state of circularity through a Landscape Analysis, Material Flow Analysis and a Final Report[127]. This report outlined key considerations for transitioning to a circular economy, aligning with the United Nation's (UN's) Sustainable Development Goals and informed by a Results Based Accountability model. While providing a vision and initial analysis, an important consideration was

[125] https://www.toronto.ca/legdocs/mmis/2024/ie/bgrd/backgroundfile-245706.pdf
[126] https://www.toronto.ca/wp-content/uploads/2024/12/8cc5-Circular-Economy-Roadmap-Phase-1-Report-AODA.pdf
[127] https://www.toronto.ca/wp-content/uploads/2021/09/90e4-Technical-Memorandum-3Final-Report-09.09.2021FinalAODA.pdf

the role of Toronto and its partners in advancing circular economy initiatives. These included civil society, indigenous communities and equity deserving groups, businesses, education and research institutions and provincial and federal governments. Community-wide goals and indicators were put forward, alongside the goals and indicators that were developed for the three selected key sectors studied: waste management, construction and food systems[128].

2.4.6.1.2 Peel, Ontario - Circular Economy Roadmap

Peel's Circular Economy Roadmap outlines 17 actions to achieve a 75% landfill diversion by 2034, working towards residential zero waste and reduced GHG emissions[129]. The plan includes enhancing programs, launching new initiatives and exploring recovery technologies. A communications strategy supports these goals through data-driven storytelling, audience-specific messaging, educational support and partnerships.

Annual campaigns utilize integrated marketing channels such as websites, social media, e-newsletters and paid advertisements, alongside educational outreach in schools and community events to enable consistent messaging.

Since implementation, waste diversion has slightly increased and GHG emissions have decreased due to the use of compressed natural gas (CNG) collection vehicles and optimized routing. Improved processes and fee structures at recycling centers have reduced wait times and increased revenues, enhancing the waste management system.

2.4.6.1.3 Richmond, BC – Circular Procurement Policy

Richmond's Circular Procurement Policy #3104, updated in February 2021, integrates circular economy principles to establish Richmond as a leader in sustainability[130]. It guides staff in embedding these principles in the procurement process and specifications so to maximize resource value, minimize waste and support a sustainable, equitable, low-carbon economy. Key aspects of the policy include the following:

- **Definition**: Provides a clear definition of the circular economy to align staff and interested partners with city goals and help Richmond understand what is in its power to control;

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[128] https://www.toronto.ca/wp-content/uploads/2022/06/8ed3-Baselining-for-A-Circular-Toronto-Highlights-FINAL.pdf
[129] https://peelregion.ca/waste/roadmap-circular-economy-peel-region
[130] https://www.richmond.ca/__shared/assets/6-Circular_Procurement_Policy_Implementation_and_Progress_Update68980.pdf

- **Integration**: Embeds circular principles in procurement, impacting bid specifications and contract decisions and outcomes;
- **Whole-of-Life Costing**: Considers full lifecycle costs, including maintenance and end-of-life value, beyond purchase prices;
- **Supplier Engagement**: Actively promotes circular opportunities and educates suppliers on circular principles and expectations; and
- **Alignment**: Supports city goals of sustainability, environmental impact reduction and financial efficiency.

2.4.6.1.4 Vancouver, BC – Zero Waste 2040

Vancouver's Zero Waste 2040 plan, completed in 2018, aims for a zero waste city by 2040[131]. Developed with significant community input, it focuses on waste avoidance, reduction, reuse, recycling and energy recovery to support a circular economy. The plan addresses the city's significant waste generation and aligns with sustainability goals such as the Greenest City Action Plan and Renewable City Strategy[132].

Key components include Community Directions to guide collective efforts toward zero waste, emphasizing cultural and behavioural shifts. It outlines priority actions for Vancouver, such as managing C&D waste, organic materials, consumer goods and implementing transformative actions.

A five year progress update was presented to Vancouver City Council in October 2024, outlining nine priority action areas for the next four years including:

- Long-term waste planning for urban growth;
- Increase C&D waste diversion and reuse;
- Boost residential participation in diversion programs;
- Expand share, reuse and repair for all residents;
- Prevent edible food waste;
- Support other government interventions;
- Expand diversion at Vancouver's Landfill and Transfer Station;
- Participate in regional solid waste planning; and
- Apply equity lenses to zero waste initiatives[133].

[131] https://council.vancouver.ca/20180516/documents/pspc2a.pdf
[132] https://council.vancouver.ca/20180516/documents/pspc2a.pdf
[133] https://council.vancouver.ca/20241023/documents/pspc3.pdf

2.4.6.1.5 Gothenburg, Sweden – Circular Gothenburg

Gothenburg launched its Circular Gothenburg strategy in 2016 to enhance resource efficiency, mitigate climate change and establish circular material flows, meaning materials are kept in use through reuse, repair and recycling rather than being discarded after a single use.[134]. The strategy targets three groups: citizens, city departments and businesses, aiming to make participation in circular initiatives simple, straightforward and appealing. This includes municipal processes and activities that promote circular living. A key initiative is the Fixotek staffed facilities located conveniently for residents offering spaces to meet, learn, repair and redesign products, as well as borrow tools and exchange toys, clothes and books. Additional details on this program are included in **Section 2.4.6.2.9**.

2.4.6.1.6 GLA, UK - ReLondon Organization

ReLondon is a partnership between the Mayor of London and GLA's 33 boroughs, focused on transforming waste management and establishing GLA as a low-carbon circular city[135]. ReLondon is an independent organization formed to exclusively focus on this issue. It allows for a coordinated effort and a dedicated demonstration of the importance that GLA attributes to circularity. It bridges policy and implementation gaps, accelerating the transition to a circular economy by overcoming practical barriers. Key initiatives of ReLondon include:

- **Evidence Building**: Conducting pilots to identify effective solutions and sharing findings;
- **Local Authority Support**: Assisting boroughs in adopting circular practices through research and toolkits;
- **Business Empowerment**: Supporting small and medium sized enterprises to adopt or scale circular business models; and
- **Public Engagement**: Designing campaigns to encourage circular lifestyles among Londoners.

ReLondon provides educational campaigns (Love Not Landfill), conducts research (Material Flow Analyses), runs pilots and demonstration projects, develops resources and supports government policy (London Textiles Action Plan), small and medium enterprises and the public in transitioning to a

[134] https://goteborg.se/wps/portal/start/kommun-och-politik/sa-arbetar-goteborgs-stad-med/hallbarhet-och-agenda-2030/cirkulara-goteborg
[135] https://relondon.gov.uk/

circular economy. Its partnership leverages GLA's ability to bring diverse groups together and influence action, fast-tracks solutions and fosters connections across government levels. Its existence helps to promote London as a leader in the circular economy.

2.4.6.2 Reuse, Sharing and Repair

Transform Waterloo Region's Community Climate Change Action Plan supports programs and services that offer repair, refurbishment and resource sharing as strategies to transform waste production, consumption and management in the Region[136]. A summary of this plan is included in Technical Memorandum 1. These initiatives, which increase reuse, sharing and repair, help foster a circular economy culture within a community. These activities not only advance materials management goals higher up the waste hierarchy (refuse, reduce, repair) but also promote community engagement. Participation requires residents to attend events or locations in person and involve volunteer efforts from residents.

The Region previously ran several reuse, sharing and repair programs including a Goods Exchange Days, bicycle program and household item, tools, small appliance and building items pick up programs. These were cancelled due to variety of reasons. The lessons learned from these historical programs are summarized in **Appendix A**. If the proposed LTWMS options suggest bringing back any of the historical programs the lessons learned will be a consideration as part of the evaluation.

Jurisdictional findings show that municipalities typically either organize these opportunities themselves or collaborate with community organizations to deliver these services to residents.

2.4.6.2.1 Guelph, Ontario – Guelph Tool Library and Repair Cafes

As outlined in **Section 2.4.5.1.1**, Guelph supports the Guelph Tool Library's sharing, reuse and repair of textiles and household goods. Initiatives include repair café events, a circular computer project, Seedy Saturday, RePurpose Fest, clothing swaps and special item recycling (e.g., car seats, end-of-life shoes)[137]. Guelph Tool Library collaborates with seniors' centers for the "Sew on the Go" program, where volunteers visit locations to perform minor clothing

[136] https://climateactionwr.ca/wp-content/uploads/2021/07/Final-TransformWR-Stragegy.pdf
[137] https://guelphtoollibrary.org/

repairs. The "Stitch Together" project hosts bi-monthly drop-in events where visitors can learn mending skills from volunteers. Guelph Tool Library also hosts a variety of other programs to teach repair (bicycles) and reuse skills to members of the community.

2.4.6.2.2 Toronto, Ontario – Community Reduce and Reuse Program

As outlined in **Section 2.4.5.1.2**,Toronto partners with neighbourhood groups to deliver CRRPs year-round, both online and in-person[138]. These programs aim to foster sustainable communities and reduce landfill waste through education, sharing, repair opportunities, skills training and community gathering spaces. Key sharing and repair programs include:

- **Sewing Repair Hubs:** In partnership with Progress Place, Scadding Court Community Centre, Delta Family Resource Centre and The Neighbourhood Organization, these hubs provide workshop spaces for clothing and textile repair. By the end of 2023, over 18,000 kg of clothing have been repaired;
- **Bicycle Repair Hubs:** Collaborating with Access Alliance, CultureLink and The Neighbourhood Organization, these hubs offer spaces, tools and training for bicycle assembly, repair and maintenance. By the end of 2023, over 23,000 bicycles have been repaired or refurbished; and
- **Sharing and Reuse Spaces:** Partnering with The Neighbourhood Organization and Rexdale Women's Centre, these spaces promote the reuse, sharing, repairing and repurposing of bicycles, electronics and textiles. By the end of 2023, over 5,500 items have been repaired or repurposed and over 6,800 kg of clothing have been repaired.

2.4.6.2.3 Peel and Durham, Ontario– Share, Reuse, Repair Hub

Peel and Durham have both partnered with the CIC to expand its virtual community hub, the Share, Reuse, Repair Hub, to their respective regions. Initially developed in 2022, this resource provides access to share, reuse and repair services and allows local businesses to promote their circular economy efforts[139]. Key features include:

- A directory of businesses, resources and events in the region that support sharing, reuse and repair;
- A map for locating businesses by category and location;

[138] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-reduction/community-reduce-reuse-programs/
[139] https://sharereuserepairhub.ca/

- Educational content on circular economy support;
- Listings of local events such as repair cafes and swaps; and
- Virtual resources.

2.4.6.2.4 Edmonton, Alberta – Reuse Centre

Edmonton's Reuse Centre is a facility where residents can donate and receive reusable items at no cost[140]. It offers workshop space for waste reduction and reuse activities. Both individuals and businesses can contribute items for reuse. Accepted materials include arts and crafts supplies, home decor, paper products, seasonal and party supplies and packaging materials. A complete list of accepted and non-accepted items is available on the centre's website. The centre also hosts "Do It Yourself" workshops, youth programs and master composter recycler education.

2.4.6.2.5 Metro Vancouver, BC – Reuse Days

Metro Vancouver organizes Reuse Days at the North Shore Recycling and Reuse Centre, collaborating with a non-profit organization to intercept and collect reusable materials before they are discarded[141]. By partnering with on-site non-profits, the initiative aims to redirect individuals from disposing of waste, thereby facilitating the reuse of materials and avoiding scavenging local regulations, as the items have not yet entered the waste stream. The non-profit organizations also help to educate residents about the potential for reuse. During one single event, 1,400 kg of materials were diverted for reuse.

Initially, the Reuse Days program was implemented through a sole-source approach based on market research; however, Metro Vancouver plans to transition to a competitive procurement process moving forward. The goal is to establish this program as a permanent feature, operational whenever the centre is open, thereby maximizing the impact on waste reduction and community education.

2.4.6.2.6 Richmond, BC – Reuse & Repair Cafe

The Richmond hosts Reuse & Repair Cafes on Saturdays year-round at various locations, encouraging residents to swap, donate, or repair items[142]. Participants can:

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[140] https://www.edmonton.ca/programs_services/garbage_waste/reuse-centre
[141] https://www.youtube.com/watch?v=pP5EyLh4Fqg
[142] https://www.richmond.ca/services/recycling-garbage/community-outreach/repairfair.htm

- Swap: Exchange items with others;
- Leave: Donate items without taking new ones; and
- Take: Pick up items, even without bringing any.

Accepted items include clothing, accessories, media, electronics, toys and small appliances. Residents can bring up to five items, each fitting in a reusable shopping bag.

2.4.6.2.7 Richmond, BC – Green Ambassadors Program

The Green Ambassador Program is a collaborative environmental stewardship initiative between Richmond and the Richmond School District. It offers secondary school students in grades eight to twelve valuable volunteer opportunities in community outreach and environmental education.

Originally formed in 2010 to provide educational support and waste diversion services at Richmond's O Zone celebration, the program has since evolved into a recognized, year-round program[143]. Now active in nine secondary schools, the Green Ambassadors are a part of Richmond's sustainability efforts.

Student volunteers actively engage with the public at community events, where they manage waste-sorting stations, collect litter and educate attendees on proper recycling and composting. Beyond events, the program provides a platform for youth to develop a deeper understanding of local environmental issues.

2.4.6.2.8 Vancouver, BC - Zero Waste Demonstration Site

Vancouver's Zero Waste Demonstration Site aimed to provide opportunities for start-up enterprises to develop and commercialize innovative zero waste technologies[144]. The pilot was conducted at Vancouver's former recycling receiving yard. Its goals included reducing waste, increasing resource recovery, decreasing GHG emissions, supporting innovation and creating green jobs. The Vancouver Economic Commission and Vancouver staff collaborated with interested partners such as the NZWC, Solid Waste Association of North America (SWANA) and Foresight Canada (a cleantech accelerator) to raise awareness of the pilot within the cleantech community.

Nine BC-based companies were selected to pilot technologies and process waste streams, including innovations that transformed plant residues into

[143] https://www.richmond.ca/services/recycling-garbage/community-outreach/GreenAmbassadors.htm
[144] https://council.vancouver.ca/20230614/documents/cfsc2.pdf

usable bio-products and re-manufactured wood, textiles and food waste. However, due to budget constraints, the pilot concluded in early 2024.

2.4.6.2.9 Gothenburg, Sweden – Fixotek Centres

Gothenburg's Fixotek Centres are neighbourhood hubs for repairing tools, clothes, furniture and electronics. They offer a tool library, donation center and mini recycling facilities. Launched as an 18-month pilot with municipal housing companies, the initiative promotes waste reduction through item exchange, tool borrowing and repairs[145].

From April 2018 to April 2019, the pilot attracted approximately 10,000 visitors, with 1,890 using workshops, 550 attending repair events and 530 borrowing tools. Over 5,810 kg of items were reused and 31% of residents reported a better understanding of recycling[146]. Key features include:

- Tool borrowing (hammers, drills, sewing machines);
- Exchange corner for clothes, household items, electronics and more; and
- Social engagement opportunities, including workshops and job training.

The project, funded by the Swedish Innovation Agency and supported by local groups, had an operating cost of $184,000 and a capital cost of $107,000 from 2018 to 2019. Key lessons include the need for long-term financing, strategic location, local support and clear project goals. A handbook is available for other cities interested in establishing their own Fixotek Centres[147].

2.4.6.2.10 Seattle, USA – Reuse Seattle

Reuse Seattle is an initiative to support the city-wide transition from single-use to reuse using standardized systems. The initiative brings reusable food and beverage container solutions and services to Seattle's institutions, venues, restaurants and business with food service operations to create a seamless transition to reusables within Seattle[148]. The intention is to create a reuse system in the city that shares the collection, transportation, washing and digital infrastructures. Key short-term objectives of this initiative are to:

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[145] https://www.researchgate.net/publication/331313869_Fixotek_Implementing_and_Testing_Urban_Reuse_and_Repair_Centers_in_Sweden
[146] https://tidningensyre.se/goteborg/2019/nummer-233/aterbruksprojektet-fixoteket-avslutas-i-september/
[147] https://databas.resource-sip.se/storage/Bilaga%201.%20Fixoteket%20handbok.pdf.pdf
[148] https://reuseseattle.org/

- Attract reuse service providers to invest in Seattle, creating shared infrastructure for reuse;
- Trial and scale reuse for takeaway, Bring-Your-Own and dine-in durables in target sectors: entertainment (music & sports), coffee shops, assisted living, corporate campus & institutions, etc.; and
- Develop a blueprint for facility-based, closed-loop reuse systems to become connected and inter-operable with external public space collection systems, leveraging a set of reuse system standards[149].

Seattle has conducted two small-scale procurement processes to establish formal relationships with reuse service providers and is currently procuring reuse service providers under a blanket contract for public events.

Additionally, Reuse Seattle launched a public engagement and education effort[150], using targeted messaging to raise awareness about reusable systems. The campaign began with community events and later expanded to other public venues, demonstrating how reusable service-ware can replace single-use items.

2.4.6.3 Circular Economy Funding

Many community organizations are initiating or already supporting circular economy efforts. Some jurisdictions leverage these community efforts by offering funding for innovative projects. Supporting these groups is found to be a productive way to achieve waste management goals by leveraging a community group's existing programs, staff efficiencies, volunteers and momentum.

2.4.6.3.1 Peel, Ontario – Circular Economy Initiatives Fund

The Circular Economy Initiatives Fund provides grants of $5,000 to $25,000 to not-for-profit organizations working on waste reduction and circular initiatives in the region. The fund is provided by annually by Peel's Waste Management division pending funding approvals.

To be eligible for funding, applicants must meet certain eligibility criteria and projects must meet at least one of the two fund objectives:

[149] https://www.reuseportal.org/project-details/reuse-seattle/a0s68000002tJXmAAM
[150] https://tilthalliance.org/wp-content/uploads/2022/06/MCSS-FAQ-Reuse-Seattle-June-launch-DRAFT-1b.pdf

- Create opportunities for Peel community members to take some form of action to reduce, reuse and reclaim waste; or
- Provide information to Peel community members that will raise their awareness and understanding on the importance of and how to contribute to a circular economy[151].

Priority is given to programs that demonstrate innovation and do not replicate pre-existing programs in the community. Collaboration among organizations is encouraged.

2.4.6.3.2 Halton, Ontario – Waste Diversion and Circular Economy Funding

Enhancing diversion and supporting a circular economy are two key objectives outlined in Halton's SWMS. In addition to Halton's own diversion services, Halton provides funding to local organizations and charities who initiate diversion projects. For example, Halton has offered the Waste Diversion Fund (WDF) since 2003. The WDF provides funding to registered charities and non-profit organizations to help divert waste from landfill through the collection of items such as clothing, toys, furniture and more. In 2024, Halton supported eight non-profit organizations in diverting 5,000 tonnes of textiles from the landfill. Since 2003, approximately 70,700 tonnes of textiles were diverted from landfill through the efforts of WDF-funded organizations

More recently, Halton Council approved the Community Circular Economy Fund, which allows organizations that have projects or programs that meet specified objectives (waste minimization and diversion, and/or education, engagement and awareness) to apply for funding support ($2,500 to $55,000 annually) from Halton.

2.4.6.3.3 Edmonton, Alberta – Waste Reduction and Reuse Grant

The Waste Reduction and Reuse Grant (WRR Grant) funds innovative initiatives that support waste reduction and reuse in Edmonton, targeting residential waste reduction and increased participation in waste diversion[152]. Primarily funded by utility fees, the grant is available to residential groups and non-profits. The grant aligns with Edmonton's 25-Year Waste Strategy and Waste Reduction Roadmap goals, with $100,000 available for 2025. Proposed initiatives must meet one or more of the following objectives:

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[151] Circular Economy Initiatives Fund: Application Guidelines
[152] https://www.gov.edmonton.ab.ca/sites/default/files/public-files/Waste_Reduction_and_Reuse_Grant_Guidelines.pdf

- Directly reduce waste production;
- Increase local material reuse;
- Enhance knowledge, ability, or motivation for waste reduction and reuse; and
- Foster long-term behavioural changes leading to waste reduction.

The WRR Grant is part of the regular annual budget planning process, reviewed alongside other budget requests.

2.4.6.4 Demonstrated Jurisdictional Commitment

To foster community trust and engagement, it is important to demonstrate an internal municipal commitment to the same initiatives being requested by its residents. Municipal jurisdictions understand that achieving internal system and cultural shifts not only builds community buy-in, but also provides insights into potential challenges when implementing programs on a broader scale externally into the community.

2.4.6.4.1 Regina, Saskatchewan – Green Routine City Facilities Sorting Program

Regina's Green Routine Program introduced a standardized four-stream waste system (mixed recycling, compost, refundable bottles and landfill disposal) across all Regina-owned facilities[153]. This initiative enhances waste diversion, enabling employees and residents to recycle, compost and reduce waste effectively. Objectives of the Green Routine Program include:

- Being a leader in waste management and improving Regina's practices; and
- Supporting the development of diversion policies or regulations for Regina's businesses.

Approximately 70% of landfill waste originates from local businesses. To foster a culture of waste diversion and demonstrate leadership, Regina implemented the program internally before mandating it for the IC&I sectors. Annual waste composition audits are conducted to assess the program's performance and impact.

[153] https://www.regina.ca/home-property/recycling-garbage/education-resources/green-routine/

2.4.6.4.2 Port Moody, BC – Zero Waste Plan for Facilities, Parks and Events

In 2024, Port Moody finalized a comprehensive Zero Waste Plan aimed at eliminating landfill waste generated by city facilities, parks and events. This initiative is a key component of Port Moody's Climate Action Plan[154]. The development of the Zero Waste Plan process involved a thorough jurisdictional analysis, waste audits of relevant sites, staff engagement and an evaluation of collection and transportation logistics to reduce GHG. The Zero Waste Plan provides a detailed framework for achieving zero waste goals across city-owned facilities, events and parks.

2.4.6.4.3 Gothenburg, Sweden – Internal Furniture Reuse and Recycling Marketplace

Gothenburg has operated an internal recycling and sharing system, called Tage, since 2013[155]. Originally as a digital platform for city departments to exchange furniture and interior design items, Tage expanded in 2022 to include a physical warehouse for storage and free transport services for city administrations and companies. The system is managed by four full-time staff who oversee material management and item maintenance.

Tage facilitates the reuse of furniture, interior design items, electronics, machinery, consumables, kitchen equipment, office supplies, work clothes and more. By late 2024, the marketplace featured approximately 400 items, with 80% claimed within three weeks. Since its launch, around 50,000 products have circulated through Tage, reducing new purchase costs by over 90 million Swedish Krona (more than $12,000,000 Canadian Dollars) and cutting GHG emissions by nearly 2,500 tonnes of CO_2e [156].

2.4.6.5 Summary –Circular Economy Culture

In summary, examples from selected jurisdictions for circular economy include:

- Complete targeted strategic planning for circular economy;
- Support circular economy initiatives that community members can participate in, such as sharing, reuse and repair or demonstration sites;

[154] https://www.portmoody.ca/parks-recreation-and-environment/climate-action/climate-action-plan/
[155] https://goteborg.se/wps/portal/enhetssida/cirkular-vagledning-for-dig-som-jobbar-i-goteborgs-stad/tage
[156] https://vartgoteborg.se/p/tage-slar-rekord-i-aterbruk/

- Provide funding for community circular economy initiatives; and
- Demonstrate an internal municipal commitment and creation of an internal circular economy culture.

2.4.7 Barriers to Waste Reduction and Diversion Participation

The following examples provide a summary on municipal programs with diverse populations that work towards inclusion and engagement. While **Section 2.4.5** identified emerging public education and engagement techniques, these examples include engagement and initiatives that are specifically geared towards equity-deserving groups or those who face some barrier(s) to participation in waste management services.

2.4.7.1 Guelph, Ontario – Guelph Tool Library

As outlined in **Section 2.4.6.2**, the Guelph provides funding to the Guelph Tool Library and partnership to operate the library and carry out programs. The Tool Library itself helps to reduce economic barriers to participation in waste reduction and diversion by providing low-cost access to tool sharing and free repair services. Memberships are provided for free to low-income residents through the Lend a Wing Program where other members can choose to pay a higher membership renewal fee to support the membership of another person[157]. The Tool Library also conducts various programs that support those facing economic barriers, including its Circular Computer Project where donated laptops in good working order are refurbished and provided to community members in need. Also, its Living Better on Less program provides education to low-income residents about how to live a healthy and simpler life by consuming less, spending less and living more sustainably[158].

[157] https://guelphtoollibrary.org/membership/
[158] https://guelphtoollibrary.org/living-better-on-less/

2.4.7.2 Toronto, Ontario – Community Reduce and Reuse Programs, Delivered to Neighbourhood Improvement Areas

As part of its LTWMS strategy, Toronto has implemented CRRPs. Since participation is free, financial barriers are removed for residents. The programs encourage sharing and reuse, which can represent affordable options rather than shopping for new items. Furthermore, the skills acquired through the programs such as bike repair, gardening and sewing, may enable participants to avoid the cost of purchasing certain household items.

The programs are delivered through agencies that were all based in Neighbourhood Improvement Areas (NIAs). These are geographic areas identified by Toronto as requiring social supports. Rather than Solid Waste Management Services, the social services section under the Social Development, Finance and Administrative division implemented agreements to run the program with social service agencies and partners that were already engaged with the public within the NIAs.

The agencies run workshops and activities on their own and they operate repair cafes, lenderies and sharing libraries at their hub locations, rather than at drop off depots or other waste facilities. Agencies use staff (either full time, part time, paid by honorarium or as volunteers) who operate these activities that typically run either on a weekly, bi-weekly or monthly basis.

2.4.7.3 Peel, Ontario – Socioeconomic Vulnerability Index

Peel addresses barriers to participation through ongoing research such as studies, including human behaviour, communications and market research. For example, studies that include multiple demographic indicators (e.g., age, income, household size, ethnicity, home ownership, etc.) inform Peel of appropriate waste terminology and effective communications strategies.

In addition, Peel seeks opportunities to improve services for equity-deserving groups and vulnerable populations, where possible. As an example, a recent initiative was launched in collaboration with Peel school boards to promote waste reduction and reuse by way of providing reusable lunch containers to select schools. To select the schools with the highest needs, Peel used its Socioeconomic Vulnerability Index which considers factors such as household

income, unemployment rate, education level, mobility needs, family structure (i.e., lone parents) and newcomer status.

2.4.7.4 Peel, Ontario – Waste Collection Design Standards Manual

Peel's Waste Collection Design Standards Manual establishes a proactive framework for waste management in all new developments. By mandating early consultation between developers and Peel, the Waste Collection Design Standards Manual shows that waste collection needs are a foundational part of the site plan, not an afterthought. Key to Peel's approach is the clear set of technical standards for collection areas, including precise specifications for road geometry, vehicle clearance, turning radii for collection trucks and the exact location and construction of concrete pads for curbside set outs and front-end containers. For large apartment buildings and IC&I properties, the manual enforces standards for dedicated waste storage rooms and secured, all-weather access routes to collection points. This front-end planning approach is designed to provide municipal waste services safely and efficiently, minimizing the risk of costly retrofits and serviceability issues after construction is complete[159].

2.4.7.5 HRM, Nova Scotia – Outreach Services

HRM provides multilingual resources to address language barriers in its waste reduction and diversion initiatives and communications. HRM conducts targeted outreach to newcomers, assisting them in understanding the local waste management system. University and college students receive door-to-door outreach during move-in and move-out peak periods to enhance education and promote proper waste disposal during these higher waste generation events. Furthermore, direct outreach is conducted in schools to ensure that youth have access to education on waste reduction and diversion [160].

[159] https://peelregion.ca/sites/default/files/2024-08/waste-collection-design-standards-manual.pdf
[160] https://www.halifax.ca/home-property/garbage-recycling-green-cart/education-outreach

2.4.7.6 Richmond, BC – Waste Management Design Guidelines for IC&I and Large Apartment Buildings

Richmond's Waste Management Design Guidelines[161] directly address the challenges of waste diversion in IC&I and large apartment buildings. The program champions a "Recycling First" hierarchy, requiring developers to prioritize space and convenient access for recycling and organics diversion systems. A central feature of the guidelines is the detailed specifications for the location and design of centralized "Waste Management Rooms." These rooms must be located on the ground floor or a parkade level for easy resident access and must provide sufficient space to accommodate separate containers for the full range of sorted materials. The guidelines also have strict requirements for collection vehicle access, mandating adequate overhead clearance, turning radii and durable paving to withstand the weight of collection trucks. By incorporating WMPs into the development permit process, Richmond aims to equip new buildings for high levels of waste diversion from the day they obtain occupancy.

2.4.7.7 San Francisco, USA – Multilingual Outreach

San Francisco provides a door-to-door multilingual outreach program for residents and businesses, aimed at offering support and education on composting and recycling[162]. By delivering resources directly to homes in various languages, the program helps overcome barriers faced by individuals who may lack English language skills, computer skills or internet access, enabling them to access important information.

2.4.7.8 Seattle, USA – Strategies to Develop Inclusive Communications

To address barriers to participation, Seattle Public Utilities employs a range of outreach tactics to offer waste management education and instructions not

[161] https://www.richmond.ca/__shared/assets/City_of_Richmond_Waste_Management_Design_Guidelines_10-25-2370576.pdf
[162] https://www.sfenvironment.org/recycling-composting-faqs

only for homes, but also in workplaces and in the community. Key approaches include:

- Partnerships with Seattle city departments, schools, different levels of governments, to develop and deliver education programs;
- Community Connection Programs involve partnership with community-based organizations;
- Customer surveys; and
- Educational programs (green business program, natural yard card program, etc.).

While communication is delivered through multiple platforms that are typical of many jurisdictions (i.e., Seattle website, social media, mobile apps, contact centre, mailed materials and labels and signage) [163], Seattle's approach is to make its communications culturally relevant and appropriately translated to relevant languages. This involves scripting messages that are meaningful across cultures and partnering with community-based organizations.

As well, Seattle Public Utilities employs community-centered design and gathers feedback through focus groups and surveys to tailor its programs to the specific needs of diverse communities. A requirement for its contractors to conduct culturally appropriate outreach also advances its efforts to prioritize equity and accessibility[164].

2.4.7.9 Summary – Barriers to Waste Reduction and Diversion Participation

In summary, examples from selected jurisdictions for overcoming barriers to waste reduction and diversion include:

- Support access to reuse, sharing and repair helps low-income residents to participate in circular economy initiatives;
- Hold circular economy programming in targeted areas of a jurisdiction to support neighbourhood strategies;

[163] https://www.seattle.gov/documents/Departments/SPU/Documents/Plans/SolidWaste/2022SolidWaste-Chapter9-EducationOutreachEnforcementComplianceSupport.pdf
[164] https://www.seattle.gov/documents/Departments/SPU/Documents/Plans/SolidWaste/2022SolidWaste-Chapter9-EducationOutreachEnforcementComplianceSupport.pdf

- Use Socioeconomic Vulnerability Index or similar approaches to target outreach and programming;
- Provide direct multi-lingual outreach or targeted outreach to specific groups facing barriers; and
- Outreach and partnership with schools and other community groups.

