RECYCLEBC™

Streetscape Recycling Roundtable Series

Final Report

February 2020

Executive Summary

Recycle BC organized a roundtable discussion series during 2019 focused on the topic of streetscape packaging and paper recycling. Recycle BC engaged a third-party organization, Alces Technologies Inc., to facilitate the six roundtable sessions among local government representatives in BC. Municipalities within BC were brought together to discuss a suitable recycling or recovery model and inputs to inform the development of a financial incentive offer for Recycle BC streetscape material, assess current and historical findings from local governments with streetscape programs, and find consensus on best practices for execution.

Streetscape recycling, as referenced in the BC Recycling Regulation (subsection 5(1)(d)(ii)), is municipal property that is not industrial, commercial or institutional property, and comprises the following, which are collectively referred to as 'streetscape':

- Sidewalks which are municipal property, which adjoin buildings in an urban commercial area and which are used for pedestrian traffic;
- Plazas or town squares which are municipal property, and which are available to the public; and Parks which are municipal property.

Extensive information collection from municipal partners occurred during the series in the form of surveys, polls, and facilitated discussions, and additional research was conducted to inform the ongoing discussions. This report contains the following information:

1. **Roundtable Discussion Series Description** – Provides an overview of eligible municipalities, attendance and structure of the series.
2. **Background Information** – Reiterates Recycle BC's streetscape recycling commitment, summarizes Recycle BC pilot and consultation outcomes plus other streetscape recycling municipal audit results.
3. **External Jurisdiction Scan** – Compiles North American and international current reality and best practices for streetscape recycling and distills related drivers and challenges.
4. **Current Practices and Opportunities for Streetscape Recycling Design in BC** – Summarizes information gathered from participating municipalities to inform Recycle BC's forthcoming recommendations and program requirements.
5. **Municipal Preferences and Priorities** – Captures key preferences and priorities expressed by municipalities throughout the session related to their role in infrastructure, collection, processing and end fate for managing packaging and paper products (PPP).
6. **Recycle BC Considerations to Inform Program Requirements** – Presents preliminary streetscape program design considerations for requirement development.
7. **Next Steps** – Reviews the program development process scheduled for 2020.

Roundtable Discussion Series Description

Twenty-seven of the 31 eligible municipalities participated in some form for the duration of the series from May to November 2019. At least 50% of invited municipalities attended a majority of the sessions held by webinar (3), and in-person (North Vancouver, Burnaby, and Kelowna). Representatives from the Extended Producer Responsibility (EPR) branch of the Ministry of Environment and Climate Change Strategy (Ministry) also participated in the roundtable series, with a presentation by the Ministry during the second in-person session.

Background Information

Since Recycle BC's inception, pilot projects have been conducted to study the feasibility of PPP collection in on-street recycling receptacles. Pilots tested recycling station types, signage, receptacle openings, and other operational components. A consultation was also held in 2017 to engage stewards, local governments, collectors and other service providers, First Nations communities, and environmental and other key stakeholder groups. Recycle BC presented a streetscape program outline and financial incentive offer as part of the consultation which was not accepted by the local governments. Hence one of the consultation outcomes was to conduct a roundtable discussion series to seek ways in partnership with local governments to conduct more streetscape collection studies to determine how best to reduce the high contamination levels such that material can meet marketability criteria. To that end, municipal audits were harmonized and aggregated alongside Recycle BC audit data to show accuracy and capture rates as available.

External Jurisdictional Scan

An external scan was conducted through select North American interviews and international online research. The intent was to gauge and evaluate current practices in higher performing jurisdictions globally to determine materials collected and what is recycled versus disposed. Scanned jurisdictions spanned Canada, the United States, Europe, Asia, and Australia. A review of best practice guidelines and behaviour change-related peer reviewed academic research was also completed.

Based on the external scan, four unique challenges emerged that apply across the board for streetscape recycling:

1. Low Accountability – public space recycling stations have the least amount of personal accountability for users, which makes marketing efforts and behaviour change tools more challenging to implement. Residents and other passersby don't always put materials in the correct recycling receptacle.
2. Outdoor-related Factors – since stations are outdoors, they are susceptible to weather conditions, wildlife impact, graffiti, and increased wear and tear over time.
3. Challenging Material and Product Types – from chip bags to take out containers and hot and cold beverage cups, more difficult to recycle items are common street side. Hot beverage cups in particular contribute to higher moisture content in recycling materials since many people discard cups with liquids contained therein. Containers can also have extra food waste, which also reduces quality of everything in the collection container they come into contact with.
4. Selective Global Markets – global markets have become stricter and less tolerant of contaminants in common recycling streams since the China National Sword policy came into effect in 2018.

Challenges aside, there is still a burgeoning cultural shift towards wanting to collect recyclables in public areas. Higher performing jurisdictions with strong diversion targets and cultural norms, including Seattle, Toronto, and Halifax, are continuing to seek improvements to education approach, infrastructure, and processing options to optimize recycling capture through streetscape recycling.

Current Practices and Opportunities for Streetscape Recycling Design in BC Municipalities

Current practices and opportunities for streetscape recycling were explored at length pertaining to material stream options for collection, signage and program promotion, and processing and end markets.

In British Columbia, Recycle BC and BC-leading jurisdictions have built upon best practices through pilots and information exchange that is well aligned with the positive findings in the external scan. In BC, we are cultivating a unique and consistent approach to capturing packaging and paper through mixed paper and mixed container recycling streams. Consistent branding and messaging will continue to support more efficient and effective participation in streetscape recycling programs across larger BC jurisdictions. This approach has gone beyond a primarily bottles and cans and newspapers recycling model, factoring in cultural norms and expectations, and has committed to continual improvement to normalize recycling beyond the home and business.

Municipal Preferences and Priorities

Multiple stakeholders are invested in how streetscape recycling infrastructure, collection systems, processing, and end fate of materials comes into place. There is a requirement for Recycle BC to meet regulatory requirements. Recycle BC and participating municipalities are committed to using best management practices to optimize capture and minimize contamination for packaging and paper collected on-street.

For Recycle BC, as with other collection programs, tonnage reporting is important to determine how much material is being captured. Given the higher level of contamination compared to the curbside, multi-family or depot collection programs, it is a priority to maintain the material quality from the curbside, multi-family and depot programs and maintain separate processing for streetscape recycling. As part of program compliance, it is also important for Recycle BC to have transparency in reporting on the end fate for the material collected (e.g., managed by recycling, recovered as engineered fuel, or if not recyclable or recoverable, disposed of through landfill).

Municipalities also have preferences and priorities related to how streetscape recycling is handled through the chain of custody, and provided feedback throughout the roundtable discussion series which is summarized below.

Infrastructure – For infrastructure development, there was broad consensus around providing a similar user experience in jurisdictions with streetscape recycling which embeds best practices for optimizing capture and reducing contamination. Examples of consistency, discussed in the Current Practices and Opportunities for Streetscape Recycling section of this report, are highlighted below:

- Recycling station design consisting of multiple receptacles that meet design guidelines for sizing (e.g., meeting minimum capacity), durability, placement, and other key elements
- Colour-coding by receptacle and signage type
- Similar branding for approach and point-of-use signage related to image (e.g., icon, picture) and product (e.g., coffee cup, newspaper)

There was some discussion around how to best determine the number of stations needed to maintain resident satisfaction and abate litter successfully. A desire was expressed for flexibility on what material streams could be established to parallel curbside collection system. Municipalities with existing curbside single stream recycling collection were generally more inclined to keep or implement single stream for streetscape recycling stations, even though contamination levels are shown to be higher than dual stream systems. Some municipalities found it fitting to have organics collection in place of paper near food areas to collect food-soiled paper and compostable food service packaging in the organics collection bin.

Collection – Municipal representatives clearly stated the importance of being able to select and procure their own streetscape recycling stations to align with existing street furniture, meet aesthetic requirements for their community, and harmonize with operational needs. Several reinforced the

expectation that the financial incentive considers capital costs for stations. Operationally, having autonomy to optimize collection schedules for efficiency, balance right sizing containers with pick up frequency, and supervise staff and/or contracts were all considered priorities.

Processing – Given the smaller tonnages resulting from streetscape recycling compared to curbside collection and civic site recycling, municipalities had concerns about the need to individually track how much material is collected and processed, and wanted support from Recycle BC for consistency, quality control, and to inform contract management. It was recognized that pre-sorting materials could play a role in supporting processing, and there was consensus that avoiding financial penalties associated with contamination was a priority. Cost, processing locations, and distance to processing facilities were other questions that arose during roundtable discussions. There was a desire to seek a cohesive, convenient and even playing field for all municipalities for realistic processing options.

End Fate – Questions arose related to how the end fate of materials could be tracked sufficiently for reporting purposes given the smaller volumes that meld with other commercial materials being processed. The importance of being transparent and avoiding greenwashing was understood. That said, it was unclear to municipalities on how audits or other measurements would be conducted, and by whom, and how the cost would be handled. It was also noted that municipalities do not generally have direct oversight for commercial processors.

Recycle BC Considerations to Inform Program Requirements

The latter part of the roundtable series involved Recycle BC presenting its preliminary streetscape program design considerations to inform future program requirements for participating municipalities. These requirements fall into two distinct areas: contractual and operational.

Contractually, only those municipalities which satisfy the eligibility qualifications[1] would be offered a streetscape recycling Services Agreement (refer to Appendix A for a list of those municipalities in BC). Recycle BC also requires that the same service standard levels be maintained, including a focus on reducing contamination, promoting and educating on which materials are accepted for recycling, and greenhouse gas (GHG) reporting on a minimum annual basis.

Given the quantity and quality of core residential recycling streams (curbside, multi-family, depot), Recycle BC intends to prioritize these materials for market by keeping material collected from streetscape recycling sources separate. Paper and packaging collected from streetscape receptacles have shown through audits contamination levels an order of magnitude higher, and so separation would minimize the risk.

Even with streetscape recycling maintained as a distinct program from the rest of Recycle BC's residential supply chain network, transparent disclosure of how materials are managed is still a core responsibility for Recycle BC—and any collection partners with a streetscape recycling agreement. Tracking how materials are managed would be a program requirement that includes reporting the amount of streetscape recycling material collected on a decided upon frequency, as well as how the material is processed and managed further downstream.

Still to be confirmed is how Recycle BC will choose to tie the financial incentive offer to the streetscape program; for example, it could be linked to a per receptacle, per weight, or per volume basis. Also, to be explored further, prior to consultation, would be how to most effectively incorporate best practices into the services agreement design, and whether to mandate or provide guidelines for key program

[1] Recycle BC Program Plan, page 16 https://recyclebc.ca/stewards/regulation_and_stewardship_plan/

elements. Recycle BC will seek to balance harmonization of the streetscape program across the province with the ability of each streetscape collection partner to cater their individual municipal programs to their unique operational needs.

Next Steps

Recycle BC greatly appreciates the information and feedback provided by each participating municipality throughout the duration of the streetscape recycling roundtable discussion series. A consultation is scheduled for 2020 and will include a review of findings from the roundtable series, and a proposal for a streetscape program design that includes a financial offer to eligible and interested municipal collectors.

By the end of 2020, Recycle BC will offer a financial incentive with corresponding Services Agreement to eligible local government collectors. The financial incentive to partnering local government collectors is intended to finance a reasonable cost of recycling PPP on-street, as well as contribute to the public education, promotion and first point of contact for collection service customers.

For the year 2021 and onwards, Recycle BC will on-board streetscape collection and recycling services based on which municipalities have entered into Service Agreements. The proposed length of these Agreements is to be presented for review and feedback during the consultation.

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Introduction

Recycle BC organized a series of roundtable discussions during 2019 focused on the topic of streetscape packaging and paper recycling. Based on a commitment put forth in Recycle BC's Program Plan[2], Recycle BC engaged a third-party organization, Alces Technologies Inc., to facilitate the roundtable discussions among local government representatives in BC. Municipalities within BC were brought together to discuss a suitable recycling or recovery model and inputs to inform the development of a financial incentive offer for Recycle BC streetscape material, assess current and historical findings from local governments with streetscape programs, and find consensus on best practices for execution. The details of these activities are summarized in this report.

Streetscape recycling, as referenced in the BC Recycling Regulation (subsection 5(1)(d)(ii)), is municipal property that is not industrial, commercial or institutional property, and comprises the following, which are collectively referred to as 'streetscape':

- Sidewalks which are municipal property, which adjoin buildings in an urban commercial area and which are used for pedestrian traffic;
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Roundtable Discussion Series Description

In total, 31 municipalities were invited to attend three webinars and three in-person sessions from May to November 2019. These municipalities were invited to participate based on their eligibility for entering into an agreement with Recycle BC for streetscape recycling services. To be eligible, municipalities need to have a population minimum of 20,000, a population density minimum of 200 people per square

[2] Recycle BC, 2019. Regulation & Stewardship Plan. https://recyclebc.ca/stewards/regulation_and_stewardship_plan/

kilometre and operate an [on-street] litter collection system. Details on population and population density for each qualifying municipality are summarized in Appendix A. Eligible Municipalities.

Of the 31 municipalities invited, 17 are located in the Lower Mainland, six on Vancouver Island, five in the Interior of the province, two in the Northern region, and one in the East Kootenays. Twenty-seven chose to participate in some form for the duration of the series, with City of Courtenay, Delta, Fort St John and Langford choosing to opt out of discussions mainly due to resourcing constraint. The majority of sessions held were attended by at least 50% of invited municipalities. Attendance by municipality and session is summarized in Appendix B. Roundtable Series Attendance.

Representatives from the Extended Producer Responsibility (EPR) branch of the Ministry of Environment and Climate Change Strategy (Ministry) also participated in the roundtable series, with a presentation by the Ministry during the second in-person session. In-person sessions were held in North Vancouver, Burnaby, and Kelowna.

