2013 ROADMAP to Commercial WASTE REDUCTION

Prepared for the Urban Sustainability Director's Network

DENVER THE MILE HIGH CITY

SERA Skumatz Economic Research Associates

USDN urban sustainability directors network

2013 ROADMAP to Commercial WASTE REDUCTION

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A Roadmap for Implementing Effective Commercial Waste Reduction Strategies

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Executive Summary

Commercial waste makes up an estimated 45-55 percent of the total waste in U.S. landfills. While waste diversion progress continues in the residential sector, there is a virtual lack of information available to guide communities concerned with the volume of commercial waste in landfills.

The USDN has funded the creation of a waste reduction toolkit to assist municipalities, waste managers and associated industries to explore methods to reduce costs, environmental liability, and land use and planning concerns associated with managing commercial waste.

The toolkit is designed to help communities inventory, evaluate and implement commercial waste reduction strategies that are in conjunction with the USDN's goals of creating a healthier environment, promoting economic prosperity and increasing social equity.

Why you may want to read this document

Do you need guidance picking effective and well-suited commercial waste diversion programs for your community? This document, in addition to the associated decision tool, website and webinars, provides implementable guidance to increase recycling and diversion in commercial businesses, suited for local circumstances in a jurisdiction. The information and recommendations are based on an extensive review of the literature, case studies of real world programs, and a statistical analysis. The combination of these documents provides best practices for commercial waste recycling and diversion for USDN members and other jurisdictions across the nation.

This project is designed to provide valuable benefits to USDN members and to other communities. It includes both a decision document and associated decision tool that any community can use to assess potential commercial waste reduction strategies, and to systematically identify which are most suited to their local situation and current priorities. Possible steps each community may follow to successfully implement the selected strategies are also included. In addition, this document provides the backup data, case studies, and supporting information needed for the decision process.

This report, and its supporting materials, detail a diverse range of previously unavailable commercial waste diversion strategies available for consideration, including:

- Customized Case Studies - Data on commercial programs and community case studies from around the nation were used to document and examine success factors and barriers, suitability characteristics, and other elements underlying commercial program success;
- Waste Diversion Decision Tool – This tool, also called "Commercial Pick", prioritizes a tailored subset of commercial strategies in order to develop a commercial waste diversion plan. The tool uses community's responses to 23 specific questions to identify those strategies that are most suited to the particular jurisdiction. A set of community case studies are provided describing existing programs for more detailed information on strategies; and
- Roadmap for Decision-Making - The "Commercial Pick" tool is a roadmap that allows a city to use its specific community characteristics and typologies to develop tailored strategies reflecting their own situations and priorities.

This report was created through an Urban Sustainability Director Network (USDN) grant, led by the City & County of Denver. USDN Partners include Adams County (CO), Boulder County (CO), City of Boulder (CO), Cincinnati (OH), Fort Collins (CO), Houston (TX), Salt Lake City (UT), Santa Fe (NM), Vancouver (WA) with work supported by the research and consulting firm Skumatz Economic Research Associates (Superior, CO).

To visit the project webpage, go to ***www.denvergov.org/environmentalhealth/EnvironmentalHealth/EnvironmentalQuality/CommercialWasteReduction/tabid/445104/Default.aspx***

1.0 *Project Overview and Findings*

Waste diversion progress continues in the residential sector, but there is a significant lack of information available to guide communities to reduce the volume of landfilled commercial waste. This project helps communities to identify and prioritize available commercial waste diversion strategies and effective decision-making guides based on their local conditions. This report, and its supporting materials, accomplishes three main objectives:

- Inventory a diverse range of commercial waste diversion strategies available for consideration, which was previously unavailable in the literature;
- Analyze and evaluate data on commercial programs and community case studies from around the nation, in order to examine the success factors and barriers, suitability characteristics, and other elements underlying commercial program success; and
- Construct a decision tool, also called the "Commercial Pick", which prioritizes a tailored subset of commercial strategies in order to develop a commercial waste diversion plan. The tool uses community's responses to 23 specific questions to identify strategies that are most suited to a specific jurisdiction. A set of community case studies is provided to provide detailed information on existing programs and strategies.