2.4.8 Energy Generation and Methane Reduction

This section provides an overview of techniques, methods, equipment, technology and infrastructure used to support the reduction of GHG emissions (particularly methane) and renewable energy generation from Canadian and international jurisdictions. Locally, the Region provides a strong example of LFG utilization. Through long-standing partnerships, the Region captures methane from its Waterloo landfill and supplies it to a specialized generating station built and operated by Toromont. This facility converts the potent GHG into electricity. The Region also captures methane from its Cambridge Landfill, which is then used by the local steel manufacturer, Gerdau, to help power its Cambridge mill. These initiatives effectively turn a waste byproduct into a valuable energy source, simultaneously reducing emissions and supporting local industry.

2.4.8.1 Toronto, Ontario – Methane Emissions Reduction

Toronto has implemented a comprehensive strategy to reduce methane emissions from organics waste by:

- Utilizing AD processing of organics waste to produce renewable natural gas (RNG); and
- Capturing LFG.

Toronto operates two major AD facilities: the Dufferin Organics Processing Facility and the Disco Road Organics Processing Facility. These AD facilities process residential green bin organics, converting them into biogas through AD processing. The biogas is then further processed to upgrade it to RNG quality specifications and injected into the natural gas grid in partnership with the utility Enbridge Gas Inc. RNG is an energy source used to fuel Toronto city vehicles and heat municipal buildings. It supports Toronto's TransformTO Net Zero Strategy which aims for net-zero emissions by 2040. The Dufferin Organics Processing Facility, following its expansion, processes up to 55,000 tonnes of organic waste annually, while the Disco Road Organics Processing

Facility handles approximately 75,000 tonnes of organic waste per year. Together, these facilities contribute to a reduction of approximately 22,000 tonnes of carbon dioxide (CO_2) emissions annually.

Toronto is continuously exploring opportunities to utilize LFG primarily at the Green Lane Landfill for RNG production to offset electricity consumption and use as a vehicle fuel and potentially at the closed Keele Valley Landfill[165]. A report entitled, **Landfill Gas to Renewable Natural Gas Project and Future Potential Renewable Energy Opportunities at the Green Lane Landfill**[166] was published in May 2023 by Toronto's Solid Waste Management Services. This report noted that Toronto is currently in the process of negotiating potential agreements to implement an RNG facility at the Green Lane Landfill, which includes funding applications.

2.4.8.2 Durham, Ontario – Energy Recovery Centre, Landfill Management and Organics Processing

Durham has taken a multi-faceted approach to methane gas emissions reduction and energy recovery through investments in infrastructure, landfill management and organics processing. The DYEC began operations in 2016 after over a decade of planning, public consultation and environmental approvals. It processes up to 140,000 tonnes of municipal solid waste annually, reducing waste volume by 85 to 90% and generating up to 17.5 Megawatts (MW) of renewable electricity. Continuous emissions monitoring supports regulatory compliance and transparency through publicly available data. Bottom ash is stabilized and used as landfill cover and metals are recovered for recycling. The facility, jointly owned by Durham and York, had capital costs of $284 million and operating costs are partly offset by ongoing revenue from a power purchase agreement.

Durham has addressed methane emissions at their closed landfill sites through targeted projects. The Blackstock Landfill underwent landfill mining to remove all waste and to restore the site. The Oshawa Landfill is currently using a methane biocover system to oxidize landfill generated methane and reduce

[165] https://www.toronto.ca/wp-content/uploads/2021/06/96b8-technical-memorandum-2-material-flow-analysis.pdf
[166] https://www.toronto.ca/legdocs/mmis/2023/ie/bgrd/backgroundfile-236724.pdf

emissions onsite. This biocover is an innovative approach and currently Durham is partnering with a university to measure its beneficial impacts.

Durham shifted from aerobic composting to AD under a third-party contract. AD processing is able to accept a wider range of organics, captures methane to offset natural gas use and provides waste heat to nearby greenhouses. Durham will re-evaluate organics management options at the end of their 10-year contract.

Further, curbside collection contracts in the Cities of Ajax and Pickering require renewable CNG vehicles in their procurement specifications. This procurement practice supports reduction of carbon emissions and noise compared to traditional waste collection vehicles historically fueled by diesel.

2.4.8.3 Peel, Ontario – Use of Third-Party Processors

Peel currently manages up to 20,000 tonnes of their waste annually at the privately owned Emerald EfW facility in the City of Brampton. Between 2012 and 2015, Peel's Peel Energy Recovery Centre (PERC) project aimed to build a regional owned and operated EfW facility with the capacity to process up to 400,000 tonnes of waste per year. However, this project was cancelled in 2015 after Peel's Council adopted a 75% waste diversion target which was to be achieved by 2034.

Peel also considered developing an AD processing facility designed with a capacity to process 90,000 tonnes of organics annually. This option reflected Peel's plans to expand their green bin program and accommodate future population growth. Although procurement began in 2018, the project was ultimately cancelled in 2021 due to cost concerns. Currently, Peel is preparing a request for proposals (RFP) for long-term third-party organics processing capacity, which may include AD technology as a processing choice by proponents.

In 2024, Peel Council endorsed a Mixed Waste Processing Diversion Program to secure third-party capacity for recovering organics from large apartment buildings garbage stream. The organics recovered through this program may be treated using AD, while the remaining waste residues could be sent to the Emerald EfW facility. This initiative followed a mixed waste processing feasibility study started in 2018, which involved vendor engagement and staff visits to mixed waste processing facilities in Europe and the USA. The associated RFP is currently on hold.

Peel continues to rely on various short-term third-party contracts for organics processing, including some that use AD processing technology. These contracts have been successful; however, they have not yet led to significant program changes.

2.4.8.4 Halton, Ontario – SWMS Emissions Reduction Measures

Currently, Halton addresses emissions reduction through organic waste diversion (and subsequent processing via AD from a third party provider), yard waste composting, and LFG collection and utilization.

In 2019, Halton's Council declared a Climate Emergency to acknowledge the impacts of climate change and that Halton must develop initiatives to reduce its impact on GHG emissions. Some proposed short and long-term climate change goals include:

- Review strategies for energy conservation, greening operations and renewable energy technologies;
- Provide strategies to increase Halton's waste diversion rate; and
- Determine a strategy for green fleet operations.

To support Halton's climate change goals, the upcoming waste collection contract will include a requirement for the successful service provider to incorporate alternatives to petroleum-based fuels for waste management vehicles in an attempt to reduce emissions.

2.4.8.5 HRM, Nova Scotia – Landfill Gas Recovery Systems, Organic Waste Management and Renewable Energy Initiatives

HRM operated an LFG collection system at the former Highway 101 landfill site from 2005 to 2022, which was collected to produce electricity. However, as methane generation from the landfill declined, active gas collection and renewable energy generation at this site were discontinued.

To address ongoing LFG emissions, HRM is investing over $500,000 in a new initiative to determine and implement infrastructure for continued LFG

collection and treatment. This includes a biocover project at Highway 101 landfill site to reduce methane emissions.

At HRM's active Otter Lake landfill, LFG is currently collected and flared. HRM is actively exploring opportunities to convert this gas into electricity. While the provincial electricity utility, Nova Scotia Power, has shown little interest in purchasing electricity generated from this source, HRM is pursuing discussions with private operators such as Renewall Energy and Mirror Nova Scotia to develop viable energy recovery options and markets.

In September 2024, HRM began operating its new Halifax Organics Management Facility, which can process up to 60,000 tonnes of organic waste annually. A feasibility study has been completed to explore supplementing the facility's electricity needs with a solar farm, with plans to propose the solar project for funding in the next fiscal budget.

HRM is also considering additional renewable energy projects, such as a potential solar farm at the former Highway 101 landfill site and retrofitting existing waste management facilities to improve energy efficiency. The municipality is also investigating the use of reduced-emission waste collection vehicles and exploring opportunities within the carbon credits and offsets market to further reduce emissions.

2.4.8.6 Edmonton, Alberta – Energy from Waste

Edmonton is advancing a EfW project designed to convert municipal waste into steam for electricity generation and industrial heating. The facility, being developed by Varme Energy, is expected to divert between 150,000 and 200,000 tonnes of waste per year from landfill over a 15-year period. This initiative forms part of Edmonton's broader strategy to reduce landfill dependency and generate low-carbon energy.

A $6.1 million front-end engineering and design (FEED) study was completed to assess the technical and economic feasibility of the project. The study has $2.8 million in funding support from Alberta's Technology Innovation and Emissions Reduction program. Findings from the EfW study confirmed the viability of the facility, which will use advanced combustion technology to incinerate waste at high temperatures, using the resulting heat to power a boiler that generates high-pressure steam for energy.

The facility is expected to sequester up to 90% of the CO_2 produced during the EfW process, significantly reducing its GHG emissions and enhancing its

environmental performance. The capital cost of the project is estimated at approximately $300 million. The facility has received regulatory approval from the Alberta Utilities Commission and is slated to begin operations in 2028.

2.4.8.7 Seattle, USA – Renewable Fuels

Seattle was one of the first cities in the USA that mandated waste collection haulers to transition to renewable fuels waste collection fleet. In 2023, Seattle introduced a Smart Fleet for waste collection (RNG and CNG powered trucks for waste collection). The waste fleet includes 200 vehicles powered by electricity, RNG and renewable diesel and includes two full size 100% electric recycling trucks[167].

2.4.8.8 Summary- Energy Generation and Methane Reduction

Municipalities are employing a range of technologies and operational strategies to reduce methane emissions and generate renewable EfW. These include:

- AD processing of organics waste for methane capture and use as a renewable energy resource and RNG;
- LFG collection, utilization and power generation;
- Landfill biocovers for passive methane oxidation;
- EfW facilities; and
- Fleet and fuel source switching.

These approaches reflect a shift toward integrated EfW systems and climate-aligned infrastructure planning, balancing cost, emissions reduction and energy recovery. They also position LFG as a strategic climate asset, where assessing its value across different end uses supports more effective GHG reduction decisions. The scale of renewable energy generated from LFG can be substantial, often exceeding the output of other municipal renewable initiatives such as solar photovoltaic (PV) or geothermal projects. Recognizing this magnitude is critical when considering how LFG is classified within the Region's renewable energy portfolio and how future investments and operational decisions are prioritized to maximize both climate and energy

[167] https://www.c40.org/case-studies/seattle-fossil-fuel-free-waste-collection-fleet/

benefits. In Ontario, generating electricity from LFG offers limited benefits due to the province's low-carbon grid; however, upgrading LFG to RNG for thermal energy or fleet fuel can displace higher-emission sources such as natural gas or diesel, delivering greater climate benefits. Each potential use carries different trade-offs between emissions reductions and revenue, underscoring the need for intentional, context-specific deployment.

2.4.9 Carbon Accounting Programs

Municipalities are increasingly shifting from traditional weight-based diversion metrics to impact-based carbon accounting to better align waste management with climate action goals. This allows for prioritizing programs based on their GHG reduction impact. A central challenge is the complexity of allocating emissions, which the **Greenhouse Gas Protocol** (global standard set by the World Resources Institute and the World Business Council for Sustainable Development) defines as the following:

- **Scope 1**: Direct emissions from sources owned or controlled by the municipality (e.g., LFG, fleet fuel combustion);
- **Scope 2**: Indirect emissions from the generation of purchased energy (e.g., electricity or steam used at facilities); and
- **Scope 3**: All other indirect emissions that occur in the value chain (e.g., emissions from production and transportation of purchased goods or contracted services).

To inform the Region's approach, the jurisdictions were reviewed to observe how other municipalities manage these reporting challenges. The following findings will help inform the Region's LTWMS to effectively contribute to the targets within the TransformWR climate action plan.

2.4.9.1 Toronto, Ontario – Sector-Based Emissions Inventory

Toronto integrates waste management into its broader climate strategy, TransformTO Net Zero Strategy. It includes a 2030 target of 70% residential waste diversion and increased sustainable consumption in Toronto operations and the local economy.

While specific data for tracking progress on these goals is currently limited, Toronto plans to update waste-related KPIs through its next LTWMS currently

under review. However, diversion data is reported through external platforms such as the Carbon Disclosure Project and World Council on City Data.

Toronto's Sector-Based Emissions Inventory (SBEI)[168] tracks direct and indirect GHG emissions across three sectors: buildings, transportation and waste. This includes emissions related to both solid waste and wastewater, reported annually under the Scope 1, 2 and 3 GHG Protocol for Cities (BASIC method[169]). A public dashboard presents community-wide and corporate (Toronto municipal operations) emissions data. Toronto also incorporates waste emissions data in its Carbon Budget[170], which helps guide municipal decision-making around GHG reductions.

In support of broader sustainability goals, Toronto is advancing a circular economy approach, focusing on reuse, repair and resource recovery, and has formed a Community Advisory Committee and Working Group to support implementation in Toronto municipal services as mentioned previously in **Section 2.4.6.1.1.**

Additionally, Toronto has released a Consumption-Based Emissions Inventory (CBEI), estimating emissions from food and goods consumed by residents. This data complements the SBEI and will inform future waste reduction and sustainable consumption initiatives.

2.4.9.2 Durham, Ontario – Corporate GHG Accounting

Durham has implemented a range of strategies aimed at reducing GHG emissions from waste management activities. Durham's carbon reduction strategy primarily focuses on Scope 1 GHG emissions, meaning that emissions from contracted services, such as waste collection, processing and disposal, are not included in corporate GHG reporting. Currently, only emissions from the DYEC and estimated methane emissions from closed landfills are accounted for at the corporate level.

Despite this scope, Durham has undertaken several initiatives to reduce waste-related GHG emissions. These include methane mitigation projects at closed landfills, such as landfill mining and re-naturalization at the Blackstock Landfill (completed in 2019) and a methane biocover pilot at the Oshawa

[168] https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/sector-based-emissions-inventory/
[169] https://ghgprotocol.org/ghg-protocol-cities
[170] https://www.toronto.ca/legdocs/mmis/2024/bu/bgrd/backgroundfile-242067.pdf

Landfill, which is currently ongoing. These projects contribute to measurable reductions in methane emissions and are reported in the Durham's waste management annual reports.

Additionally, Durham has transitioned to AD for processing organic waste to enable the capture and reuse of methane to offset fossil fuel use. Further, in July 2024, the Cities of Ajax and Pickering mandated the use of RNG-fueled vehicles for waste collection contracts.

To support its EfW strategy, Durham conducted a life cycle assessment during the DYEC Environmental Assessment, comparing the emissions impacts of long-haul landfilling versus local incineration[171]. The results demonstrated the GHG reduction benefits of DYEC, helping to justify the facility's role in the Durham's LTWMS.

Although many of these initiatives contribute significantly to emission avoidance, their benefits are not fully captured in Durham's corporate GHG inventory due to the limited Scope 1 accounting. Durham acknowledges this gap and continues to pursue innovative strategies to reduce emissions, even as it faces challenges in aligning these actions with current reporting frameworks. Measurable benefits, such as reductions in methane from closed landfills, are reported periodically and provide evidence of progress toward broader climate goals.

2.4.9.3 HRM, Nova Scotia - HalifACT

HRM is aligning its solid waste management system with its climate plan, HalifACT, which sets ambitious community-wide GHG reduction targets:

- Seventy-five percent reduction in GHG emissions by 2030 (from a 2016 baseline); and
- Net-zero community emissions by 2050.

Since 2016, corporate and community emissions have decreased by approximately 31% and 17.9%, respectively[172]. While specific waste-related emissions data is not detailed, efforts are underway to integrate waste system planning with HalifACT's broader goals. This alignment aims to confirm that the

[171] https://www.durhamyorkwaste.ca/en/facility-approvals/resources/Documents/20191202_DYEC_ESR.pdf
[172] https://cdn.halifax.ca/sites/default/files/documents/city-hall/standing-committees/241003essc1311.pdf

waste sector contributes meaningfully to achieving community-wide climate targets.

2.4.9.4 Edmonton, Alberta – GHG Management Plan

The GHG Management Plan 2019 to 2030 is aimed to support civic operations to reduce GHG emissions from corporate municipal operations. Waste services have multiple initiatives to reduce operations GHG emissions such as:

- Retrofitting buildings for energy efficiency;
- Switching to lower-emission fuel sources to heat and power facilities;
- Building infrastructure to support low-emission vehicles; and
- Generating renewable energy at Edmonton facilities.

This plan forecasts a 28% reduction in internal GHG emission from 2022 levels by 2030[173].

2.4.9.5 Richmond, BC – Community Energy and Emissions Plan

The Community Energy and Emissions Plan aims to set Richmond on a path to achieve a 50% reduction in community GHG emissions by 2030 and net zero emissions by 2050. Strategic Direction #8 outlines the transition to the circular economy, outlining the same target of a fully circular city by 2050. The waste emissions data is provided by the Community Energy and Emissions Inventory (CEEI) data and Metro Vancouver's Waste and GHG tracking model.

CEEI calculates landfill-related GHG emissions using two methods:

- Waste-in-Place (WIP): Estimates emissions from the total historical waste decomposing in landfills; and
- Waste Commitment: Estimates emissions from waste landfilled in a specific year (useful for year-over-year or municipal comparisons).

These methodologies help Richmond monitor progress toward its emissions and circular economy goals while supporting regional and provincial reporting consistency.

[173] https://pub-edmonton.escribemeetings.com/filestream.ashx?DocumentId=241716

2.4.9.6 Abbotsford, BC – Official Community Plan

Abbotsford's OCP sets solid waste goals aligned with the Fraser Valley Regional District's target of 90% waste diversion by 2025. GHG reduction targets from solid waste include:

- Twenty percent per capita reduction by 2025; and
- Forty percent per capita reduction by 2040, based on a 2007 baseline, where waste contributed approximately 2% of total emissions.

In 2023, Abbotsford reported that carbon emissions from corporate operations were 24% lower than 2007 baseline levels, exceeding their short-term reduction target for 2025[174].

To track progress, Abbotsford uses the provincial CEEI which provides community-level data on municipal solid waste emissions. A new CEEI update is planned for 2025 to serve as a baseline to benchmark achievements and guide future emissions reduction strategies.

2.4.9.7 Seattle, USA – Climate Change Action Plan

Seattle calculates GHG emissions from waste using two approaches:

- **Disposal-based method**: Emissions are estimated based on waste disposal weights using emissions factors from the Environmental Protection Agency's Waste Reduction Model (WARM); and
- **Consumption-based method**: Emissions are assessed from a lifecycle perspective, accounting for goods and services consumed by residents.

Seattle's Climate Action Plan set a target of carbon neutrality by 2050 and includes 150 recommendations, with seventy actions to be implemented within one to three years. The action plan prioritizes reducing both direct and indirect GHG emissions associated with waste disposal.

Seattle maintains a climate dashboard to track progress across sectors, including waste and uses emissions data to inform planning and public reporting.

[174] https://www.abbotsford.ca/council/your-council-community/blog/happy-earth-day-abbotsford

2.4.9.8 GLA, UK – FoodSave Program

Food waste is a significant contributor to GHG emissions. FoodSave was a project launched in 2013 and provided support to businesses to prevent waste, donate surplus food and allow proper recycling of unavoidable waste. This is achieved through a combination of waste composition audits, tailored advice and support in implementing sustainable practices. The program was funded by the European Regional development Fund, the London Waste and Recycling Board and the Mayor of London[175].

From 2013 to 2015, FoodSave achieved the following:

- Diverted 1,000 tonnes of food waste from landfill a year;
- Prevented over 150 tonnes a year of food waste; and
- Saved participating businesses a total of over £550,000 (over $1,000,000 Canadian dollars) a year.

This program played a crucial role in reducing GHG by helping businesses divert waste from landfills and adopt more sustainable practices. However, following the program's completion, the UK government has introduced the Simpler Recycling program. This initiative mandates that businesses and relevant non-domestic premises separate food waste for collection by March 31, 2025.

2.4.9.9 Summary – Carbon Accounting Programs

Jurisdictions use a mix of emissions inventories, planning tools and targeted programs to measure and manage GHG emissions from the waste sector. Methods vary in scope; however, they typically include the following:

- Emissions inventories;
- GHG reporting and dashboards;
- Carbon budgets and climate plans;
- Operational GHG reductions; and
- Targeted organic waste diversion programs.

[175] https://www.london.gov.uk/city-hall-blog/erdf-foodsave-project-wins-award

Despite challenges in capturing outsourced or community-wide impacts, municipalities are advancing innovative strategies to reduce waste-related GHGs and align with long-term net-zero goals.

2.4.10 Provincial and Federal Waste Management Legislation and Policy

Jurisdictions both respond to and influence legislative changes at higher levels of government. Based on the scan, the following three topics are focal points for municipalities with respect to Provincial and Federal legislation and policy:

- SUPs: Federal regulations and government action to address the issue at the local level;
- Provincial Legislation and Guidelines: Local government's efforts to respond collaboratively;
- Changing responsibilities: Approaches to IC&I sector waste management responsibilities; and
- Federal Methane Commitments: Canada's co-leadership of the Global Methane Pledge[176] and implementation of the Federal Methane Strategy[177], which aim to accelerate methane reductions, will have direct implications for municipal waste management practices.

2.4.10.1 Federal Legislation - Single-use Plastics

In December 2021, the Government of Canada published the proposed Single-use Plastics Prohibition Regulations in the Canada Gazette, Part I and Guidance for Selecting Alternatives to the Single-use Plastics in the Proposed Single-use Plastics Prohibition Regulations. These Federal regulations are part of Canada's broader strategy to combat pollution, achieve zero plastic waste by 2030 and reduce GHG emissions[178].

On November 16, 2023, a Federal Court overturned the regulations; then, on December 8, 2023, the Government appealed the Court's decision. On January 25, 2024, the Federal Court of Appeal granted a stay motion, preventing the

[176] https://www.globalmethanepledge.org/
[177] https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/reducing-methane-emissions/faster-further-strategy.html#toc10
[178] https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste/single-use-plastic-overview.html

November 16, 2023, ruling from taking effect while the appeal is ongoing. As a result, the Single-use Plastics Prohibition Regulations remain in force at the time of writing.

Concurrently, Canadian municipalities have been developing approaches to address SUPs. Despite the small size of SUP type materials, SUPs are ubiquitous, especially in urban spaces, and have negative impacts on waterways and wildlife. Some alternatives to SUPs may cause unintended waste management issues, such as consumer confusion around materials with labels such as "compostable plastics" and increased contamination in organics waste processing and recycling streams.

2.4.10.1.1 Guelph, Ontario – Single-use Items Reduction Strategy and By-law

In 2019, as part of the SWMMP process, Guelph Council directed staff to develop a strategy to reduce or eliminate SUPs. Development of the single-use strategy involved substantial research, jurisdictional scans, consultation with businesses and community engagement.

The Single-use Items Reduction Strategy was approved by Guelph council in April 2022 and outlines the approach that Guelph will take to implement procedural changes in businesses to decrease SUPs waste and encourage sustainable behaviour by residents[179]. The strategy takes a phased approach to banning the use of SUPs by businesses throughout the city. Bans were implemented by introducing the Single-use Items By-law (2024) – 20938.

More specifically, beginning in March 2025 Guelph began enforcing that businesses, with some exemptions, must accept a customer's clean reusable drink cup for beverage orders made in-store. Secondly, businesses must offer single-use accessory food ware items (e.g., utensils, stir sticks, condiments and beverage trays) by request and/or at self-serve stations. Additionally, paper shopping bags must contain at least 40% post-consumer recycled content and this information must be clearly printed on the bag.

Effective September 1, 2025, businesses will also be required to accept a customer's clean reusable food container for food orders made in-store. Exemptions apply to charitable or non-profit organizations, hospital or community care facilities, special events and self-serve businesses such as buffets, salad bars and all-you-can-eat restaurants.

[179] https://guelph.ca/living/environment/garbage-and-recycling/single-use-items-reduction-strategy-and-ban/

Resources are provided on the website of the Single-use Item Reduction Strategy to residents and businesses to understand the by-law requirements, implementation of the SUPs bans and answers to frequently asked questions.

2.4.10.1.2 Toronto, Ontario – Single-use and Takeaway Items Reduction Strategy and By-law

Toronto is implementing a Single-use and Takeaway Items (SUTI) Reduction Strategy, which supports recommendations established in Toronto's LTWMS (2016)[180]. Phase 1 of the LTWMS was a voluntary Reducing Single-use program, implemented in 2021.

Toronto is now in Stage 2 of the LTWMS, which involved the adoption of a by-law: Toronto Municipal Code (702) - Single-use and Takeaway Items, passed in February 2024 (updated May 2024). This by-law includes details and directions for accessory food items, paper shopping bags, reusable shopping bags and reusable beverage cups. The by-law also outlines penalties for not following the by-law.

The by-law has been updated and amended since its first adoption, including a clarification on definition of a "beverage cup". Key stipulations involve requirements for retail business establishments, including:

- Ask customers prior to providing accessory SUTI items, including an update to extend this condition to business that is provided by a third-party service (i.e., take-out for delivery);
- Accept reusable items;
- Offer products that are compatible with the Toronto's waste diversion programs; and
- Post notice on the acceptance of reusable beverage cup[181].

Toronto is committed to helping retail business establishments comply with the by-law through targeted education, outreach activities and incentives[182] and retail business establishments have indicated strong support for the Single-

[180] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/reducing-single-use-takeaway-items/single-use-takeaway-items-reduction-strategy-bylaw/
[181] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/reducing-single-use-takeaway-items/
[182] https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/reducing-single-use-takeaway-items/resources-for-business-reducing-single-use-takeaway-items/

use and Takeaway Items By-law. Public consultations were held in 2022, with retail business establishments indicating their support for the acceptance of reusable bags (84%), the implementation of an Ask-First/By-Request requirement (74%) and the acceptance of reusable hot (70%) and cold (63%) beverage cups[183]. Toronto municipal staff have attributed success on the SUTI portfolio to an approach that included incremental implementation, monitoring and adaptability, consultation with a range of businesses, clear messaging in communications and promotional and educational resources as well as financial resources of SUTI alternatives.

2.4.10.1.2.1 Circular Food Innovators Fund

Launched in February 2024, the Toronto's Circular Food Innovators Fund is an example of a municipal initiative that achieves objectives related to multiple categories from other sections (e.g., **Section 2.4.1.1**). It also represents an innovative approach to addressing single-use packaging. By encouraging businesses to adopt zero waste models, Toronto is working towards circular economy transformation and building a more circular food system.

Through an application system, the Circular Food Innovators Fund provides financial support to select local small businesses (both for-profit and not-for-profit). The funds can be used to implement reuse systems that replace SUTI with reusable foodservice ware that is collected and redistributed for further use[184].

2.4.10.1.3 Durham, Ontario – Absence of Regional SUPs By-law

Actions related to SUPs are included as part of Durham LTWMS (2022 to 2040), including:

- Supporting residents in making behavioural changes to reduce the amount of waste generated (this action includes durable goods, textiles and SUP);
- Developing a monitoring program (this action includes composition audits that may include monitoring of SUP); and

[183] Attachment 4: 2022 Public Consultation Report (with Executive Summary from IPSOS report)
[184] https://www.toronto.ca/services-payments/grants-incentives-rebates/circular-food-innovators-fund/

- Partnering with local area municipalities on a common message and approach to diversion (including SUP, in support of federal action)[185].

As an upper tier government, Durham provides services and programs to eight local area municipalities. Durham has not implemented a by-law related to SUPs; however, the municipalities that make up the region have been addressing SUPs, starting with the Town of Ajax, which adopted a related by-law in March 2020.

At the upper tier level, advocacy for legislation at the Provincial or Federal level has been demonstrated, for example, in Durham's March 27, 2019, letter to the Premier calling for the Province of Ontario to work together with the federal government to establish a national plastics reduction program[186].

Durham's current communications reflect that the region's focus is on providing tips on how to limit the consumption of SUP[187].

2.4.10.1.4 Edmonton, Alberta – Plan to Reduce Single-use Items and Single-use Item Reduction By-law

Concurrent to the Government of Canada's development of legislation on SUPs, the Edmonton has established a Plan to Reduce Single-use Items in 2022[188]. Informed by research and findings from other local governments, along with input from residents, businesses and industry association, the plan recommended a combination of voluntary and regulatory approaches to reduce SUPs. Voluntary approaches included outreach and education, working with other levels of government and leading by example. The recommendation was that a regulatory approach (i.e., a by-law) be implemented to address single-use shopping bags, food ware accessories, polystyrene foam and other non-foam disposable cups.

Edmonton's goal is to reduce the total number of single-use items rather than switching from plastic items to non-plastic items. The Single-use Item Reduction By-law (20117) targets shopping bags, Styrofoam, take-out cups

[185] https://www.durham.ca/en/living-here/resources/Documents/GarbageandRecycling/Long-Term-Waste-Plan/Final-Documents/Durham_Region_LTWMP_FINAL_Jan-31-2022-AODA.pdf; page 49

[186] https://plasticactioncentre.ca/wp-content/uploads/2019/05/03272019-Premier-Ford-Single-Use-Plastics.pdf

[187] https://www.durham.ca/en/living-here/reduce-and-reuse.aspx#Avoid-single-use-items-when-you-can

[188] https://www.edmonton.ca/sites/default/files/public-files/Edmonton%27s_Plan_to_Reduce_Single-use_Items.pdf

and foodware accessories (e.g., utensils, straws)[189]. It bans plastic film shopping bags and foam cups, plates, bowls and containers. It also regulates the provision of foodware accessories including stir sticks, straws cutlery, so that they may only be provided when a customer requests them. As well, dine-in drinks are expected to be served in reusable cups.

If Edmonton receives a complaint regarding a by-law infraction, it will respond first through outreach and education, such as a phone call and in-person visit by Waste Services staff. A warning or fine may be issued in the event that corrective action is not taken[190].

2.4.10.1.5 BC Adoption

In December 2023, the Government of BC implemented the Single-use and Plastic Waste Prevention Regulation, which includes bans, fees and requires by-request provisions for SUPs, with a phased implementation[191], including the following:

- December 20, 2023: Restrictions on food service accessories;
- July 15, 2024: Restrictions on plastic shopping bags, food service ware and oxo-degradable plastics. Minimum fees on alternative shopping bags;
- July 1, 2028: Restriction on Polyvinyl Chloride (PVC) film wrap; and
- July 1, 2030: Restrictions on polystyrene foam meat trays[192].

Examples of municipalities that began addressing SUPs prior to this provincial regulation include the Richmond (with the 2022 Single-use Plastic and Other Items By-law No. 10000[193]) and Vancouver (with the Single-use Item Reduction Strategy, developed for implementation from 2018 to 2025)[194]. As well, the NZWC and Vancouver raised the issue at the provincial and national level, advocating for regulatory action. To avoid overlap and simplify compliance for businesses and non-profits, these cities are now phasing out their local by-laws to rely on the Province's regulation.