Prior to the first session, municipalities were invited to complete a pre-workshop survey, requesting details related to each municipality's streetscape collection and processing activities. This same survey was circulated again for completion prior to the last session.

Information was collected during each session. Below is a list of surveys, polls or other queries asked at each session. See Appendix E. Survey Questions for more information.

Table 1: Session Overview: Date, Type, Topics, Engagement Activity

Date	Session Type	Topics	Engagement Activity
May 23	Webinar	Introduce objectives, summary of obtained audit results	Pre-workshop municipal survey
June 17 & 19	In Person	Current Reality – Survey results, case study presentations	Victoria, Vancouver, West Vancouver presented results from their previous audits & programs; "Post-It Polling" and design element brainstorm exercise
July 18	Webinar	Options Development; Summary of In Person 1	In-session poll questions; post-webinar follow up poll
September 18	In Person	External Scan, Public Policy, Program Design, Managing Risk & Challenges	Presentations from Ministry, Recycle BC Breakout groups to discuss operational efficiencies, reporting, and managing greenwashing concerns
October 10	Webinar	Summary of In Person 2	Second round of request to complete municipal survey
November 26	In Person	Roundtable Findings & Next Steps	Stakeholder Group Priority exercise (Infrastructure, Collection, Processing, End Fate)

Background Information

Since Recycle BC's inception, pilot projects have been conducted to study the feasibility of PPP collection in on-street recycling receptacles. Summary reports of Recycle BC's work to date can be found on the Recycle BC website in the On-Street Recycling section[3].

Recycle BC Commitment

Recycle BC's Program Plan commitment states (Section 4.3.10):

> *"Recycle BC will continue to perform further research through streetscape collection projects to determine alternate approaches to streetscape collection. R&D will be conducted on the container type, bin signage and other design elements, utilizing accompanying composition audits, until a workable model for streetscape can be found…*
>
> *…Should streetscape produce a reasonable amount of recoverable PPP and a suitable recycling model be successfully tested, Recycle BC will consult on the program's design and financial offering. To that end, in 2019, Recycle BC will bring together a roundtable of streetscape collectors for a series of meetings to plan and discuss a suitable recycling or recovery model and financial incentive offer for streetscape material."*

2014 Pilot Project

In 2014, Recycle BC conducted concurrent two-week studies in the cities of North Vancouver, Penticton, and Richmond. PPP recyclable material was collected from streetscape stations that were already in place in each of the three communities. Samples indicated that many materials were being placed in the wrong material-specific streetscape receptacles, resulting in cross contamination of packaging and paper materials and heavy contamination by garbage and organics in PPP recycling stream(s).

2015 Pilot Project

In 2015, the pilot project included installing a variety of streetscape station designs in North Vancouver, Penticton, and Richmond for a two-week timeframe. The contents were audited to compare the impact of station design on contamination results. The results indicated a streetscape station designed by students from the Emily Carr University of Art + Design and Metro Vancouver had the best results for both the paper and containers recycling streams. These results influenced Recycle BC's decision to pursue the Emily Carr University of Art + Design and Metro Vancouver station design for the longer City of Vancouver pilot.

2016-2017 City of Vancouver West End Pilot

In August 2016, Recycle BC partnered with the City of Vancouver for a nine-month pilot project. The pilot involved the installation of 26 recycling stations along Denman St, Robson St, and Davie St in the West End, a densely populated residential area of Vancouver. The majority of the recycling stations had three receptacles which collected mixed paper (yellow), containers (blue), and garbage/landfill materials (black), with select locations offering an organics (green) receptacle option. During the pilot, four 7-day audits of the material were conducted in September 2016, January 2017, and May 2017. The pilot was extended until the end of the year, with one additional audit completed in July 2017. Stations are still in operation, with a plan for phasing them out in favour of a cart-based system to replace the use of single-use bags which are manually pulled from the stations during collection.

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[3] Recycle BC, 2019. On-Street Recycling. https://recyclebc.ca/promotion-education-resources/on-street-recycling/

2018-2019 City of Vancouver Receptacle Retrofit & Audit

In December 2018, faceplates to restrict the receptacle openings were installed to half of the mixed paper and containers bins within the West End streetscape pilot area. This decision to retrofit only half of the receptacles was a proposed measure to test whether contamination is reduced if receptacle openings were restricted. The impact of this change was assessed during a one week, seven-day audit of each receptacle in January 2019. Only the mixed paper and containers streams were audited, not the garbage or organics streams, and so accuracy and not capture rates were calculated.

Photo 1. City of Vancouver West End pilot recycling stations – without retrofitted faceplates

Photo 2. City of Vancouver West End pilot recycling stations – with retrofitted faceplates

Accuracy rate results from this audit period are included in Appendix C. For receptacles with modified faceplates collecting mixed containers, accuracy was higher while contamination of liquids and organics and cross-contamination of paper was lower compared to the original receptacle design. However, for receptacles with modified faceplates collecting mixed paper, accuracy was lower and contamination of liquids and organics higher. Overall, for both streams the variances between the accuracy rates for the original and modified faceplate bins was not statistically significant enough to recommend best practice.

2017 Consultations

In November 2017, Recycle BC conducted consultation meetings with stewards, local governments, collectors and other service providers, First Nations communities, and environmental and other key stakeholder groups. Streetscape recycling-related stakeholder feedback from local governments called for a clearer commitment from Recycle BC to fulfill its responsibilities under the BC Recycling Regulation. Recycle BC presented a streetscape program outline and financial incentive offer as part of the consultation which was not accepted by the local governments. At that time, municipalities also suggested that they be provided the option to present their findings from already executed on-street recycling programs. This suggestion led to the proposal for the 2019 roundtable discussion series.

In contrast, the steward community questioned the practicality and feasibility of continued investment in streetscape collection and whether it can be an efficient or cost-effective way of collecting recyclables. The sentiment from stewards providing consultation feedback was that most streetscape material comes from the industrial, commercial and institutional (ICI) sector, which is outside of the scope of Recycle BC. Stewards also suggested that Recycle BC consider directing material to an energy from waste facility given the high contamination levels observed in historical pilot projects.

Recycle BC's conclusion was to stay committed to continuing to work in partnership with local governments to conduct more streetscape collection studies to determine how best to reduce the high contamination levels such that material can meet marketability criteria. This was in keeping with the requirement set in the Recycling Regulation for Recycle BC members to fund the provision of streetscape services for the recycling of paper and packaging.

Other Audits

As part of the series, Alces Technologies Inc. harmonized findings from Recycle BC and other BC recycling station waste composition audits. Audits were reviewed from the following jurisdictions and sources:

- 2019 – Recycle BC
- 2018 – Metro Vancouver
- 2018 – City of Vancouver
- 2018 – Recycle BC
- 2018 – Keeping America Beautiful/SERA Study (Average & Median)
- 2017 – District of West Vancouver
- 2016-2017 – Recycle BC
- 2016 – City of Victoria
- 2016 – Metro Vancouver
- 2016 – Township of Langley
- 2015 – Recycle BC

Two primary results were derived from audits completed. The first was the **accuracy rate** by material stream, which determines what percentage of the contents of a given receptacle contains the correct material. It is ultimately the inverse of contamination. For example, if a recycling receptacle had a 75% accuracy rate, it would have a corresponding 25% contamination rate.

The second result was **capture rate**. This metric determines how much of a specific material type is placed into the correct receptacle, as compared to other receptacles. Combining PPP across receptacles provides the total potential available PPP tonnage for capture. For example, 70-80% of the paper available for capture might be found in the paper recycling receptacle with the rest found in the other receptacles.

It is of note that varying streetscape recycling systems and audit methodology variations affected the ability to compare audit results. For example, it was challenging to compare between systems that were single stream vs dual stream. Results for container recycling varied considerably depending on access to beverage containers by binners who collect these items for their return deposits. From an audit methodology perspective, sometimes beverage containers were weighed separately, other times they were combined into the container recycling stream weight. Glass containers, beverage or other, were also evaluated differently by audit. The ability to gauge total potential PPP capture was limited for audits where the garbage stream was not sorted to separate out containers and paper. Moisture was also measured and tracked differently depending on the audit methodology. As audit harmonization continues to evolve, results will be more comparable and can inform streetscape program development.

For accurate and capture rate results by audit, visit Appendix C. Audit Results and Available Studies.

External Jurisdictional Scan

As part of the roundtable discussion series, an external scan was conducted through online research and select North American interviews. The intent was to gauge and evaluate current practices in higher performing jurisdictions globally to determine materials collected and what is recycled versus disposed.

The external scan provided an overview of:

- Public receptacle and/or station examples showing how materials are collected
- Streetscape collection showing various material stream options by jurisdiction
- Innovation and technology examples
- Common diversion practices
- Drivers and challenges summary

Jurisdictions included in the scan were as follows:

- Canada: Manitoba, Halifax NS, Toronto ON
- United States (US): Seattle WA, Portland OR, San Francisco CA, New York, NY, others via the SERA Study (2018) prepared for Keeping America Beautiful
- Europe: jurisdictions in Denmark, France, Germany, Italy, Switzerland, and United Kingdom (UK)
- Asia: jurisdictions in Japan, Hong Kong, and China
- Oceanic: jurisdictions in Australia

See Appendix D. External Scan Resource List for weblinks and articles by jurisdiction.

Public Collection Examples

Recycling materials were publicly collected in three primary forms: streetscape stations; neighbourhood hubs; and larger solo recycling collection receptacles. Streetscape collection stations consisting of grouped separate receptacles were most common across countries; solo trash cans were generally available in all urban settings whether recycling stations were in place or not. In Europe and some Asian jurisdictions, neighbourhood hubs were available for discarding multiple types of materials in a shared system at the community level. In some French cities, larger solo recycling collection receptacles were also placed in high density residential neighbourhoods.

Photo 3. Streetscape Train Recycling Station; Milan, Italy

(plastic, paper, metal, trash)

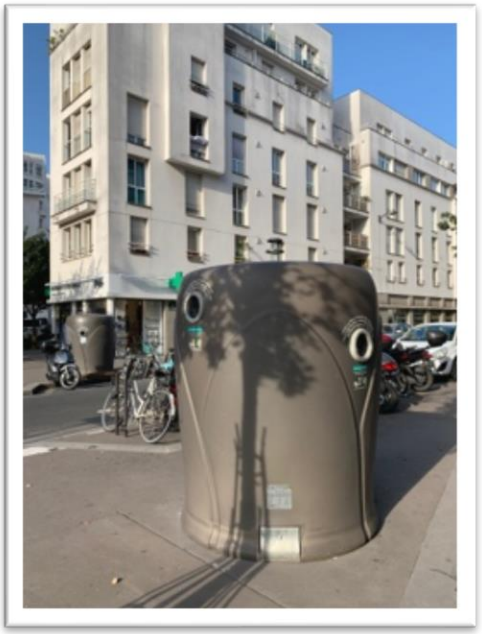

Photo 4. Solo Recycling Receptacle; Paris, France

(mixed and beverage containers)

Photo 5. Neighbourhood Hub; Shanghai, China

(recyclable goods – including bottles/cans, harmful waste – including drugs/cosmetics, kitchen waste - wet, and other waste – dry)

Photo 6. Neighbourhood Hub; Lido, Italy

(textiles, paper and cartons, plastic containers, trash, metal, organics, glass)

Streetscape Collection – Various Material Stream Options

Streetscape collection ranged from solo trash cans to prioritize litter abatement through to seven-part receptacles comprising larger stations to optimize diversion. Receptacles consisted as simply as metal openings with transparent bags to more complex, sturdier enclosures. Examples by material type, from smallest to largest, are provided to represent examples across jurisdictions.

Trash Only

Most cities had trash only receptacles available to manage litter issues as a primary priority, or in concert with recycling stations in higher density areas.

Photo 7. Streetscape; Paris, France

(trash only)

Photo 8. Streetscape Bag Label: "Together, Let's Make Paris Clean"; Paris, France

Trash/Cans & Bottles

Trash receptacles plus cans and bottles (i.e., sealed beverage containers) collected using a side rack, where bottle bills exist, or an adjacent receptacle were quite common throughout larger Canadian and US cities, and some European jurisdictions including Copenhagen, Denmark.

Photo 9. Streetscape Receptacle; Copenhagen, Denmark

(trash, bottles & cans with side rack)

Photo 10. Streetscape Station; Manitoba - province wide

(trash, bottles and cans)

Trash/Recyclables - Single Stream

Other jurisdictions used a trash plus single stream recycling model, where paper and mixed containers were accepted as part of the single stream. Toronto, Ontario, Seattle, Washington, and a site in the

state of Victoria in Australia were three examples of single stream recycling plus trash streetscape stations.

Photo 11. Streetscape Station; Toronto, Ontario

(trash, single stream recycling)

Photo 12. Streetscape Station; Seattle, Washington

(trash, single stream recycling)

Photo 13. Streetscape Station; Victoria, Australia

(trash, single stream recycling – paper and containers)

Trash/Paper/Cans & Bottles/Organics

In Halifax, Nova Scotia, four-part Big Belly streetscape recycling stations were put into place to collect recyclables (e.g. containers), garbage, paper, and organics.

Photo 14. Streetscape Station; Halifax, Nova Scotia

(recyclables, garbage, paper, and organics)

Trash and Multiple Materials

Some more established streetscape recycling stations expanded the number of receptacles for specific materials including types of glass, metal, plastic, and paper. While four-part stations were provided in Italian train stations, five and seven-part stations were available in some German and Swiss jurisdictions, respectively.