The "Commercial Pick" tool is a roadmap for decision-making that allows a city to use its specific community characteristics and typologies to develop tailored program recommendations. The roadmap provides a logical framework to help cities (a) assess their current commercial waste situation; (b) review and evaluate a wide range of policy, regulatory, programmatic, incentive, and other commercial waste reduction strategies; and (c) prioritize and select strategies for implementation. Using this tool, communities are able to identify their own important decision criteria and develop distinct commercial strategies that reflect their own situations and priorities.

This report and associated materials are the result of a grant awarded by the USDN to the City and County of Denver (lead), Adams County (CO), Boulder County (CO), City of Boulder (CO), Cincinnati (OH), Fort Collins (CO), Houston (TX), Salt Lake City (UT), Santa Fe (NM), Vancouver (WA), with work supported by the research and consulting firm Skumatz Economic Research Associates (Superior, CO).

1.1 *Introduction to the Project*

Communities across the country and USDN members have historically focused diversion efforts on reducing residentially-generated solid waste. However, there have been little efforts to implement commercial waste diversion programs, even with it typically making up 45-55% of the waste stream. Simple algebra shows that residential diversion efforts alone will not allow communities to achieve ambitious overall waste reduction goals if commercial diversion lags. As a result, we find many leading communities stagnated at overall diversion levels of around 40-50% (for those that have measured combined progress).[1] To meet overall waste diversion goals of greater than about 20%, it is apparent that cities will need to significantly and strategically expand efforts to reduce waste generated by the commercial sector. This project's purpose is to develop a roadmap that helps cities make strategic and effective decisions to reduce the volume of commercial waste sent to landfill, thereby achieving sustainability goals.

[1] In general, communities would need to reach 100% diversion in the residential sector to reach 50% overall (if commercial represents half the waste stream). It would not be unusual for a community to reach diversion levels of 20% or 30% overall without significant diversion activity in the commercial sector.

1.1 *Cont.*

Although there are ample amounts of literature and examples focusing on residential solid waste planning and management, information on commercial strategies is comparatively limited. A review of commercial literature shows the predominant waste streams identified were paper/office waste, food/restaurant waste, and construction/demolition wastes. During the initial research[2], we uncovered a few articles, papers, and reports specifically focusing on commercial waste generation and recycling. Some included case studies; however, we were unable to find comparisons of available strategies or existing decision guides that cities could use to prioritize and select appropriate strategies for a commercial waste reduction program.

To help communities establish and further their commercial waste reduction efforts, this project focused on filling this gap by conducting literature review, collecting and analyzing data, and developing a roadmap tool that allows jurisdictions to:

- better understand the predominant commercial waste stream components;
- consider the range of available strategies (or programs) – including a wide range of policy, regulatory, programmatic, incentive, and other commercial strategies - for reducing these waste stream components;
- understand the role of decision criteria and local factors (such as infrastructure, community support, cost, and regulatory climate) in identifying the "readiness" of a community for commercial strategies, and the types of strategies that may be most suited for their jurisdiction; and
- prioritize strategies and programs to develop and implement actionable plans/portfolios that are suitable to the jurisdiction's objectives to reduce commercial waste.

This report, Microsoft Excel tool "Commercial Pick", along with a webinar, will provide jurisdictions with a reasonable framework to assess their current commercial waste situation, priorities, and opportunities, and then guide them in prioritizing and selecting strategies for implementation. In addition, the decision tool points out data that will help in decision-making and provides proxy information for those lacking data.

[2] This included review of numerous websites, including various EPA, state, city, industry association, and consulting firm websites for information on commercial sector waste management; reports prepared for communities and counties across the US; and conversations with experts across the country.

The scan document (this report) identifies and provides:

- predominant components of commercial waste (by region if there are differences);
- summaries of the available strategies for reducing commercial waste including strengths and weaknesses, diversion potential, and relative costs;
- identification of the types of co-benefits that may derive from particular strategies; and
- analysis of these strategies with recommendations of why/when certain waste reduction options may be more effective than others.