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189 https://www.edmonton.ca/sites/default/files/public-files/Bylaw20117.pdf
190 https://www.edmonton.ca/programs_services/garbage_waste/single-use-items
191 https://bcgreenbusiness.ca/wp-content/uploads/2024/01/BCGB-Single-use-plastic-waste-prevention-regulation.pdf
192 https://www2.gov.bc.ca/gov/content/environment/waste-management/zero-waste/plastics/supwpr
193 https://www.richmond.ca/__shared/assets/BL1000065140.pdf
194 https://vancouver.ca/files/cov/single-use-item-reduction-strategy-with-amendments.pdf

2.4.10.1.6 Summary – Single-use Plastics

In summary, examples from selected jurisdictions for reducing the use of SUPs include:

- Develop a strategy or plan for reducing SUPs in the jurisdiction;
- Conduct outreach and engagement with businesses and the community on reducing SUPs;
- Implement by-laws or bans on SUPs for businesses operating in the jurisdiction; and
- Advocate and communicate about provincial and federal regulations.

2.4.10.2 Provincial Legislation and Guidelines

Over the past decade, the legislative context governing municipal waste management has changed significantly, as outlined in Technical Memorandum 1. Two major areas of change are the shift towards EPR and the introduction of policy guidelines for diverting food and organic waste in Ontario.

Recognizing that the jurisdictions covered in this report are navigating a period of substantial change, it has been examined how they are responding to these shifts. One notable response is their involvement in various associations that promote research, collaboration and advocacy.

2.4.10.2.1 Research, Collaboration and Advocacy

Engagement with and participation in the following organizations and groups were commented in the jurisdictional responses from Ontario jurisdictions:

2.4.10.2.1.1 Municipal Advocacy Organizations

1. **Association of Municipalities of Ontario (AMO):** AMO is a non-profit organization representing Ontario's municipal governments, advocating for their interests and providing them with resources and support.
2. **Regional Public Works Commissioners of Ontario (RPWCO)**: RPWCO is an organization representing public works commissioners in Ontario, focusing on sharing knowledge and advocating for effective public infrastructure management.
3. **MWA:** Membership-based organization that coordinates committees on key themes, peer networking, learning and advocacy opportunities and workshops. Working committees currently include:
   - Markets, Operations & Contracts;
   - Organics;
   - HHW;

- Promotion and Education;
- Large Apartment Buildings; and
- Depots.

2.4.10.2.1.2 Waste Industry and Technical Organizations

1. **Waste 2 Resources Ontario (W2RO):** W2RO is an organization dedicated to promoting sustainable waste management practices and resource recovery in Ontario.
2. **Ontario Environmental Industry Association (ONEIA):** ONEIA is an association representing Ontario's environmental industry, advocating for policies and practices that support environmental protection and sustainable development.
3. **SWANA:** SWANA is a professional association in North America that focuses on advancing the practice of environmentally and economically sustainable solid waste management.
4. **North American Hazardous Materials Management Association (NAHMMA):** NAHMMA is a professional organization dedicated to promoting best practices in hazardous materials management and pollution prevention across North America.
5. **Continuous Improvement Fund (CIF) (formerly):** The CIF historically provided financial and technical support to enhance waste diversion and recycling programs in Ontario municipalities (windup December 2024).

2.4.10.2.1.3 Other Industry Groups

1. **Ontario Food Collaborative**: The Ontario Food Collaborative is a network focused on reducing food waste and promoting sustainable food systems through collaboration and education.
2. **Compost Council of Canada:** The Compost Council of Canada is a national organization dedicated to the advancement of composting and organic waste management practices across Canada.
3. **Canadian Biogas Association:** The Canadian Biogas Association is a national organization that advocates for the development and utilization of biogas as a clean, renewable energy source in Canada.
4. **Cement Industry Association:** Identified by Durham, due to an opportunity to learn about alternative low-carbon fuels to reduce GHG emissions and enhance sustainability in cement production processes.
5. **Canadian Standards Association (CSA):** CSA is a standards organization that develops and maintains standards to ensure safety, sustainability and performance across various industries in Canada and internationally.

6. **PAC Next:** PAC Next is a packaging-industry group that considers sustainability topics and the life-cycle of packaging. Its aim is to identify optimal packaging solutions and support packaging innovation through collaboration amongst their members.

2.4.10.2.1.4 Circular Economy Learning

1. **Circular Economy Leaders Consortium:** This consortium is a collaborative group of organizations and businesses committed to advancing the circular economy by promoting sustainable practices and innovation.
2. **Dutch Canadian Circular Economy Alliance:** The Dutch Canadian Circular Economy Alliance fosters collaboration between Dutch and Canadian entities to promote circular economy initiatives and sustainable business practices.
3. **Circular Cities and Regions Initiative:** This initiative aims to support cities and regions in transitioning to a circular economy by sharing knowledge, best practices and fostering collaboration.

In addition, for the purposes of program, land-use and infrastructure planning, as well as permitting and approvals, collaboration with neighbouring jurisdictions, the Ministry of Environment, Conservation and Parks (MECP) and conservation authorities was identified by Ontario jurisdictions.

2.4.10.2.2 Ontario Municipal Responses to Blue Box Regulations

In transitioning the Blue Box Program to full EPR, the Region negotiated with Circular Materials, the Common Collection Service Administrator to continue the collection of Blue Box Materials from current Business Improvement Areas, which include approximately 1,500 businesses. However, it will not be collecting Blue Box Materials from large apartment buildings who do not currently receive collection. Though these decisions are finalized, participating in municipal advocacy associations remains important, as regulatory changes and amendments are ongoing. Most recently, a consultation comment period on amending the Blue Box Regulation was open until July 4, 2025. The proposed amendments identify significant changes to producer obligations for designated printed paper and packaging. These proposed changes particularly may affect Blue Box Materials in public spaces, large apartment buildings, long-term care facilities, retirement homes and schools, which were initially planned to come into effected in 2026 per the Blue Box Regulation.

Additionally, many jurisdictions have recognized that implementing other potential new EPR programs. For example, on behalf of Ontario municipalities,

AMO's "Where to from here: Expanding materials under Ontario's Resource Recovery and Circular Economy Act" provides information on the potential to designate additional products under EPR in Ontario. It suggested additions to existing regulations (i.e., for electrical and electronic equipment, and hazardous or special products) and new designations under new regulations (for carpets, furniture, mattresses and textiles)[195].

2.4.10.2.3 Responses to the Food and Organic Waste Policy Statement

As outlined in Technical Memorandum 1, the Food and Organic Waste Policy Statement is a policy statement that identifies the direction that the Province of Ontario envisions with respect to food and organic waste management[196]. The policy statement directs organics diversion programs to accept a wide range of materials, including food waste, yard waste and soiled paper products, to maximize waste diversion and support environmental goals. The policy statement also promotes collaboration between the IC&I sectors and municipalities to enhance resource recovery and develop sustainable end-markets for recovered organics materials.

2.4.10.2.3.1 Guelph, Ontario– Engagement with CIC for IC&I Organics Collection Program

As part of the policy statement, Ontario included targets for the quantity of food and organic waste to be diverted from communities of various sizes and from the IC&I sector. Municipalities are not responsible to achieve the targets that apply to the IC&I sector; however, may choose to include feedstock from IC&I establishments if it supports their green bin programs and the reduction of garbage to landfill within their jurisdiction.

A pilot project in Guelph, led by the CIC, offers businesses the opportunity to join an organics collection program specifically for the IC&I sector. Importantly, this pilot is not managed by Guelph. Instead, the CIC has partnered with various groups to provide services directly to the private sector, which generates a large amount of organic waste. This approach allows the program to operate independently of municipal waste management services in terms of operations and funding. The main goal of the program is to lower the costs of diverting organic waste by fostering collaboration among businesses such as grocery stores, restaurants, hotels, catering services,

[195] https://www.amo.on.ca/sites/default/files/assets/DOCUMENTS/Waste/Waste-Diversion/2022/Expanding%20Designated%20Materials%20Under%20Ontario's%20Resource%20Recovery%20and%20Circular%20Economy%20Act%202022-08-05.pdf
[196] https://www.ontario.ca/page/food-and-organic-waste-policy-statement

long-term care facilities and large apartment buildings, all of which produce significant amounts of food and organic waste[197]. As outlined in **Section 2.4.1.1.1** , the project has recently been taken over by Sustainable Waterloo Region with a goal of expanding its services to a larger geographic area[198].

2.4.10.2.3.2 Durham, Ontario – Expansion of Accepted Materials

In July 2024, Durham expanded its green bin collection program to include more types of accepted materials (e.g., pet waste, sanitary products) and added large apartment buildings in the collection program. This decision can, in part, be attributed to the Province's policy statement.

2.4.10.2.4 Summary – Provincial Legislation and Guidelines

In summary, examples from selected jurisdictions for responding to provincial legislation and guidelines include:

- Participate in various municipal and industry associations and waste and circular economy education groups to monitor and influence changes to legislation; and
- Implement programs or strategies in response to the Ontario policy statement in anticipation of future legislation.

2.5 Jurisdictional Scan Summary

Sections 2.1 to **2.4** present the results of a comprehensive jurisdictional scan, conducted to identify best practices, innovations and emerging trends that could inform the Region's LTWMS. Twenty jurisdictions across Canada, the USA and Europe were selected based on their leadership in waste reduction, diversion, circular economy practices and operational innovation. These jurisdictions were assessed across seven focus areas, including waste reduction and reuse, recovery and EfW, operational improvements, circular economy, carbon offsetting, public engagement and performance metrics.

The scan highlighted several key opportunities for the Region to consider. Jurisdictions are increasingly moving beyond traditional recycling programs, placing greater emphasis on upstream interventions such as waste prevention, reuse systems and sector-specific strategies for food waste, C&D

[197] https://circularinnovation.ca/guelphwellingtonpilot/
[198] https://circularinnovation.ca/circular-innovation-council-and-sustainable-waterloo-region-partner-up-to-continue-solving-the-commercial-food-waste-problem-together/

materials, textiles and bulky items. New approaches are also emerging in monitoring and performance tracking, with technologies such as AI-enabled cameras, RFID-tagged carts and mobile audit apps supporting more accurate data collection and program accountability. Performance measurement is also evolving, with jurisdictions incorporating metrics tied to climate action, behaviour change and circularity, rather than relying solely on diversion rates.

Overall, the scan highlights a growing shift toward more integrated and forward-looking waste management strategies. Leading municipalities are aligning waste planning with broader sustainability goals, adopting flexible service models and leveraging community partnerships and innovation to improve outcomes. These findings provide a foundation for the Region to explore new approaches and tailor solutions that are both practical and progressive, setting the stage for option development in the next phase of the LTWMS.

Table 2 includes a summary of the jurisdictions and areas of interest that were considered in this document.

Table 2: Jurisdictional Scan Summary

Theme	Jurisdiction and Area of Interest
Items for Reduction, Reuse and Diversion - Food and Organic Waste	• **Guelph** – IC&I Organics; • **Metro Vancouver/NZWC** – Love Food Hate Waste Canada Campaign; • **Toronto** – Food Waste Reductions Partnerships; • **HRM** – Organics Ban and Circular Food Hub; • **Vancouver** – Circular Food Innovation Lab; and • **GLA** – ReLondon's Circular Food Projects.
Items for Reduction, Reuse and Diversion – C&D Waste	• **Guelph** – Construction, Renovation and Demolition Waste Management Guidebook; • **Toronto** – Renovation Waste Collection at Depots; • **Metro Vancouver** – C&D Waste Reduction Toolkit and Calculator; • **Richmond** – Demolition By-law; • **Vancouver** – Green Demolition By-law; • **Port Moody** – Deconstruction Waste Management By-law; • **San Francisco** – C&D Debris Recovery Ordinance; and • **Seattle** – Salvaged Lumber Warehouse.

Theme	Jurisdiction and Area of Interest
Items for Reduction, Reuse and Diversion – Textiles	• **Guelph** – Textile Donations Mapping and Guelph Tool Library; • **Toronto** – Sewing Repair Hubs; • **Peel** – Textile Donation; and • **GLA** – ReLondon's Textiles Action Plan.
Items for Reduction, Reuse and Diversion - Mattresses	• **Guelph** – Mattress Recycling Program; and • **San Francisco** – Mattress Recycling Program.
Approaches and Technologies for Waste Monitoring – Waste Composition Audits	• **Guelph** – Waste Composition Audits and Inspections; and • **Durham** – Waste Composition Audits.
Approaches and Technologies for Waste Monitoring – AI-Enabled Camera Solutions	• **Peel** – AI and Power BI to Monitor and Track Waste Metrics; • **Regina** – SortSmart Education Program; • **Abbotsford** – AI to Measure Contamination and Provide Feedback; and • **Metro Vancouver** – Camera Based Sensors to Detect Banned Items and Fullness.
Approaches and Technologies for Waste Monitoring	• **Mobile Applications** – Many Jurisdictions • **RFID Tags** – Many Jurisdictions
Metris and KPIs for Waste Reduction	• **Toronto** - Circular Economy Baselining and Forthcoming Circular Economy Roadmap; • **Durham** - System and Program Metrics; • **Peel** - System Metrics, AI and Educational Campaigns; • **Halton** – Overall and Program-Specific Metrics; • **HRM** - System Metrics and Climate Change; • **Montréal** - Circular Economy Roadmap; • **Regina** - Waste Diversion Rate; • **Edmonton** - Waste Diversion Rate; • **Metro Vancouver** - Integrated Solid Waste and Resource Management Plan; • **Richmond** - System Metrics, Customer Service and Enforcement; • **Vancouver** - Zero Waste Disposed by 2040; • **Abbotsford** - Contamination Remediation Plan and GHG Emissions Targets; • **New York State** - Recycling Rates; and • **Seattle** - Weight-Based Metrics.

Theme	Jurisdiction and Area of Interest
Leading or Comparable Waste Plans	• **Guelph** – SWMMP (2021 to 2041); • **Toronto** - LTWMS (2016 to 2026); • **Durham** – Waste Plan (2022 to 2040); • **HRM** - SWS (2025 to 2030); • **Edmonton** - Future of Waste (2019); and • **New York State** - SWMMP: Building the Circular Economy Through Sustainable Materials Management (2023 to 2032).
Emerging Public Education and Engagement Techniques – Partnerships with Community Groups / Delivery Partners	• **Guelph** – Guelph Tool Library; • **Toronto** – Various Community Organizations; and • **Peel** – Ecosource.
Emerging Public Education and Engagement Techniques – Technology Approaches	• **Regina** – SortSmart Education Program; • **Abbotsford** – Use of Artificial Intelligence for Targeted Feedback; and • **Peel** – Virtual Facility Tours.
Emerging Public Education and Engagement Techniques – Engagement Approaches	• **Guelph** – Behavioural Insights Gold Star Program; • **Richmond** – Iterative Engagement Approach; • **Metro Vancouver** - Consistent Communication Materials; and • **Metro Vancouver** - Collaborative Engagement Program.
Emerging Public Education and Engagement Techniques – Targeted IC&I – Large Apartment Building	• **Toronto** – 3R Ambassador Program; • **Halton** – Multi-Residential Organic Waste Collection; • **Edmonton** – Waste Reduction Network; • **Richmond** – Business Recycling Resources Program; • **Vancouver** – Zero Waste Ambassador Program; • **San Francisco** – Green Business Program; and • **BC Housing** – Tenant Engagement Toolkits.
Circular Economy Culture – Strategic Planning	• **Toronto** – Strategy for a Circular Toronto; • **Peel** – Circular Economy Roadmap; • **Richmond** – Circular Procurement Policy; • **Vancouver** – Zero Waste 2040; • **Gothenburg** – Circular Gothenburg; and • **GLA** – ReLondon Organization.

Theme	Jurisdiction and Area of Interest
Circular Economy Culture – Reuse, Sharing and Repair	• **Guelph** – Guelph Tool Library and Repair Cafes; • **Toronto** – Community Reduce and Reuse Program; • **Peel and Durham** – Share, Reuse, Repair Hub • **Edmonton** – Reuse Centre; • **Metro Vancouver** – Reuse Days • **Richmond** – Reuse & Repair Café; • **Vancouver** – Zero Waste Demonstration Site; • **Gothenburg** – Fixotek Centres; and • **Seattle** – Reuse Seattle.
Circular Economy Culture – Funding	• **Peel** – Circular Economy Initiatives Fund; • **Halton** – Waste Diversion and Circular Economy Funding; and • **Edmonton** – Waste Reduction and Reuse Grant.
Circular Economy Culture – Demonstrated Jurisdictional Commitments	• **Regina** – Green Routine City Facilities Sorting Program; • **Port Moody** – Zero Waste Plan for Facilities, Parks and Events; and • **Gothenburg** – Internal Furniture Reuse and Recycling Marketplace.
Barriers to Waste Reduction and Diversion Participation	• **Guelph** - Guelph Tool Library; • **Toronto** - Community Reduce and Reuse Programs, Delivered to Neighbourhood Improvement Areas; • **Peel** - Socioeconomic Vulnerability Index; • **Peel** - Waste Collection Design Standards Manual; • **HRM** - Outreach Services; • **Richmond** - Waste Management Design Guidelines for IC&I and Large Apartment Buildings; • **San Francisco** - Multilingual Outreach; and • **Seattle** - Strategies to Develop Inclusive Communications.
Energy Generation and Methane Reduction	• **Toronto** - Methane Emissions Reduction; • **Durham** - Energy Recovery Centre, Landfill Management and Organics Processing; • **Peel** - Use of Third-Party Processors; • **Halton** – SWMS Emissions Reduction Measures; • **HRM** - LFG Recovery Systems, Organic Waste Management and Renewable Energy Initiatives; • **Edmonton** - Energy from Waste; and

Theme	Jurisdiction and Area of Interest
	• **Seattle** - Renewable Fuels
Carbon Accounting Programs	• **Toronto** - Sector-Based Emissions Inventory; • **Durham** - Corporate GHG Accounting; • **HRM** - HalifACT; • **Edmonton** - GHG Management Plan; • **Richmond** - Community Energy and Emissions Plan; • **Abbotsford** - Official Community Plan; • **Seattle** - Climate Change Action Plan; and • **GLA** - FoodSave Program.
Federal Legislation - SUPs	• **Guelph** – Single-use Items Reduction Strategy and By-law; • **Toronto** – Single-use and Takeaway Items Reduction Strategy and By-law; • **Durham** – Phase out of the SUPs By-law; • **Edmonton** – Plan to Reduce Single-use Items and Single-use Item Reduction By-law; and • **BC Adoption** - Single-use and Plastic Waste Prevention Regulation.
Provincial Legislation and Guidelines – Food and Organic Waste Policy Statement	• **Guelph** – Engagement with CIC for IC&I Organics Collection Program; and • **Durham** – Expansion of Accepted Materials.

3.0 Waste Management Requirements and Needs

This section outlines the Region's current and future waste management requirements to guide the development of a forward-looking strategy. It builds on past successes and identifies key service gaps, emerging opportunities and policy considerations needed to support a circular economy. The analysis includes landfill diversion targets, legislative drivers, system-wide and sector-specific needs, GHG reduction goals and decision-making considerations to inform the Region's long-term direction.

3.1 Vision and Guiding Principles

To determine the Region's Vision and Guiding Principles for the LTWMS, the Vision and Guiding Principles identified in the 2013 Waste Management Master Plan (WMMP) were used as a starting baseline for review and update. They were then refined based on consultation feedback through the Phase 1 Consultations process. The confirmed Vision and Guiding Principles to guide the goals/needs and to inform evaluations approach applied throughout the development of the LTWMS update include the following:

Vision:

To develop a sustainable and inclusive long-term waste management strategy, in consultation with our community, that is environmentally, socially and fiscally responsible while meeting our current and future needs.

Guiding Principles:

Collaborate with community and Region partners to achieve climate and energy consumption reduction targets;

Align waste management services with the principles of a circular economy; and

Explore new and additional opportunities to reduce waste.

Additional information on the consultation process is provided in **Section 4.2.1**

3.2 Successes, Best Practices, Service Gaps and Opportunities

Technical Memorandum 2 provided a review and evaluation of the Region's 2013 WMMP, including:

- An assessment of the status of recommended options, identifying which have been completed, which remain outstanding and the factors influencing their implementation;
- A summary of the progress made in key areas including:
  - Diversion initiatives, including standardization of service areas;
  - Residual waste management, including the feasibility of EfW; and
  - Planning efforts, such as intermunicipal working groups.
- An evaluation of internal and external factors that have influenced the implementation of the 2013 WMMP, including policy changes, regulatory shifts, operational considerations and broader industry trends; and
- A comparison of historical and current waste management data to assess progress, identify emerging challenges and opportunities and provide insights that can inform the development of the LTWMS.

3.2.1 Region Successes

The Region has made significant strides in implementing the 2013 WMMP. Key achievements include the following:

1. **Adaptation to Change**: The Region has successfully navigated significant service changes, accommodated considerable population growth and adapted to regulatory shifts over the past 12 years;
2. **Waste Reduction**: There has been a steady decrease in residential waste landfilled per capita, indicating effective waste management and diversion strategies;
3. **Educational Initiatives**: The deployment of field inspectors for the 2017 changes to curbside collection has been instrumental in educating residents and promoting proper waste sorting practices;
4. **Adoption of the 4R Waste Hierarchy**: The Region adopted the 4R waste hierarchy (Reduce, Reuse, Recycle, Recover), reinforcing its commitment to sustainable waste management practices;

5. **Collaborative Efforts**: Initial meetings of the Inter-Municipal Working Group (IMWG) were successful in fostering collaboration and setting the groundwork for future initiatives;
6. **Alternative Waste Management Studies**: The IMWG played a key role in developing the EfW Feasibility Study, contributing to alternative waste management solutions;
7. **Emission Reductions**: Programs such as the green bin initiative have contributed to reducing emissions, supporting the Region's corporate and community climate related goals; and
8. **Covid-19 Pandemic (Pandemic) Resilience**: The Region maintained waste management services during the pandemic, adapting to changes in waste flows and consumer behaviour.

3.2.2 Opportunities and Service Gaps

Several opportunities and services gaps exist for the Region, including the following:

1. **Service Gaps in Large Apartment Buildings Waste Collection**: The initiative to provide large apartment buildings with waste (garbage and organics) collection by the Region has currently not been actioned due to budget and pending provincial policy did move this forward. This sector's waste needs could be supported through other means such as providing tools and resources (to existing buildings, new developers or condominium boards). This could support and improve large apartment waste diversion performance;
2. **Economic Constraints**: The economic environment since 2013 has increased the Region's mandatory operating expenses, slowing potential future initiatives;
3. **Inactivity of the IMWG**: The IMWG has faced inactivity, limiting its capacity for collaborative efforts due to shifting priorities. There is renewed interest in reactivating the group to explore potential synergies. With many Ontario municipalities currently developing or updating their waste plans, there is an opportunity to coordinate efforts, enhance waste diversion initiatives and identify outlets for additional diverted materials;
4. **Need for Improved Data Tracking and Standardization**: Frequent changes to bans and related programs have complicated data collection and tracking, leading to potential gaps. Standardizing data collection and analysis methods is recommended to enhance accuracy in measuring diversion and other key metrics;

5. **Public Engagement and Education**: Continued outreach efforts are critical to the success of waste diversion programs and public engagement should be tailored to reflect the needs of a growing and more diverse population. Incorporating multilingual education materials, translation services and visual aids (e.g., graphics and infographics) to enhance accessibility; and
6. **Performance Management and Accountability**: There is a need to define performance measures and establish a framework for tracking progress and setting clear goals. It is important to define what is successful implementation and how it is tracked, setting clear goals and defining metrics for success.

Despite the Region's successes and opportunities, several service gaps remain that need to be addressed in the updated LTWMS. The key service gaps and their alignment with the updated vision and guiding principles are presented in **Table 3**.

Table 3: Key Service Gaps Aligned with the Vision and Guiding Principles

Service Gap	Vision and Guiding Principles Alignment
Circular economy integration requires specific objectives and monitoring approaches for effective implementation	• Align waste management services with the principles of a circular economy • Achieve climate and energy consumption reduction targets • Environmentally and fiscally responsible
Performance management and accountability frameworks are needed to define successful implementation and track progress	• Sustainable long-term waste management strategy • Achieve climate and energy consumption reduction targets • Environmentally and fiscally responsible • Meets our current and future needs • Explore new and additional opportunities to reduce waste
Public engagement and education should be tailored to a growing and diverse population, incorporating multilingual materials and digital tools to enhance accessibility	• Inclusive long-term waste management strategy • Socially responsible
Data tracking and standardization improvements are necessary, particularly for	• Environmentally, socially and fiscally responsible • Meets our current and future needs

Service Gap	Vision and Guiding Principles Alignment
large apartment buildings and the IC&I sectors	• Explore new and additional opportunities to reduce waste
Collaboration with the Water Services Division and reactivation of the IMWG	• In consultation with our community • Collaborate with community and Region partners

The Region's landfill has approximately 20 years of remaining capacity based on the airspace modelling review in Technical Memorandum 1. Since the LTWMS spans a 25-year planning horizon, there is a risk that the landfill could reach capacity before the end of the strategy period if significant changes to waste generation and disposal patterns are not made. Preserving landfill capacity must therefore be a key focus throughout the strategy.

Extending the landfill's lifespan will require continued and expanded application of the waste hierarchy through reduce, reuse, refill, rethink, refuse, repair, repurpose, return, resell and recycle initiatives. Opportunities may also exist through operational efficiencies and site-based measures such as bans and vertical or horizontal expansions. However, even with these efforts, the potential for full depletion remains a longer-term service gap that must be addressed.

The LTWMS will also consider options for managing residual waste after the landfill reaches capacity. For example, EfW technologies may be evaluated, though these systems still generate ash requiring final disposal, typically around 15% of the original input waste. Technical Memorandum 4 will outline a timeline of future waste management options to support proactive planning, consultation, permitting, design and development in advance of the landfill's end-of-life.

3.2.3 Weaknesses and Threats

The Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis identified several weaknesses and threats that may constrain the Region's ability to achieve the long-term goals of the LTWMS. Key weaknesses and threats include the following:

Internal Weaknesses

1. **Funding Constraints:** Limited resources and perceptions that waste services should be free or low-cost create financial pressures that restrict program expansion and modernization;

2. **Enforcement Challenges:** Difficulty enforcing bans, bag limits and participation requirements affects program outcomes and compliance;
3. **Competing Priorities:** Balancing waste initiatives with other municipal priorities can dilute focus and slow implementation of recommended actions;
4. **Data Gaps:** Incomplete or inconsistent data, particularly for the IC&I sector and large apartment buildings, hampers performance measurement and evidence-based planning;
5. **Legislative and System Complexity:** Provincial policy changes and coordination challenges within a two-tier governance structure complicate long-term planning;
6. **Community Understanding:** Limited awareness of emerging concepts, such as the circular economy, constrains community support for new initiatives; and
7. **Large Apartment and Student Housing Gaps:** High-density areas and transient populations often face access and communication challenges that reduce program performance.

External Threats

1. **Financial Pressures:** Rising costs, economic volatility, and competing demands for municipal funding may affect the Region's ability to invest in new infrastructure and programs;
2. **Political and Policy Shifts:** Changes in government priorities at local, provincial or federal levels could redirect or delay planned initiatives;
3. **Climate Change Impacts:** Increasing frequency of severe weather events poses risks to infrastructure resilience and service continuity;
4. **Misinformation and Disinformation:** Spread of inaccurate information regarding programs and policies can erode public trust and undermine participation;
5. **Land Use Planning Challenges:** Limited influence over development decisions, particularly for large apartment buildings, may restrict the ability to integrate effective waste management solutions; and
6. **Resident Apathy:** Ongoing disengagement or resistance to behavioural change may reduce participation in diversion programs and impede progress toward targets.

A more in-depth summary of the SWOT analysis is provided in **Section 4.2.1.2.**

3.3 Waste Diversion and Reduction Targets

For the Region, some identified waste metrics summarized from Technical Memorandum 1 and Technical Memorandum 2 include the following:

- The average waste generated per household has decreased from 8.1 kg/household (hh)/week (wk) in 2012/2013 to 4.8 kg/hh/wk in 2018/2019, indicating progress in waste reduction efforts;
- The single family household diversion rate increased slightly from 52% in 2012/2013 to 54% in 2018/2019, showing a modest improvement in waste diversion;
- The presence of recyclable and compostable materials in garbage decreased from 67% in 2012/2013 to 59% in 2018/2019, reflecting better waste sorting and recycling practices;
- The curbside green bin weight increased from 1.03 kg/hh/wk in 2012/2013 to 2.6 kg/hh/wk in 2018/2019, indicating increased participation in organics diversion programs;
- Compostable organic materials still constituted nearly half (46%) of household garbage by weight as of the 2018/2019 study, highlighting an ongoing challenge in reducing organic waste in garbage; and
- There were increases in non-recyclable plastic, metal, glass and electronic waste between the 2012/2013 and 2018/2019 studies, indicating emerging challenges in managing these waste streams.

The evolving waste composition, with greater emphasis on recovery of designated Blue Box Materials and organic materials, requires more sophisticated waste diversion strategies, presenting both challenges and opportunities for the Region's LTWMS. With the transition to full EPR for the Blue Box Program in Ontario, all Ontario municipalities will be faced with the challenge of using a diversion percent as a metric since they will no longer have Blue Box data specific to their municipal calculations. There is a need to consider alternatives to the current diversion metrics. A circular economy framework also poses challenges in measuring circularity and the GHG attributed to waste management will need to be clearly defined with a standard methodology as one metric for circularity.

Municipalities are looking to a kg/capita disposal rate and GHG emissions reductions (CO_2e) as performance and target metrics for comparable benchmarking with other jurisdictions. In addition, kg/capita recovery rates by material streams (diversion program materials, organics, yard waste) and

also by sector (residential single family, small apartment buildings, IC&I/Business Improvement Areas (BIAs)) are measurable performance indicators for solid waste management. The quantitative potential for each metric will depend on the aggregation of metrics for the final LTWMS options to be defined and evaluated in Technical Memorandum 4. An action plan and approach to monitoring the metrics (including regular waste composition audits) will need to be implemented and continued in the long term.

3.3.1 Summary from Best Practices

Municipalities across Canada and select international jurisdictions use various performance indicators to measure waste goals and targets. These include:

- Participation and capture rates for diversion programs (e.g., organics, recycling);
- Waste generation and capture rates (weight per capita);
- Contamination rates in streams such as organics and Blue Box Material streams;
- Waste generation and disposal rates (measured in kilograms per capita and total tonnes);
- Waste composition audits;
- GHG emissions from waste and energy recovery; and
- Education and outreach metrics, such as event attendance and social media engagement.