Photo 15. Streetscape Station; Italy various

(paper, plastic, aluminum, and trash)

Photo 16. Streetscape Station; Germany various

(trash, packaging materials, glass types clear, brown, green, paper/cardboard, organics bio-bin)

Photo 17. Streetscape Station; Switzerland various

(paper, aluminum, glass, PET bottles, incinerable waste)

Trash/Hazardous Waste/Recyclables/Organics

In Shanghai, China, a new program is switching out 40,000 street side trash cans for 13,000 four-part stations including: recyclables, hazardous waste, food waste, and residual waste. The streetscape recycling stations are designed to align with the neighbourhood recycling hubs.

Photo 18. Streetscape Station; Shanghai, China

(recyclables, hazardous waste, food waste, residual waste)

Photo 19. Neighbourhood Hub; Shanghai, China

(recyclables, hazardous waste, food waste, residual waste)

Innovation and Technology

Innovation emerged in the external scan through creative approaches as well as the use of technology. Creativity was applied to how the user would interface with the streetscape recycling station. Examples ranged from using pithy approach signage, “I’m not trashy my dear, I recycle” to using dog food donations as an incentive to return beverage containers.

Photo 20. Catchy Approach Signage; El Cajon, California

Photo 21. Deposit Container Receptacle; Turkey

Return Designed to Feed Hungry Stray Dogs

The City of Chicago held a greenest initiatives contest to explore design options that included green eyeball shapes above receptacles to hold paper and provide a target for containers. In the UK, plastic bottle collection was encouraged by splitting the receptacle to create an impromptu voting booth for or against Brexit.

Photo 22. Streetscape Station; Chicago, Illinois

Greenest Initiatives Urban Recycling

Photo 23. Beverage Container Receptacle; UK

Impromptu 'Use Your Container to Vote on Brexit' Station

With technology added, Volkswagen's The Fun Theory campaign created a Bottle Bank Arcade for beverage containers and the World's Deepest Bin where the receptacle makes a long whistle sound to imitate what a falling item sound like if the container had no bottom.

Photo 24. Beverage Container Return Bottle Arcade; Sweden

Volkswagen Fun Theory Campaign

Photo 25. Trash Receptacle World's Deepest Bin; Sweden

Volkswagen Fun Theory Campaign

Containers that light up when items are added increased appeal for use; there was also a newer station fondly named after the Sesame Street character Oscar that uses artificial intelligence (AI) to help the user separate materials by type. With creativity and technology applied, bomb proof receptacles – complete with news reporting – were developed for London's business district in response to related terrorist bombing incidents in the lead up to the 2012 Summer Olympics.

Photo 26. Oscar Sorting Station with Artificial Intelligence; Vancouver, BC

Vancouver International Airport

Photo 27. Bomb Proof Recycling Station; London, England, UK

For larger scale systems including on Roosevelt Island in New York City, pneumatic systems are in use with consideration for expanding to other settings, such as High Line Park, as viable. In neighbourhood hubs in Beijing, face recognition technology was used to access their multi-stream receptacles that include kitchen waste, metal, textiles, paper, plastic and other waste. Use of product labels or QR codes may help to inform future material separation as we keep pace with our rapidly evolving material options and the infrastructure required to handle materials efficiently and effectively.

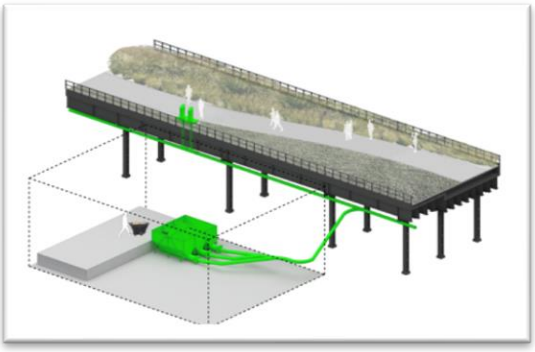

Photo 28. Pneumatic Collection System Schematic; High Line Park - New York, New York

Photo 29. Neighbourhood Hub; Beijing, China

Using Face Recognition for Access

Common Diversion Practices

Public space recycling is becoming increasingly important. Residential programs are maturing, and jurisdictions are seeking ways to further increase diversion. In many regions, the public expects

streetscape recycling to be readily accessible and sees it as a new norm. To this end, the US organization Keeping America Beautiful commissioned a public space recycling study[4]. Some key findings relevant to BC jurisdictions are as follows:

- Public spaces with recycling stations had statistically lower amounts of litter
- Larger communities had more contamination in public space recycling stations
- 'Greener' communities, based on legislation and residential diversion rates, had less contamination
- Primary contaminants in recycling consisted mostly of organics, take-out food containers and trash; up to 1/3 of overall materials in streetscape are food scraps which contribute significantly to recycling stream contamination

Leading North American jurisdictions, in particular Toronto, Seattle, and Halifax, were able to provide some additional findings relevant to the roundtable discussions.

Seattle – trash and single stream recycling stations are most prominent throughout the City. There is considerable political will to expand and improve public space recycling given the expectation that Seattleites recycle. They are considering the impact of homeless encampments as station placement criteria are updated and are establishing a coding system to track how recycling bags are managed. They currently train operations staff to accept materials collected in recycling receptacles only if they visually appear to contain less than 10% contamination.

Toronto – trash and single stream recycling stations are also used throughout the City. The stations are maintained by a vendor who leverages advertising opportunities on the sides of the stations. The City is course correcting following some negative publicity related to poorly maintained stations. Approximately 20% of what goes into their recycling receptacles gets processed as recycling.

Halifax – four-part stations were first established in 2009 as a pilot initiated in part by the Waterfront Development Corporation; they continue to be maintained by that same entity. The Regional Municipality of Halifax initially adopted a four-part station with paper, containers, organics and garbage, but has been shifting to a two-stream model with garbage and bottles and cans only given high contamination in the recycling streams. Their intent is to continue to expand the two-part station into park areas and remove solo garbage cans along the way. Staff find that the bottle and can receptacle contamination is minimal so no post-consumer sorting is needed.

Halifax is in a unique position to pre-sort their material through access to post-consumer sorting at Otter Lake, where residential material is sorted at a material recycling facility (MRF) to remove hazardous waste and organics materials prior to landfilling the remaining residual. While commercial garbage is no longer sorted at the MRF, a separate contract with an increased tipping fee is in place for streetscape material sorting.

Behaviour Change-Related Academic Literature Review

As part of the external scan, review of academic peer-reviewed literature of behaviour change-related research was conducted. The literature generally reinforced the lessons learned from BC pilots

[4] SERA, 2018. Public Space Recycling Benchmarking Study and Toolkit. Prepared for Keeping America Beautiful. https://www.kab.org/sites/default/files/KAB_SERA_PublicSpaceRecycling_Final_Aug18.pdf

conducted by Recycle BC and local governments. See the last page of Appendix D. External Scan Resource List for a complete list of studies and guidelines reviewed.

For signage, coloured picture-based signs were most effective for response time. As shown in Figure 1, accuracy was slightly better for colour images as compared to black and white pictures and icons, which had about the same accuracy response. Both pictures and icons were considered more effective than words only signs.[5]

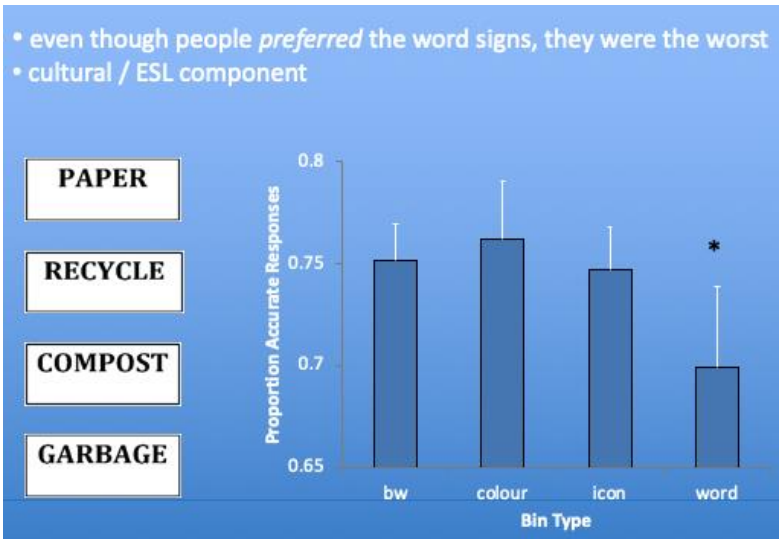

Figure 1: Accuracy Responses Based on Signage Types

(black and white and colour pictures, icons, word only)

Other findings indicated that the consistent ordering of signs – and recycling receptacles – improves performance, and signs defining what is permitted are as good as or better than listing what is prohibited from going into a given receptacle.[6]

Other studies and guidelines reviewed highlighted infrastructure and operational best practices that optimize capture and reduce contamination. Grouping receptacles, placing stations in areas where users were most likely to access them, adjusting receptacle size and collection frequency, and having clear visually based signage were all considered priority approaches.[7,8]

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[5] Wu, D. et al., 2018. How does the design of waste disposal signage influence waste disposal behavior? https://www.sciencedirect.com/science/article/abs/pii/S0272494418301804

[6] ibid

[7] Ontario Continuous Improvement Fund, 2019. Public Space Recycling – a Review of Better Practices. https://thecif.ca/public-space-recycling-a-review-of-better-practices/

[8] Sustainable Victoria, 2019. Public Space Recycling. https://www.sustainability.vic.gov.au/Government/Waste-and-resource-recovery/Public-place-recycling

One study compared recycling collection unit configurations and found that pairing receptacles was even more important than signage.[9] Another study explored the increased participation that resulted when eco-feedback technology (i.e., placing low tech lights and sounds that activate when someone puts recycling into a receptacle) was added to recycling stations.[10]

Related to the psychological side of behaviour change, one study showed that station users were more likely to recycle accurately if they knew how the material was to be managed at end of life. There was additional appeal to being involved when users were prompted to think about recyclables turning into new products.[11]

Also related to influencing behaviour, a French study showed that social comparative feedback was more effective and lasting than having generally persuasive messaging.[12] The underlying premise of social comparison theory is based on the belief that there is a drive within individuals to gain accurate self-evaluations. In other words, individuals may be more inclined to do something if others are perceived as already participating – no one wants to be left behind. Using feedback to make a social comparison with two groups or a longitudinal comparison where a neighbourhood's performance was shown at two different times were both considered quite effective and had longer lasting change than other behaviour change methods. A positive social comparison example would be to say, "participation in your neighbourhood is better than in Y neighbourhood", while a longitudinal comparison would be to note that "two weeks ago X% of your neighbourhood participated in collection, compared to this week when X% participated." Further adapting this approach to streetscape recycling where there is less personal accountability would require some innovation; the key take away for consideration is that the most effective means of communication is to appeal to a resident's competitive side and to make a meaningful (local) comparison.

Many behaviour change approaches have been consolidated for broader scale usage under the umbrella of community based social marketing (CBSM), as developed by environmental psychologist Doug McKenzie Mohr.[13] CBSM is an approach to achieving broad sustainable behaviour in our communities that combines the knowledge from psychology and social marketing to leverage community members' action to change behaviour. Many municipalities already use a CBSM approach when developing education programs; it efficiently consolidates the academic behaviour change literature into a practical form.

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[9] Andrews, A. et al. 2013. Comparison of recycling outcomes in three types of recycling collection units. https://www.sciencedirect.com/science/article/pii/S0956053X12003844

[10] Mozo-Reyes, E. et al., 2016. Will they recycle? Design and implementation of eco-feedback technology to promote on-the-go recycling in a university environment. https://www.sciencedirect.com/science/article/pii/S0921344916301616

[11] Penn State, 2016. Knowing What It Makes: How Product Transformation Salience Increases Recycling. https://www.sciencedaily.com/releases/2019/07/190710121549.htm

[12] Dupre, M. & Meineri, S., 2016. Increasing recycling through displaying feedback and social comparative feedback. https://www.sciencedirect.com/science/article/abs/pii/S0272494416300652 https://mickaeldupre.com/wp-content/uploads/2016/06/Dupré-augmenter-le-tri-grace-au-feedback.pdf

[13] McKenzie-Mohr, D., 2011. Fostering Sustainable Behavior Change. https://www.cbsm.com/about

Drivers and Challenges

The factors affecting streetscape collection of recycling and trash were manifold in the external jurisdictional scan. Diversion-oriented legislation that promoted bottle bills or set diversion goals and responded to growing cultural and social influences were two more notable drivers for pursuing streetscape recycling stations. Other factors that influenced how streetscape collection was designed included responding to safety issues and seeking ways to prevent litter and avoid illegal dumping. In London, Paris, and Japan, trash receptacles were used in bombing incidents. As a result, receptacles were either removed, made into simpler collection systems with metal rings and transparent bags, or slowly reintegrated but still wrapped prior to larger public events as a preventative measure. In New York and San Francisco, some receptacles were removed from high dumping areas as a way to help mitigate illegal discarding of larger household items.

Cost was also an ongoing factor; in one example, receptacles were removed in the New York City subway to save money but cleaning costs went up significantly, so they were re-established. Significant contamination levels were consistently reported by jurisdictions aiming to divert recycling street side.

Four unique challenges emerged that apply across the board for streetscape recycling:

5. Low Accountability – public space recycling stations have the least amount of personal accountability for users, which makes marketing efforts and behaviour change tools more challenging to implement. Residents and other passersby don't always put materials in the correct recycling receptacle.
6. Outdoor-related Factors – since stations are outdoors, they are susceptible to weather conditions, wildlife impact, graffiti, and increased wear and tear over time.
7. Challenging Material and Product Types – from chip bags to take out containers and hot and cold beverage cups, more difficult to recycle items are common street side. Hot beverage cups in particular contribute to higher moisture content in recycling materials since many people discard cups with liquids contained therein. Containers can also have extra food waste, which also reduces quality of everything in the collection container they come into contact with.
8. Selective Global Markets – global markets have become stricter and less tolerant of contaminants in common recycling streams since the China National Sword policy came into effect in 2018.