The "Commercial Pick" decision tool provides:

- a list of twenty-three questions, easily answered by the jurisdiction, which provides the model with information on priorities and the current waste-related infrastructure, incentives, commercial, and political situation in the community;
- output specifying a list of programs that are suitable for the community (a portfolio for consideration), based on their stated priorities and conditions, including descriptions and implementation information;
- output specifying a list of "similar" community peer case studies with similar characteristics providing referencing and context information useful to communities;
- specific information on implementation strategies for the programs, and links to sample language and supporting information (legislation, ordinances, etc.); and
- proxy waste composition values for communities lacking commercial waste information, for use in developing planning level estimates.

1.1 Cont.

The associated website provides this report and the user-friendly tool for: 1) assessing and estimating the key local commercial waste stream targets; 2) identifying key factors to use for prioritizing commercial waste reduction strategies by community typology and evaluation criteria; 3) assessing and prioritizing from a set of strategies (policies, programs, and incentives suitable for the commercial sector) that fit with a community's typology and criteria; and 4) developing recommendations, associated direct and indirect impacts, and key implementation steps and needs.

The seven major project phases and tasks that the team accomplished for the report are outlined in *Figure 1.1.*

Figure 1.1 Major Project Steps/Tasks

1. Kickoff

1. **Kickoff Meeting:** Identify status quo and known information; research plan and tool design; prioritization criteria; and strategize survey and data collection.

2. Waste Components

2. **Commercial Waste Characterization:** Using available city, state, and national data, analyze and summarize commercial waste components and variability, and develop workable estimates for communities lacking characterization data. Develop and provide guidelines, tools, or ranges for developing estimated waste streams in communities lacking planning-level information.

3. Drivers

3. **Identify Community "Typologies" and Assessment Criteria (Drivers):** Using surveys, interviews, statistical analyses, and other techniques, identify community typologies and factors that influence a community's ability to select and implement commercial waste diversion strategies and how that might affect the relative cost effectiveness and performance,[3] including local context factors,[4] industries, recycling infrastructure, political situation, and other factors. Work with partner communities to clarify assessment and prioritization factors. See *Appendix A* for the list of broadcast and detailed survey questions.

4. Strategies

4. **Strategies Research:** Research, through literature review and questionnaires, the wide range of commercial strategies (broad-based and targeted) that have been used successfully and unsuccessfully in other communities. Develop implementation-oriented descriptions of best practices and assessments of their performance,[5] strengths and weaknesses, relative cost, suitability by typology, and community examples. Outline key implementation steps for the promising strategies. *Appendices B, C, and D* provide regulations and education related references, detailed case studies, and detailed program descriptions, respectively.

5. Decision Tool

5. **Decision Tool:** "Commercial Pick" tool gathers data from the community, applies community-weighted criteria, and generates ranked outputs for 1) commercial strategies (and associated descriptions) for the jurisdiction to consider for implementation; and 2) peer community case studies. The framework produces tailored sets of priority strategies based on community inputs of typology, local context/community factors and key criteria, along with key implementation steps.

6. Reporting

6. **Reporting:** Monitor project progress, prepare a report documenting the findings and support information, and prepare reports required as part of the USDN grant conditions.

7. Website/ Outreach

7. **Website of Resources and Outreach and Training Webinar:** Create a website (or information on USDN's website) making the project information and decision tool available to other USDN communities. Provide a webinar introducing the use of the tool to communities across the nation.

[3] Performance is used in terms of tons reduced, Green House Gas (GHG) reduced, vehicle miles traveled, etc.

[4] Other factors may include region (related to recycling market access/prices), lower disposal cost, urban/suburban/size characteristics, political will to implement regulation, major commercial waste components, major industries, availability of waste diversion infrastructure, etc.

[5] Where possible, address effectiveness, measurement tools, barriers to success, enforcement tools, etc.