These metrics provide insights into program success and support decisions on program expansion. For example, Durham tracks a range of annual waste management metrics, including:

- Waste generation rate (measured in kilograms per capita);
- Green bin organic waste generation rate (measured in kilograms per capita);
- Green bin organic waste diversion (measured as a percentage);
- Quantity of Blue Box Materials in garbage (measured as a percentage);
- Quantity of textiles in garbage (measured as a percentage); and
- Battery and electronic waste generation rates.

These metrics are used to evaluate diversion programs and are often supported by waste composition data to provide insights into program success and support decisions on program expansion. This is particularly important as relying only on measures such as green bin tonnages could provide an incomplete picture; an increase in collected organics might indicate more food is being wasted, rather than a reduction in overall organic waste generation. Waste composition data helps determine what is actually in the waste stream and whether organics are truly being reduced.

3.3.2 Measurement Triggers for Planning

Effective long-term waste management planning relies on regular assessment of system performance and capacity to support timely, informed decisions. The strategy itself serves as a primary tool for identifying when and where actions are required. By establishing a framework for monitoring key indicators such as landfill airspace depletion, population growth, program capture rates and waste composition, municipalities can determine when to update policies, invest in infrastructure or redesign services.

Rather than relying solely on rigid thresholds, a waste strategy enables the municipality to periodically evaluate conditions and assess whether the system is meeting its goals. The strategy acts as a trigger mechanism; its scheduled reviews and performance assessments are what prompt the planning of new initiatives. For example, a review may reveal that organics capture rates are stagnating, prompting targeted education or program redesign. Similarly, nearing landfill capacity identified through the strategy process may initiate disposal planning or exploration of alternative technologies.

As new waste facilities or system changes often involve lengthy permitting, procurement and construction timelines, the LTWMS incorporates triggers and review points well in advance. This approach supports proactive decision-making, helps prioritize actions and provides continuity of service delivery across the 25-year planning horizon.

3.4 Impacts of Provincial Waste Legislative Frameworks

As summarized in Technical Memorandum 1, Section 4, solid waste management is the responsibility of federal, provincial and municipal government jurisdictions. As a municipality, the Region is responsible for:

- Implementing local waste management programs and services from eligible dwellings;
- Developing and enforcing local by-laws related to waste management and environmental protection;
- Providing waste services for some non-residential customers (i.e., small-scale IC&I sector customers) although not obligated and pursuant to municipal policies; and
- Managing the processing of materials collected through municipal diversion programs and disposal of residual waste.

The impact to the Region of current and future provincial waste legislative frameworks includes changes in responsibilities and approaches to waste management and performance, particularly in the IC&I sector. Municipalities can respond to these provincial changes and updates by participating in various associations that promote research, collaboration and advocacy on their behalf as a collective.

The legislative context has shifted towards plastics reduction, EPR legislation amendments and ongoing policy guidelines for diverting food and organic waste in Ontario by 2026. These legislative changes require municipalities to adapt their waste management strategies and programs as legislative frameworks change, particularly as anticipated amendments to the Blue Box program and potential changes for organics could affect diversion outcomes for large apartment buildings.

The federal government has recently focused on plastic waste reduction and the commitment to international climate change initiatives. The national plastics registry and the classification of plastic as a toxic material to the environment led some municipalities to establish their own SUPs strategies and new bylaws. There is a need to support SUPs reduction and bans per the federal government guidance.

In addition, GHG from landfills has been a recent focus of the federal government. Canada is a signatory to the Global Methane Pledge, which aims to reduce global methane emissions by 30% by 2030. In support of this pledge, the federal government released Canada's Methane Strategy, which outlines actions to cut methane emissions across sectors, including enhanced LFG capture and utilization. Landfills are a significant source of methane emissions. Decomposition of organics in landfills produces the methane gas. Canada has committed to reducing these emissions, including through regulations and offset systems. The Landfill Methane Recovery and Destruction federal offset protocol creates an incentive for landfill owners and operators to implement projects that recover and destroy LFG. The Region's CorCAP outlines actions to be taken over the next five years (2025 to 2030) to reduce the corporate emissions. One of the CorCAP's four goal areas is "Waste, Water and Wastewater" where the Region shall mitigate the release of fugitive methane and adopt innovative approaches to reduce operational emissions.

Municipalities are implementing programs or strategies in response to the Ontario policy statement on organics wastes in anticipation of future legislation. This includes expanding green bin programs to include more types of accepted materials and engaging with organizations such as the CIC for organics collection programs in the IC&I sector, extending organics collection to large apartment buildings and municipal facilities. Applying the waste hierarchy, there is a need to further reduce organics waste generated, support the increased diversion of organics wastes to landfill and maximize the capture and energy potential of GHG from AD and landfills.

More recently, the MECP posted proposed draft amendments to the Resource Recovery and Circular Economy Act for consultations in June 2025. The Blue Box Regulation draft amendments could have impacts, if passed, on the public space services as well some eligible sources in the residential sector, such as schools, long term care facilities and the large apartment sector. The proposed drafts are a provincial response to the escalating costs of the diversion programs in Ontario and a proposed means to delay some planned new services, materials and targets in the short term (five years). The potential impact to waste services provided, equity of those services and disposed waste received at the Region's landfill annually will need to be monitored and updated.

3.5 Requirements to Address All Waste within the Region

To effectively manage all waste generated within its boundaries, the Region must consider the distinct responsibilities, challenges and opportunities associated with different sectors. This includes waste generated by the residential sector (eligible for municipal collection), large apartment buildings (currently outside the Region's service mandate) and IC&I sector. Each sector has a different service model, regulatory context and performance profile, which influences how the Region can support waste diversion, landfill capacity preservation and climate-related goals.

While the Region is directly responsible for residential waste collection and disposal, other sectors, particularly large apartment buildings and IC&I contribute significant waste volumes and face persistent challenges in diversion performance. The LTWMS must consider how to improve outcomes across all sectors through a combination of municipal services, partnerships, policy tools, advocacy and system planning.

3.5.1 Residential or Eligible for Collection

The Municipal Act, 2001 in Ontario grants municipalities broad powers to manage waste, including the ability to collect, process and dispose of residential waste, as well as to implement waste reduction and education programs. The Municipal Act provides the legal framework for municipalities to manage waste in a way that is tailored to their local needs and circumstances, while also promoting waste reduction and environmental protection. This includes the ability to pass bylaws related to waste management and to enter land for inspection purposes. The Municipal Act allows municipalities to finance waste management services through fees charged to households[199].

With regards to requirements, municipal governments are required to provide solid waste services to its residential sector. For municipalities that have a two tier system (Regional – upper tier and Area Municipalities – lower tier) responsibility may vary across jurisdictions.

[199] https://www.ontario.ca/laws/statute/01m25

As discussed in Technical Memorandum 1, Section 7, the Region offers curbside collection services to all Area Municipalities, which includes approximately 166,000 eligible residential dwellings. Disposed waste from the residential sector in 2023 was 65,041 tonnes or 25% of all waste managed by the Region[200].

The responsibilities in the relationship between the Region, the Cities of Kitchener, Cambridge and Waterloo (the Tri-Cities) and the Townships are not the same for all seven Area Municipalities. Those differences were outlined in Technical Memorandum 1, Section 5.

3.5.2 Large Apartment Buildings

In Ontario, municipalities are generally not required to provide waste collection services to large apartment buildings (rental apartments and private condominiums). While municipalities handle waste collection for single family homes and some larger townhouse developments, large apartment buildings typically manage their waste through private waste collection contracts with waste management companies. However, some municipalities in other jurisdictions do offer services under specific conditions, such as collection of oversized items.

Large apartment buildings (seven units and larger) are currently not serviced by the Region; however, the Region's future growth and densification for new housing will be focused on densification and large apartment buildings. The Region will need to consider how it will address and support this growing sector's waste generation and contributions from this sector. Traditionally, large apartment buildings have a lower waste diversion performance compared to single family homes. This is a consistent finding across jurisdictions and provinces and is an ongoing challenge in the waste management industry.

To improve performance and reduce pressure on landfill capacity, design considerations for new developments should incorporate waste diversion best practices. Planning for this sector must include strategies that support reduction, reuse and recycling, as well as education, infrastructure and policy tools that help raise diversion performance. Proactively addressing the waste

[200] Technical Memorandum 1, Section 7.1: Waste Tonnages, Figure 3: 2023 Total Waste Tonnages (Residential and IC&I). The 2023 disposed waste of 65,041 tonnes is the residential portion only and does not include IC&I.

impacts of large apartment buildings will be essential to managing long-term system sustainability and aligning with broader housing and environmental priorities and GHG reduction commitments.

3.5.3 IC&I

The Region is not responsible for managing waste from the IC&I sector. However, as noted in Technical Memorandum 1 (Section 7.1), the IC&I sector contributed an estimated 33% (86,704 tonnes) of the total waste managed (259,241 tonnes) by the Region in 2023. The total managed waste streams include garbage, recyclables, green bin, Blue Box, yard waste, other divertables and building materials. From a disposal perspective, IC&I was 57% (86,704 tonnes) of the total disposed waste (151,740 tonnes) at the Region's landfill in 2023[201]. It is likely that this total includes some waste from large apartment buildings, which are not separately tracked and also fall outside the Region's collection responsibility.

Although the Region does not directly provide waste services to the IC&I sector, there are opportunities to engage with businesses and institutions through partnerships, programming and policy to promote circular economy practices and reduce waste generation. The Region also retains control over how much IC&I waste is accepted at the landfill through the management of tipping fees and access policies. Tipping fees can be adjusted to either discourage or encourage IC&I tonnages, depending on available capacity and long-term planning goals.

Looking ahead, the Region will need to consider how much landfill capacity should be reserved for the IC&I sector. Given the Region's mandate to prioritize residential waste management, careful consideration will be required to balance IC&I access with the need to preserve landfill capacity for residential needs over the strategy's 25-year horizon.

Under Ontario's Blue Box Program, non-eligible sources, typically small businesses and BIAs, are not entitled to producer-funded collection services. As noted in the Region's recent Downtown Services Review, approximately 250

[201] Technical Memorandum 1, Section 7.1: Waste Tonnages, Figure 3: 2023 Total Waste Tonnages (Residential and IC&I). The 2023 disposed waste of 86,704 tonnes is the IC&I portion only and does not include residential disposed waste. 57% is the portion of total disposed and 33% is the portion of the total managed of all waste streams.

tonnes of Blue Box Materials are generated annually from these non-residential sources.

With the ongoing transition to full EPR, the Region will need to determine whether and how it will continue providing collection services for these non-eligible sources, many of which were historically serviced alongside residential properties. Small and medium-sized enterprises and BIAs may still expect collection, particularly if they fall within existing residential service routes.

A proposed amendment to the Blue Box Regulation by the MECP would allow producer responsibility organizations to offer collection services for certain non-eligible sources, at a cost to municipalities. If approved, this would create a potential opportunity for the Region to negotiate service contracts or define cost-sharing arrangements to maintain or expand Blue Box service in these areas.

More broadly, continued collaboration with local partners, including small businesses and BIAs, can help support the Region's waste diversion and climate action goals, particularly in high-density, mixed-use areas.

3.6 Key Policies that Impact Waste Management

The Region's new 2023-2027 Strategic Plan outlines its climate change initiatives and targets for climate aligned growth in the Region. The LTWMS will also need to align with the Region's climate change initiatives, TransformWR and CorCAP. From a waste management perspective, GHG emissions are largely attributed to LFG, organics waste streams, transportation emissions from waste collection vehicles and due to lack of application to the higher levels of the waste hierarchy (reduce, reuse, recycle) by residential and IC&I sectors. The new federal LFG protocols also aligns with the focused priority on LFG reduction with minimum targets now set for approved facilities.

With regards to the provincial policy statement on food and organic waste:

- The Region must:

    - Achieve 70% diversion of organic waste from its single family residential sector, which the Region is achieving through the organics and leaf and yard waste diversion programs;
    - Prepare for a potential provincial landfill disposal ban on organic waste, which is currently under consultation. All landfill owners would need to comply if the ban is enacted;
- "Multi-unit" residential buildings must:
    - Divert 50% of organics wastes they generate;
    - Provide convenient access and promotion and education materials.
- IC&I establishment generating 300 kilograms per week of organics wastes must divert 50% to 70% of that organic waste depending on the establishment type.

The future direction for the Region will need to consider how to maximize GHG reductions from the various waste services, programs and facilities. Planning is also required for the long term management of organic waste, as the Region's current organics processing contracts expire in 2027. In addition, the lack of organic waste diversion services from the large apartment building sector is a key opportunity for GHG mitigation; however, this sector is not serviced by the Region. EfW also presents opportunities for GHG reductions as an energy displacement from carbon based fuels.

As mentioned in **Section 3.5** and Technical Memorandum 1, the proposed amendments to the Ontario Blue Box Regulation have the potential to also impact the Region's long-term waste planning objectives. By delaying recovery targets to 2031 and removing the planned expansion of eligible sources, the regulatory direction may result in lower diversion performance and increased pressure on the Region's and provinces approved landfill capacity. These changes may result in higher long-term waste management costs or operational challenges for the Region, particularly as new developments and demographic shifts increase demand on local systems.

Finally, the federal focus on plastic waste should also align with long term goals in the reduction of this waste stream. This includes reuse and recycling of the plastic materials, reduction of plastics release into the environment and refusal (waste hierarchy addition) of its ubiquitous use in consumption, procurement and application.

3.7 Regional GHG Reduction Targets

The Region has set a community GHG reduction target of 80% of total emissions (below 2010 baseline levels) by the year 2050, with an interim target of 50% reduction of total emissions by 2030. In 2022, the Region observed a 12% reduction in total GHG emissions from the 2010 baseline levels. This level of reduction has been noted as insufficient to achieve the Region's interim target. To meet the interim target, it is estimated that the total annual GHG emissions must be reduced by 1,720,000 tonnes of CO_2e.

The Region's community GHG emissions profile consists of the following sectors:

- Transportation (47.2%);
- Buildings (45.4%);
- Agriculture (5.8%); and
- Waste (1.5%).

The majority of GHG emissions associated with the waste sector are from the release of fugitive LFG (containing methane) that results from the breakdown of organics at the landfills. As more waste is received at the Waterloo Landfill, it is expected that the generation of methane and subsequent fugitive release will slightly increase each year. It is noted that a large portion of the methane generated at both the Cambridge and Waterloo Landfills is captured for utilization or flaring. The Cambridge Landfill has been closed since 2003; therefore, the expected LFG generation has been reducing each year.

Although the waste sector accounts for a smaller portion of the Region's community GHG emissions profile, the utilization of captured LFG has the potential to offset emissions typically resulting from the combustion of fossil fuels (e.g., natural gas).

In addition, as outlined in CorCAP the Region has committed to achieving net-zero corporate emissions by 2050 (described in Technical Memorandum 1).

3.7.1 Current Landfill Gas Collection

The captured LFG at the Waterloo Landfill is directed towards Toromont generators to produce electricity or to flares for destruction.

In 2023, the Waterloo Landfill captured approximately 14,500,000 cubic metres (m^3) of LFG, at approximately 50% methane. This captured gas resulted in the removal of a potential emission of 130,000 tonnes of CO_2e which would result from fugitive methane release. Additionally, the captured gas equates to approximately 7,250,000 m^3 of potential RNG resulting in a potential GHG offset of 14,000 tonnes of CO_2e. For context, the Region's entire corporate GHG inventory in 2022 was approximately 114,000 tonnes of CO_2e, which highlights the significant climate benefit of the LFG capture system.

The captured LFG at the Cambridge Landfill is directed towards a nearby steel mill (Gerdau) for utilization and displacement of fossil fuels or to a flare for destruction. In 2023, the Cambridge Landfill delivered approximately 625,000 m^3 of LFG to Gerdau, resulting in an offset of 600 tonnes of CO_2e.

There exists opportunity to improve the current LFG collection system to improve collection efficiency at both landfills. The Waterloo LFG Action Plan was updated in 2020 (LFG Action Plan) and included recommendations for the installation of infrastructure to align with the development and cell sequencing plans. The LFG Action Plan suggests that potential LFG recovery efficiencies between 50% to 70% could be attainable resulting in 2,100 to 2,940 m^3 per hour of collected gas. The 2023 data indicates that the Waterloo Landfill is collecting 1,655 m^3 per hour (14,500,000 m^3 per year) and operating at a collection efficiency of 46% with potential LFG generation. The Region should continue to work on the previous LFG Action Plan as part of the recommendation. This document provided considerations for improving LFG collection efficiency, such as leachate circulation and the separation of good and poor-quality LFG streams. Additionally, at the Cambridge Landfill, LFG collection is temporarily paused to help build up the methane concentrations, which may cause additional methane release into the atmosphere. The Region can investigate the potential for continuous collection flow to help reduce emissions associated with LFG collection.

Currently, the Cambridge Landfill's LFG collection system is not operational over 40% of the year. While the shutdown of the collection system could result in significant fugitive CH_4 release, Region staff noted that the system is often intentionally closed for several days to allow sufficient gas to accumulate before being directed to Gerdau.

3.7.2 Current GHG Reporting Data Gaps

The landfills currently report their GHG emissions as per Ontario Regulation 390/18 and the federal GHG Reporting Program. The current GHG emissions profile for both sites, as included in **Table 4**, include the following sources and GHGs.

Table 4: Current GHG Emissions Profile for the Region

Note:

* The emissions of CO_2 from biomass combustion are not included as part of the total reported value as they are considered to be biogenic CO_2.

Source	CO_2	CH_4	N_2O
Leakage Emissions	N	N	Y
Waste Emissions	Y	Y	Y
Biomass Combustion	Y*	N	N

The Region's inclusion of CO_2 from waste has the potential to overreport the total emissions from the sites. CO_2 generated and fugitively emitted from the decomposition of waste is considered to be biogenic and therefore is not required to be included in emission totals. It is expected that the emissions profile would reflect the following in **Table 5**.

Table 5: Expected GHG Emissions Profile for the Region

Note:

* The emissions of CO_2 from the combustion of LFG are not included as part of the total reported value as they are considered to be biogenic CO_2. They may be reported as biogenic CO_2; however, they would be removed from the total reported emissions.

Source	CO_2	CH_4	N_2O
Stationary Fuel Combustion Emissions	Y*	Y	Y
Flaring Emissions	N*	Y	Y
On-Site Transportation Emissions	Y	Y	Y
Waste Emissions	N*	Y	N

The Region's exclusion of on-site transportation emissions could result in an underreporting of emissions from the sites. It is expected that the sites consume diesel, propane or gasoline for on-site equipment used in landfill activity.

Additionally, it is understood that there are limitations to calculating meaningful LFG generation values as the first-order decomposition rate equation calculates generation based on mass of waste received (historical) and simplified values for methane generation rate (year-1) and potential methane generation capacity (m^3 per tonne) which treats the waste as homogenous. The known LFG collection is then compared to the theoretical LFG production to yield a significantly lower collection efficiency of the landfills than the estimated 80% efficiency used in the calculation of LFG fugitives.

Outside of the LTWMS, Region staff are currently refining the GHG emissions reporting.

3.8 Strategies to Offset Legacy Fugitive Methane Emissions

The landfills currently have gas collection systems that use the captured gas for energy production (Toromont Generators at the Waterloo Landfill) or to offset natural gas usage (Gerdau Steel Mill from the Cambridge Landfill).

Earlier studies completed by Comcor Environmental Ltd, indicated that the Waterloo landfill production rates were in the order of 4,200 square metres (m^2)/hr (2,500 cubic feet per minute (cfm)); however, peak LFG production occurred between 2013 to 2017. The potential production of LFG is approximately 3,800 m^3/hr (2,200 cfm), predicted to stabilize in the 2030s. Using a collection efficiency of 50 to 70% the recoverable LFG is estimated to be between 2,100 to 2,900 m^3/hr (1,200 to 1,700 cfm).

Although the landfill has already passed its peak production period, the stabilization in the 2030s still represents a long-term gas volume for 20+ years. This sustained flow allows for planning around LFG monetization options. Energy recovery and potential conversion RNG remain viable opportunities to reduce emissions and create value. RNG may be further processed to bio-Compressed Natural Gas (bio-CNG) or compressed biogas to displace high-carbon-intensity fuels such as diesel fuels used for trucks and waste collection vehicles.

While the majority of fugitive methane emissions are associated with active landfills, other sources across the waste management system, such as organics storage, composting sites, transfer stations and legacy landfills may contribute to diffuse emissions. These should be monitored and considered in future offset planning and infrastructure investment strategies.

3.8.1 Existing Offset Initiatives

The Region undertakes several existing offset initiatives specific to waste management, previously noted in Technical Memorandum 1 and 2. LFG is currently being used to offset fossil fuel use at two major facilities in the Region. At the Cambridge Landfill, Gerdau Steel Mill has integrated LFG as a supplementary energy source since 1999, reducing its dependence on natural gas and contributing to lower GHG emissions. The current supply contract with Gerdau expires in 2028 and will require future planning for renewal or adjustment of objectives.

At the Waterloo Landfill, Toromont Energy has operated an electricity generation facility since 1999. In addition to providing a renewable energy source and reducing GHG emissions, the facility generates royalty payments for the Region. The contract with Toromont is set to expire in 2027 and is currently under renegotiation.

Offset values for both facilities are provided in **Appendix B**.

Previously Considered Alternatives

The Region's LFG Action Plan recommended continuing the existing energy recovery contract with Toromont Energy. A financial analysis of alternatives, including the production of RNG or CNG for the Region's fleet, indicated a 25-year return on investment. Operationally, pursuing RNG or CNG production would require the utilization of all gas collected on-site. This would introduce the challenge of developing a strategy to utilize the remaining poor-quality gas stream to maximize energy recovery.

Since 2020, the costs of converting LFG and organic waste to RNG have significantly decreased, while the carbon intensity of the Ontario electricity grid has also been reduced, with further improvements forecasted by 2050. These changes are narrowing the economic gap between RNG investments and Combined Heat and Power systems.

It is recommended to reassess the feasibility of RNG production, including the integration of AD, and explore the potential for selling RNG to utility providers and/or converting the RNG to bio-CNG to at least partially replace diesel fuel associated with high carbon intensity.

3.8.2 Offset Opportunities

As the Region explores opportunities to reduce its GHG footprint and strengthen climate alignment, LFG capture and utilization will continue to play a key role. In addition to existing programs, there are offset opportunities that can support both environmental and economic objectives by converting captured methane into energy or avoiding its release altogether. These options may qualify for recognized carbon offset credits, contribute to national GHG reduction goals, and align with long-term planning objectives.

Community carbon markets are increasingly providing substantial opportunities for localized climate action through a diverse array of projects. These markets enable communities to engage in carbon reduction strategies, including reforestation, renewable energy deployment and energy efficiency enhancements. Platforms such as the Community Carbon Marketplace in British Columbia facilitate projects like urban afforestation, photovoltaic system installations on municipal structures and residential energy retrofits. By targeting projects that deliver ancillary benefits such as biodiversity conservation, enhanced air quality and employment generation, these markets advance broader community development objectives.

As outlined in the Ontario Carbon Offset Program by the Ontario Ministry of the Environment, Conservation and Parks, voluntary carbon offset programs provide a mechanism to mitigate carbon footprint by investing in projects aimed at reducing or removing GHG emissions, including reforestation and renewable energy initiatives.

In Ontario, a carbon credit represents a tradable certificate or permit that represents the right to emit one tonne of CO_2e or an equivalent amount of another GHG. Carbon credits can be used by organizations to offset their emissions, to meet regulatory requirements or to achieve voluntary goals. Each credit corresponds to a verified reduction in emissions.

Canada's GHG Offset Credit System incentivizes innovative projects that reduce GHG emissions beyond typical practices, targeting municipalities, Indigenous communities, foresters, farmers, and other developers. By

registering and implementing projects that comply with the Canadian GHG Offset Credit System Regulations and relevant federal protocols, proponents can earn federal offset credits. These credits are tradeable and can be used for compliance under the federal Output-Based Pricing System and Clean Electricity Regulations, or by entities aiming to meet voluntary goals. The system currently accepts project applications under protocols for Landfill Methane Recovery and Destruction, Refrigeration Systems and Improved Forest Management on Private Land.

Ontario Carbon Offset Program – Landfill Methane Capture

Ontario's carbon offset program identifies landfill methane capture and destruction projects as eligible initiatives for generating offset credits. Projects must demonstrate the avoidance, reduction or removal of at least one tonne of CO_2e and must meet criteria for being real, additional, verifiable and quantifiable**.** Eligible systems typically include flaring or conversion of methane to energy through engines or turbines. Participating in this program could provide financial returns while supporting emission reduction objectives.

Ozone Depleting Substances Protocol

In addition to methane-related offsets, Ontario's program includes a protocol for Ozone Depleting Substances (ODS) recovery. This protocol supports projects that recover and destroy ozone-depleting substances, such as CFC-11, CFC-12, and HCFC-22, typically found in foam insulation or refrigerants. The substances must be collected from residential, commercial, or institutional equipment. ODS used as solvents or in aerosol products are not eligible. These projects represent an additional opportunity to claim offset credits while responsibly managing legacy materials.

Alignment with National and Regional GHG Targets

Canada has committed to reducing methane emissions from landfills by 50% below 2019 levels by 2030**,** aligning with the Global Methane Pledge and broader federal decarbonization strategies. New federal regulations under the *Canadian Environmental Protection Act* (CEPA) are expected to require methane control systems at select landfills. These national targets highlight the value of offset-oriented projects and reinforce the importance of continued LFG capture and innovation at the local level.

The Region's CorCAP directly aligns with these federal objectives and demonstrate a holistic approach to managing landfill emissions. While the

national focus is on capturing methane after it is generated, the Region's strategy prioritizes upstream, preventative measures to reduce the amount of organic waste entering the landfill. Furthermore, the Region's commitments go beyond compliance by:

- Implementing advanced systems to collect and use LFG;
- Pursuing academic partnership to develop and test innovative technologies to reduce fugitive methane emissions; and
- Planning for enhanced diversion.

3.8.3 Evaluation of Offset Strategies

As the Region considers future offset strategies, a robust evaluation framework is required to assess their suitability across environmental, economic and social factors. This section outlines a proposed framework for evaluating LFG utilization and offset opportunities, drawing on both established climate principles and practical implementation factors. The intent is to guide the Region in identifying the most viable and impactful offset pathways over the long term.

3.8.3.1 Strategic Evaluation Framework

Offset strategies should be assessed against five key principles, adapted from the Oxford Principles for Net Zero Aligned Carbon Offsetting. These principles provide a structured lens to guide decision-making, maximize benefits and provide long-term credibility and alignment with broader climate goals:

- **Effectiveness**: Prioritize initiatives that maximize methane capture efficiency—up to 70%—and support conversion to renewable RNG or bio-CNG, which offer greater emissions reductions than flaring;
- **Efficiency**: Consider the landfill's stable production potential (estimated at 3,800 m^3/hr or 2,200 cfm) and focus on offset pathways that optimize this output. Partnerships with industrial energy users such as Gerdau and Toromont can further enhance system value and reliability;
- **Equity**: Confirm that local communities benefit from offset programs through mechanisms such as royalty payments, access to clean energy and inclusive decision-making processes that consider equity across stakeholders;

- **Transparency**: Offset initiatives must include clear, auditable reporting mechanisms to verify methane capture volumes and GHG reductions, building trust and supporting regulatory compliance; and
- **Sustainability**: All offset strategies should be designed with a long-term view, including scalability beyond 2030, alignment with federal regulations (e.g., CEPA) and integration with landfill preservation planning.

3.8.3.2 Key Evaluation Criteria

In addition to alignment with guiding principles, offset strategies should also be evaluated based on practical viability and strategic fit within the Region's waste management system. The following considerations support this evaluation:

- **Regulatory Compatibility**: Projects should align with Ontario's carbon offset program and federal requirements under CEPA, particularly for landfill methane control;
- **GHG Reduction Potential**: Eligible offset strategies must demonstrate quantifiable and verifiable reductions in GHG emissions, ideally in the form of offset credits or emission intensity improvements;
- **Revenue and Co-Benefits**: Initiatives that offer financial returns (e.g., offset credit sales, royalties, energy cost savings) and generate additional environmental or community benefits could be considered; however, the Region should prioritize using these credits to offset emissions the Region cannot reduce;
- **Long-Term Viability**: Strategies should be scalable, resilient to market changes and capable of aligning with long-term landfill planning and gas production forecasts; and
- **Alignment with Community Priorities**: Offset opportunities should reflect the Region's equity, sustainability and transparency goals, while advancing the broader objectives of its LTWMS.

3.8.4 Recommendations and Implementation

Implementation of offset strategies should reflect both short-term readiness and long-term planning, while aligning with the Region's climate goals, regulatory obligations and infrastructure capacity. The following recommendations are structured around key implementation themes:

Short-Term Actions (1 to 3 years):

- Re-evaluate existing contracts at the time of renewal:
  - Strengthen partnerships and assess if terms still provide the best alternative, with the current LFG users, such as Gerdau and Toromont Energy; and
  - Explore feasibility of alternate long-term LFG monetization scenarios and compare to existing contracts, i.e., RNG/CNG and AD addition to the landfill operations.
- Explore feasibility of a Region-wide centralized monitoring and reporting system to track offset performance across LFG, ODS and any future offset categories;
- Expand internal data management and technical capacity to confirm eligibility, compliance and audit-readiness for offset protocols; and
- When negotiating future contracts, confirm objectives and appropriately balance potential revenue generation and environmental credits.

Long-Term Opportunities (3+ years):

- Explore opportunities to increase organics processing capacity in the future, including AD. This could help balance changes in LFG recovery as diversion rates improve and may require partnerships.
- Evaluate the monetization of using AD by-products to enhance both the economic viability and GHG reduction potential of the investment;
- Re-evaluate the business case for converting LFG into RNG and/or bio-CNG, considering revised infrastructure needs, market opportunities, updated cost structures and changes in electric grid carbon intensity;
- Monitor federal regulatory developments under CEPA and adapt LFG system upgrades to align with methane reduction requirements; and
- Explore innovative tools such as AI-enhanced LFG monitoring systems and sensor-based leak detection to improve methane capture efficiency.

Funding Considerations:

In Ontario, landfills with existing LFG collection systems may still qualify for funding to enhance or expand operations, particularly for renewable energy upgrades or further GHG reductions. Potential funding opportunities include:

- Provincial and Federal Grants: Available for projects aimed at reducing emissions and promoting renewable energy, such as upgrading LFG systems to produce RNG;

- Green Infrastructure Funding: Supports projects that improve environmental sustainability, such as enhancing methane capture or integrating AD;
- Innovation and Technology Grants: For landfills adopting innovative technologies to improve LFG collection and utilization; and
  Public-Private Partnerships: Collaborations with renewable energy or waste management companies can provide financial support or investment in exchange for shared project benefits.

Policy and Regulatory Considerations:

- Stay engaged with provincial and federal offset policy evolution to confirm eligibility and access to future offset categories; and
- Align offset program design with the Region's broader waste strategy, particularly in support of emissions reduction, equity and sustainability objectives.