Challenges aside, there is still a burgeoning cultural shift towards wanting to collect recyclables in public areas. Higher performing jurisdictions with strong diversion targets and cultural norms, including Seattle, Toronto, and Halifax, are continuing to seek improvements to education approach, infrastructure, and processing options to optimize recycling capture through streetscape recycling.

In British Columbia, Recycle BC and BC-leading jurisdictions have built upon best practices through pilots and information exchange that is well aligned with the positive findings in the external scan. In BC, we are cultivating a unique and consistent approach to capturing packaging and paper through mixed paper and mixed container recycling streams. Consistent branding and messaging will continue to support more efficient and effective participation in streetscape recycling programs across larger BC jurisdictions. This approach has gone beyond a primarily bottles and cans recycling model, factoring in cultural norms and expectations, with commitment to continual improvement to normalize recycling beyond the home and business.

Photo 30. Streetscape Recycling Station (Emily Carr); Vancouver, BC

Photo 31. Streetscape Recycling Station (Customized); Vancouver, BC

Photo 32. BC Streetscape Recycling Station; District of North Vancouver, BC

Current Practices and Opportunities for Streetscape Recycling Design in BC Municipalities

Over the course of the six session roundtable discussions, current practices and opportunities for streetscape recycling were explored at length. This section provides an overview of related findings that incorporate cumulative inputs and feedback from municipalities that participated in the roundtable session engagement activities. See Appendix F. Survey Results for responses to two related polls conducted during in person session one and following webinar two.

Material Stream Selection and Streetscape Stations

Current

Currently a mix of receptacle types and configurations are in use by municipalities. Recycling stations consist of two to four receptacles with combinations ranging as follows:

- Garbage Only
- Garbage/Beverage Containers
- Garbage/Beverage Containers/Paper
- Garbage/Single Stream Recycling
- Garbage/Dual Stream Recycling (Mixed Containers/Mixed Paper)
- Garbage/Mixed Containers/Mixed Paper/Organics
- Garbage/Containers/Organics & Paper
- Garbage/Single Stream Recycling/Organics
- Garbage/Compost/Dog Waste/Recycling
- Garbage/Dog Waste (Parks using rolling carts)

For municipalities with more established streetscape recycling programs, garbage with dual stream recycling (mixed containers and mixed paper) was most common followed by garbage plus single stream (containers and paper comingled) recycling. All municipalities maintain some solo garbage cans; those phasing in streetscape recycling stations aim to reduce the number of solo cans with the goal of balancing overall volume and user convenience.

Colour coding is fairly consistent across municipalities with black or grey for garbage, blue for containers and single stream recycling, yellow for paper, green for organics, and red for dog waste. Receptacles are colour-coded in full at point of manufacture or a marketing wrap is used, and the collection order is

generally containers, paper, and then garbage from left to right. Some municipalities employ restricted shapes for slot openings by material type including rectangular for garbage and organics, a circle for containers, a wide slot for paper, or a circle/slot combination for single stream recycling.

While consistency is emerging related to overall branding, on the station design front municipalities select their own container types by either buying prefabricated stations or producing customized versions. Considerations for design include durability with anti-graffiti coating, sufficient capacity, and ability to align truck types with collection station servicing needs. Operationally there is a mix of manual bag pull and semi-automated cart-based systems with a growing preference towards the latter.

Some of the challenges in existing streetscape collection programs pertain to station placement to optimize usage while not blocking pedestrian side-walk traffic and intersections, and blending with existing street furniture. Managing access for individuals who wish to retrieve deposit return beverage containers plays a factor in design; municipalities have a mix of systems with a mix of unlocked and locked receptacles with a trend towards the latter. Maintenance is ongoing with cleaning and some repair required, in particular as relates to lock damage and other minor vandalism. Design features that require touching lids or flaps to access are less effective, receptacles with sensors are not always accurate, and advertising may help to offset capital costs and/or offer minimal revenue but there are inconveniences around unrelated messaging affecting station usage and binding contracts.

Opportunities

Opportunities for harmonizing container design and usage fit into two categories: what works for optimizing diversion as part of the user experience, and ensuring operational elements are considered.

For consistent user experience across municipalities, it is helpful to set up stations similarly as it relates to grouping receptacles, colour coding by receptacle, keeping consistent order, and maintaining an overall consistent aesthetic. However, balancing that consistency with the operational desire for municipalities to customize stations through different preferences (e.g., production ready vs customized, footprint, modular vs conjoined, price point, receptacle size, placement and installation, security, and collection frequency over time and type (e.g., bags vs carts).

What materials are selected and how they are grouped is another factor to consider for user experience and operations. Some municipalities choose to adopt single stream or multi-stream recycling on-street in the same way they collect their material through their curbside recycling program so that the experience is consistent across collection systems for the user. Operationally, audits show benefit to separating streams into mixed paper and mixed containers to reduce moisture in paper streams and recover more recyclables overall. A majority of municipalities noted support for paper and container categories throughout engagement activities. Finding ways to minimize moisture collection in receptacles is a potential area for innovation. As technology evolves, there may also be opportunities to consider use of artificial intelligence for material sorting at the recycling station.

Usage of streetscape recycling options is also determined by what materials are being generated in a given area. For example, if the area is near a concession stand or food service businesses, there could be desire to replace the mixed paper recycling stream with an organics receptacle to capture food soiled paper suitable for organics processing in addition to food scraps.

Legislation and cultural shifts to reduce single-use items may also have an influence on material stream selection and station design over time. There is an opportunity to build from lessons learned within BC and beyond to create dynamic station placement and material selection best practices guidelines.

Signage and Program Promotion

Current

Streetscape signage consists of an approach icon often with a word label. In some cases, municipalities also add more specific instruction with point-of-use signage in the sight line of the receptacle opening. The Emily Carr and City of Vancouver streetscape stations adjust the angle of the approach icon and word label, so it serves a dual function as point-of-use signage. The Township of Langley example shows point-of-use signage just above the receptacle openings.

Photos 33, 34, 35, 36. Angled Approach Signage Examples; Emily Carr, City of Vancouver, Township of Langley

Signage icons primarily showcase items likely to be found in streetscape recycling, such as coffee cups and chip bags. There is also a desire to keep some consistency with curbside collection branding and messaging as relevant. The list provided below provides some commonly used material stream labels and product images; photos below show three municipalities have made minor modifications to similar signage.

- Garbage/Landfill – trash can, chip bag, cutlery/straw
- Containers – coffee cup plus lid, water bottle, aluminum can
- Paper – newspaper, paper bag, office paper
- Organics – apple core

Photos 37, 38, 39. Approach Signage Images Examples; District of West Vancouver, City of Vancouver, District of North Vancouver

Best practices for point-of-use signage is evolving as material and product types continue to evolve, and messages are simplified. In the City of Burnaby example below, the City reduced the number of images, removed the Yes/No signs in place of putting a red strike through circles over recyclable items going into the litter stream.

Photos 40, 41. Point-of-Use Signage; City of Burnaby

Several promotion and education efforts are in place to raise the visibility of streetscape recycling. Proper use of stations is promoted through municipal websites, social media, bus stop ads, and other outlets. The District of West Vancouver has a Waste Evaders online game. Tag lines used to promote the program include 'Bins Don't Recycle, People Do" and "Look for the Bins". Some municipalities are also coordinating with the commercial sector to foster support for streetscape recycling.

Photos 42, 43. Waste Evaders Interactive Sorting Game; District of West Vancouver

Opportunities

There's an opportunity to continue to pursue consistency across product examples, image types (e.g. icon, pictures), material stream labels, colour-coding, signage visibility, and overall branding. During the roundtable engagement exercises, many participating municipalities expressed support for having consistent name labels, approach icons, and colours across the province. Recognizing product types vary and will likely continue to evolve in streetscape settings is also important; keeping images relevant and simple will support users to participate in the program more accurately. Continuing to work closely with commercial sector representatives including Business Improvement Associations (BIAs) to support streetscape recycling buy in and potentially affect procurement choices will be beneficial over time. To avoid greenwashing while actively supporting diversion efforts, interim signage and promotion options that acknowledge streetscape recycling and a reduction in contamination could be beneficial.

Challenges related to signage and promotion include municipal-specific barriers to harmonizing across jurisdictions, avoiding design faux pas such as using too much text or yes/no signs, and struggling to get buy in from Parks departments and commercial sector entities. Contracted advertising can be distracting and detract from other signage efforts.

Opportunities for innovation could include use of wayfinding or aerial signage, harmonizing signage and promotion efforts further across the province and/or within various regions. Signage specifications could also be added to building specifications within development guidelines to further harmonize recycling stations available to BC residents.

Processing and End Markets

Current

Currently municipalities send streetscape recycling to transfer stations and then material recovery facilities. If materials are clean enough, they may be sent to works yards to be combined with other civic site recycling. Audits show that, while contamination is still a significant issue – especially for the containers stream, contamination is gradually reducing, and capture is increasing in municipalities with more established programs.

There are information gaps around how much collected recyclables are too contaminated to be processed as recycling, and how much streetscape recycling material goes to market successfully. There is also lack of clarity what streetscape recycling materials can be consistently recycled, what is suitable for engineered fuel for cement kilns or what material is being sent to waste to energy facilities, and how this information can be measured and consistently reported for municipal (and Recycle BC) records. Market fluctuation influences what processors are able to accept and process successfully, which needs to be factored into how streetscape recycling is managed. How to handle materials intended for depot drop off, such as glass containers, foams and plastic film, is another unresolved question.

Opportunities

For municipalities with direct processor interaction, communication can support expectation management for what materials are accepted and to keep channels open in both directions for feedback. Dual stream is shown to help reduce contamination and increase the chances of recyclables getting processed and baled for recycling. Given liquid contamination issues that result in moldy paper, minimizing storage time is recommended. It was agreed by municipalities throughout the roundtable discussions that products from other extended producer responsibility programs compatible with the sorting process (e.g., sealed beverage containers) should be collected, and then a cost share on the back end could potentially be managed among product stewardship programs.

There is a desire to pursue local processing and end markets where possible. Municipalities were interested in having support around processing, while recognizing that streetscape recycling is to stay separate from materials and products collected through the curbside and depot recycling program to avoid harming the marketability of those materials. Other innovations for consideration include post-collection sorting options should mixed waste MRF infrastructure or other opportunities emerge over time. Pyrolysis or other thermal recovery options could also be pursued to extract better value from these harder to recycle products. Ultimately influencing the inputs to the market via procurement choice and product design (design for environment) to push up the waste prevention hierarchy will support more successful streetscape recycling programs.

Municipal Preferences & Priorities

There are multiple stakeholders invested in how streetscape recycling infrastructure, collection systems, processing, and end fate of materials comes into place. The Ministry requires Recycle BC to meet regulatory requirements. Recycle BC is committed to using best management practices to optimize capture and minimize contamination for packaging and paper collected at street side for marketability. As with other programs, tonnage reporting is important to determine how much material is being captured. Given the high level of contamination compared to the curbside collection program, it is a priority to maintain material quality from the curbside program and maintain separate processing for streetscape recycling. As part of program compliance, it is also important for Recycle BC to have

transparency in reporting on the end fate for the material collected (e.g., recycled, sent to kilns as engineered fuel, sent to waste to energy, or buried in a landfill).

Table 2: Priorities by Stakeholder across the Supply Chain

Supply Chain	Ministry	Recycle BC	Municipalities
Infrastructure	Recycle BC is to meet regulatory requirements	Use best management practices to optimize capture and minimize contamination	*Detailed by supply chain category below*
Collection		Tonnage provided (scale weight)	
Processing		Maintain separate processing	
End Fate		Transparency and reporting	

Municipalities also have preferences and priorities related to how streetscape recycling is handled through the chain of custody and provided feedback throughout the roundtable discussion series that is summarized below.

Infrastructure – For infrastructure development, there was broad consensus around providing a similar user experience in jurisdictions with streetscape recycling which embeds best practices for optimizing capture and reducing contamination. Examples of consistency, discussed in the Current Practices and Opportunities for Streetscape Recycling section of this report, are highlighted below:

- Recycling station design consisting of multiple receptacles that meet design guidelines for sizing (e.g., meeting minimum capacity), durability, placement, and other key elements
- Colour-coding by receptacle and signage type
- Similar branding for approach and point-of-use signage related to image (e.g., icon, picture) and product (e.g., coffee cup, newspaper)

There was some discussion around how to best determine the number of stations needed to maintain resident satisfaction and abate litter successfully. A desire was expressed for flexibility on what material streams could be established depending on curbside collection system and location. Municipalities with existing curbside single stream recycling collection were generally more inclined to keep or implement single stream for streetscape recycling stations, even though contamination levels are shown to be higher than dual stream systems. Some municipalities found it fitting to have organics collection in place of paper near food areas while others emphasized the importance of adding dog waste collection in streetscape stations in parks.

Collection – Municipal representatives clearly stated the importance of being able to select and procure their own streetscape recycling stations to align with existing street furniture, meet aesthetic requirements for their community, and harmonize with operational needs. Several reinforced the expectation that the financial incentive considers capital costs for stations. Operationally, having autonomy to optimize collection schedules for efficiency, balance right sizing containers with pick up frequency, and supervise staff and/or contracts were all considered priorities.

Processing – Given the smaller tonnages resulting from streetscape recycling compared to curbside collection and civic site recycling, municipalities had concerns about the need to track how much material is collected and processed, and wanted support from Recycle BC for consistency, quality control, and to inform contract management. It was recognized that pre-sorting materials could play a role in supporting processing, and there was consensus that avoiding financial penalties associated with contamination was a priority. Cost, processing locations, and distance to processing facilities were other questions that arose during roundtable discussions. There was a desire to seek a cohesive, convenient and even playing field for all municipalities for realistic processing options.