1.2 Commercial Programs in Respondent Communities

The team surveyed a large variety of contrasting communities across the US, including USDN members. The survey was not intended to produce statistics of commercial programs in communities around the nation,[6] but rather to provide sufficient responses to allow us to: 1) identify communities that could be interviewed in more depth about specific commercial programs in place; 2) support analysis of correlations of causal-type factors; and 3) identify insights into drivers and barriers related to community interventions into the commercial waste arena.[7]

The respondents include communities, counties and city/county entities with populations varying from under 5,000 to over 1 million, and representing urban, suburban, rural communities, and combinations of those. Business sectors differed widely among the respondents, including office, finance, farming and ranching industries. A variety of responses were received, with the key observations summarized below:

Commercial collection arrangement and "authority": Private haulers providing collection directly, as opposed to organizations operating under contracted or franchised arrangements, are most common for provision of commercial service. However, all contracted and franchised collection arrangements were represented. Respondents commonly noted that they had not asserted the authority to control collections or influence rates in the commercial sector, but they did state some authorities are available. A few of the respondents were also at the other extreme, having taken over collection in the commercial sector with municipal staff, or via contract or other arrangements. Others were asserting some regulatory authority in the commercial sector.

Recycling access and processing: When asked about their recycling situation, most communities stated they did not have recycling access barriers[8] (half to two-thirds), but less than a third were specifically near ports or other direct markets. The vast majority of respondents have access to a recycling center/materials recovery facility (MRF) (two-thirds to three-quarters), and for half, the technology is single stream. A minority of respondents (about one in five) noted their MRF was limited to a few materials. More than half said they had access to yard waste processing in the region, but fewer processed food waste as well.

Waste management facilities and tipping fees: In most cases, the facilities (landfill, transfer station, and processing) were not operated by partnerships; they were either publicly owned and operated, or private facilities. Disposal tipping fees for municipal solid waste (MSW) were clustered in the $20-$70 range, with $40/ton as the most common value. A few said MSW disposal was free or nearly free. Tipping fees for other materials varied; it was not uncommon for communities and facilities to assess differential per-ton fees (or revenues) for construction and demolition (C&D), recycling,[9] or organics disposal at facilities. This includes situations in which fees are artificially lowered (or subsidized) to provide incentives for separation and management outside the MSW disposal stream.

[6] National representation would have required selection of a random sample of communities and counties, and considerable follow-up to assure random responses. This would require additional, more expensive efforts that were beyond the grant's budget.

[7] Because of the relatively low sample count, we are not focusing on precise percentages.

[8] Includes markets, facilities, and ports.

[9] Fees here can be positive or negative. Many communities and facilities provide revenues for bringing recyclables, but others charge fees.

1.2 *Cont.*

Commercial sector programs and policies: Most communities stated they had no commercial sector programs of any kind. Those that did usually funded them through commercial or residential user fees, property tax, or "generator fees" assessed to households or businesses. Commercial rates were commonly structured based on volume and frequency of collection, with most of those detailing that commercial fees for recycling were separate or extra in conjunction with trash service. Rates were most commonly negotiated between the service provider or hauler and the business directly. Waste related "crises" generally have not been an issue in communities, and have not served as drivers.[10] When material disposal bans or mandates are in place, they tend to be state-level bans.[11] About a third of respondents reported no bans or mandates in place.[12]

Commercial sector waste stream and diversion information: Commercial sector diversion is not tracked as routinely as residential, and many diversion rates are inaccurate based on how and what is included in the calculation. Often tracking and reporting are focused on the state level or general tonnage reports of material disposed of in a landfill. There are many communities that do not know their diversion rates for all sectors combined; let alone for the residential sector versus the commercial sector. Waste composition studies of the commercial sector had been conducted by some respondents, but less commonly than residential waste studies.

Respondent interest: Survey respondents were most interested in the toolkits, case studies, and website information that would be provided by this study.[13] Generally, communities would like financial assistance to help with acquisition of equipment, technical assistance, and the like. Community representatives stated the information most needed is cost and cost-effectiveness of commercial strategies, funding sources, and methods to get approval from decision-makers.

[10] Some crises that were mentioned included glass as a sporadic crisis; others noted landfill expansion opposition, compost odors, paper mill bankruptcies, decreases in overseas markets, fluctuating commodities markets, and economic downturns.

[11] The most commonly-reported bans were of electronics, hazardous materials, vehicle materials, and yard waste. A few mentioned construction and demolition waste, paper, or traditional recyclables.

[12] Bans and mandates were usually reported as hauler responsibilities or enforced via inspections at transfer stations or other facilities. About a quarter of the respondents said there was no enforcement of bans.