Monitoring and Performance Metrics:

- Track methane capture volumes, destruction efficiencies and verified emission reductions across all participating projects;
- Use performance data to guide future infrastructure investments and technology upgrades; and
- Report annually on offset contributions to the Region's overall GHG reduction targets and strategic climate commitments.

3.9 Decision Making Models

As part of this technical memorandum, a review was undertaken to assess the availability and applicability of decision-making models to support long-term planning and operational decisions. While no widely adopted off-the-shelf tools for municipal waste systems in Ontario were identified, a range of customizable tools and modelling approaches have been developed and applied in other jurisdictions to support informed and context-specific decision-making. These examples include the following:

- Population projections and baseline waste generation data are commonly used to model future waste quantities under different scenarios. These projections can estimate how programmatic changes, such as the introduction of new diversion programs, may affect total waste generation and the cost per tonne managed. Scenario-based

forecasting can support long-term financial planning, infrastructure needs assessments and strategic program design.

- Metro Vancouver created an interactive modelling tool to assess the potential impact of circular economy initiatives on GHG emissions, waste generation and diversion performance. Using a project-specific set of indicators, the tool estimates the net benefits of introducing such initiatives, supporting evidence-based strategy development;
- A geospatial, weighted-criteria decision-making model has been applied to infrastructure planning projects. This model considers technical, environmental, economic and social factors to identify optimal routes (e.g., Hydro One used for transmission lines) and site locations. It incorporates 3D visualization, real-time collaboration tools and stakeholder and regulatory input to streamline approvals, identify risks early and build public trust through transparent planning.
- Collection system modelling tools have also been used to support the development of curbside waste collection options for communities such as the Halton and the City of Hamilton. These tools allow municipalities to input parameters such as the number of serviced properties, collection schedules, material types, truck configurations and cost data. They provide a means to compare alternative scenarios against current operations to identify opportunities for cost savings, diversion increases and service optimization.

While each of these tools is customized to local needs, the Region's LTWMS will function as a foundational decision-making framework. It will incorporate performance indicators, targets and tracking methodologies to support future program reviews, capital investments and strategic updates. Projected targets, anticipated performance and future service requirements developed through the LTWMS will support long-term implementation and inform future planning decisions including anticipated tonnes diverted, capital and operating costs.

3.10 Waste Management Requirements and Needs Summary

Sections 3.1 to **3.9** outline the Region's current and future waste management requirements, building the foundation for the updated LTWMS. The section identifies key service gaps, performance trends, legislative drivers and

highlights critical system needs that must be addressed to achieve long-term goals related to waste diversion, landfill capacity, circularity and climate action.

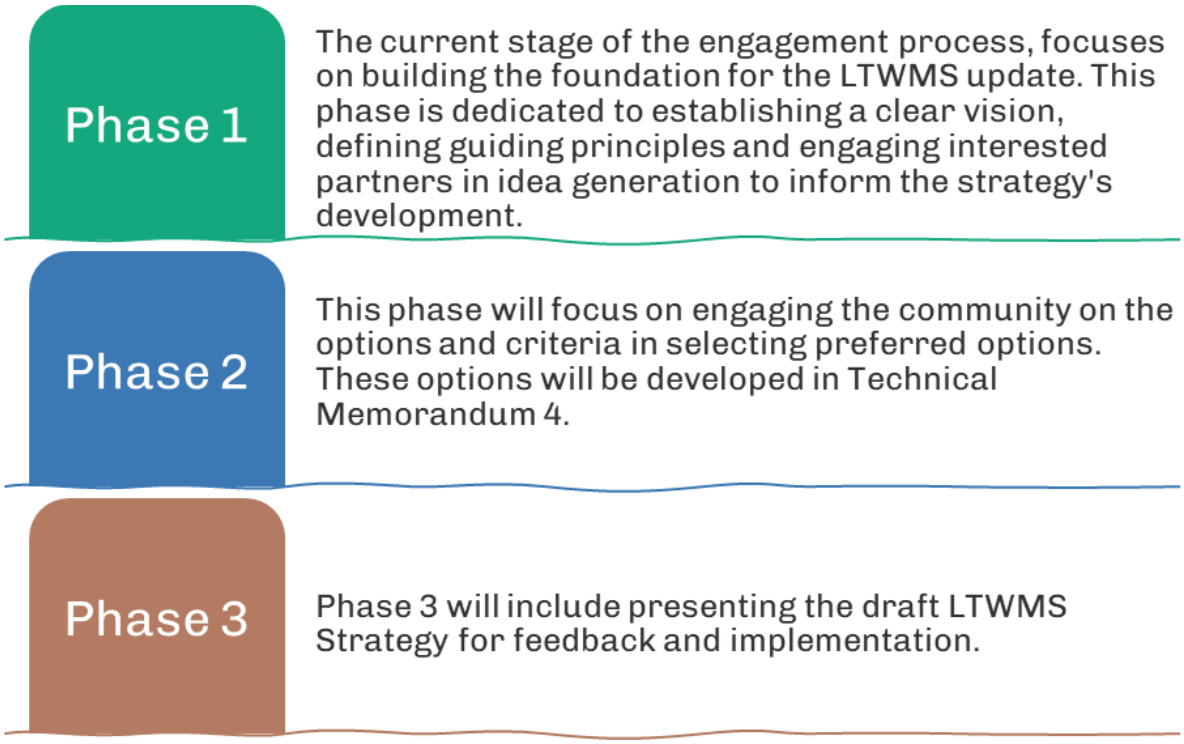
The Region has made notable progress since the 2013 WMMP, including per capita waste reduction, expansion of organics programs, increased system standardization and collaborative planning initiatives. However, several challenges remain. These include low diversion performance from large apartment buildings and businesses, legislative changes that require continual adaptation, resident apathy that impacts behaviour change efforts, limited influence over planning decisions that affect waste outcomes, gaps in performance monitoring and a need to expand public engagement approaches to better reflect the Region's growing and diverse population. The Region's landfill has an estimated 20 years of capacity remaining, while the LTWMS must plan for 25 years, making landfill preservation, residual waste planning and future infrastructure development essential strategic priorities.

The section also presents updated waste generation and diversion data, outlines the impacts of evolving provincial and federal legislation, and emphasizes the need to plan across all sectors: residential, large apartment buildings, and the IC&I sector. Measurement indicators and planning triggers are introduced to support proactive decision-making. Forecasting, scenario analysis, and performance tracking are identified as essential tools to support the Strategy's implementation. Finally, the section reviews potential decision-support models and tools, GHG emissions from landfills, and offset strategies, reinforcing the need to integrate environmental performance into long-term system planning. Together, these findings frame the Region's current position and identify the strategic needs that will shape the next phase of the LTWMS.

4.0 Interested Partner Consultation

The development of the LTWMS involves a structured consultation process divided into three distinct phases (**Figure 1**).

Figure 1: Interested Partner Consultation Phases



During Phase 1, Dillon collaborated closely with Region staff, including the Waste Management team and Communication and Community Engagement team, to develop an approach for public consultation. This collaboration created a consultation process that was inclusive and invited the diverse perspectives within the Waterloo Region to participate.

As the foundational phase, Phase 1 set the stage for the subsequent phases of consultation, which will further evaluate possibilities and create a roadmap for the LTWMS update. By engaging the community and interested partners early in the process, Phase 1 aimed to build a strong base of understanding and support for the strategy's future development.

4.1 Phase 1 Overview

In the spring of 2025, Phase 1 of consultation was conducted to gather valuable insights and feedback from various interested partners within the Waterloo Region. This phase included a series of workshops and a survey aimed at refining the LTWMS. The activities were designed to inform and engage staff, advisory committees and the public in discussions regarding the mission statement, guiding principles and SWOT analysis, as well as to explore innovative approaches to advancing a circular economy.

The information collected during these consultations will play a role in informing the options for Technical Memorandum 4 and guiding the development of the LTWMS. By incorporating diverse perspectives and expertise, the strategy aims to address the current and future waste management needs of the Region in an environmentally, socially and fiscally responsible manner. The survey results further enrich this process, providing additional perspective so that the strategy is aligned with community priorities.

4.2 Consultation Activities Completed

Phase 1 consultation included activities to inform audiences on the project status and seek feedback to capture the voices and opinions of the Region to be integrated into the LTWMS. Tasks included:

- Mission Statement, Guiding Principles and SWOT Workshop with Staff;
- Advisory Committees Workshop;
- Public Consultation Workshops;
- Region staff participation in several community events and committee meetings; and
- LTWMS Survey #1.

The following section describes the description and results of the above activities.

4.2.1 Mission Statement, Guiding Principles and SWOT Workshop with Staff

On April 11, 2025, Dillon held a workshop with Region staff to gather feedback on the 2013 WMMP's Mission Statement, updated Guiding Principles for the LTWMS and to conduct a SWOT analysis focused on the future state of waste management in the Region. The following Region staff attended the workshop:

- Director of Waste Management;
- Senior Engineer for Waste Management;
- Manager of Engineering and Infrastructure for Waste Management;
- Manager of Waste Operations;
- Supervisor of Projects and Policy;
- Waste Management Co-op Student; and
- Communications and Community Engagement Advisor.

The workshop focused on the following questions:

Mission Statement, Guiding Principles

1. How should we update the mission statement and guiding principles?
2. Is anything missing that needs to be included?

SWOT

1. What are our strengths? What are we well-prepared for?
2. What weaknesses could hinder our future vision for the waste system? What do we need to improve? How can we mitigate these weaknesses?
3. What opportunities can we leverage to enhance our waste system? What future opportunities exist?
4. What threats could challenge our waste system vision? What are potential risks? What strategies can we implement to mitigate these threats?

The following subsections provide a summary of what was discussed in each activity.

4.2.1.1 Mission Statement and Guiding Principles

Participants discussed the following mission statements from the 2013 WMMP:

> **To develop a sustainable waste management master plan, in consultation with the community, that is environmentally, socially and fiscally responsible while meeting the current and future needs of Waterloo Region.**

As noted in **Section 3.1,** the mission statement was updated and reworded based on discussions with Region staff to better reflect the 2025 LTWMS was current goals and priorities to the following:

> **To develop a sustainable and inclusive long-term waste management strategy, in consultation with our community, that is environmentally, socially and fiscally responsible while meeting our current and future needs.**

Participants discussed the following guiding principles from the 2013 WMMP and the 2024 guiding principles approved by Council[202]:

2013 WMMP Guiding Principles

The Region will:

- Consider options which supports waste reduction, reuse, recycling and recovery ahead of disposal;
- Use an open and transparent decision making process to explore, evaluate and recommend responsible waste management services; and
- Foster innovation and incorporate flexibility to adapt to emerging technologies, policies, growth and opportunities for collaboration.

2024 Guiding Principles Approved by Council

- Explore new and additional opportunities to reduce waste;
- Collaborate with community and Region partners to achieve climate and energy consumption reduction targets; and

[202] EES-WMS-24-002 Council Report, June 4, 2024.

- Align waste management services with the principles of a circular economy.

The following key points were discussed:

- The 2024 guiding principles approved by Council will be used for the project, as they meet the Region's current and future needs; and
- The guiding principles should be reordered to better reflect the Region's priorities.

Based on the discussion, and as noted in **Section 3.1**, the guiding principles were reordered as:

Collaborate with community and Region partners to achieve climate and energy consumption reduction targets;

Align waste management services with the principles of a circular economy; and

Explore new and additional opportunities to reduce waste.

4.2.1.2 SWOT

Figure 2 provides a summary of key insights gathered during the SWOT analysis, highlighting the Region's internal strengths and weaknesses as well as external opportunities and threats impacting future waste management planning.

A more in-depth summary of the discussion for each component of the SWOT analysis is provided in **Appendix C.**

Figure 2: SWOT Summary

Strengths

- Staff expertise and dedication
- Reputation
- Resilient
- Education and community engagement
- Innovation
- Single-body service

Weaknesses

- Funding
- Enforcement
- Competing priorities
- Quality of goods
- Lack of data
- Behaviour change
- Students and large apartment buildings residents
- Legislative changes
- Community understanding
- Two-tier system

Opportunities

- Community partnerships
- Community engagement and education
- Data gathering and KPIs
- Youth engagement
- Funding
- Circular economy
- Climate change
- Land Use Planning
- Council education and engagement

Threats

- Financing
- Political and policy changes
- Climate change
- Misinformation and disinformation
- Land use planning
- Resident apathy

4.2.2 Advisory Committee Workshop

Two advisory committees were formed for this project, which will meet in each phase of engagement to provide feedback on the LTWMS. The two groups include the following:

- Regional Internal Planning and Technical Advisory Committee: Includes Region Staff; and
- Invited Planning and Technical Committee: Includes external groups identified by the Region and/or Dillon with an interest in the LTWMS.

In Phase 1 both groups met together for one Advisory Committee Workshop. The objective of the Phase 1 Advisory Committee Workshop was to inform the committee on the vision and guiding principles for the LTWMS, discuss the current successes and areas for improvement and solicit input from participants on innovative approaches to advancing a circular economy in the Region.

The Advisory Committee Workshop was conducted virtually on May 14, 2025, and was attended by seven Advisory Committee members. A presentation provided participants with an overview of the LTWMS, detailing progress to date and outlining the Advisory Committee Workshop's objectives. This was followed by a facilitated discussion led by Dillon. An online collaboration board was used to capture feedback from participants during the Advisory Committee Workshop.

4.2.2.1 Successes and Areas for Improvement

Key discussion points regarding current successes and areas for improvement included:

1. What current waste management practices are most effective in moving towards diverting waste?
2. Are there any existing initiatives or programs that could be expanded or improved?
3. What are key opportunities for reducing waste generation in your household, community, or organization?

Figure 3 provides a summary of the themes that were heard during the Advisory Committee Workshop regarding the successes and areas for improvement.

A more in-depth summary of the discussion from the virtual collaboration activity regarding successes and areas for improvement is included in **Appendix C**.

Figure 3: Advisory Committee Successes and Areas for Improvement Summary

Additional feedback collected through follow-up emails identified the following specific successes and opportunities:

- Yard waste pickup continues to be effective and well used; leaf collection programs (e.g., in Cambridge) could be expanded region-wide;
- Donation and reuse programs, including item drop-offs and online exchanges, remain strong diversion tools; however, require greater visibility; and
- Community education around source separation is important and needs continual support to maintain participation rates.

4.2.2.2 Innovative Approaches to Advance the Circular Economy

Key discussion questions regarding innovative approaches to advance the circular economy included:

1. What partnerships exist that we can leverage? What new partnerships could be formed?
2. How can we involve the community in creating solution for the LTWMS and to implement the programs that are put forward in the Strategy?
3. What are the main barriers to achieving a circular economy and how can they be addressed?
4. How can we create solutions that are equitable and accessible to all community members?
5. What innovative ideas have you seen that exist in our community or other communities?

The following themes were heard during the Advisory Committee Workshop regarding innovative approaches to advance the circular economy.

Partnership Opportunities

- Increase number and accessibility of drop-off locations;
- Introduce or expand textile recycling programs, possibly in partnership with organizations that manage bin collection (Peel's curbside textile program);
- Enhance visibility and access to reuse and donation channels for household items;
- Introduce incentive-based programs for clean material separation to improve marketability;
- Incorporate social media influencers in waste diversion campaigns to amplify messaging;
- Existing Partnerships
    - Gerdau Steel uses LFG as a heat source. LFG is used to offset natural gas;
- Form new partnerships with:
    - Sustainable Waterloo Region and wastewater services for energy production;
    - Kitchener Utilities for RNG initiatives.
    - BioEn for organics-to-energy projects;

    - Habitat for Humanity and second-hand stores for material redirection;
    - Private waste contractors for large apartment building services;
    - Large industries and agricultural societies for waste management collaboration;
    - Local restaurants and Biofuel Oils Inc. for biofuel from used cooking oil;
    - WISA for biofuel opportunities in airport operations;
    - Groups such as COIL to accelerate circular solutions across supply chains and sectors; and
- Additional partnership opportunities from follow-up feedback:
    - Collaborate with condominium boards to pilot diversion programs in large apartment buildings;
    - Engage major IC&I sector food waste generators (e.g., Loblaws Distribution Centre, Dare Foods, Conestoga Meats) for organics diversion partnerships; and
    - Explore regional-scale collaborations with agricultural producers and district energy networks to integrate forest residues and organics into circular solutions.

Community Involvement in LTWMS Solutions

- Leverage school boards for educational programs;
- Hire Regional Waste Reduction Facilitators and expand online resources;
- Utilize community centres and social media for program implementation; and
- Partner with organizations at community events and use media for outreach.

Barriers and Solutions for Circular Economy

- Cost and convenience;
- Support grassroots initiatives and ensure markets for reclaimed items;
- Overcome resistance from private developers with policies and mandates;
- Learn from municipalities with circular economy initiatives;
- Launch or support a collaborative group for local circular economy initiatives;
- Build programs to make circular economy models accessible, including awareness and training;

- Tailor communications to distinct audiences for maximum impact;
- Strategic pairings: For example connect wood waste generators with manufacturers and hazardous waste handlers with recycled-content product makers; and
- Integrate targeted messaging into workshops and campaigns to amplify adoption and participation.
- Additional barriers and solutions from follow-up feedback:
    - Segment the audience as different groups require different messages and approaches e.g., low-density residential, large apartments, IC&I and product lifecycle interested partners.

Equity and Accessibility

- Increase accessible locations for waste disposal;
- Leverage social media and youth-friendly platforms to raise awareness and build understanding of equitable waste solutions among younger community members; and
- Pair social media efforts with fun, educational events for kids and youth to promote early engagement.

Innovative Ideas

- Energy-from-waste systems in Metro Vancouver and Durham;
- Grassroots second-hand culture and repair cafes;
- Initiatives such as Guelph's The Seed for food redistribution;
- Garbage trucks fueled by LFG (noting that the Region's next collection contract, initiating in 2026, will use CNG trucks);
- Replicate Peel's circular economy grant program;
- Using LFG or organics as a renewable energy source (noting that the Region currently does this);
- Engage directly with major food waste generators (e.g., grocery stores, manufacturers) and coordinate collection or redistribution; and
- Pair with agriculture to pursue AD.
- Additional insights from follow-up technical feedback:
    - LFG captured at Waterloo landfill in 2022 generated 24,000 MW hour (h) of electricity, displacing ~730 tonnes of carbon dioxide equivalent (tCO_2e). Converting methane directly to RNG could unlock ~128,800 tCO_2e in climate value — equal to ~70% of total corporate natural gas use;

- Residential organics diversion (current and potential) represents ~3.4 million m^3 of RNG annually, ~1% of Kitchener Utilities' natural gas consumption;
- Expanding organics capture from the IC&I sector could further scale RNG supply and support community climate targets; and
- AD by-products (digestate) could replace synthetic fertilizers, benefiting soil health and reducing agricultural nitrous oxide (N_2O) emissions.

4.2.3 Public Consultation Workshop

Two Public Consultation Workshops were held to engage with community members and organizations across Waterloo Region. The Public Consultation Workshops were held virtually during the afternoon of May 14, 2025, and evening of May 15, 2025. In total, there were 35 attendees (22 on May 14 and 13 on May 15).

Both Public Consultation Workshops followed the same format. A presentation provided participants with an overview of the LTWMS, detailing progress to date and outlining the Public Consultation Workshop's objectives. This was followed by a facilitated discussion led by Dillon. Participants were provided with an opportunity to learn about the LTWMS, discuss the current successes and areas for improvement and solicit input from participants on ideas to help cultivate a circular economy culture. An online collaboration board was used to capture feedback from participants during each Public Consultation Workshop.

4.2.3.1 Successes and Areas for Improvement

Key discussion points regarding current successes and areas for improvement included:

1. What current waste management practices are most effective in moving towards diverting waste?
2. Are there any existing initiatives or programs that could be expanded or improved?
3. What are key opportunities for reducing waste generation in your household, community, or organization?

Figure 4 provides a summary of the themes that were heard during the Public Consultation Workshops regarding the successes and areas for improvement.

A more in-depth summary of the discussion from the virtual collaboration activity regarding successes and areas for improvement is included in **Appendix C.**

Figure 4: Public Consultation Strengths and Weakness Summary

4.2.3.2 Innovative Approaches to Advance the Circular Economy

Key discussion points regarding innovative approaches to advance the circular economy included the following:

1. How do you divert or reduce waste at home and at work?

2. Are there any local groups, organizations or businesses you know of that are already working towards the circular economy and reducing waste?
3. What do you see as the biggest challenges in reducing waste in your daily life?
4. How can we overcome common barriers, such as convenience and cost, to make circular economy practices more accessible?
5. What information or resources would help you better understand and adopt waste diversion practices?
6. What would you like to see in your community in terms of waste management programs?

A summary of the points made regarding circular economy culture includes the following:

Participant's Diversion Practices

- Engage in backyard composting to reduce food waste;
- Shop at local thrift stores and donate items for reuse;
- Ensure waste is placed in the correct bins (organics, garbage, recycling);
- Utilize green bins at home and work for organic waste;
- Participate in TerraCycle programs (e.g., personal care items, snack packaging etc.) for items not accepted in local recycling;
- Avoid purchasing unnecessary items to minimize waste;
- Use cloth napkins, bidets and rags instead of disposable paper products; and
- Prepare most meals at home to reduce packaging waste.

Local Groups, Organization and Businesses Supporting Circular Economy and Waste Reduction

- Sustainable Waterloo Region works on BIA organics diversion;
- KW Library of Things provides access to shared resources and promotes reuse;
- University of Waterloo Initiatives include the Sustainability Office, UW Move-out Waste Diversion Project and UWaterloo Free Store, all promoting sustainability and waste reduction;
- Repair and Reuse Organizations including Kwartzlab and 4RepairKW, focusing on repair and waste reduction;
- Community Donation Programs such as clothing pickup for Cerebral Palsy (CP for CP), Habitat for Humanity, local churches and

organizations that collect household items and clothing for those in need;
- EcoTech and Plastics Redeemed focus on recycling and waste reduction;
- Full Circle Foods offers zero or low-waste options, including bulk refills;
- Bio-En processes organic waste through AD;
- Too Good To Go App & Buy Nothing KW help reduce waste by connecting users with surplus food and encouraging sharing; and
- Recycle Cycles is a community bike shop that supports bike reuse and repair.

Challenges in Reducing Waste in Daily Life

- Managing excessive packaging, especially mixed materials and organic products;
- Encouraging companies to reduce packaging and improve waste management;
- Finding time to make positive waste reduction choices;
- Distinguishing between compostable and garbage items;
- Overcoming system barriers, such as lack of three-stream options in public spaces;
- The absence of green bins in condo buildings;
- Making local shopping more accessible and affordable compared to larger retailers; and
- Making home C&D projects more sustainable.

Overcoming Common Barriers to Circular Economy Practices

- Expand bottle deposit programs to include more products and implement public recycling options such as British Columbia's exterior rings on garbage bins;
- Encourage and support sustainable practices in large apartment buildings as more people move into these types of housing;
- Support initiatives such as KW Library of Things by providing low or no-cost memberships at a regional level to increase accessibility;
- Educate new residents on waste segregation to improve participation in recycling and composting programs;
- Encourage businesses to integrate and promote circular economy practices as part of their brand identity;
- Incorporate waste segregation education into school curriculums to instill sustainable habits from a young age;

- Engage the community by demonstrating upcycling opportunities and promoting circular economy practices; and
- Develop programs that actively encourage and facilitate circular economy practices among residents.

Information and Resources to Adapt Waste Management Practices

- Equip social services and legal aid staff with information on organizations that collect and distribute needed items;
- Encourage public visits to the landfill to provide firsthand experience of the waste management challenge;
- Implement clear graphical notices in garbage rooms to reduce confusion about waste sorting;
- Make waste diversion engaging by finding ways to make it cool and fun, potentially turning it into a game;
- Enhance the Waste Whiz app with an AI feature to identify waste and provide disposal guidance;
- Organize events that foster community engagement around waste issues and highlight the visibility of waste management efforts; and
- Provide further specificity in the Waste Whiz app for niche items to improve waste sorting accuracy.

New Waste Management Programs in the Community

- Implement a program that encourages personal responsibility and ownership of waste;
- Develop competitive waste management initiatives that compare favorably with neighbouring regions;
- Ensure recycled items are visibly utilized within the community;
- Standardize public recycling bins to simplify waste sorting;
- Offer incentives for using reusable coffee and teacups;
- Connect individuals in need with locations that have food surpluses;
- Establish soil, fill and gravel recycling with free drop-off and pickup;
- Create a Transformation Lab to improve C&D waste management;
- Introduce carpet and shingle recycling programs;
- Utilize a Reuse Depot for transitory populations, as seen in other communities;
- Promote relocation of homes instead of demolition, following examples from BC;
- Mandate organics collection, particularly targeting large apartment buildings and the restaurant sector;

- Improve access to battery and hazardous waste drop-off locations, ensuring accessibility by transit;
- Facilitate easier replacement of broken green bins and Blue Boxes; and
- Develop a plan to manage existing green carts during the transition to new automated collection vehicles, ensuring reuse or rehoming of manual-load carts.

4.2.4 Indigenous Consultation

To consult with Indigenous communities in the Waterloo Region, an email communication was sent to inform them of the LTWMS and to ask whether they wished to be involved. Two individuals responded expressing interest; however, they were participating in a personal capacity rather than as official representatives of their communities. They were invited to a meeting where the Region reviewed the same set of questions used during the advisory workshop. In addition, one of the individuals was able to complete the Phase 1 survey.

Figure 5 provides a summary of the themes that were heard during the Indigenous consultation regarding the successes and areas for improvement.

Figure 5: Public Consultation Strengths and Weakness Summary

A summary of the points made regarding circular economy culture includes the following:

Partnership Opportunities

- Partner with Human Resources and Citizen Services to facilitate direct employment pathways into the circular economy sector;
- Establish workforce integration programs with transitional housing providers to support residents securing green-sector employment;
- Collaborate with youth organizations to deliver practical skills-training workshops on repair and refurbishment; and
- Enhance community makerspaces (Kitchener maker space, collab hive, Kwartslab, Kitchener Museum) to support public access to tools and training for waste reduction projects.

Community Involvement in LTWMS Solutions

- Engage Indigenous Peoples and newcomer groups through targeted consultations to integrate their perspectives into waste management planning; and
- Deploy a proactive outreach strategy by embedding waste reduction education into existing programs at community centres and schools.

Barriers and Solutions for Circular Economy

- Address the public information gap by launching a comprehensive educational campaign on circular economy principles.

Equity and Accessibility

- Improve service equity by establishing a network of decentralized, neighbourhood-based waste drop-off depots;
- Introduce specialized collection services, such as residential pick-ups and mobile depots, to overcome accessibility barriers;
- Support community-led urban agriculture to simultaneously promote local food security and reduce organic waste; and
- Provide dedicated funding and mentorship to foster innovative, youth-led environmental initiatives.

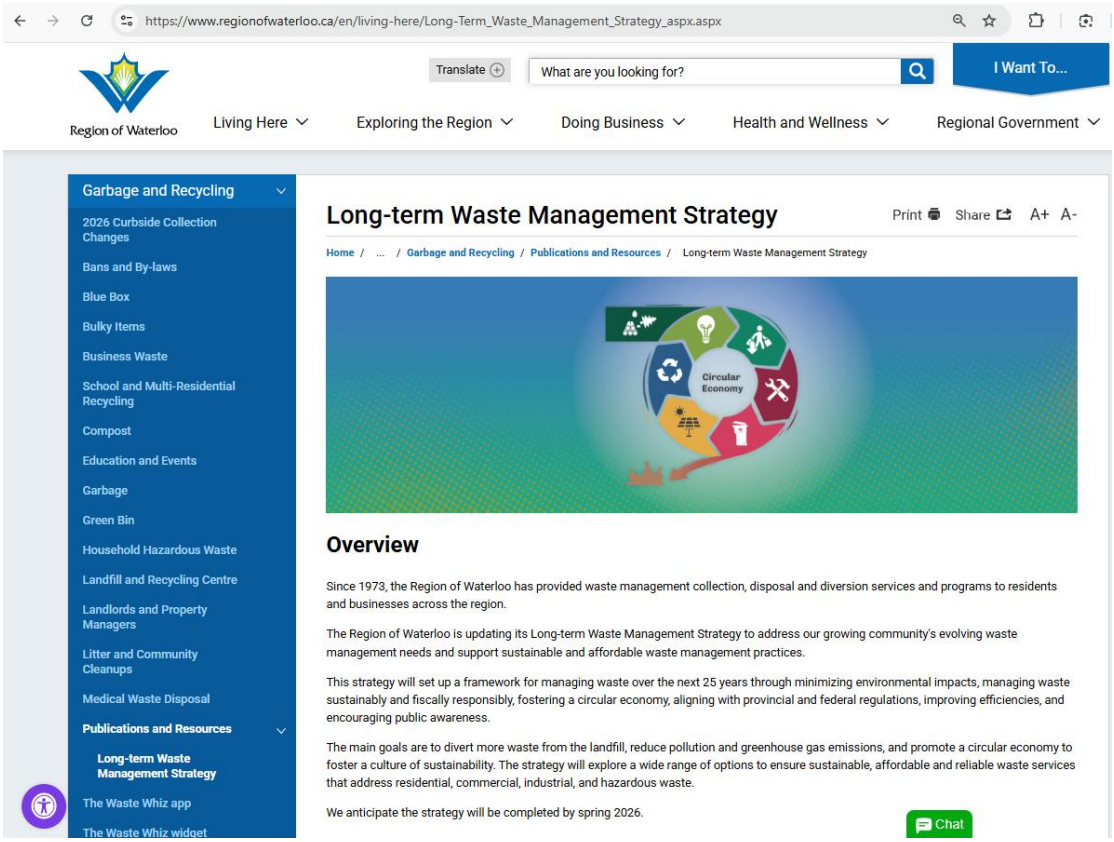
Innovative Ideas

- Pilot a green-careers mentorship program for youth in transitional housing to build skills and create opportunity;
- Increase landfill diversion rates by expanding the range of materials accepted in the curbside collection program;
- Facilitate a local marketplace for the community to exchange, sell and acquire repaired and repurposed goods; and
- Develop certified job-training programs with educational partners to build a skilled workforce for the circular economy.

4.2.5 Project Website

A dedicated project page was established on the Region's website (**Figure 6**). During Phase 1 it included an overview of the project, project schedule, contact information and links to the Public Consultation Workshop recordings and EngageWR site.