End Fate – Questions arose related to how the end fate of materials could be tracked sufficiently for reporting purposes given the smaller volumes that meld with other commercial materials being processed. The importance of being transparent and avoiding greenwashing was understood. That said, it was unclear to municipalities on how audits or other measurements would be conducted, and by whom, and how the cost would be handled. It was also noted that municipalities do not generally have direct oversight for commercial processors.

Recycle BC Considerations to Inform Program Requirements

The latter part of the roundtable series involved Recycle BC presenting its preliminary streetscape program design considerations to inform future program requirements for participating municipalities. These requirements fall into two distinct areas: contractual and operational.

Contractually, only those municipalities which satisfy the eligibility qualifications[14] would be offered a streetscape recycling Services Agreement (refer to Appendix A for a list of those municipalities in BC). Recycle BC also requires that the same service standard levels be maintained, including a focus on reducing contamination, promoting and educating on which materials are accepted for recycling, and greenhouse gas (GHG) reporting on a minimum annual basis.

Given the quantity and quality of core residential recycling streams (curbside, multi-family, depot), Recycle BC intends to prioritize these materials for market by keeping material collected from streetscape recycling sources separate. Paper and packaging collected from streetscape receptacles have shown through audits contamination levels an order of magnitude higher, and so separation would minimize the risk.

Even with streetscape recycling maintained as a distinct program from the rest of Recycle BC's residential supply chain network, transparent disclosure of how materials are managed is still a core responsibility for Recycle BC—and any collection partners with a streetscape recycling agreement. Tracking how materials are managed would be a program requirement that includes reporting the amount of streetscape recycling material collected on a decided upon frequency, as well as how the material is processed and managed further downstream.

Still to be confirmed is how Recycle BC will choose to tie the financial incentive offer to the streetscape program; for example, it could be linked to a per receptacle, per weight, or per volume basis. Also, to be explored further, prior to consultation, would be how to most effectively incorporate best practices into the services agreement design, and whether to mandate or provide guidelines for key program elements. Recycle BC will seek to balance harmonization of the streetscape program across the province with the ability of each streetscape collection partner to cater their individual municipal programs to their unique operational needs.

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[14] Recycle BC Program Plan, page 16 https://recyclebc.ca/stewards/regulation_and_stewardship_plan/

Next Steps

Recycle BC greatly appreciates the information and feedback provided by each participating municipality throughout the duration of the streetscape recycling roundtable discussion series. A consultation is scheduled for 2020 and will include a review of findings from the roundtable series, and a proposal for a streetscape program design that includes a financial offer to eligible and interested municipal collectors.

By the end of 2020, Recycle BC will offer a financial incentive with corresponding Services Agreement to eligible local government collectors. The financial incentive to partnering local government collectors is intended to finance a reasonable cost of recycling PPP on-street, as well as contribute to the public education, promotion and first point of contact for collection service customers.

For the year 2021 and onwards, Recycle BC will on-board streetscape collection and recycling services based on which municipalities have entered into Service Agreements. The proposed length of these Agreements is to be presented for review and feedback during the consultation.

Glossary of Terms

Accuracy rate – What percentage of the contents of a given receptacle contains the correct material, the inverse of contamination.

Binners – A person who collects redeemable containers and other things from bins to sustain their livelihood and to divert waste from landfills.[15]

Capture rate – How much of a specific material type is placed into the correct receptacle, as compared to other receptacles. Combining PPP across receptacles within a station provides the total potential available PPP tonnage for capture.

Collection Service Provider – Each service provider contracted to Recycle BC that provides collection services within a service area, which may include curbside, multi-family, or depot collection.

Contamination rate – The percentage of material not accepted for recycling that was included in recycling collection. Contamination rate is determined by audit samples conducted by Recycle BC and its post-collection contractor.

Curbside collection – Collection of packaging and paper from single-family dwellings, buildings with up to four households and row house complexes with any number of households where each household sets out material separately for collection by collection vehicles.

Depot collection – Collection of packaging and paper at a location operated by a local government, First Nation or private company under agreement with Recycle BC at which packaging and paper is dropped off and received from residents.

Industrial, Commercial and Institutional or ICI – Any operation or facility other than a curbside or multi-family household, including but not limited to industrial facilities such as warehouses, distribution centres, manufacturing facilities; commercial facilities such as retail stores, offices, strip malls and vacation facilities, such as hotels, motels, cottages, cabins and rental, co-operative, fractional ownership, time-share or condominium accommodation associated with sports and leisure facilities (e.g., ski resorts); and, institutional facilities such as schools, churches, community buildings, local government buildings, arenas, libraries, fire halls, police stations and residences at which medical care is provided, such as nursing homes, long-term care facilities and hospices.

Multi-family collection – Collection of packaging and paper from residential complexes with five or more units where all households deposit their recycling at a centralized location in shared containers.

Multi-stream collection – The method of curbside or multi-family collection where containers and paper are placed in separate receptacles for collection.

Packaging and Paper Product (PPP) – Packaging is described in BC's Environmental Management Act as "a material, substance or object that is used to protect, contain or transport a commodity or product, or attached to a commodity or product or its container for the purpose of marketing or communicating information about the commodity or product".

As of November 2017, paper product is defined in the BC Recycling Regulation as paper of any description, including flyers, brochures, booklets, catalogues, telephone directories, newspapers, magazines, paper fibre, and paper used for copying, writing or any other general use. The definition does not include paper products that could become unsafe or unsanitary to recycle.

[15] Binner's Project https://www.binnersproject.org/

Packaging and Paper Product Extended Producer Responsibility Plan or Program Plan - The British Columbia (BC) Recycling Regulation under the Environmental Management Act requires that every producer of packaging and paper that wishes to sell, offer for sale or distribute their products to residents in British Columbia must operate, or be a member of, an approved plan concerning the end-of-life management of their products. Recycle BC writes and delivers against this stewardship plan on behalf of producers that are members of the Recycle BC program. The plans are 5-year plans, and Recycle BC's second 5-year plan was approved by the Ministry of Environment and Climate Change Strategy in mid-2019.

Receptacle – A separate unit for discarding materials; one receptacle can be used as a solo garbage can or multiple receptacles can be grouped to form a station.

Single stream collection – The method of curbside or multi-family collection where all containers and paper are placed in one receptacle for collection.

Station – A group of receptacles grouped in one location.

Streetscape recycling – Municipal property that is not industrial, commercial or institutional property, comprises the following, which are collectively referred to as 'streetscape':

- Sidewalks which are municipal property, which adjoin buildings in an urban commercial area and which are used for pedestrian traffic;
- Plazas or town squares which are municipal property and which are available to the public; and
- Parks which are municipal property.

Appendix A. Eligible Municipalities

Table A: BC Municipalities Eligible for Streetscape Program

Geographic name	CSD type	Population*	Population density / km^{2*}
Vancouver	City (CY)	631,486	5,492.6
Surrey	City (CY)	517,887	1,636.8
Burnaby	City (CY)	232,755	2,568.7
Richmond	City (CY)	198,309	1,534.1
Abbotsford	City (CY)	141,397	376.5
Coquitlam	City (CY)	139,284	1,138.9
Kelowna	City (CY)	127,380	601.3
Langley	District municipality (DM)	117,285	380.8
Saanich	District municipality (DM)	114,148	1,099.9
Delta	District municipality (DM)	102,238	567.4
Nanaimo	City (CY)	90,504	997.2
Kamloops	City (CY)	90,280	301.7
North Vancouver	District municipality (DM)	85,935	534.6
Victoria	City (CY)	85,792	4,405.8
Chilliwack	City (CY)	83,788	320.2
Maple Ridge	City (CY)	82,256	308.3
Prince George	City (CY)	74,003	232.5
New Westminster	City (CY)	70,996	4,543.4
Port Coquitlam	City (CY)	58,612	2,009.4
North Vancouver	City (CY)	52,898	4,465.1
West Vancouver	District municipality (DM)	42,473	486.8
Vernon	City (CY)	40,116	417.7
Langford	City (CY)	35,342	885.0
Penticton	City (CY)	33,761	801.8
Port Moody	City (CY)	33,551	1,295.9
West Kelowna	District municipality (DM)	32,655	264.4
Campbell River	City (CY)	32,588	225.7
Langley	City (CY)	25,888	2,533.6
Courtenay	City (CY)	25,599	789.9
Fort St. John	City (CY)	20,155	767.3
Cranbrook	City (CY)	20,047	626.6

**Population and population density source: StatsCan 2016 Census data*

Appendix B. Roundtable Series Attendance

Table B: Roundtable Series Attendance – By Eligible Municipality

Municipality	Webinar 1 May 23	In Person 1 June 17&19	Webinar 2 July 18	In Person 2 Sept 18	Webinar 3 Oct 10	In Person 3 Nov 26
City of Abbotsford	YES	YES	YES	NO	NO	NO
City of Burnaby	NO	YES	YES	YES	YES	YES
City of Campbell River	NO	NO	NO	NO	NO	NO
City of Chilliwack	YES	YES	YES	YES	NO	NO
City of Coquitlam	NO	NO	NO	NO	NO	NO
City of Courtenay*	NO	NO	NO	NO	NO	NO
City of Cranbrook	NO	NO	NO	NO	NO	NO
City of Delta*	NO	NO	NO	NO	NO	NO
City of Fort St. John*	NO	NO	NO	NO	NO	NO
City of Kamloops	YES	YES	YES	NO	YES	YES
City of Kelowna	NO	NO	NO	NO	NO	NO
City of Langford*	NO	NO	NO	NO	NO	NO
City of Langley	YES	NO	NO	NO	NO	NO
City of Maple Ridge	NO	NO	NO	NO	NO	NO
City of Nanaimo	YES	YES	YES	NO	NO	NO
City of New Westminster	NO	NO	YES	YES	NO	YES
City of North Vancouver	YES	YES	YES	YES	YES	YES
City of Penticton	YES	YES	YES	NO	YES	NO
City of Port Coquitlam	YES	NO	NO	YES	YES	NO
City of Port Moody	NO	NO	NO	NO	YES	NO
City of Prince George	YES	NO	YES	NO	NO	NO
City of Richmond	YES	YES	NO	NO	YES	YES
City of Surrey	YES	YES	YES	YES	NO	YES
City of Vancouver	YES	YES	YES	YES	YES	YES
City of Vernon	YES	YES	NO	NO	NO	NO
City of Victoria	YES	YES	YES	YES	YES	NO
City of West Kelowna	NO	YES	NO	NO	NO	NO
District of North Vancouver	YES	YES	YES	YES	YES	YES
District of Saanich	YES	NO	YES	NO	YES	NO
District of West Vancouver	YES	YES	YES	YES	YES	YES
Township of Langley	YES	YES	YES	YES	YES	YES

**Opted out of participation*

Appendix C. Audit Results and Available Studies

Table C-1: Audit Results Comparison – Accuracy

Study	% Paper in Paper Receptacle	% Containers (PPP) in Containers Receptacle	% Containers (Refundable) in Containers Receptacle	% Containers (Total) in Containers Receptacle	% Paper and Containers (Total) in Single-Stream Recycling Receptacle
Recycle BC (2019) - **Original faceplate** - **Modified faceplate**	 79.7% 75.0%	 35.3% 43.3%	 7.9% 8.3%	 43.2% 51.6%	Not applicable
Metro Vancouver (2018)	92%	42%	22%	64%	41%
City of Vancouver (2018)	95%	54%	35%	89%	Not applicable
Recycle BC (2018)	73%	Not available	Not available	69%	Not applicable
District of West Vancouver (2017)	84%	36%	42%	78%	Not applicable
Recycle BC (2016-2017)	64%	35%	7%	42%	Not applicable
City of Victoria (2016)	Not applicable	Not available	Not available	83%	Not applicable
Metro Vancouver (2016)	82%	25%	7%	33%	Not applicable
Township of Langley (2016)	Not applicable	Not applicable	Not applicable	Not applicable	83%
Recycle BC (2015)	97%	Not available	Not available	75%	73%
SERA Study (2018) Average & Median	Not applicable	Not applicable	Not applicable	Not applicable	71%/83%

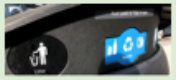
Table C-2: Audit Results Comparison – Capture

Study	% PPP Across All Receptacles	% Paper Diverted into Paper Receptacle	% Containers (PPP) Diverted into Containers Receptacle	% Containers (Refundable) Diverted into Containers Receptacle	% Containers (Total) in Containers Receptacle	% Paper and Containers (Total) Diverted into Single-Stream Recycling Receptacle
Recycle BC (2019)	Not available (no garbage or organics audit)					
Metro Vancouver (2018)	41%	89%	41%	67%	48%	45%
City of Vancouver (2018)	43%	79%	58%	85%	66%	No applicable
Recycle BC (2018)	Not available	Not available	Not available	Not available	Not available	Not available
District of West Vancouver (2017)	37%	79%	58%	89%	72%	Not applicable
Recycle BC (2016-2017)	32%	64%	56%	71%	58%	Not applicable
City of Victoria (2016)	15%*	Not applicable	Not available	Not available	57%	Not applicable
Metro Vancouver (2016)	28%	64%	43%	84%	59%	Not applicable
Township of Langley (2016)	30%	Not applicable	Not applicable	Not applicable	Not applicable	39%
Recycle BC (2015)	47%	Not available	Not available	Not available	Not available	Not available