[13] The most useful help from the grant program mentioned under "other" was funding for implementation and equipment. A few mentioned consultant technical assistance hours, and education directed to businesses.

1.3 *Strategies that are Most Effective, Least Costly, or Most Cost-Effective*

The program descriptions, detailed interviews, and the rankings and descriptions *(Attachment A)*, all provide information on patterns of features that lead to strong performance. The factors that tend to matter to communities include tonnage diverted from disposal, relative cost to the jurisdiction, and resulting cost-effectiveness (C/E). A program that is highly cost-effective from a community perspective may, in fact, lead to increases in business waste costs or hauler costs. These tradeoffs are clearly noted in *Attachment A, Figure A.1.*

Changes to commercial sector solid waste collection and management to increase waste diversion are likely to increase costs to businesses sector-wide. Without community intervention, the system has tended to gravitate to lowest out-of-pocket cost. Meeting diversion goals or making progress in the sector will require change. The information in *Attachment A* identifies those programs that are more versus less cost-effective, or that are especially strong in their tonnage impacts.

Some programs or initiatives may need to be phased in to implement the most high-performing programs. For example, it is hard to consider a ban in a community without an interested council, or without goals. Beyond phasing considerations, which are described in Section 1.5, the high performing programs are discussed below. Communities also care about the cost to the commercial sector and cost or burden on the haulers. These issues are presented in the performance characteristics tallied in *Attachment A, Figure A.1.*

Findings regarding high performing programs include:

- Mandates and bans, when enforced, drive diversion in the commercial sector. The cost to the community to implement the program is low. The cost to businesses is lower than it would be under a voluntary program because economies of scale can come into play, such as collection and markets. Hauler costs are covered by user fees, so their impacts are not strongly negative, unless they are asked to play a key role in enforcement. Options are listed in *Appendix D*.
- Mandates and bans can sound off-putting, politically. However, studies[14] indicate that these types of strategies deliver more than ten times (and as much as thirty times) the amount of tons per dollar spent by the jurisdiction. Communities may want to prioritize where to spend their "political capital" to get programs passed. However, the mandates and bans must be enforced and provide a level playing field to be most effective, and those are not free. Communities must to be prepared to explain this to the public and to businesses whose costs may increase as a consequence.
- Financial incentives motivate changes, and those should be designed to align with and reinforce the goals desired by the community. If tons diverted are the goal, then tons diverted should be rewarded, etc. Note that efficiencies can be achieved if the goals for haulers are set sector-wide; for example, asking for 25% from the total tonnage of all their commercial customers, rather than from each one of their commercial customers. Requiring 25% diversion by each commercial customer is far more complex and costly to achieve than rewarding for 25% diversion across the hauler's entire commercial customer base. Given an incentive, the hauler can use its knowledge of the customer base to find the tons that are the easiest and least costly to obtain. It may be they can achieve 25% diversion sector-wide by targeting 10% of their biggest-generating or worse-recycling large customers. If a "ton is a ton" to the community, then this is a preferred design.

[14] Skumatz, Lisa A., Ph.D., see SWANA Webinar presentation, 1/8/14, noting achievement of 10-30 times tons for nearly identify community costs. Also presented at Resource Recycling conference, 2012.

1.3 Cont.

Findings regarding high performing programs include:

- Considerations related to business and hauler costs are important, especially as those factors affect the likelihood of gaining political support.
- With a few exceptions, any change to the system is going to cost money. There are some cost savings that a few businesses may realize, such as larger generators that can substantially reduce disposal enough to offset the costs from new recycling bins. Most communities are in a situation in which private haulers run commercial collection, so the community will not see revenue or cost savings from additional recycling. Additional collections cost additional dollars, meaning recycling will tend to increase costs to commercial businesses. Programs that substantially change the framework for recycling can help mitigate the increases by achieving economies of scale, but will be unlikely to decrease total solid waste costs sector-wide. Cities need to be able to either pay money themselves for programs, or be prepared for concerns from commercial generators for increasing their costs.
- Education and outreach programs are popular, and are among the most widely recommended by comprehensive plans and stakeholder committees. Nearly every program in the list will require an educational component, which is critical to effective diversion. However, independent outreach programs may not be the most cost effective, and may not maintain long-term results. Research on this topic in the commercial sector is nearly non-existent, but parallel findings from the residential sector may be useful. Solid waste and recycling education and outreach generally focuses on providing information, based on the assumption that this changes behaviors. To change behavior, an understanding of barriers and program design to reduce those barriers are needed.[15] Unfortunately, the slim statistics available[16] indicate that education and outreach cost-effectiveness ranks below other types of programs. It is also uncertain how long impacts from investments in education and outreach programs last.[17]
- Funding sources are important to explore and compare. The community can reduce budget stresses from outreach programs by requiring quality education or outreach as part of any hauler contracts, franchises, or licensing arrangements. However, this has rarely been required in the commercial sector. Service-based programs are not generally as difficult to fund; costs for collection-based programs can often be recovered through user fees.