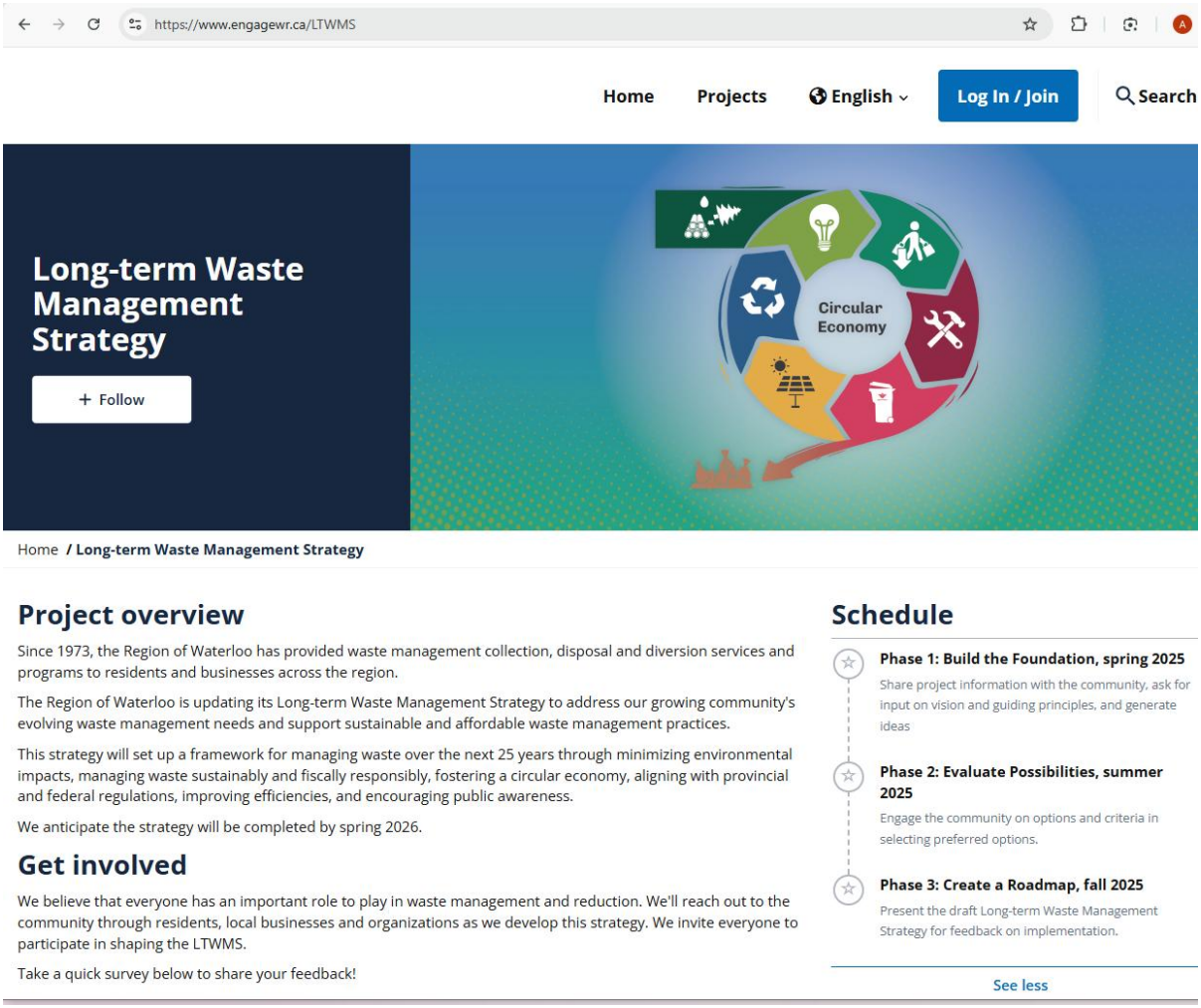
Figure 6: Project Website Page



4.2.6 EngageWR Page

An EngageWR page was also created to support public engagement (**Figure 7**). It featured the online survey for residents to complete, along with project background information and related resources. During the consultation period, there were 5,462 visits from 4,146 visitors.

Figure 7: EngageWR Page



4.2.7 Media

The Region promoted the project through multiple media outlets. Two articles were published in the **Waterloo Region Record** on May 12 and May 22, 2025, supported by an interview provided by the Region. Additional coverage included an interview with 570 News resulting in an article published on May 12, 2025, and an interview with **Cambridge Today** published on May 8, 2025.

4.2.8 LTWMS Survey #1

The Region conducted its Phase 1 survey from May 9 to June 6, 2025, receiving 1,940 responses from community members, including residents, businesses, students and visitors. This represents approximately 0.29% of Waterloo Region's population. The survey was advertised online through the

Region's LTWMS and EngageWR webpages, social media and email, and was also promoted on the Waste Whiz app. Region staff promoted the survey at in-person or virtual events as well as presentations at various committees for diverse inclusion and participation. This was supported by handing out over 1,500 postcards to promote the project and provide the community with the project website information.

On Instagram, a video was posted to encourage youth to take the survey, as included in **Figure 8**.

Figure 8: Region of Waterloo Instagram Promotion Video for Phase 1 Survey

The Phase 1 survey aimed to gather feedback on existing waste services, programs and educational initiatives, as well as to explore potential new programs for the updated LTWMS. The primary objective was to identify potential sustainable and affordable waste management solutions.

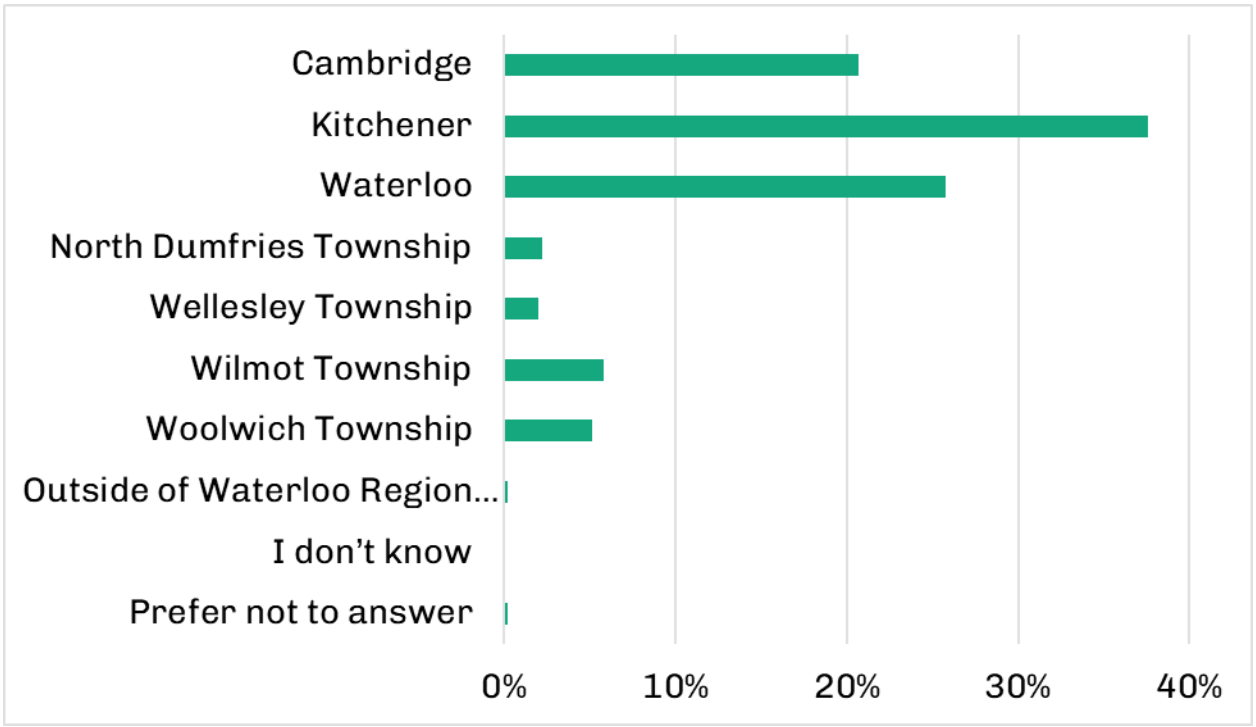
4.2.8.1 Respondent Demographics

Demographic questions were included to assess the representation of different groups within the survey responses and to identify any underrepresented communities. Responses were monitored throughout the survey period and targeted outreach was used to improve representation where gaps were identified. For example, the Region encouraged greater youth participation by having staff promote the survey with youth at events and directly engage with attendees to complete it.

Among the respondents, 97% identified as residents using waste services, 1% as local business owners or employees and 1% as students, indicating substantial engagement from those residing within the Region.

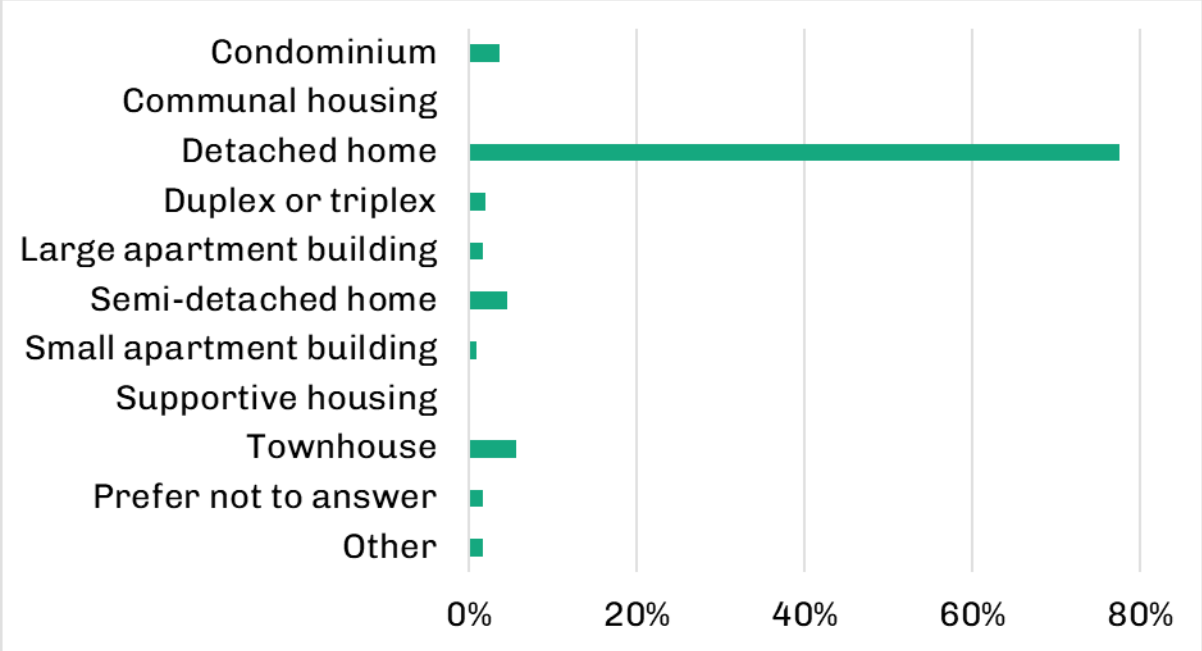
Geographic distribution of respondents is illustrated in **Figure 9.** This highlights that over 80% of respondents were from the Tri-Cities, with 15% from the Townships, closely mirroring the population breakdown of the Waterloo Region.

Figure 9: Survey Responses to "Where do you live in Waterloo Region?"



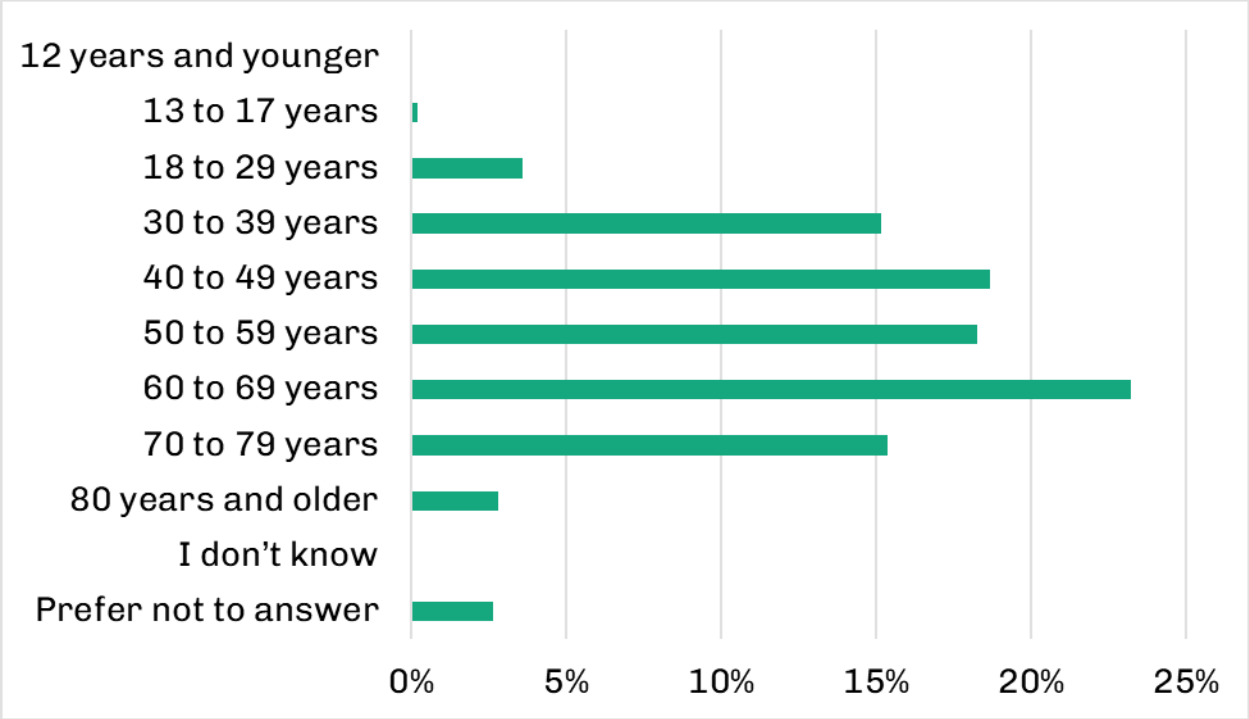
Respondents were also asked to identify their type of residence (**Figure 10**). Seventy-eight percent reported living in detached homes, followed by townhouses (6%), semi-detached homes (5%) and condominiums (4%). This information can be used in developing solutions that address barriers in different living situations. For instance, residents in small and large apartment buildings frequently cite difficulty in diverting organic waste and space concerns. In contrast, detached homes may face different issues such as collection limits.

Figure 10: Survey Responses to "What type of residence do you live in?"



The age of respondents ranged from a category capturing ages 13 to 17 years to a category capturing respondents aged over 80 years, with the largest group of respondents identifying as between 60 to 69 years old (23%) as included in **Figure 11**.

Figure 11: Survey Responses to "What Is your age?"



Additionally, respondents were asked about annual income to capture a comprehensive view of the Region's population. Income data ranged from no income to over $150,000, although 30% or respondents preferred not to disclose their income.

Overall, the demographic data collected suggests a reasonably well-rounded representation of the Region's population, though not entirely comprehensive of all communities.

Sections 4.2.8.2 to **4.2.8.4** provide a breakdown of the survey results. The data was further analyzed by demographic group to identify any differences in responses. For example, given that the majority of respondents lived in detached homes, an additional analysis was conducted excluding this group to determine whether overall trends or majorities in responses shifted. Only where notable differences were observed following the removal of a specific demographic group were they reported; if not noted, the results remained consistent.

4.2.8.2 Sources of Waste Information and Awareness of the LTWMS Update

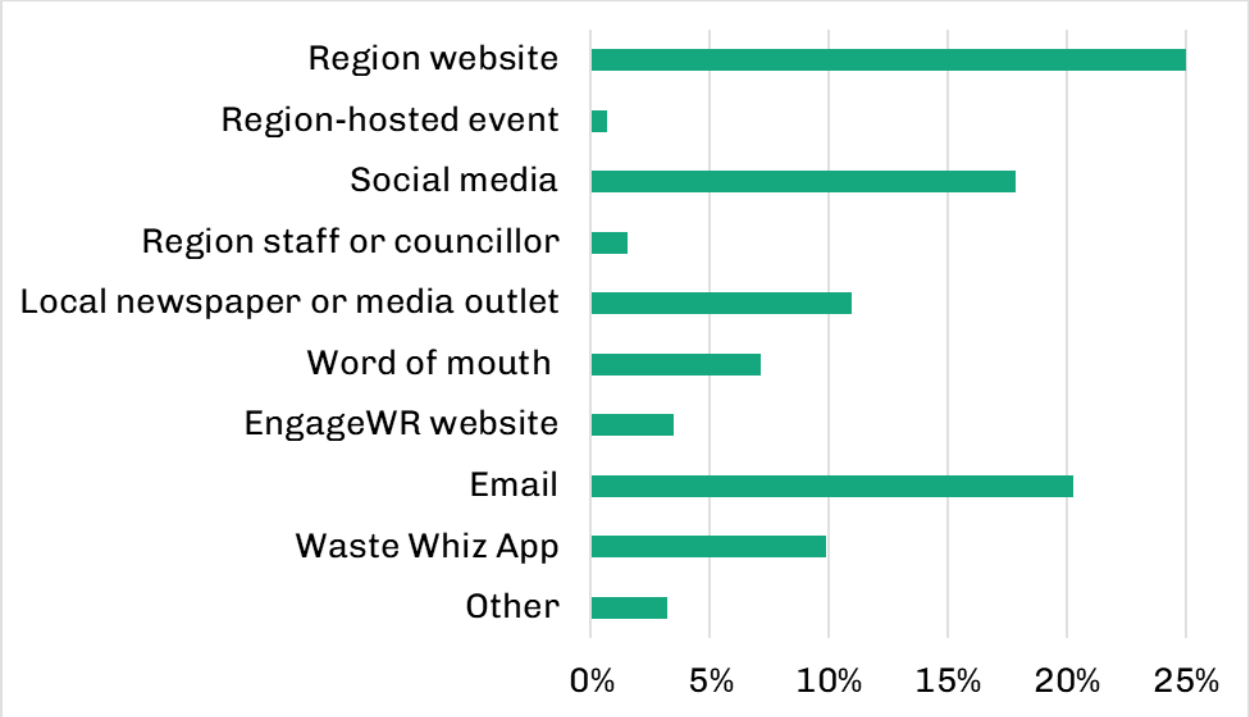
Understanding where respondents obtain information about waste services and how they became aware of the LTWMS update is important for evaluating the effectiveness of communication strategies.

Respondents were asked about their primary sources for learning about waste services and programs offered by the Region. The most frequently cited sources included the Region's official website (31%), the Waste Whiz App (26%) and the Region's Waste Calendar (20%). Social media platforms (12%), partner municipality websites (11%) and word-of-mouth from friends and family (16%) also played a role in spreading information. This diverse range of information sources highlights the importance of maintaining a multi-channel communication approach to reach various segments of the population effectively.

In addition, respondents were asked how they heard about the LTWMS update. **Figure 12** indicates that most respondents learned about it through the Region's website (25%), email (20%) or social media (18%). Respondents who indicated email identified several sources including EngageWR, Region waste collection reminders or updates, community groups and partner municipalities newsletters. The responses in the other category consisted of community groups and newsletters, radio and news reports, Google News feeds, church social ministry initiatives, Region Youth Advisory Meeting, Kitchener Public Library or the Region's bulletins. These findings suggest that direct communication and media engagement are effective strategies for informing the public about Region initiatives.

Figure 12: Survey Responses to "How did you hear about the LTWMS?"

Figure Note: Not all respondents answered the survey question and therefore the total percentages presented do not add up to 100%.



Overall, the data indicates that while traditional media and direct communication remain vital, digital platforms are increasingly important for reaching a broader audience. This insight can guide future efforts to enhance public awareness and engagement with regional waste management programs.

4.2.8.3 Current Waste Management Programs and Challenges

To assess the effectiveness of existing waste management programs and identify areas for improvement, residents were surveyed regarding their satisfaction with current programs, challenges in household waste management, types of waste that are difficult to manage and barriers to participating in waste reduction activities.

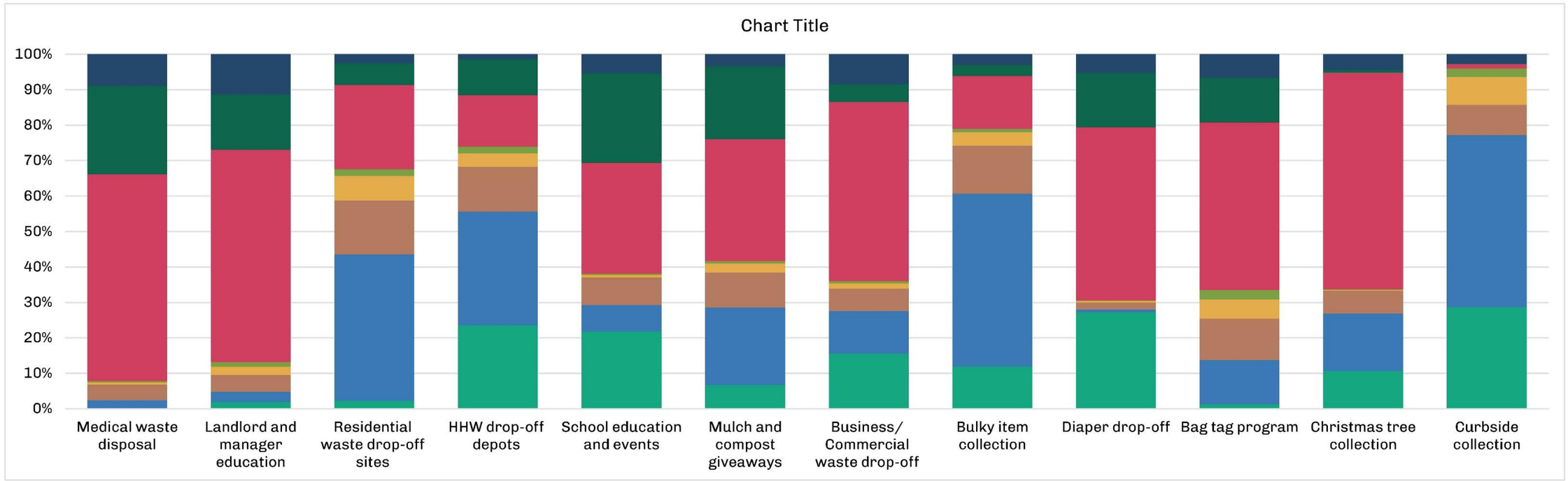
4.2.8.3.1 Current Waste Management Programs

Respondents rated their satisfaction with the Region's current waste management programs, which include:

- Curbside collection;
- Christmas tree collection;
- Bag tag program;
- Diaper drop-off;
- Bulky item collection;
- Business/Commercial waste drop-off sites (Cambridge Waste Management site and Waterloo Waste Management site);
- Mulch and compost giveaways;
- Education and events at schools, community presentations and workshops and Waste Discovery Day;
- HHW drop-off depots;
- Residential waste drop-off sites;
- Education and information for landlords and property managers; and
- Medical waste disposal.

Figure 13 illustrates that residents show satisfaction to programs such as curbside collection (81%), bulky item collection (72%), HHW drop-offs (57%) and residential drop-off sites (55%). Many respondents also indicated that they do not currently use, are unaware of, or do not receive most other services. The programs with the highest dissatisfaction rates were curbside collection (8%), bag tag program (7%) and residential waste drop-off (7%), indicating potential areas for improvement. **Figure 13** lists survey responses from "very satisfied" (bottom of the bars) to "I do not receive this service" (top of the bars).

Figure 13: Survey Responses to "How satisfied are you with the following waste programs the Region offers?"



Colour	Response	Medical waste disposal	Landlord and manager education	Residential waste drop-off sites	HHW drop-off depots	School education and events	Mulch and compost giveaways	Business/ Commercial waste drop-off	Bulky item collection	Diaper drop-off	Bag tag program	Christmas tree collection	Curbside collection
	I don't receive this service	9%	11%	2%	1%	6%	3%	9%	2%	7%	6%	4%	2%
	I was unaware of this program	25%	16%	5%	10%	30%	18%	5%	2%	21%	12%	1%	0%
	I don't currently use this program because I don't need it	57%	60%	19%	14%	38%	31%	55%	11%	66%	43%	52%	1%
	Very unsatisfied	0%	1%	2%	2%	0%	1%	1%	1%	0%	2%	0%	2%
	Unsatisfied	1%	2%	5%	4%	1%	2%	2%	3%	1%	5%	0%	6%
	Neutral	4%	5%	12%	12%	9%	9%	7%	10%	3%	11%	6%	7%
	Satisfied	2%	3%	33%	31%	9%	19%	13%	35%	1%	11%	14%	40%
	Very satisfied		2%	2%	23%	26%	6%	17%	9%	37%	1%	9%	24%

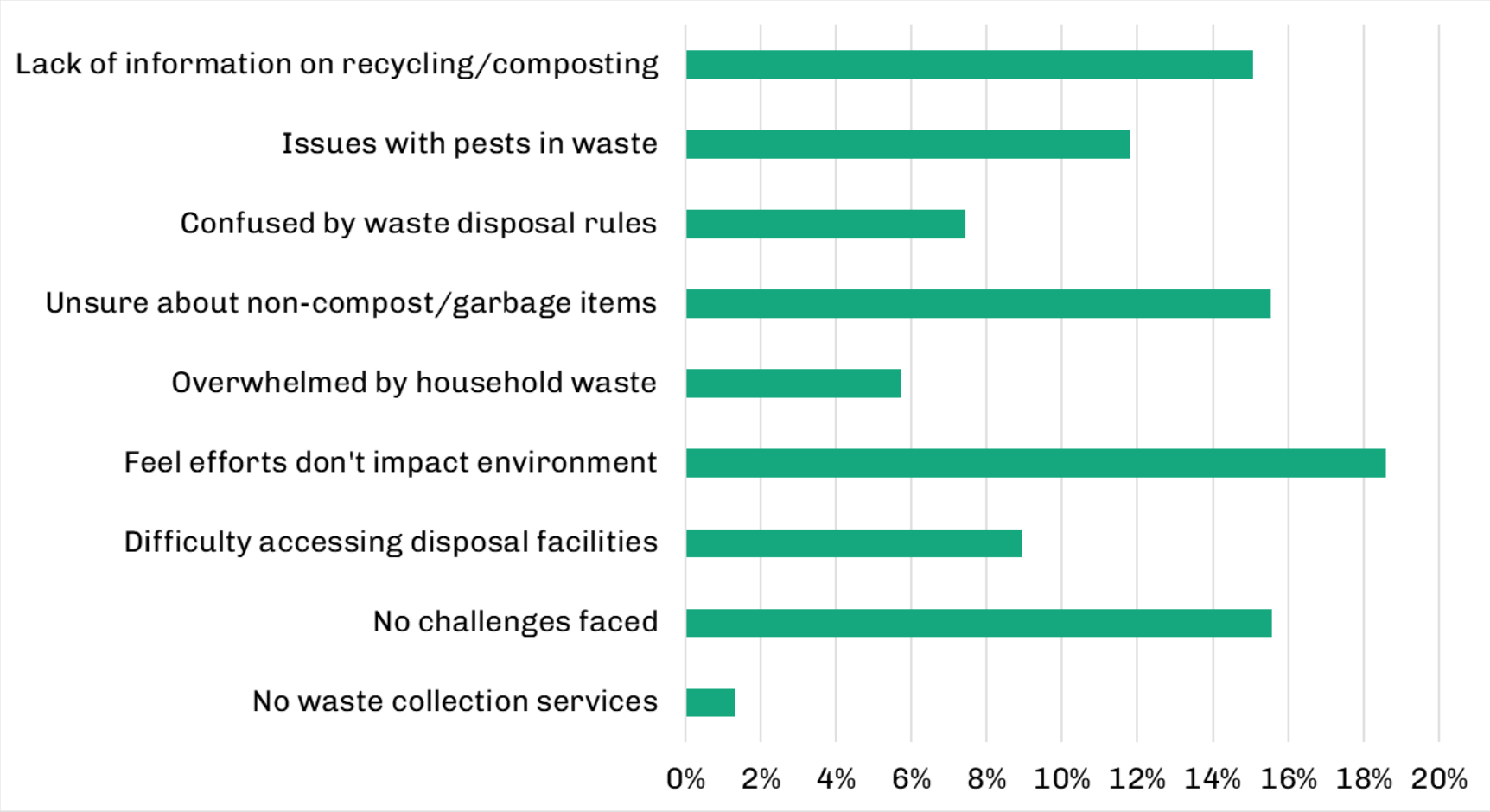
4.2.8.3.2 Challenges in Household Waste Management

Respondents identified the challenges they face in managing household waste from the following options:

- I lack clear information on what I can recycle or compost;
- I have issues with animals or pests in my waste;
- I struggle to understand the rules and regulations for waste disposal in my area;
- I am unsure about what to do with items that aren't compost or garbage;
- I feel overwhelmed by the amount of waste my household produces;
- I feel that my individual efforts don't make a big difference in reducing waste and protecting the environment;
- I have difficulty accessing the waste disposal facilities in Cambridge and Waterloo for dropping off HHW or other materials;
- I do not face any challenges; and
- I do not receive waste collection services from the Region.

The most common challenges identified in survey responses (**Figure 14**) included the perception that individual efforts have little impact (19%), insufficient information on recycling and composting (15%) and confusion regarding non-compost or garbage item disposal (16%). Additionally, many respondents reported not facing any challenges (16%). Although there are many residents that feel that they do not face challenges, it is still important to address those that do through communication on waste management practices and demonstrate the impact of individual efforts within the Region.

Figure 14: Survey Responses to "What are the biggest challenges you face in managing waste in your household?"