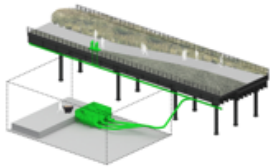
Appendix D. External Scan Resource List

RECYCLE BC STREETSCAPE RECYCLING ROUND TABLE DISCUSSION — EXTERNAL SCAN FALL 2019

STREETSCAPE RECYCLING EXTERNAL SCAN

Countr	Country/City	Related Image	Source	Description	Link
North America	Canada - Halifax		2010. Halifax Harbourwalk Public Spaces Recycling Pilot Project Report	*95% recovery rate for bev containers, 60% recovery rate for fibre. Confusion with coffee cups and compostable fibres in paper bin. P. 9 table shows all materials. (2019 based on ops staff interviews, Halifax has a contract with Otter Lake facility to do post-collection sorting for 4 part bins, and trash from 2 part bins [blue bag with bottles/cans goes direclty to MRF]).	https://americarecyclesday.org/wp-content/uploads/2013/07/HalifaxHarbourfrontFinalReport.pdf
North America	Canada - Manitoba		2019. Manitoba Recycles	*Provincial wide program with municipal opt in. They provide beverage container bins, don't service the bins. Additional Notes: •Program covers about 95% of the province's population •65,000 bins. •Offer the recycling bins for free and the municipality (or venue or school) covers the cost of servicing as well as the garbage bin if they get a dual stream bin. •Municipalities can request different models of bins based on their needs. •Since CBCRA provides the bins, they also have control of the branding and therefore can have consistency in colour and signage, but will co-brand with a municipality if they request it.	https://www.recyclemanitoba.ca
North America	Canada - Toronto	 	2019. Toronto Public Spaces Recycling	*Parks bin have signage, street bins don't. Signage is important. Contamination seems worse in downtown areas. Foot pedals and flaps do not work, switched out for openings only. Getting less revenue for recyclables due to markets, but that has not been causing them to not send recycling to MRFs. Streetscape is about 1% of all waste collected. *Per website 4 top offenders for contamination: coffee cups, dog poop, food scraps, black plastic.	https://www.toronto.ca/services-payments/recycling-organics-garbage/recycling-right-in-public-spaces/
North America	Canada - Toronto		2019. Toronto to put more resources into derelict trash	*Inspections and cleaning change to 2x/week from 1x/week.	https://www.thestar.com/yourtoronto/the_fixer/2019/04/24/toronto-to-put-more-resources-into-derelict-trash-bins.html
North America	Canada - Toronto		2018. City street garbage bins are a waste	*Stats on servicing bins, cost goes to Astral (who get advertising revenue) rather than tax payer, take back @ street vendor level.	https://www.thestar.com/yourtoronto/the_fixer/2018/05/22/citys-street-garbage-bins-are-a-waste.html
North America	Canada - Toronto		2016. Trash bins with no pedals or flaps are next big thing: fixer	*No flaps, no pedals - keep it simple.	https://www.thestar.com/yourtoronto/the_fixer/2016/06/05/trash-bins-with-no-pedals-or-flaps-are-the-next-big-thing-fixer.html
North America	US - New York City		2019 NYT. Harlem's Trash Bins Were Overflowing. So the City Took 223 Away.	•Went through process of removing >200 trash cans in Harlem; what became intended for litter from pedestrians instead became crammed full of trash bags, debris from homes, businesses. •Harlem residents fighting back, saying loss of trash cans has left mess on sidewalks; argue that trash is tossed where cans used to be regardless. Still more litter baskets than other neighborhoods. •Municipality also laying out illegal dumping fines for trash outside their homes/businesses. •Becoming a health issue, with >150 complaints from residents. •Despite resident pushback, litter has improved on streets according to Sanitation dept, with overall cleanliness improving for neighbourhood also.	https://www.nytimes.com/2018/08/19/nyregion/harlem-litter-baskets-sanitation-department-nyc.html

RECYCLE BC STREETSCAPE RECYCLING ROUND TABLE DISCUSSION **EXTERNAL SCAN FALL 2019**

Countr	Country/City	Related Image	Source	Description	Link
North America	US - New York City		2017. Below the High Line How Pneumatic Tues Could Alter the Future of Urban Waste	• Looking into pneumatic waste collection system, small-scale anaerobic digestion and rail transfer system for High Line park corridor; ClosedLoops. • Would involve pneumatic tubing hung underneath the elevated park, transporting it using vacuum collection system; one tube handling waste/recyclables/organics at different times of day. • "Pay-as-you-throw" system. • Could head straight to processor eg. recycling facility, WWTP, compost facility. • Similar system already in place on Roosevelt Island. • Very simple technology, but requires political will. • Similar system brought to Barcelona for 1992 Olympics.	https://www.wastedive.com/news/below-the-high-line-how-pneumatic-tubes-could-alter-the-future-of-urban-wa/439845/
North America	US - New York City		2017. Trash Cans will return to subway stations after failed bid to stop litter	*Agency was cash strapped, and removed 8500 bags of trash daily, was hard to keep up with refuse. *Removed cans at 39 stations across the city and litter situation worsened as shown by two audits. *Launched removal in 2011, five years later are putting them back. *Cleaning costs went up.	https://www.dnainfo.com/new-york/20170329/greenwich-village/mta-subway-trash-cans/
North America	US - San Francisco		2013. Sea Change Comes to Waste Practices at Fisherman's Wharf	*A two part streetscape system (trash, recycling) was put in at Fisherman's Wharf (a separate association) as part of a larger diversion effort that included organics for businesses.	http://www.baycrossings.com/dispnews.php?id=2956
North America	US - San Francisco		2007. City took away 1k SF trash cans, and now returns many to Mission St	*Littering and extra dumping happens with or without trash cans. Removed some and returned them when littering worsened.	https://missionlocal.org/2017/04/city-took-away-1000-sf-trash-cans-and-now-returns-many-to-mission-st/
North America	US - Seattle		2019. Seattle Utilities Public Litter Cans page	*Provides overview of Seattle's two part streetscape recycling system.	https://www.seattle.gov/utilities/environment-and-conservation/our-city/public-litter-cans
Europe	Denmark		2015. Finding Money in Copenhagen's Trash Cans	*Side racks make bottle collecting easier. (shows that they are in initial stages of public space recycling, despite forward thinking re resources overall).	https://www.citylab.com/solutions/2015/10/finding-money-copenhagens-trash-cans/412498/
Europe	France		2009. The Garbage Genius of Paris	*Switched to hoop and clear bag given safety issues re bombs.	https://www.planetizen.com/node/39107
Europe	France		2019. France's newly implemented deposit-return scheme receives strong criticism	*Not yet adopted deposit return system (DRS) gets criticism *Made in France, ? re what is included (GMP, glass for refill only, larger return combined to include textiles? *Goal to reach 90% return (vs current 57%). *Munis get PET resales currently, will be expensive to implement *Outdoor waste not on the radar - packaging thrown outside one's home represents 30% of used packaging but less than 5% of it is being recycled.	https://www.euractiv.com/section/circular-economy/news/frances-newly-implemented-deposit-return-scheme-receives-strong-criticism/

RECYCLE BC STREETSCAPE RECYCLING ROUND TABLE DISCUSSION **EXTERNAL SCAN FALL 2019**

Countr	Country/City	Related Image	Source	Description	Link
Europe	Germany		2019. Waste Management in Europe	*EU recycling overview, Germany leads with 7 part station and other collection systems. Yellow for packaging materials; blue for paper and cardboard; three bins for clear, brown, and green glass; a "Bio" bin for leftover food and other organic wastes	https://www.climate-policy-watcher.org/waste-management/waste-management-in-europe.html
Europe	Italy		2017. Italy's deposit retur scheme for bottles gets underway.	*Gov'ts goal is to promote culture of recycling by DRS for glass bottles.	https://www.thelocal.it/20171010/italys-deposit-return-scheme-for-bottles-gets-underway
Europe	Italy		2017. Italy top in EU for waste recycling.	*Recycling diversion is higher than many EU countries.	http://www.ansa.it/english/news/business/2017/10/09/italy-top-in-eu-for-waste-recycling_30a65bb3-e868-4afd-84f7-1b7e242cd04b.html
Europe	Switzerland		2019. Waste Management in Switzerland	*Bins collect paper, aluminum, glass PET bottles and incinerable waste. Switzerland is based on polluter pays principle with pay per bag fees; it has a recycling rate over 50% with a per capita waste total of 713 annually.	https://en.wikipedia.org/wiki/Waste_management_in_Switzerland
Europe	UK - Newcastle		2019. Recycling in the UK	*Recycling overview with bottle bank mention and image.	https://en.wikipedia.org/wiki/Recycling_in_the_United_Kingdom
Europe	UK - London		2017. Recycle Your Coffee Cup with the #Squaremilechallenge	*Pilot to recycle coffee cups, didn't continue. *All coffee cups collected for the #SquareMileChallenge will be recycled. There are two ways, the first shreds the whole coffee cup, processing it into a resin which is mixed with recycled plastic to create a new mouldable plastic material. This can then be made into a range of products such as picnic benches, trays and coasters. *The second involves separating the plastic lining and paper in the coffee cup, so the plastic can be removed and fibres can be recovered and made into products like cardboard containers.	http://www.squaremilechallenge.co.uk https://issuu.com/hubbubuk/docs/sqm_report_final_print
Europe	UK - London		2012. The Wi-Fi-Enabled, Bomb-proof Can of the Future	Company, Renew, manufactures high-tech sidewalk pods; application in London UK prior to 2012 Summer Olympics (25 stations in total, with plans to add more over 10 years). • Goal is to ensure public safety while reducing litter and increasing recycling. • Slots for paper recycling, along with large LCD screens, wifi-enabled options to allow for display of wide range of real-time information (eg. public transportation schedules/updates), bike availability for bike shares, news, ads, etc. • Bins are incredibly strong in withstanding bomb blasts; in the event of an emergency, LCD screens can be used as an emergency broadcast systems; could communicate directly with mobile devices in future. • $47K per bin.	https://www.fastcompany.com/1679281/the-wi-fi-enabled-bomb-proof-trash-can-of-the-future https://www.treehugger.com/infrastructure/bomb-proof-recycling-bins-hit-londons-streets.html
Asia	China - Beijing		2019. Residents sort trash, make cash	• Use of high tech in garbage sorting. • Use facial recognition technology to open trash bins after they register; users can earn points if garbage is sorted successfully, points can be exchanged for daily necessities. • Waste is divided into six categories: kitchen waste, metal, textiles, paper, plastics, other waste.	http://www.globaltimes.cn/content/1157823.shtml

Countr	Country/City	Related Image	Source	Description	Link
Asia	China - Shanghai		2019. Residents become garbage expets as new rules kick in	*13,000 waste stations covering 75% of the city has replaced more than 40k streetside trash cans. Use obvious and easy to understand signage. *four classifications: food/kitchen waste, haz waste, recyclable waste, residual waste *garbage sorting is including in junior high tests	http://www.globaltimes.cn/content/1156297.shtml
Asia	China - Shanghai		2019. What kind of rubbish are you?: China's first serious trash-sorting rule is driving Shanghai crazy	• "What kind of rubbish are you?" • Brought in mandatory trash sorting roles as part of China's work to improve recycling rates, including RES mini depots • Fines incurred for businesses, individuals who fail to separate their trash correctly • China looking to neighbour Japan which has a sophisticated sorting system • Waste supposed to be categorized into 4 streams: recyclable goods like bottles/cans, harmful waste like drugs/cosmetics, kitchen waste (wet waste), and other waste (dry waste) • In some areas, people need to sign in with their house numbers in order to know who has participated • Customized playing cards issued to help with sorting • New job being created for people to act as garbage dumpers and sort trash properly for a HH • Rules are so strict they're changing behaviour of people to drink certain beverages based on confusion to get rid of related waste	https://qz.com/1659132/shanghai-is-giving-japanese-style-trash-sorting-a-try/?utm_source=email&utm_medium=quartz-obsession
Asia	Hong Kong		2017. Hong Kong is misusing its public recycling bins, green group says	*Less than 40% of city 4 in one bins were actually recyclable items. *public bins in place for convenient sorting of waste and to ensure cleanliness/hygiene of area *Bins managed by Food and Environment Hygiene Department and Leisure and Cultural Services Department	https://www.scmp.com/news/hong-kong/health-environment/article/2109234/hong-kong-misusing-its-public-recycling-bins-green
Asia	Japan		2019. Carefully, Japan Reconsiders the Trash Can	*no public garbage bins in cities like Tokyo is both a security measure and a reflection of a cultural aversion to littering. *bins still get covered during events such as diplomat visits and marathons.	https://www.citylab.com/life/2019/05/trash-cans-japan-garbage-bin-recycling-waste-tidying-up/589825/
Asia	Japan	-	2017. Why Japan's streets are spotless	*90s – waste management laws with strict recycling due to Tokyo's landfills running out of space. Main cultural differences: packaging back to businesses, take waste home, not walking/eating.	https://www.weforum.org/agenda/2017/07/why-japanese-dont-litter/
Asia	Japan		2017. Japan's 'zero waste town' is so good at recycling that it is attracting foreign visitors	*45 categories to sort, need to bring to one drop spot (small town). Main driver was not incinerating due to environmental concern.	https://www.scmp.com/news/asia/east-asia/article/2072602/japans-zero-waste-town-so-good-recycling-it-attracting-foreign https://www.businessinsider.com/zero-waste-town-kamikatsu-japan-2017-7
Asia	Japan	-	2012. On finding a Rubbish Bin in Japan	*No public trash cans in Japan due to 80s terrorist threat	https://thisjapaneselife.org/2012/02/08/trash-cans-in-japan/