[15] This enhancement on basic outreach is the basis of the community-based social marketing literature.

[16] Note that the only statistics available are from the residential sector. Clearly, more study is needed. For two quantitative residential studies, see Skumatz and Green (2001) Evaluating the Impacts of Recycling/Diversion Education Programs – Effective Methods and Optimizing Expenditures, report prepared for Econservation Institute, for Iowa Department of Natural Resources, August 2001, and Skumatz and Freeman, "Social Marketing – Measuring Impacts and Costs in a Project in the Broadlands Neighborhood", Proceedings of the Solid Waste Association of North America Wastecon Conference, 2010.

[17] There is very limited information on the persistence of changes in residential energy behaviors from outreach and education programs (Skumatz, Lisa A., et. al., Lessons Learned and Next Steps in Energy Efficiency Measurement and Attribution: Energy Savings, Net to Gross, Non-Energy Benefits, and Persistence of Energy Efficiency Behavior, prepared for California Institute for Energy and Environment, November 2009). Retention of one-time expenditures does not provide long-term results. The most aggressive assumptions are three years (but this is not based on studies); one year may be a more justifiable assumption.

Figure 1.3 Ten Highest Performing Programs (assessed from jurisdiction perspective)

(Note: Program numbers from Figure 3.2.3 in parentheses are provided for easy reference)

Program Type	Program Title	High tons	Low cost to jurisdiction	High C/E
Mandates and Bans	Targeted mandatory recycling (31)	✓	✓	✓
Mandates and Bans	Mandatory recycling of all beverage containers for selected businesses (32)	✓	✓	✓
Mandates and Bans	Mandatory recycling commercial-wide (33)	✓	✓	✓
Mandates and Bans	Targeted commercial food scraps program (34)	✓	✓	✓
Mandates and Bans	Pay As You Through (PAYT) with embedded recycling (no separate fee) (35)	✓	✓	✓
Mandates and Bans	Disposal or collection bans for key commercially-generated materials (37)	✓	✓	✓
Business Incentives (also mandate/ban)	Recycling and food scraps service available and embedded in all commercial rates (14)	✓	✓	✓
Hauler Goals	Hauler financial and other incentives for meeting commercial sector performance meeting goals	✓	✓	✓
Requirements through Ordinance	Require clear hauler invoices and contracts (9)		✓	✓
Construction and Demolition (C&D)	C&D deposit program (53)	✓	✓	✓

Other programs that provide high- or medium-high tonnage or medium-high cost effectiveness are listed below, also with their reference to the program numbers.

- Hauler incentives with two-tiered disposal rates (lower rates for haulers reaching assigned or agreed goals) (program 16) motivate the haulers financially to reduce trash and increase diversion.
- Business incentives (18) require haulers to charge lower rates for recycling and food scraps than for trash.
- Provide 96-gallon carts to small businesses and allow them to be part of the residential curbside program (27 and 28); and provide convenient, space conscious, and inexpensive ways to divert their recyclable material. Assisting small businesses is especially helpful because they usually represent a large number of businesses, and they may have recycling volumes that are too low to attract affordable recycling service from haulers.
- Implement no bin/no barrel in which collection of trash does not occur if recycling is not set out (36), thereby driving behavior change.
- Change to contracts or municipal collection for the commercial sector (45 and 46), because the municipality can adjust rates for better incentives (or subsidies), and install attractive programs and pricing.