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4.2.8.3.3 Difficult to Manage Household Waste

In response to an open-ended question, respondents identified several types of household waste that are challenging to manage or dispose of properly within the current waste stream, which does not typically include recycling or composting. The survey responses highlighted several key themes:

- **HHW:** Many respondents mentioned difficulties with disposing of hazardous waste, including paint, chemicals, batteries and light bulbs. The inconvenience of traveling to designated drop-off locations, especially for those without personal transportation, is a common concern;
- **Electronic Waste (E-Waste):** Disposing of electronic waste, such as old electronics, batteries and small appliances, is frequently mentioned. Respondents' expressed confusion regarding where to dispose of these items and concerns about data security;
- **Bulky Items:** Large and bulky items, such as furniture, mattresses and appliances, are challenging to dispose of. Respondents' expressed frustration with the limitations on curbside pickup for these items;
- **Styrofoam and Packaging Materials:** Styrofoam, particularly from packaging, is a concern due to its bulkiness and non-recyclability in many areas. Respondents also mention difficulties with various types of plastic packaging and mixed-material packaging;
- **Plastics:** There is widespread confusion regarding which types of plastics are recyclable. Respondents mention issues with plastic bags, food packaging and other plastic items that are not clearly marked or accepted in recycling programs;
- **Recycling Confusion (e.g., food wrappers, coffee cups, pizza boxes):** Many respondents express confusion about Blue Box Material guidelines, particularly regarding items with mixed materials or unclear recycling (chasing arrows) symbols. There is a desire for clearer instructions and more consistent recycling practices;
- **Textiles and Clothing:** Disposing of old clothing, textiles and shoes is a concern, especially when these items are not suitable for donation;
- **Diapers and Personal Hygiene Products:** Diapers and other personal hygiene products are challenging due to their volume and odour, particularly with bi-weekly garbage collection schedules;
- **Food Waste and Composting:** Respondents living in large apartment buildings often lack access to composting facilities, leading to food

waste being disposed of in regular garbage. Concerns about odours and pests are also mentioned;

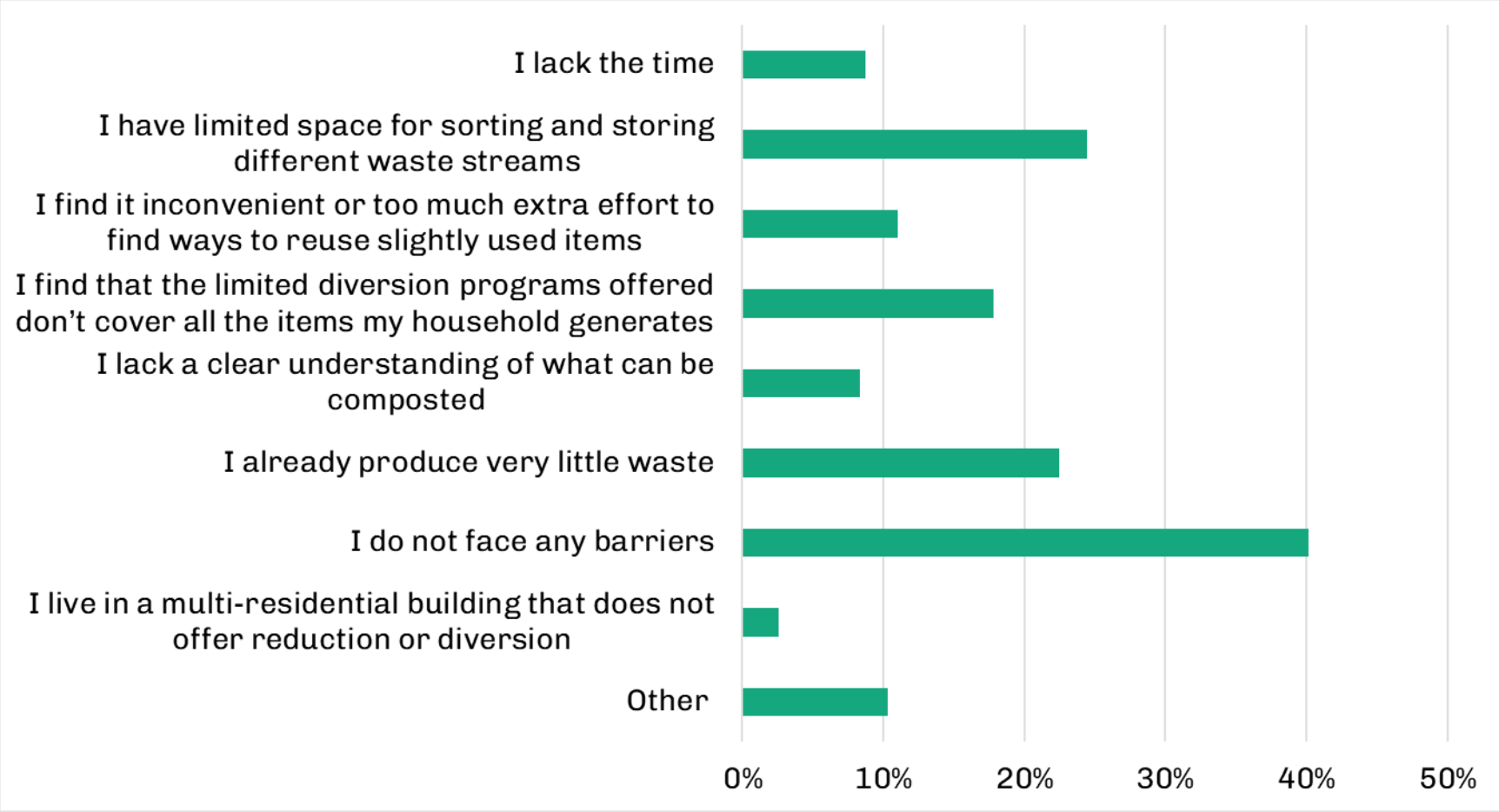
- **Yard Waste and Organic Materials:** Yard waste, especially during off-collection seasons, is difficult to manage. Respondents' expressed frustration with the limited collection schedule and the need to store organic waste; and
- **C&D Waste:** Respondents mentioned challenges with disposing of construction and renovation materials, such as wood, drywall and other debris, which are often too large or bulky for regular waste collection services.

The survey responses reveal several gaps in the Region's waste management system. Residents face challenges with hazardous and electronic waste disposal due to inconvenient drop-off locations, suggesting a need for more accessible collection points or community events. While many businesses in the Region already accept certain electronic waste items, feedback indicates that greater promotion and public awareness of these existing options may also help address this barrier. Confusion about Blue Box Material guidelines, particularly for plastics and mixed-material packaging, highlights a need for clearer public education and communication. Bulky item disposal is limited by current curbside services, indicating a need for more flexible collection options. The bi-weekly garbage collection schedule creates difficulties for managing diapers, hygiene products and food waste, especially in warmer months, suggesting a need for specialized disposal options. Additionally, the lack of composting facilities in large apartment buildings points to a need for changes or incentives to encourage appropriate infrastructure.

4.2.8.3.4 Barriers to Waste Reduction Participation

Several barriers hinder participation in waste reduction or diversion activities (**Figure 15**). 40% of respondents indicated that they do not face any barriers. For those that did indicate they had barriers, this included a lack of space for sorting (24%), limited diversion programs (18%) and producing low levels of waste (22%). Addressing these obstacles could enhance community engagement in waste reduction efforts. It was noted that those who do not live in detached homes showed an increase in lacking space for sorting.

Figure 15: Survey Responses to "What are some reasons that make it difficult for you to participate in waste reduction or diversion activities at your household?"



Overall, the survey responses offer valuable insights into the current state of waste management programs and the challenges faced by residents. Respondents expressed satisfaction with several aspects of the current programs, such as curbside collection and drop-off depots, indicating strong community support for these services. However, gaps were identified, particularly in the disposal of HHW and bulky items, as well as the need for clearer guidelines on sorting requirements. These findings underscore both the strengths of the current programs and the areas needing improvement to enhance program effectiveness and increase community participation in sustainable waste practices.

4.2.8.4 Development of the LTWMS

Based on the survey results, this section explores community perspectives on the future of waste management in the Region, with a focus on the LTWMS. Key topics include understanding of the circular economy, openness to new programs, support for technological investments and input on strategic ideas.

4.2.8.4.1 Understanding and Alignment of Circular Economy

The survey assessed respondents' familiarity with the "circular economy," which was defined to survey respondents as the following:

> Using resources, such as materials and products, for as long as possible, maximizing their useful life, then reusing or recycling them when they are no longer useful.

Results indicated that 32% of respondents understand the term, 39% are aware of it, 7% have heard it but do not understand it and 22% have not heard it before. Of all respondents, 68% emphasized the importance of integrating circular economy principles into the LTWMS, highlighting the community's desire for sustainable waste management practices.

4.2.8.4.2 Willingness to Adopt New Programs

The survey assessed respondents' openness to new programs as part of the LTWMS, including:

- Reuse initiatives, such as event sharing and repair cafés;
- Reuse programs for large items such as couches, including resale options for items in good condition and educational repair workshops;

- Community-based initiatives, such as waste reduction classes or workshops in collaboration with local groups;
- Additional resources for learning effective waste separation and reduction techniques;
- Educational outreach through social marketing and social media platforms;
- Initiatives aimed at reducing litter and preventing illegal dumping;
- Programs that improve access to convenient drop-off services for items such as HHW and bulky items;
- Partnerships with community groups or businesses to develop local circular economy opportunities;
- Programs focused on minimizing food waste; and
- Other (respondent suggestions).

Respondents expressed the most interest in initiatives that improve access to drop-off services, reuse programs and litter reduction, indicating a readiness to enhance waste management practices. Other suggestions from respondents included the following:

- **Education and Awareness:** Improved public education on waste management practices and clearer Blue Box recycling guidelines;
- **Infrastructure and Accessibility:** Enhanced access to waste disposal facilities and better support for Blue Box recycling and composting in large apartment buildings;
- **Manufacturer Responsibility**: Increased accountability for packaging waste and promotion of recyclable or compostable packaging;
- **Community Initiatives:** Programs promoting reuse, sharing and partnerships with nonprofits; and
- **Policy and Incentives:** Legislative measures to reduce SUPs and encourage Blue Box recycling and waste reduction through incentives and support.

4.2.8.4.3 Support for Technological Investments

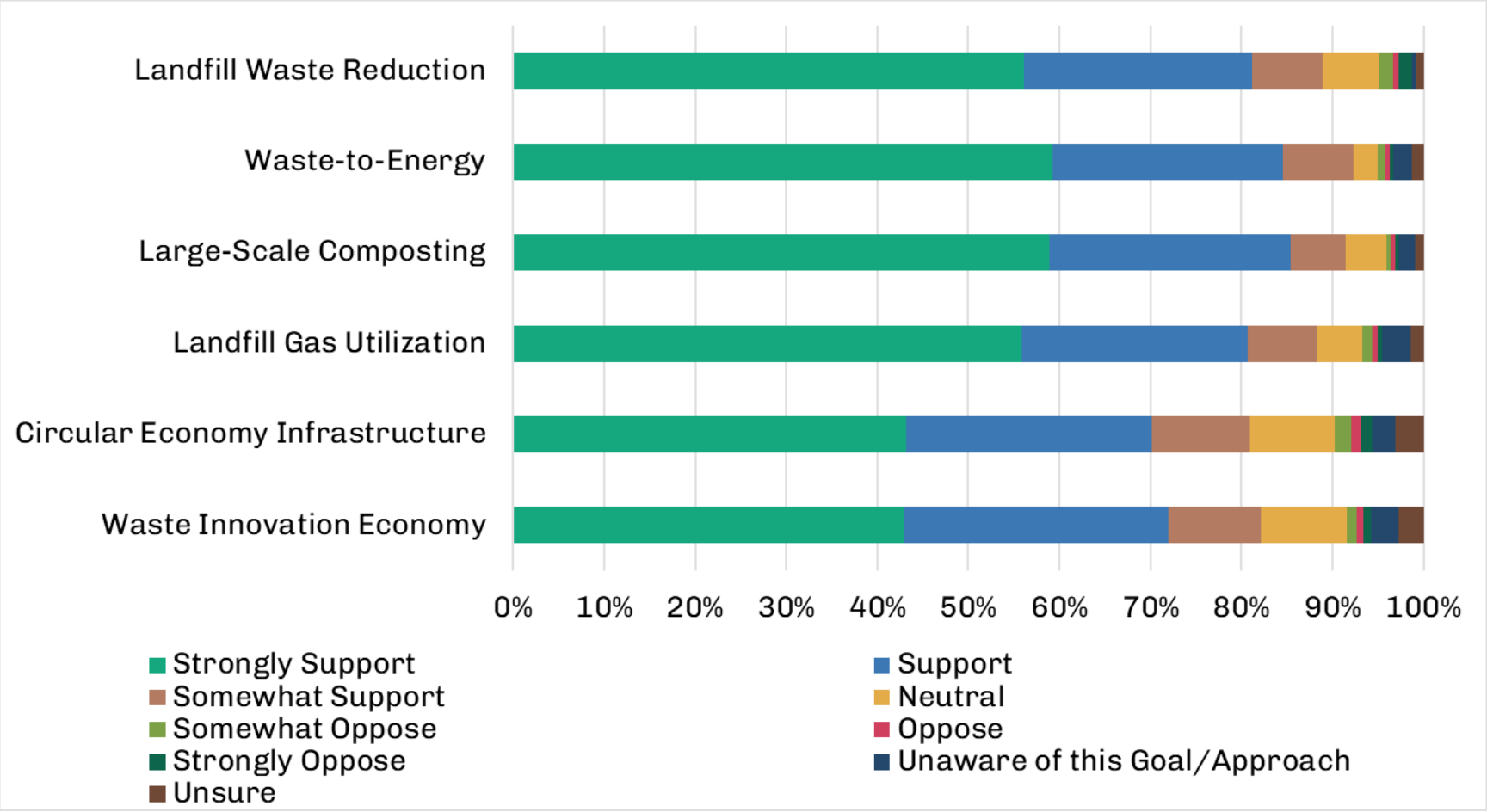
Respondents were asked about the types of technologies or approaches they would support the Region investing in, including:

- Reducing the amount of waste sent to landfill;
- Creating EfW from waste that cannot be recycled;
- Turning organic waste into products such as biogas or compost on a large scale;

- Capturing and using GHGs produced from landfills to reduce pollution;
- Developing local infrastructure to help create more opportunities for the circular economy; and
- Creating new economic opportunities within the Region through waste management innovation.

All options received at least 80% support from respondents, with the most popular being investments in creating EfW and converting organic waste into biogas or compost. None of the proposed technologies or approaches received more than 4% opposition (**Figure 16**). These responses indicate strong community support for leveraging technology to enhance waste management efficiency and sustainability.

Figure 16: Survey Responses to "The Region of Waterloo is exploring different technologies and approaches to meet our long-term waste management goals. How much would you support the Region investing in technologies and approaches that focus on the following goals?"



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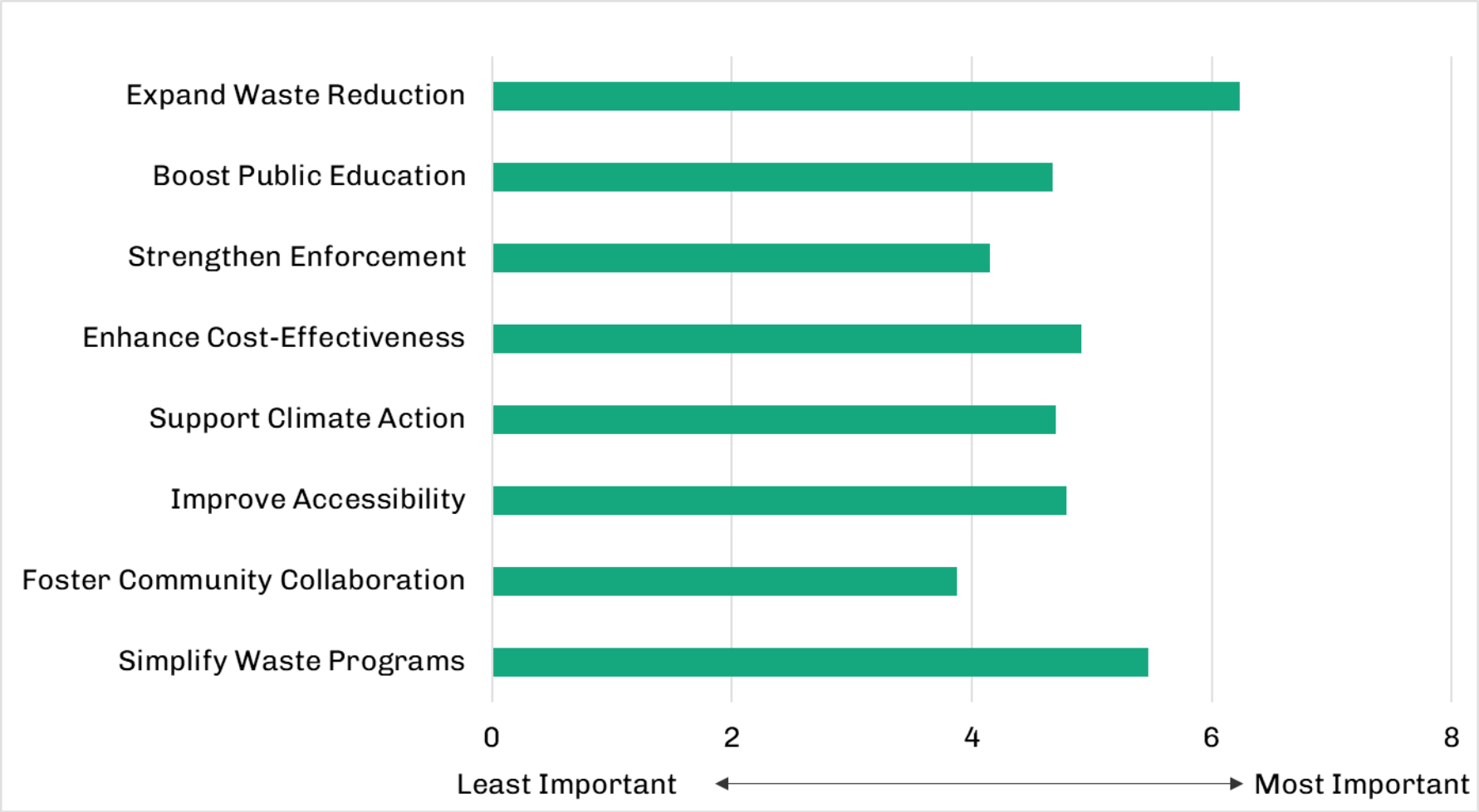
4.2.8.4.4 Priorities for Future Waste Management

The survey identified key priorities for the future of waste management in the Region. Respondents were asked to rank the following options based on importance from 1 being the least important to 8 being the most important:

- Expanding waste reduction and reuse initiatives to minimize landfill use;
- Enhancing public education and awareness about sustainable waste practices;
- Strengthening enforcement of waste management regulations to ensure compliance;
- Improving the cost-effectiveness and efficiency of waste collection and processing services;
- Advancing initiatives to reduce environmental impact and support climate action goals;
- Increasing accessibility to waste management services for all community members;
- Collaborating with community groups who are already working in reuse and reduction efforts; and
- Making waste programs and services easier to reduce effort and increase participation.

While all priorities were highlighted by respondents, the options chosen as the most important were expanding waste reduction and reuse initiatives (41%) and simplifying waste programs to boost participation (18%) **Figure 17**.

Figure 17: Survey Responses to "When thinking about the future of waste management, what is important to you?"



4.2.8.4.5 Community Ideas for LTWMS Development

Respondents were asked about specific ideas or suggestions for the Region to consider as the LTWMS is updated. There were 1,063 respondents that provided input on what ideas the Region should consider as part of the LTWMS. Responses were categorized according to the areas explored through the jurisdictional scan.

Reduction and Reuse of Waste

- Encourage setup of tool and appliance libraries, baby equipment and toy libraries to promote reuse;
- Incentivize repairing products and textile recycling to reduce landfill waste; and
- Promote businesses and programs that support reuse, such as thrift shops and repair workshops.

Recovery and Energy from Waste

- Explore EfW technologies, such as incineration with pollutant capture and partner with local industries; and
- Invest in infrastructure for AD and biogas production.

Optimize & Improve Operations

- Increase accessibility and frequency of HHW collection;
- Improve access to waste management facilities for those without vehicles;
- Provide accessible waste management solutions, including those in large apartment buildings; and
- Implement fines for littering and illegal dumping.

Circular Economy Culture

- Formalize relationships with local waste diversion groups and circular economy initiatives;
- Develop policies to reduce packaging waste and promote sustainable materials; and
- Support existing programs that enhance the reuse of materials, such as the KW Library of Things.

Carbon Offsetting

- Assess feasibility of creating carbon-rich materials from biomass waste for urban applications;

- Capture carbon from waste and store it in soils as part of long-term goals; and
- Explore partnerships for biochar projects to offset carbon emissions.

Public Engagement

- Enhance public education on proper Blue Box recycling and composting practices, targeting newcomers and students;
- Use social media and community events to increase awareness of waste management programs; and
- Provide clear labeling on products and packaging to inform residents on disposal methods.

Data and Metrics

- Share detailed information on what happens to waste after it is collected from the curb, including the proportion that is diverted versus sent to landfill;
- Develop strategies to track and analyze waste generation and diversion metrics; and
- Use data to inform and improve waste management policies and practices.

Other idea's that were provided by respondents but do not fall into the themes above include lobbying higher levels of government to act and cost effectiveness of all options.

The insights gathered from the survey responses provide an understanding of community expectations and priorities for the future of waste management in the Region. Residents have demonstrated a strong interest in aligning the LTWMS with circular economy principles, adopting new programs and supporting technological advancements. Their ideas and priorities will play a role in shaping the strategic direction of the LTWMS to reflect the values and aspirations of the community. By integrating these perspectives, the Region is well-positioned to develop a forward-thinking waste management strategy that promotes sustainability and inclusivity.

4.3 Consultation Results

The consultation process, engaging Region staff, advisory committees and the public, provided insights into the strengths and weaknesses of the current waste management system. This feedback revealed gaps in existing services and

infrastructure, while also identifying the community's needs and priorities for the LTWMS.

4.3.1 Gaps Identified from Consultation

The following gaps were identified across the SWOT analysis, Advisory Committee Workshop, Public Consultation Workshops and public survey:

- **Information and Education:** A portion of the community lacks clear, accessible information on waste sorting, particularly for plastics, mixed materials and items not accepted in curbside programs. There is also low awareness of many existing regional programs;
- **Service Deficiencies for Specific Waste Streams:** Residents face challenges with the proper disposal of HHW, electronic waste, bulky items, Styrofoam and textiles due to inconvenient or limited disposal options;
- **Underserved Sectors:** Large apartment buildings and the IC&I sector are highlighted as being underserved, with a notable lack of access to organics collection and other diversion programs;
- **Policy and Enforcement:** There is a perceived weakness in the enforcement of existing regulations, such as bag limits and illegal dumping, which undermines the effectiveness of current programs.
- **Behavioural and Systemic Barriers:** Resident apathy, the perception that individual actions have little impact and a lack of convenient options (e.g., public space recycling, sorting space in homes) present barriers to increasing waste diversion; and
- **Infrastructure Limitations:** The current large apartment building infrastructure does not adequately support widespread composting in large apartment buildings and the bi-weekly collection schedule poses challenges for households with diapers and organic waste.

4.3.2 Needs and Recommendations Identified

To address the identified gaps, participants supported the development and implementation of the following:

- **Enhance Education and Engagement:** There is a demand for simplified, targeted and multi-channel educational campaigns to improve sorting accuracy, increase program awareness and build a stronger community culture around waste reduction;

- **Improve and Expand Services:** Residents desire more convenient and accessible options for managing difficult waste, including expanded drop-off locations for HHW, specialty recycling programs (e.g., textiles, mattresses) and standardized three-stream collection in all public spaces;
- **Support Large Apartment Buildings and IC&I sectors:** A key recommendation is to mandate and support the implementation of comprehensive waste diversion programs, especially organics collection, in all large apartment buildings and for IC&I partners;
- **Foster a Circular Economy:** The community is interested in programs that promote reuse and repair, such as supporting repair cafés, creating sharing libraries (e.g., for tools, equipment) and establishing partnerships with local reuse businesses;
- **Leverage Technology and Innovation:** There is support for investing in technologies that create EfW, process organic waste into valuable by-products such as biogas and capture LFGs; and
- **Strengthen Policy and Partnerships:** Recommendations include strengthening enforcement of existing by-laws, advocating for EPR for packaging and formalizing partnerships with community groups and local businesses already active in waste reduction.

The consultation results suggest that, while the Region's current programs are appreciated, there is community support for continued evolution and improvement. By focusing on enhanced education, expanded services and strategic investments in infrastructure and policy, this approach can support the community's needs and successfully guide the Region toward its long-term waste management goals.

4.4 Consultation Next Steps

In Phase 2 of the consultation process, the options for consideration will be developed and will be evaluated through additional community engagement activities, including a follow-up survey and a series of public events across the Region. This phase will also include further public workshops and a dedicated session with both advisory committees as well as two additional exploration workshops for waste reduction to review the options in alignment with community priorities and guiding principles. The findings from this phase will be summarized in a forthcoming technical memorandum to inform the development of the LTWMS.

5.0 Summary

Technical Memorandum 3 identifies key system needs, service gaps and strategic pressures facing the Region's waste management system. Drawing from performance data, interested partner insights, legislative analysis and jurisdictional research, the technical memorandum highlights opportunities to enhance program delivery, extend landfill life and align with circular economy and climate goals. The following sections summarize the recommended actions to address these needs and guide the development of options for Technical Memorandum 4.

5.1 Recommendations

The recommendations outlined below respond to the findings of Technical Memorandum 3 and reflect input gathered through interested partner engagement, staff interviews, an international jurisdictional scan, and technical analysis. They focus on targeted improvements across education, service delivery, data systems, sector engagement and innovation, worthy of further evaluation as part of the LTWMS process, to position the Region for long-term success.

Education and Engagement

Outreach efforts should continue to evolve to better reflect diverse audiences, emerging waste challenges and the Region's circular economy and climate goals. Interested partner feedback emphasized the importance of meaningful, practical and accessible communication.

- **Simplify and Target Communications**: Interested partners expressed the need for waste education that is easier to understand, tailored by audience and available in multiple formats and languages to improve sorting and reduce contamination;
- **Expand Digital Engagement Tools**: Interest was shown in digital reminders, apps, waste sorting tools and QR codes on bins, suggesting that these can increase awareness and improve participation; and
- **Broaden Community Engagement**: Residents emphasized the value of interactive and community-based outreach approaches, this could include pop-up booths, school partnerships and local events attendance, to make waste education more visible, relatable and action-oriented across neighbourhoods.

Behavioural Change and Apathy

Effective education and engagement are important for achieving waste reduction targets, yet a significant barrier remains in resident apathy and resistance to behavioural change.

- **Develop Targeted, Behavioural-Based Campaigns**: Go beyond general education by recommending the use of behavioural insights, as seen in Guelph's Gold Star Program , to design programs that positively reinforce waste-sorting and reduction efforts.
- **Make Participation more Convenient:** Feedback highlighted that a lack of convenience is a major barrier. Recommend simplifying waste programs to reduce effort and increase participation. This includes supporting initiatives that improve access to convenient drop-off services for items such as HHW and bulky waste, as highlighted by survey respondents.
- **Empower Community Ambassadors:** Suggest formalizing programs such as Toronto's 3Rs Ambassador Program or Vancouver's Zero Waste Ambassador Program to directly engage residents in large apartment buildings, addressing the challenge of reaching residents in high-density areas.

System Access and Service Expansion

There is a growing expectation for more inclusive and accessible waste services, particularly for under-served areas and hard-to-recycle materials.

- **Support Public Space Collection**: Feedback highlighted the inconsistent availability of three-stream waste bins in public parks and transit areas, which limits diversion opportunities and undermines public education; and
- **Enhance Drop-off Convenience**: Interested partners requested more accessible drop-off points for hazardous and hard-to-manage materials, such as HHW, electronics and bulky waste, particularly in rural or less-serviced areas.

Sector-Specific Focus: Large Apartments and IC&I

The large apartment and IC&I sectors represent gaps in the Region's diversion performance. While not under direct service jurisdiction, their influence has system-wide outcomes.

- **Support Waste Separation in High-Density Settings**: Findings highlight low participation in organics programs and high contamination from large apartment buildings and IC&I generators. Interested partners indicated

that requiring waste diversion infrastructure, building ambassadors, and education would improve performance; and

- **Provide Compliance and Education Tools**: Suggestions include waste audits, onsite education, centralized organics drop-offs and standardized signage to improve engagement and performance tracking in these sectors.

Circular Economy Advancement

Circular economy strategies were a central focus of the jurisdictional review, with multiple examples examined for their relevance and applicability to the Region. There is growing interest from the public in waste prevention, reuse and material sharing. The Region's past experiences with programs such as Goods Exchange Days, bicycle programs, and the paint reuse program provide valuable insights that can be leveraged to build a more successful and sustainable future waste services.

- **Support Reuse and Repair Programs**: Interested partners were highly supportive of initiatives such as repair cafés, sharing libraries and donation partnerships. These efforts were also reflected as best practices from other jurisdictions;
- **Encourage Upstream Prevention**: The technical memorandum identifies the need for upstream solutions, such as waste avoidance campaigns and reuse marketplaces to reduce reliance on the landfill and contribute to a circular economy; and
- **Implement Circular Policies and Resource Investment:** Some jurisdictions have established circular policies to mandate or encourage circular practices and have created funding programs to support the growth and expansion of circular innovations.

Technology and Innovation

Modern waste systems integrate emerging technologies to optimize performance, improve environmental outcomes and engage communities.

- **Explore Energy and Resource Recovery**: Interested partner engagement and the jurisdictional scan both highlighted the value of innovative organics processing and EfW technologies to reduce reliance on landfill and support climate goals; and
- **Explore AI-enabled sorting and contamination tools**: Other jurisdictions are using AI and smart sensor systems to monitor waste stream quality

and improve diversion, offering insight into technologies the Region could explore.

Policy, Partnership and Governance

To build a more integrated and resilient waste system, the Region will need to strengthen governance tools and expand collaborative networks.

- **Refresh the IMWG**: The group has been inactive but presents a significant opportunity to collaborate with other municipalities on diversion, enforcement and procurement strategies;
- **Strengthen Internal and External Partnerships**: The need for stronger collaboration between the Region, local municipalities, community groups and businesses was noted throughout consultation and reflects best practice models from comparator jurisdictions; and
- **Use Policy Tools to Drive System Change**: Interested partners noted the importance of stronger enforcement of existing waste by-laws and suggested the Region continue to advocate for regulatory changes, such as expanded EPR. Clarifying roles and responsibilities across sectors was also indicated as important to improve consistency and address service and data gaps.

Data, Metrics and Performance Tracking

Technical Memorandum 3 highlights gaps in performance data and emphasizes the need for more standardized and actionable metrics to support long-term planning.

- **Improve Data Collection and Develop Consistent Performance Metrics**: Data limitations, particularly in sectors not served by the Region, were a repeated barrier to system-wide analysis. There's a need to define consistent and inclusive KPIs beyond just diversion rates, such as contamination levels, GHG emissions and cost-per-tonne. An approach for tracking performance metrics should be established over time, including the use of regular waste composition audits, and ensure this monitoring is continued over the long term;
- **Implement Planning Triggers and Forecasting Tools**: Technical Memorandum 3 references the need for planning thresholds (e.g., landfill capacity) and long-range forecasts to support proactive decision-making; and
- **Establish Future GHG and Methane Baseline Targets**: While detailed modelling of waste-related GHG emissions was not completed for this

update, future work should establish BAU methane and GHG baselines for the landfill and assess potential reductions achievable through recommended actions in the LTWMS. This would enable the Region to directly link waste KPIs to broader climate goals and integrate waste into future corporate or community emissions reduction strategies.

Landfill Preservation and Residual Waste Planning

Landfill capacity remains one of the most significant drivers of long-term waste system decisions. Technical Memorandum 3 identifies the narrowing landfill timeline and explores options for managing remaining residuals.