RECYCLE BC STREETSCAPE RECYCLING ROUND TABLE DISCUSSION — EXTERNAL SCAN FALL 2019

Countr	Country/City	Related Image	Source	Description	Link
BEHAVIOUR CHANGE-RELATED RESEARCH					
Europe	France	-	Dupre, M. & Meineri, S. (2016). Increasing recycling through displaying feedback and social comparative feedback.	*Social comparative feedback was most effective at increasing recycling and decreasing contamination in public space recycling stations at a university in a cafeteria.	https://www.sciencedirect.com/science/article/abs/pii/S0272494416300652 https://mickaeldupre.com/wp-content/uploads/2016/06/Dupré-augmenter-le-tri-grace-au-feedback.pdf
North America	Canada - Ontario	-	Ontario Continuous Improvement Fund (2019). Public Space Recycling – a Review of Better Practices.	*Lessons learned bmps: clear signage, twinning bins, bin location, type and size of bin as relates to operations.	https://thecif.ca/public-space-recycling-a-review-of-better-practices/
North America	Canada - British Columbia		Wu, D. et al. (2018). How does the design of waste disposal signage influence waste disposal behavior?	*Reinforce colour picture based signs are most effective for response time but accuracy between picture and icon had pictures only slightly higher. Yes only signs performed better than yes/no for icons, but the yes and yes/no were about the same for pictures.	https://www.sciencedirect.com/science/article/abs/pii/S0272494418301804
North America	Canada	-	McKenzie-Mohr, D. (2011). Fostering Sustanable Behavior Change.	Foundational community-based social marketing resources explains how the field of CBSM has emerged as an effective tool for encouraging positive social change.	https://www.cbsm.com/about
North America	US - Keep America Beautiful	-	Keeping America Beautiful (2019). Public Space Recycling Resources.	*Best practies by recycling type	https://americarecyclesday.org/public-space-recycling-resources/
North America	US - Keep America Beautiful	-	SERA (2018). Public Space Recycling Benchmarking Study and Toolkit. Prepared for Keeping America Beautiful.	*Best practices in US, how influenced by bottle bill, res curbside recycling performance	https://www.kab.org/sites/default/files/KAB_SERA_PublicSpaceRecycling_Final_Aug18.pdf
North America	US - Keep America Beautiful	-	Keeping America Beautiful (2019). KAB recycling campaign.	*Shows where items go, what they turn into, how to recycle etc.	https://berecycled.org
North America	US - Illinois	-	Andrews, A. et al. (2013). Comparison of recycling outcomes in three types of recycling collection units.	*Results reinforce need for paired garbage and recycling bins, show statistically significant difference in lower recycling and higher contamination when not paired. Showed signage didn't have much effect.	https://www.sciencedirect.com/science/article/pii/S0956053X12003844
North America	US - Georgia	-	Mozo-Reyes E. et al. (2016). Will they recycle? Design and implementation of eco-feedback technology to promote on-the-go recycling in a university environment.	*Increase in recycling from a counter and lights/sound that go off when someone puts recycling into a bin.	https://www.sciencedirect.com/science/article/pii/S0921344916301616
North America	US - Pennsylvania	-	Penn State (2019). Knowing What It Makes: How Product Transformation Salience Increases Recycling.	*Penn State Study. Recycling campaigns abound, but do consumers think about what becomes of those recyclables? This research proposes that product transformation salience (thinking about recyclables turning into new products) increases recycling.	https://www.sciencedaily.com/releases/2019/07/190710121549.htm
Oceanic	Australia	-	Sustainable Victoria (2019). Public place recycling.	*Overview of public recycling best practices in Victoria	https://www.sustainability.vic.gov.au/Government/Waste-and-resource-recovery/Public-place-recycling

Appendix E. Survey Questions

MUNICIPAL SURVEY

1. General information

	General Information	**Response**
a.	Name of Municipality	
b.	Name of Municipal Employee completing survey	

2. Streetscape operations and oversight

	Operations and Oversight	**Response**
a.	Do you have on-street recycling?	*Y/N*
b.	Streetscape oversight by department (s) *(Staff name, position)*	
c.	Collection service type *(contracted/in-house)*	
d.	If in house – cost of service per bin and/or station *(factor in labour – cost for FTE/week, service frequency – hours/week, and #bins/stations)*	
e.	Vehicle used for collection *(e.g., manual, semi-automated, automated, multiple compartments, single compartment)*	
f.	Partnerships *(Regional District, private sector, across internal Departments)*	
f.	How funded *(% by general tax/utility, advertising revenue offset, other)*	

3. Collection – streetscape bin types and groupings.

Bin Type (company name, description)	**Materials Collected within each Station**	**Purchase Date** (year or range,	**Receptacle Size** (volume by individual bin)	**Estimated number**	**Receptacle Warranty** (# years)	**Station Cost (Capital)** (est. per station)	**Collection Frequency** (avg per week)

	(list materials per station labels as relevant)	'ongoing' if solo garbage)					
Company X – 3 part conjoined station	*Mixed Containers/Paper/Garbage*	*Ongoing*	*100L*	*20; downtown core; along main st and north ave*	*1 year*	*$200/unit*	*Daily; 7 per week*
	Start here…						

Capital Cost

Station Type	**# Receptacles within Station**	**Cost per Station**

4. Measurement
    a. List annual tonnage by material type, as available.

Material Type	**Annual Tonnage**

    b. How do you monitor material stream quality and at what frequency? (e.g. visual inspection, waste audits)
        i. Please attach any relevant data or reports you are willing to share.
        ii. The intent will be to share aggregated data with the roundtable group; if we would like to use individual data sets in presentations, we will contact you directly to discuss and potentially co-present.
    c. Other data or reports:

5. End Destination and End Fate by Material

Material Type	**End Destination** (landfill or WTE location, recycling depot)	**End Fate** (recycled all or partial – provide estimated amount; landfill, WTE)

Example: *Mixed paper*	*Recycling Depot*	*20% recycled – bailed for sale @ recycling market; 80% landfill – too contaminated to recycle*
Garbage		
Mixed Paper		
Mixed Containers		
Beverage Containers only		
Recycling (single stream)		
Organics		

In Person Session One – Post It Poll Questions

Questions for Likert Scale Responses (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree)

1. Streetscape recycling is a high priority for my municipality
2. Litter in public spaces is a major problem in my municipality.
3. My municipality prefers to provide access to binners (vs restricting / locking).
4. My municipality is interested in measuring streetscape recycling diversion (tonnage) and accuracy (composition).
5. My municipality is committed to reducing the number of solo garbage cans to increase diversion, while still mitigating litter issues via other means.

Questions for Likert Scale Responses (Never, Rarely, Sometimes, Often, Other)

1. For municipalities with streetscape recycling, how often does recycling from streetscape bins get disposed of as garbage?
2. My municipality collaborates across departments (e.g., engineering, parks).
3. For municipalities with streetscape recycling, managers get feedback from collectors (in house or external hauler) regarding contamination in recycling streams.

Webinar 2 – Follow Up Poll Questions

1. What other design features would your municipality like to see consistently used across the province?
    a. Name labels
    b. Approach icons
    c. Sightline signage
    d. Bin order
    e. Restricted opening shapes, containers etc.
    f. None

2. If recycling is happening consistently, what is the biggest influence?
    a. Streetscape recycling (resulting in low contamination)
    b. Tolerance of processor
    c. Correlation to resident curbside program performance
    d. Don’t know

3. If you were to adjust and/or start a parks-based streetscape recycling program, what material streams would you pick? Check all that apply:

4. If you were to adjust and/or start a downtown-based streetscape recycling program, what material streams would you pick? Check all that apply:
    a. Mixed containers
    b. Mixed paper
    c. Organics/compost
    d. Garbage/landfill
    e. Dog waste
    f. Paper/organics
    g. Defined items only (e.g. coffee cups)
    h. Single stream recycling

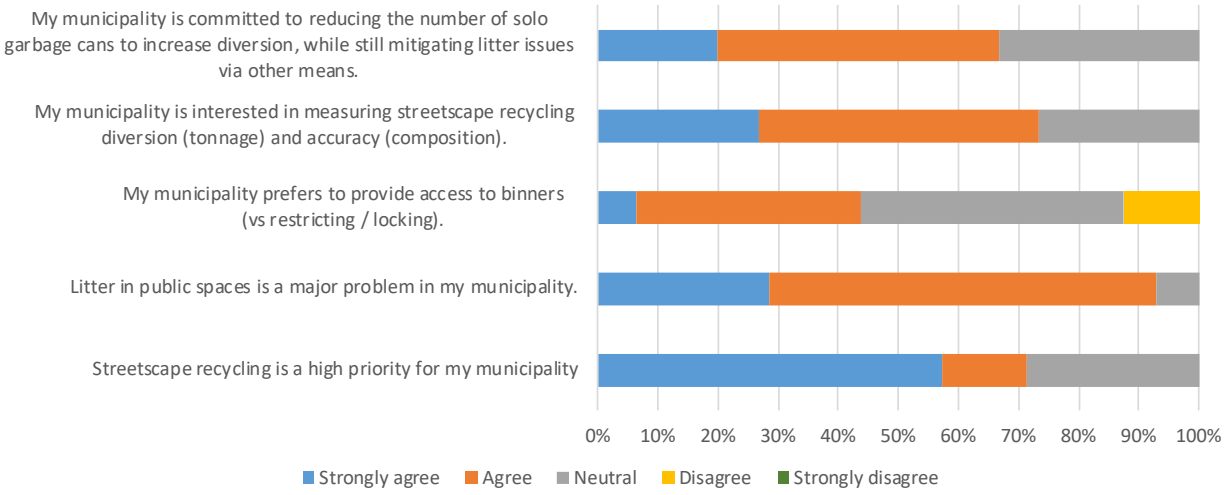
5. If you have single-stream curbside, would you be willing to adopt dual-stream streetscape recycling?
    a. Yes
    b. No
    c. Not applicable

Webinar 2 – Follow Up Poll – Questions for Likert Scale Responses
(Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree)

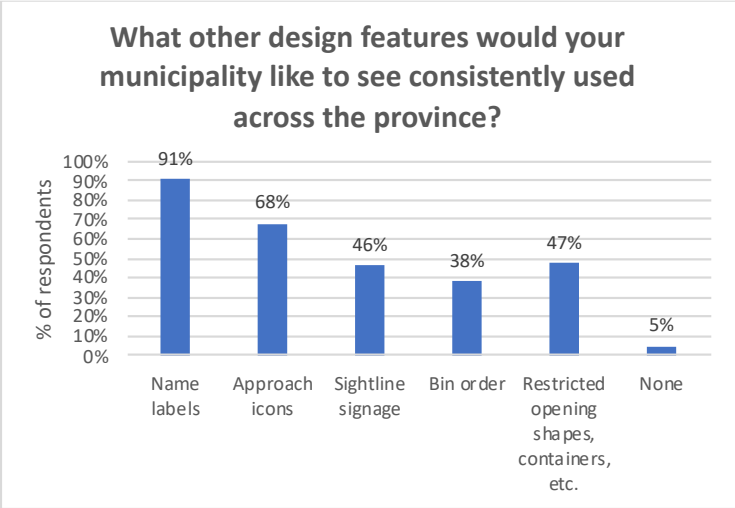
1. Would your municipality be open to having consistent colour-coding as part of a provincial program?
2. If there were no restrictions, financing or otherwise, would your municipality prefer a cart system over manual collection if you were to upgrade and/or start a new system?
3. Would you consider changing out the paper stream for an organics container that accepts some paper?
4. When comparing streetscape to curbside, would your municipality prefer to adjust name labels?
5. When comparing streetscape to curbside, would your municipality prefer to adjust for items/products?
6. My municipality prefers to provide access to binners.

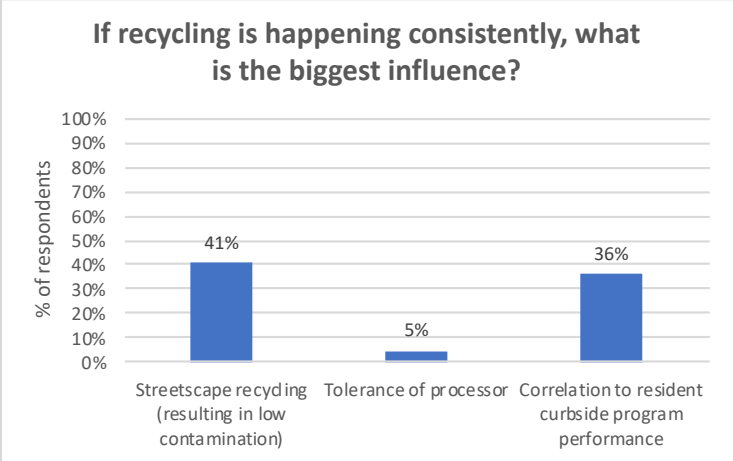
Appendix F. Survey Results

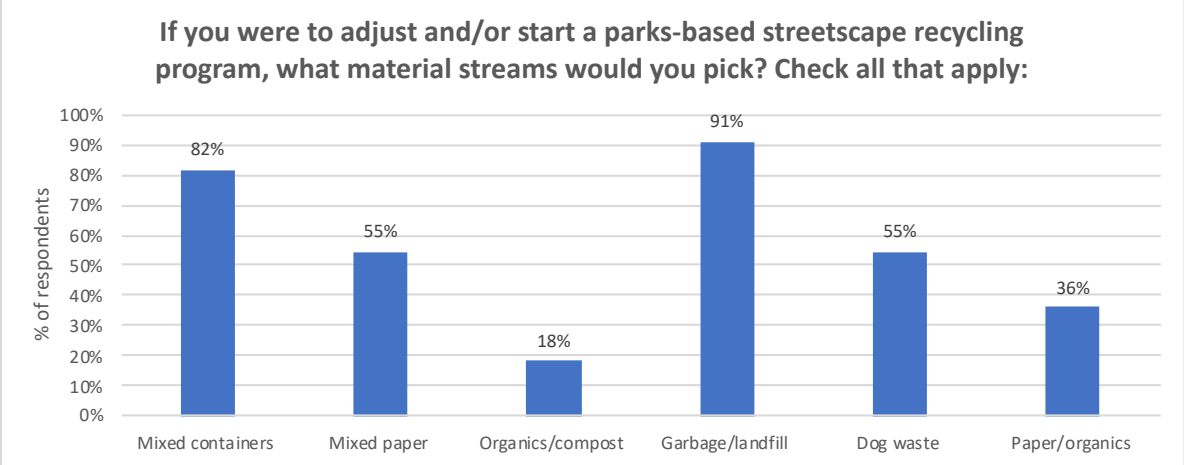
In Person Session One – Post It Poll Questions