1.3 Cont.

- Develop mixed waste recycling facility (or "dirty MRF"), potentially through public/private partnerships (31). A "dirty MRF" can be a realistic fall-back option to divert recycling materials when behavior change has been difficult or impossible to obtain. Communities have generally considered this a weaker option because of the effects on condition of recycled materials and their value, and because it does not lead to a change in behaviors or a recognition of value for different materials.[18] The presence of a "dirty MRF" option tends to lead to routing changes to keep contaminating waste (restaurants) separate from paper-rich business streams.
- Implement construction and demolition disposal ban (57), which works well, as long as there is processing available.[19]
- Implement a program for small businesses that requires the use of Pay As You Through (PAYT) bags for small businesses (30). If businesses only have to pay for the trash they actually generate (avoiding paying for a "full bin's worth"), they have additional incentives to recycle. This can be an especially important incentive for those on the smallest bin size, with few options to save money through trash reductions.

Other suggestions and considerations for implementing programs include the following.

- Haulers or recyclers may be interested in starting programs, but may not have the means to either find accounts or set up the initial program. Approaching haulers and recyclers or composters can help establish this link. The municipality can intervene with either marketing assistance or initial program help.
- Including the stakeholders such as haulers or businesses in the development stage can point out problems staff may overlook and also create a vested interest in the program on the part of the hauler or businesses.
- Level the playing field by not setting mandates for a specific type of business if there is only one in town. Work with them to establish a recycling program.
- Proper and consistent program enforcement is key to successful and effective programs. Ensure that program enforcement affects all businesses equally.

[18] However, technologies are improving and a few, newer facilities are reporting diversion rates that, even after pulling out the residual and no-marketable commodities, are higher than low-intervention, traditional commercial programs.

[19] The San Jose area provides an excellent model for the types of C&D sorting and recovery facilities that can be encouraged when C&D policies are in place.

1.4 *Sustainability Implications*

The relative sustainability implications of the strategies derive from the greenhouse gas emission avoidance from the diversion of tons from landfill to either recycling or composting. Recycling saves energy and emissions by providing replacement materials for raw materials from virgin sources, and reduces the associated transportation, refining and other steps. Composting is a mostly an aerobic process, which avoids the methane generation that would be produced from landfilling the material, and produces a useful product. Methane is a particularly carbon-heavy material, at least 23 times more potent than carbon dioxide.

These Green House Gas (GHG) benefits follow directly, and in proportion to, the tonnage performances noted below. The following simplified multipliers from the EPA Waste Reduction Model (WARM)[20] can be applied in communities lacking other sources of information. The common units for measuring emissions presented below are "metric tons of carbon dioxide equivalent" (abbreviated MTCO2E here), and energy units are BTUs, or British Thermal Units; both are available from the WARM model outputs.

GHG emissions avoided per 100 Tons of material diverted	Traditional Recycling Mix	Food Scraps	Yard Trimmings	BTU from Recycling
MTCO2E avoided (source: EPA's WARM Model). This is the net difference between recycling/composting and landfilling.	267	89	3.7	1522

In addition, reducing Vehicle Miles Traveled (VMT) from fewer collections, fewer trucks or reduced hauling distances also provides environmental benefits. The literature finds the following factor associated with reductions in emissions from VMT. Note that trash- and recycling-related vehicles achieve miles per gallon in the 2-10 mpg range.

MTCO2E emissions created or avoided from changes in vehicle miles traveled in tons/gallon fuel used	0.00975[21]

[20] Citation www.epa.gov/warm

[21] This is equivalent to 19.5 pounds of carbon dioxide per gallon of fuel.

1.5 *Key Implementation Phases*

Phases for each program represent the general, logical progression of a community from the phase of considering or organizing toward commercial programs, through some of the most aggressive strategies that communities can implement to achieve high levels of commercial recycling and diversion.