- **Plan for Extended Landfill Lifespan**: With current projections indicating capacity depletion within approximately 20 years, strategic investment in diversion, organics processing and alternative treatment is required to extend landfill life;
- **Evaluate Residual Waste Technologies**: Jurisdictional scans and public feedback support consideration of EfW or other residual waste treatment technologies to reduce future reliance on landfill; and
- **Integrate Landfill Metrics into Planning**: Airspace consumption, tonnage trends and composition of residuals should continue to be tracked regularly and tied to planning triggers for new infrastructure or system upgrades.

Funding and Financial Resiliency

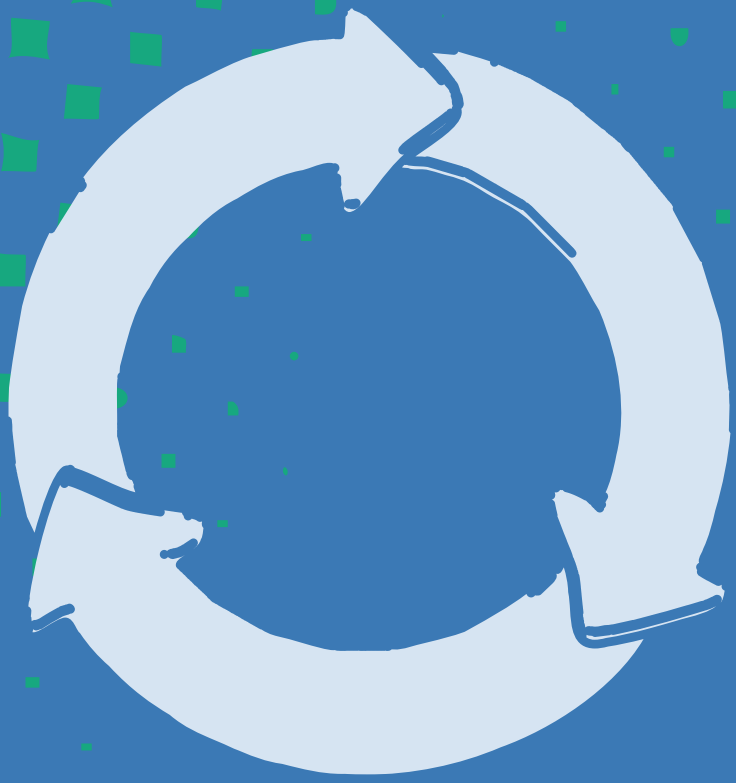
The Region could consider developing a sustainable financial strategy that moves beyond current funding models to support long-term, capital-intensive projects.

- **Implement a financial strategy for long-term initiatives**: This could include exploring alternative funding models, applying for provincial and federal grants for projects like RNG upgrades, and leveraging public-private partnerships for new infrastructure.
- **Incorporate revenue generation**: Consider evaluating new programs and technologies, such as AD and bio-CNG conversion, based on their potential to not only reduce emissions but also generate revenue through the sale of products which can help offset costs.

5.2 Next Steps

The upcoming Technical Memorandum 4, will be developed to outline, consult on (Phase 2) and also evaluate a range of potential waste management options. The

potential options will focus on policies, programs and technologies to address the Region's upstream and downstream waste impacts and fulfill the long-term waste management needs and requirements. Emphasis will be placed on options for waste reduction, reuse, recycling and recovery. An analysis will be conducted to identify effective approaches for minimizing waste impacts. The evaluation of viable options will incorporate findings from previous technical memorandums and future consultations to provide a well-rounded evaluation and assessment. These insights will guide the development of the final strategic recommendations for enhancing the Region's waste management for the long term.



Appendix A – Former Region Programs

The following provides a brief history of the Waste Management Division's programs and services[203]:

- 1973: Landfilling begins at Waterloo Site. Originally built by County of Waterloo but transferred to Region. At this point, the Region is responsible for garbage disposal only.
- 1980: A Pilot Blue Box Program starts in a subdivision by the Kitchener Auditorium. Nyle Ludolph, from BFI, starts the initiative and it quickly catches on in the community.
- 1986: Residential Household Hazardous Waste program begins. The program consists of one-day depots set up around the Region.
- 1988: Tires are banned from the landfill disposal.
- 1990: A region-wide recycling program is implemented & the Tri-Cities & Townships now have access to recycling. Material Recycling Centre is built.
- 1991: Cardboard is banned from the landfill.
- 1993: Centralized composting begins onsite.
- 1995: New materials are added to the recycling program.
- 2000:
    - Local municipalities (Tri-Cities and Townships) transfer curbside garbage collection to the Region. The Region is now responsible for collection as well as disposal of residential waste.
    - Funding model changes: Moving away from User Rate to Tax-based.
- 2002: The Region significantly expands curbside collection service to the residents. Yard wastes, large items, all plastics from # 2 to 7 are collected. An innovative Environmental Education Program is developed.
- 2003: Wooden pallets and grass are also banned from landfill disposal. A new and innovative Cambridge Transfer Station officially opens.
- 2004: Milk cartons and juice boxes are added to the recycling program. Waterloo HHW program is expanded to full-time to better serve residents.
- 2005:
    - Computer/electronics are banned from the landfill and an Electronic Recycling Program is established.
    - Shingles diversion program implemented

[203] Document Number: 851136

- 2006:
  - An Organic Pilot Program (green bin) starts in the region. A recycling program diverting bale wrap for farmers is launched at the rural transfer stations.
  - A bicycle reuse partnership is established with several stakeholders including the local school boards.
  - The education program is launched with the addition of a permanent education building on-site.
- 2007:
  - Goodwill opens "Express Donation" at Waterloo Transfer offering residents an opportunity to divert their gently used household items.
  - Shingles diversion program suspended.
- 2008: Services in the Townships are expanded including adding large item and yard waste collection.
- 2010:
  - Organic collection is now offered to the majority of residents.
  - A voluntary diversion program for drywall is available in the Waste Diversion Area at the transfer station. Over 300 tonnes diverted in the initial year.
  - A demonstration project for IC&I sector for Organic Waste was launched in the fall. Approximately 50 – 60 percent of the waste received at the Waterloo Landfill comes from the IC&I sector.
  - Green Cart Pilot Program launches for schools and multi-residential homes.
- 2011:
  - The Used Cooking Oil Diversion program is now available at the HHW depots.
  - Drywall program diverted 900 tonnes and the Pallet program diverted 1,200 tonnes from landfill.
- 2012:
  - MRC was renamed the Nyle Ludolph Recycling Centre, in honour of the "Father of the Blue Box".
  - Shingles diversion program reinstated.
- 2013:
  - WMMP Approved.
  - Compostable plastic bags were added to the green bin program.
- 2014:
  - Blue Box Materials expanded: more plastic bags and outerwrap.

    - Shingles, drywall and pallet recycling programs discontinued due to financial reasons.
- 2015: Paint Reuse program suspended.
- 2016: All rural transfer stations closed
- 2017:
    - Bag limits, every other week garbage collection and large item collection in effect.
    - Green bin, Christmas tree collection and yard waste are now offered to all rural residents for the first time.
- 2018: Drywall and pallet diversion programs reinstated.
- 2019: Onsite education centre revamped and relaunched.
- 2020:
    - Launch of a Region-branded garbage and recycle app – Waste Whiz.
    - Pandemic hits and green bin and blue box distribution moves from WMC Admin Building to HHW at Waterloo.
    - Free loop at Waterloo Small Vehicle Transfer Station, Gate 2 discontinues after season ends (Goodwill, Habitat and the Bicycle Diversion Program).
    - During pandemic collection services were not impacted. Transfer stations were closed to the public for approximately 6 weeks. Delay to the start of the yard waste program and an increase in bag limits were temporarily allowed to accommodate for extra residential waste (masks, gloves, etc.)
- 2021: Virtual tour and interactive education program launches during the pandemic.
- 2022:
    - Garbage bag limits are reduced from 4 bags to 3 for Single-family, semi-detached and townhouses. Multi-residential houses (3 to 6 units) were not affected and remain at 10 bags.
    - Ziploc bags, sandwich bags and books removed from blue box in preparation of the new recycling legislation.
    - MRES Rebate Program discontinued due to budgetary constraints.
- 2023: Council approved opting out of the recycling program during transition period.
- 2024:
    - March 2024 - Residential recycling moves to Circular Materials, a producer-led not-for-profit organization. Council approves recycling collection for the downtown areas past January 1, 2026. A new

program which now includes food waste collection will launch in March 2026.
    - Backyard Composter distribution is on hold due to budget restrictions as of March 2024.
    - Automated cart collection contract is awarded to Halton Recycling (Emterra) to start March 2026.
    - A new strategic plan review (the LTWMS) is underway focusing on the circular economy.
    - The MRC's equipment is dismantled, and the building serves as a recycling transfer operation for producers.
- 2025: Cart Implementation

The following provides context regarding several of the Region's programs which discontinued.

Goods Exchange Days: In the 1990s in spring and fall, the Region coordinated Goods Exchange Days which consisted of residents putting to the curb, reuse items for free pick-up. This program was well received by the community, has been successfully implemented by other municipalities, and a good way to effortlessly promote a circular economy. There were several issues with enforcement of this program given several items not intended to be taken for free were stolen out of garages and with the two-tier system, items that remained at the curb violated some of the area municipalities by-laws.

Bicycle Program and Small Household Item Reuse: The Region used to accept bicycles and have Goodwill and Habitat for Humanity collect household items, tools, small appliances and building items. If a reuse centre is recommended as part of this LTWMS then consideration needs to be coordinated for a covered building near the Small Vehicle Transfer Station Site entrance to be incorporated into the design and to develop a selection process so it is fair to community partners to have space on Site. The bicycle program, which ran from 2006 to 2010, was a success in terms of repair, reuse, skill building and partnerships that were developed with a local high school. However, this program did require a lot of operational support and oversight as residents dropped off bike parts that had to be sorted, organized, and monitored to ensure all bikes were repurposed and not just bikes that could be easily fixed and resold.

Paint: Previously the Region offered a Paint Reuse program, which was suspended in 2015. Storage during winter months was problematic as well as the intended reuse was for residents; however, Waste Operations had noticed that small businesses were making use of this program.

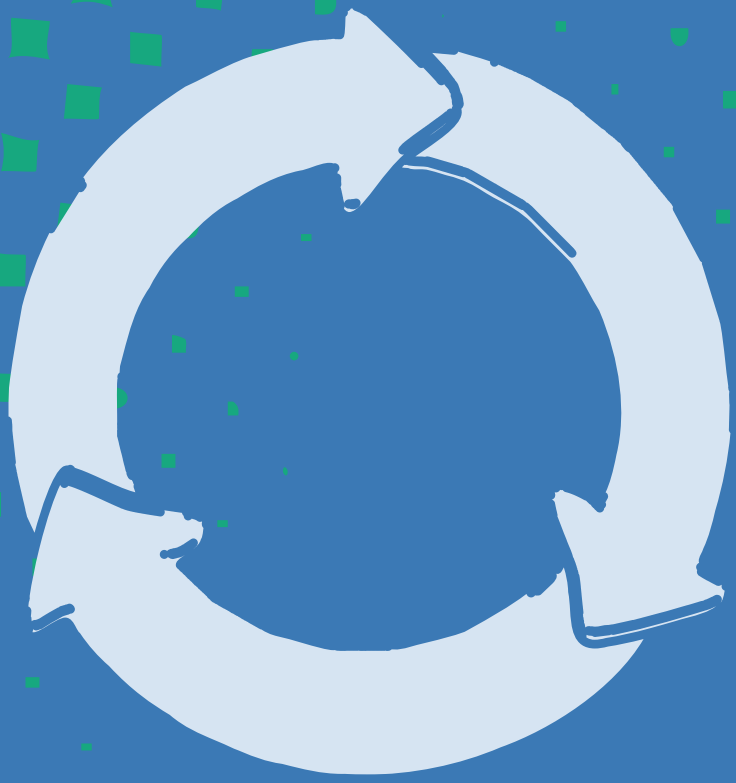
Shingles: the Region offered a shingles diversion program from approximately 2005 to 2007 and again in 2012 to 2014, which was cancelled due to lack of funding and the local recycler closed while the program was discontinued. This program offered several benefits that included several years of diverting over 10,000 tonnes of shingles from landfill, avoidance of nails falling out of loads on main landfill roads to the tip face, which resulted in less customers picking up nails in their tires, and that recycled shingles can be made into other beneficial products (i.e., driveway product). This program did require a higher degree of operational resources and oversight given contractors tend to bring in other waste with shingles, causing contamination. It was noted that any diversion program is more costly to manage than landfilling. Possibly partnering with a neighbouring municipality to share transport costs should be considered should the program be brought back as there is no longer a local recycler.

Textiles: In 2019, the Region put out a request for quotation to implement once per month residential curbside collection for all textiles. This program was never implemented.

Food Waste School Program: Since 2010, the Region has undertaken two ICI food waste initiatives. The first being an organics pilot targeting food waste collection in elementary schools, the University of Waterloo food services, long term care, and low income housing. The pilot was most successful diverting food waste with little contamination in establishments where professional kitchen staff are involved. However, where the health unit required outdoor storage of food waste bin was a problem with frozen contents being a challenge for pick-up during winter months. In addition, it was determined that food waste collection for elementary schools is not practical with the boomerang lunch requirement that all left over food items are returned home, schools mostly generate paper towel waste which is costly to pick up as part of a food waste diversion program. Lastly, food waste diversion in low income housing was a challenge for contamination requiring a lot of education in different languages.

Large Apartments Food Waste Program: The second initiative involved IC&I food waste diversion from 50 large apartment buildings, where 10 buildings are still participating. Equitable services and increased awareness are the benefits of this program and the demonstration revealed that each building must have a trained ambassador to help reduce the amount of contamination in the food waste stream. Another negative was that high turnover of building personnel increased the training requirement.

Dumpster into Dollars Campaign: The Region historically supported several IC&I waste reduction initiatives that ran over three decades, which were cancelled mostly due to lack of funding. The Region previously offered a “Dumpsters into Dollars” campaign where staff would run full day workshops to assist local businesses with waste reduction and education and helped foster reuse and circular economy with a business directory to assist local connections. The directory was suspended in 2019 and was resource intensive to maintain at the time.



Appendix B – Landfill Offset Values

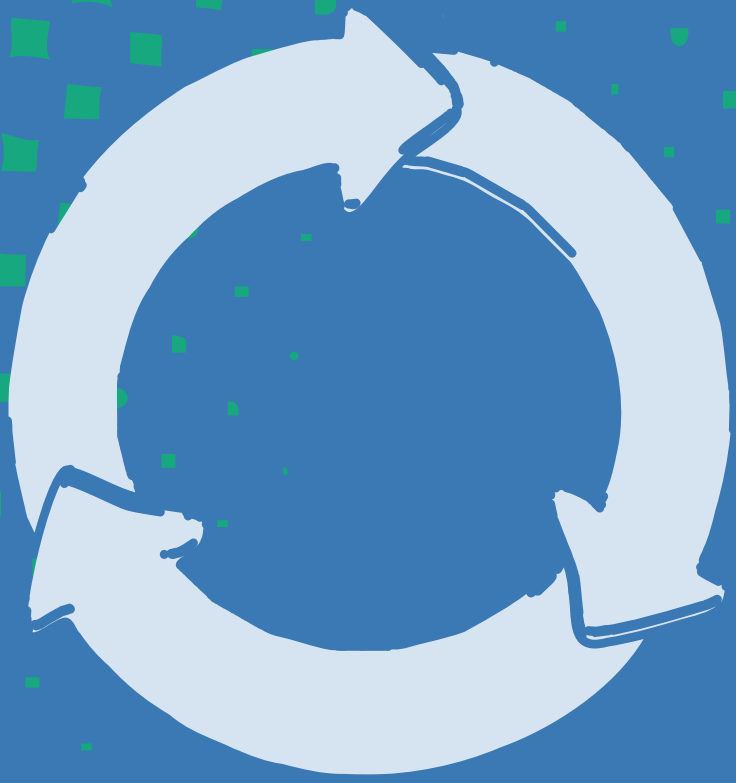
The following summarizes the energy recovery and associated GHG benefits from the Region's two LFG utilization programs:

Cambridge Landfill – Gerdau Steel Mill

- Initiative launched in 1999.
- Total energy delivered to 2022: ~1.9 million gigajoule.
- Share of mill's total energy demand (2022): 6.5%.
- Avoided GHG emissions: ~27,000 tonnes CO_2e.
- Contract expiry: 2028.

Waterloo Landfill – Toromont Energy

- Electricity generation facility launched in 1999.
- Plant capacity: ~6.2 MW; however, based on supply the output is approximately 4.5 MW.
- Provides royalty payments to the Region.
- Avoided GHG emissions: ~130,000 tonnes CO_2e.
- Contract expiry: 2027.



Appendix C – Consultation Results

A summary of the discussion for each component of the SWOT analysis is provided in **Tables C-1** to **C-4**.

Table C-1: SWOT Analysis Breakdown - Strengths

Theme	Discussion
Staff capacity	• Experienced, highly skilled and reliable staff that have established community relationships and seek opportunities for continuous improvement.
Reputation	• Reputation of strong vision, leadership and a history of successful planning and implementation; and • Community members consistently turn to the Region for accurate information regarding waste.
Resilient	• Resilient and adaptable services and staff.
Education and Community Engagement	• Strong existing engagement and educational programs that promote a culture of less waste.
Innovation	• Highly innovative community with access to resources at local universities and colleges.
Single-Body	• Single body government running unified waste management services across the Region.

Table C-2: SWOT Analysis Breakdown - Weaknesses

Theme	Discussion
Funding	• Perceptions that waste management should be free or low cost from residents; and • Financial stresses on the Region and residents.
Enforcement	• Limited ability to enforce bans and bag limits.
Competing Priorities	• There can be challenges in effectively identifying and prioritizing among multiple, often conflicting, priorities.
Quality of Goods	• The Region can't influence the quality of goods being produced which directly impact waste management programs and services.
Lack of Data	• Lack of data available for the residential and IC&I sector.
Behaviour Change	• Residents may be indifferent to waste management, reduction and diversion; and • There may be a reluctance to change home waste practices, fueled by the perception that waste "disappears" once collected at the curb.

Theme	Discussion
Students and Large Apartment Building Residents	• Residents of large apartment buildings and students often face challenges in accessing accurate waste management information.
Legislative Changes	• Inconsistent and changing policies that impact Regional waste management practices.
Community Understanding	• Community understanding of what waste management concepts such as circular economy mean.
Two-Tier System	• Potential disconnects between upper-tier and lower-tier governments.

Table C-3: SWOT Analysis Breakdown - Opportunities

Theme	Discussion
Community Partnerships	• Opportunities for new partnerships and to strengthen existing ones within the Region at the Local Area Municipal level and within the community.
Community Engagement and Education	• Continue to educate and empower the community to support a culture of waste diversion and reduction; • Highlight the Region's vital and innovative programs and services; and • Residents are open to learning more.
Data Gathering and KPIs	• Opportunities to redefine KPIs and standardize data collection to better measure and improve performance.
Technology	• Opportunities to explore and adopt new technologies and innovations that enhance waste management.
Youth Engagement	• Opportunities to engage younger generations on waste and climate-related issues to support long-term sustainability.
Funding	• Opportunities to explore and implement alternative funding models to support programs and services.
Circular Economy	• Opportunities to promote a regional circular economy by reducing waste and keeping materials in use.

Theme	Discussion
Climate Change	• Opportunities to align waste services with broader climate change goals and pursue climate-resilient service delivery.
Land Use Planning	• Opportunities to influence planning and policy decisions to better accommodate waste management in growing and large apartment building communities.
Council Education and Engagement	• Opportunities to inform and engage Regional and Area Municipality councils on risks, opportunities and the benefits of proactive waste management planning.

Table C-4: SWOT Analysis Breakdown - Threats

Theme	Discussion
Financing	• Budget available to implement changes and budgetary pressures that may impact the ability to implement new programs and service changes; and • Rise of external financial pressures on residents due to global markets and trends.
Political and Policy Changes	• Potential for competing priorities in the Region; and • Changing priorities and policies from the various levels of governments.
Climate Change	• Increasing levels of severe weather events that impact waste management services.
Misinformation and Disinformation	• Misinformation and disinformation related to waste, waste management and the Region's services spreading on social media.
Land Use Planning	• Lack of influence over planning decisions affecting waste management, especially for growing large apartment buildings.
Resident Apathy	• Resident apathy and resistance to participating in social behavioural changes.

A summary of the discussion from the virtual collaboration activity with the Advisory Committee regarding successes and areas for improvement is included in **Tables C-5** to **C-10**. Additional feedback received following the advisory workshop has also been incorporated.

Table C-5: Advisory Committee Feedback - What current waste management practices are most effective in moving towards diverting waste?

Theme	Discussion
Effective Collection Practices	• Bi-weekly waste pickup and yard waste collection are highlighted as effective practices in reducing waste. These methods encourage residents to minimize waste generation and promote composting and recycling.
Recycling and Diversion Programs	• The Blue Box and green bin program are recognized for their success in diverting recyclable and compostable materials from landfills, playing a crucial role in promoting recycling and reducing overall waste. Donation and reuse programs extend material life. Yard leaves pickup in the City of Cambridge could be expanded regionally.
Policy and Regulation	• Policy changes, such as implementing bi-weekly collection and bag limits, are impactful in encouraging waste reduction and fostering sustainable waste management practices.
Education and Awareness	• Educational initiatives, including Waste Whiz App, magnets, calendars and information on waste disposal options, are helping residents to make informed decisions and actively participate in waste reduction efforts.
Yard Waste Services	• Yard waste pickup is effective and widely used for diversion; consider expanding leaf pickup (as in Cambridge) region-wide to reduce bagged material.
Donation and Reuse	• Donation and reuse programs (e.g., item drop-offs, online platforms) help extend material life and keep items out of landfill.
Community Education	• Education on source separation remains critical but requires ongoing reinforcement to maintain participation and quality.

Table C-6: Advisory Committee Feedback - Are there any existing initiatives or programs that could be expanded or improved?

Theme	Discussion
Education and Digital Resources	• Expanding consumer education initiatives and digital resources to inform residents about waste management progress and their responsibilities. This includes enhancing online tools such as the Waste Whiz App and website sections to provide information on waste reduction, reuse tips and the environmental impact of waste habits.
Organics and Recycling Initiatives	• Improving organics management through mandatory participation in organics collection and increasing awareness of organics division. Enhancing recycling programs, such as mandatory C&D and developing reuse hubs to connect generators with receivers to improve waste diversion. Exploring additional energy recovery options.
Regulation and Enforcement	• Strengthening enforcement of existing regulations, such as bag limits, to carry out compliance and encourage waste reduction and implementing bans on certain waste types to support sustainable waste management practices.
Large Apartment Buildings and IC&I Waste Solutions	• Addressing waste generated by large apartment buildings and IC&I sectors. Expanding recycling and composting initiatives in large apartment buildings to improve waste diversion rates and support broader community waste management goals.
Accessibility and Drop-offs	• Increase the number and accessibility of drop-off locations for various waste streams.
Textiles and Reuse	• Introduce or expand textile recycling programs, potentially in partnership with bin operators; Peel's curbside textile program provides a useful precedent. Enhance access to reuse and donation options, especially for household items and textiles.
Incentives and Market Value	• Develop incentive-based programs to encourage clean separation at source (e.g., cardboard), which improves material marketability and can yield revenue benefits.
Education and Outreach	• Incorporate social media influencers into diversion campaigns to amplify messaging and promote behaviour change across wider audiences.

Table C-7: Advisory Committee Feedback - What are key opportunities for reducing waste generation in your household, community or organization?

Theme	Discussion
Collaboration and Community Initiatives	• Connecting groups to reduce food waste, such as linking restaurants to shelters and establishing resource-sharing initiatives such as a Library of Things or tool rental services can enhance community collaboration and minimize waste generation.
Consumption and Product Standards	• Encouraging mindful consumption by demanding higher quality products and consuming less can reduce waste. Advocating for better waste management in construction and improved packaging from corporations can further support waste reduction.
Infrastructure and Accessibility	• Implementing source-separated garbage options in public spaces and providing water filling stations at community events can facilitate waste reduction. Introducing battery drop-off points at workplaces offers a convenient solution for specialized waste disposal.

Table C-8: Advisory Committee Feedback – What are the main barriers to achieving a circular economy and how can they be addressed?

Theme	Discussion
Collaboration and Working Groups	• Launch or support an ongoing collaborative or working group to advance circular economy initiatives locally.
Accessibility and Awareness	• Build programs that make circular economy models accessible to the broader community through awareness, training, and education.
Program Models	• Peel Region's circular economy grant program could serve as a useful precedent for replication in Waterloo Region.
Communication and Engagement	• Tailor communications to distinct audiences to maximize impact: low-density residential (curbside pickup), medium/high-density residents (often reliant on private contractors), IC&I sectors, and product lifecycle stakeholders (e.g., manufacturers and reuse coordinators).

Theme	Discussion
Strategic Pairings	• Pair waste generators with potential users, e.g., wood waste (arborists, sawmills) with particle board manufacturers or landscapers; HHW handlers (refrigerants, batteries, used oil) with recycled-content manufacturers.
Business and Industry Engagement	• Incorporate targeted messaging into circular economy workshops attended by regional industry (e.g., TMMC, Loblaws, CGT, Tigercat Industries) and build campaigns to amplify community and commercial participation. The principle of "one company's waste is another company's treasure" highlights the importance of enabling these connections.

Table C-9: Advisory Committee Feedback – What new partnerships could be formed to support circular waste strategies?

Theme	Discussion
Large Apartment Pilots	• Work with condo boards to pilot and incentivize diversion in large apartment buildings.
Biofuel and Energy	• Explore partnerships with restaurants and companies such as Biofuel Oils Inc. for used cooking oil collection. Engage aviation sustainability groups such as WISA to evaluate biofuels in airport operations.
Community Partnerships	• Strengthen connections with Habitat for Humanity and second-hand stores to redirect surplus materials.
Innovation Networks	• Collaborate with COIL to accelerate circular solutions across supply chains and sectors.
Regional Resource Strategies	• Develop regional partnerships to integrate forest residues and organics into circular strategies, collaborating with agricultural producers, district energy systems, and bioproduct innovators.
LFG as an Energy Asset	• The Waterloo landfill collects gas which is mostly used to make electricity; however, it could be turned into RNG instead. This could replace a meaningful amount of fossil fuel use locally and help reduce GHG emissions.
Organics Diversion to RNG	• Capturing the organics that still end up in the landfill could double what is currently being captured.

Theme	Discussion
Agricultural Linkages	• AD digestate could replace synthetic fertilizers across regional farms, lowering N_2O emissions, improving soil health and supporting climate-smart agriculture adding a second emissions-reduction pathway alongside energy.

Table C-10: Advisory Committee Feedback – How can we create solutions that are equitable and accessible to all community members?

Theme	Discussion
Youth and Awareness	• Use social media and youth-friendly platforms to raise awareness; pair with events for kids and youth to promote early engagement in equitable waste solutions.
IC&I Organics Partnerships	• Engage food waste generators (e.g., Loblaws distribution centres, Dare Foods, Frito-Lay, Grand River Foods, Conestoga Meats) for coordinated organics collection. Potential to collaborate with Bio-En in Elmira to expand large-scale AD capacity, scaling RNG supply while advancing circular economy goals.

A summary of the discussion from the virtual collaboration activity with the public regarding successes and areas for improvement is included in **Tables C-11** to **C-13**.

Table C-11: Public Consultation Feedback - What current waste management practices are most effective in moving towards diverting waste?

Theme	Discussion
Green bin and Organics programs	• The green bin program effectively diverts organic waste. Enhancing public education on composting and increasing accessibility to existing composting facilities can improve participation and efficiency.
Education, Awareness and Community Engagement	• Current educational initiatives, including the Waste Whiz app and direct engagement through staff visits, are vital for improving waste sorting accuracy. Strengthening community engagement and partnerships with existing waste management organizations can enhance resource allocation and program effectiveness.
Waste Restrictions and Limits	• Enforcing limits on garbage bag quantities and collection frequency can drive increased use of recycling and composting systems, thereby reducing landfill dependency.

Theme	Discussion
Cost and Accessibility	• Maintaining low costs for landfill access while optimizing waste diversion at existing collection points can improve overall waste management efficiency. Ensuring widespread availability of current recycling and composting facilities is crucial for equitable access.

Table C-12: Public Consultation Feedback - Are there any existing initiatives or programs that could be expanded or improved?

Theme	Discussion
Expansion of Drop-off Programs	• Expand City of Kitchener community center drop-off programs for non-Blue Box Materials, including Teracycle programs, to all community centers for increased accessibility.
Enforcement and Regulation	• Improve enforcement of bag limits and consider reducing the number of untagged garbage bags allowed to encourage waste reduction.
Support for Large Apartment Buildings	• Reinstate the regional grant program to support waste collection costs for large apartment buildings. Mandate compliance with resident requests for waste diversion, especially organics.
Education and Awareness	• Enhance education on waste diversion and its regional impact. Implement mandatory education and source separation in schools, including organics pickup. Promote classroom trips to waste management sites.
Specialized Programs	• Ensure newcomer welcome centers offer 3-stream waste education. Add multilingual signage. Develop specialized recycling programs for items not accepted in blue bins, such as scrap metal. Expand BIA collection to cover all businesses. Advocate for industry standards on packaging dates to reduce food waste.
Community Engagement and Reporting	• Increase public education efforts in schools, newcomer language classes and public venues such as farmers markets. Publish the annual waste report consistently to maintain transparency and accountability.

Table C-13: Public Consultation Feedback - What are key opportunities for reducing waste generation in your household, community, or organization?

Theme	Discussion
Consumer Behaviour and Education	• Encourage shopping at local markets to reduce packaging waste. Promote the use of green bins. Advocate public responsibility in waste reduction through educational materials and initiatives such as mailed waste calendars.
Advocacy and Policy	• Advocate for improved packaging standards and lobby government officials to enhance programs. Demand industries take responsibility for reducing commercial waste. Implement innovative waste management techniques, such as variable waste bin sizes and targeted curbside audits, to encourage proper sorting and recycling.
Reuse, Upcycling and Community Programs	• Promote reusing and upcycling containers and items and encourage buying rechargeable items. Develop textile recycling options and clothing pickup services. Implement large item waste diversion programs for post-secondary students and explore reuse depot models. Assist large apartment buildings in supporting 'Green Champions' to promote waste diversion.
Partnerships and Innovative Techniques	• Partner with organizations such as EcoTech and Plastics Redeemed to support local businesses and stimulate waste reuse. Explore innovative techniques such as Quebec's 'purple bag' system and City of Nelson's FoodCycler program. Encourage consumption of whole foods with less packaging and assist residents in growing their own vegetables to minimize packaging.