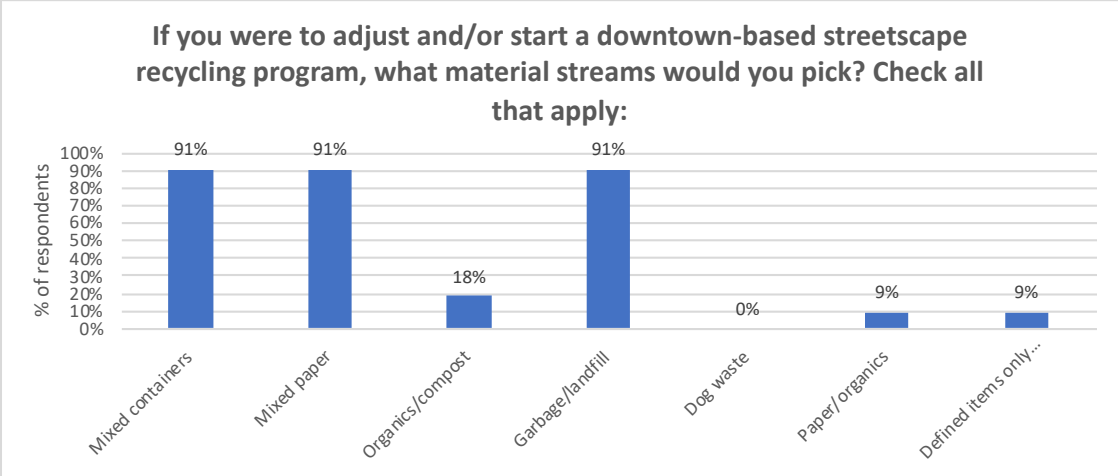


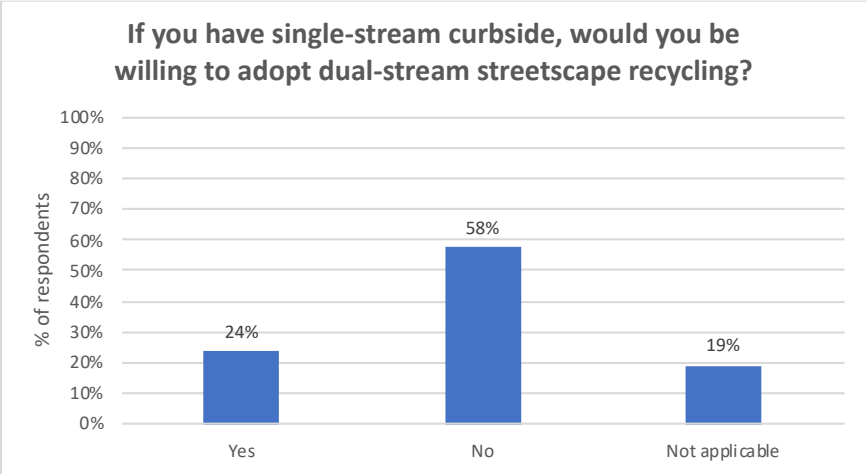
Webinar 2 – Follow Up Poll Questions

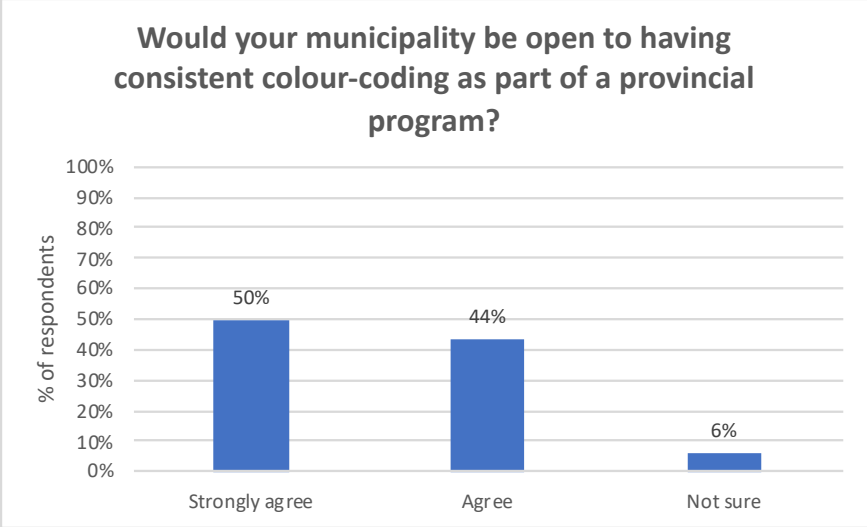


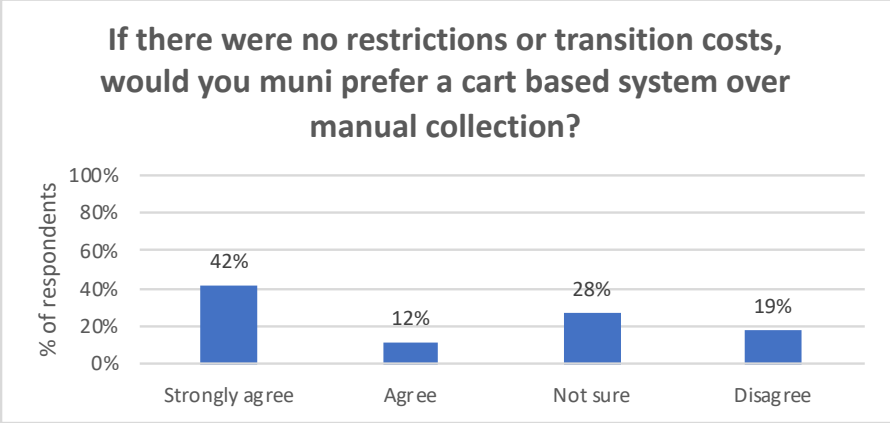


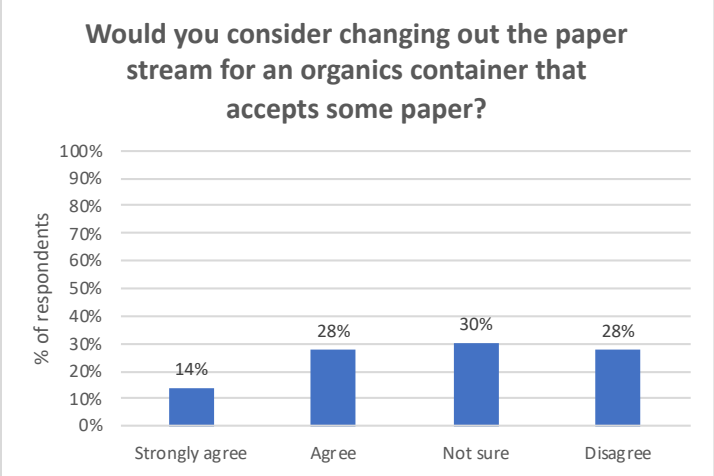


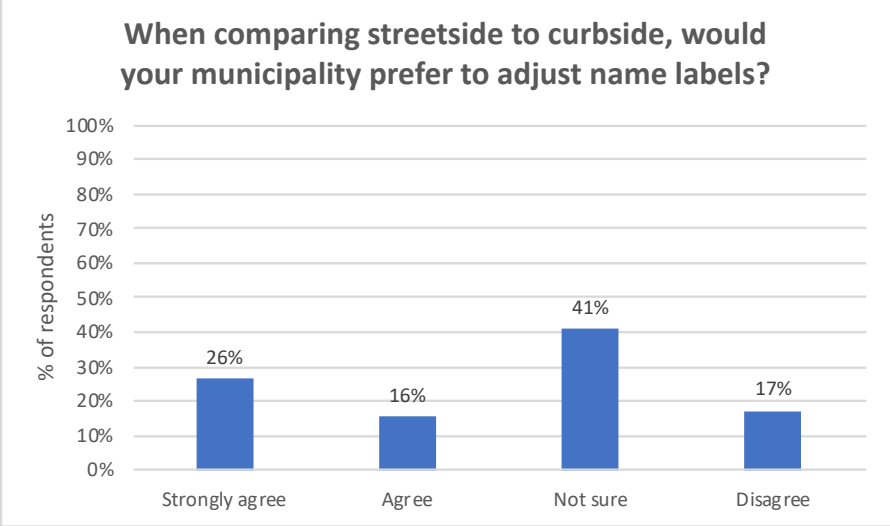

If you were to adjust and/or start a downtown-based streetscape recycling program, what material streams would you pick? Check all that apply:
% of respondents
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
91%
91%
18%
91%
0%
9%
9%
Mixed containers
Mixed paper
Organics/compost
Garbage/landfill
Dog waste
Paper/organics
Defined items only...

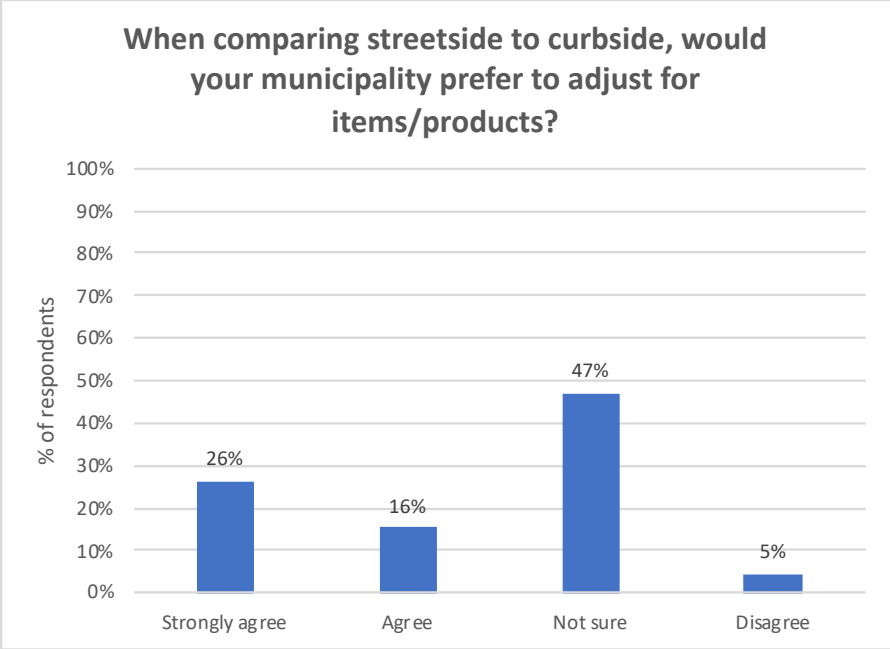

If you have single-stream curbside, would you be willing to adopt dual-stream streetscape recycling?
% of respondents
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
24%
58%
19%
Yes
No
Not applicable

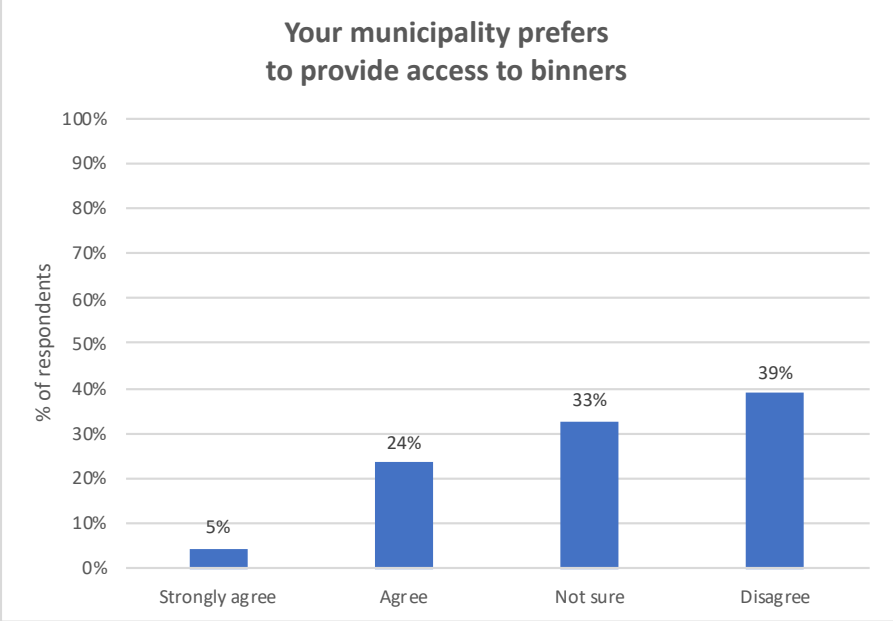

Would your municipality be open to having consistent colour-coding as part of a provincial program?
% of respondents
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
50%
44%
6%
Strongly agree
Agree
Not sure


If there were no restrictions or transition costs, would you muni prefer a cart based system over manual collection?
% of respondents
100%
80%
60%
40%
20%
0%
42%
12%
28%
19%
Strongly agree
Agree
Not sure
Disagree


Would you consider changing out the paper stream for an organics container that accepts some paper?
% of respondents
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
14%
28%
30%
28%
Strongly agree
Agree
Not sure
Disagree


When comparing streetside to curbside, would your municipality prefer to adjust name labels?
% of respondents
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
26%
16%
41%
17%
Strongly agree
Agree
Not sure
Disagree


When comparing streetside to curbside, would your municipality prefer to adjust for items/products?
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% of respondents
26%
16%
47%
5%
Strongly agree
Agree
Not sure
Disagree


Your municipality prefers to provide access to binners
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% of respondents
5%
24%
33%
39%
Strongly agree
Agree
Not sure
Disagree

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