- **Phase 1:** The goal of the Phase 1 programs is to gather information, prepare the community, and assess potential waste streams and sectors to prioritize implementation of programs with greater impact. Goals established in this phase will guide selection of programs in other phases. There is usually little cost associated with this phase other than research and there is no specific impact to diversion.
- **Phase 2:** Phase 2 programs require specific information/reporting from haulers and businesses, such as tonnages from haulers and recycling goals from businesses. Phase 2 also includes programs requiring haulers to educate their accounts on available programs and cost savings. Programs in this phase also contain informative-only programs (no requirements) on general cost benefits of recycling or available free services, such as drop off sites. Phase 2 begins to impact tonnage and diversion and involves more community influence and control of programs by establishing ordinances.
- **Phase 3:** Phase 3 programs include incentives for businesses through money saved on normal recycling costs or recognition programs. They are also negatively impacted for failing to recycle through direct fines or paying higher trash rates. In this phase, programs begin to represent direct costs to jurisdiction and businesses, ranging from low to high impacts. These programs tend to have medium to high impacts on tonnage, with most consistently in the middle range. Programs in this phase also require more expenditures by the jurisdiction through implementation of programs and providing more technical assistance to businesses.
- **Phase 4:** Phase 4 programs establish partnerships among businesses and other communities to initiate programs or set up facilities that are lacking. Strategies provide help for small businesses through community programs such as inclusion on residential routes; incentives for haulers and businesses with lower tip fees and taxes on recycling streams; and reduced costs on recycling service. Programs established in this phase have a more cooperative approach as well as positive reinforcement for both businesses and haulers for recycling or offering recycling.
- **Phase 5:** Phase 5 programs incorporate bans, mandates, and programs that target specific waste streams or commercial sectors. Programs target specific items or businesses and have direct consequences for non-compliance and/or for not recycling and can provide cost-effective alternatives for businesses with correct implementation. Included in this phase are programs such as requiring all C&D projects to recycle in order to receive their permit, requiring all businesses to pay for recycling but offering tiered rates, or PAYT for trash service. This phase is the most strict in terms of requirements and enforcement. In general, these programs have the highest impact on diversion and the lowest cost to implement but usually do not require the development of facilities.
- **Phase 6:** Phase 6 programs have a broad reach through policies, contracting, partnerships and include market and facility development. The programs have varying effects on diversion, but create the framework to fully integrate "net zero" waste management in the future.

1.6 Case Study Findings

The information contained in the 39 case studies *(Appendix C)* was derived predominantly from the detailed follow-up interviews of communities nationwide on both the city and county level. Each case study contains links to further resources and information regarding each community, including contact information for a representative of the community. In the course of conducting interviews, several common themes emerged among the participating communities.

The following section describes lessons learned regarding general strategies leading to commercial waste diversion.

Involve the Business Community

Supporting businesses with technical support and advising services is an exceptional model for a successful commercial waste program. For example, Boulder, CO promotes advising services, and it finds these services are an effective technique for businesses with little time or resources to solve energy efficiency and waste management issues. Several other communities offer waste audits to businesses upon request and some proactively visit businesses to schedule audits.

Largo, FL and Boulder County, CO each encourage businesses to find a "champion" within the business to educate other employees and to increase the enthusiasm about waste reduction. The "champion" is not necessarily a decision-maker in the business, but rather a knowledgeable, eager participant leading by example and encouraging behavior changes. Each community found this technique a valuable feature of a successful commercial program.

Many cities emphasized the importance of engaging the business community when formulating policy to address commercial waste. Those surveyed indicated that local businesses were far more likely to comply with commercial waste policy when they were asked for input about the policy. Cities also underscored the importance of engaging businesses as early as possible in the policymaking process to ensure maximum support from the business community. Several cities, including Boise, Idaho, partner with local business organizations, like Chambers of Commerce, for education and outreach. These cities stressed the extent to which this helped inform local businesses of commercial waste policy and rally support in the business community.

Providing businesses with materials and educating those businesses about commercial waste solutions are important steps in helping businesses reach a personalized solution. Many cities offer customized waste audits for businesses to design a unique plan of action for each business. Some cities find it easier to focus outreach on specific sector behaviors and practices. For instance, hotels are presented with a different outreach kit than office buildings or auto repair shops. Working to advance current systems and procedures to improve recycling efforts has been more successful than creating entirely new procedures. Additionally, cities mentioned the importance of approaching businesses with recognition and celebrating previous accomplishments, before improving existing systems. Providing suggestions to create a simple and streamlined waste management process is essential. Frequent and continual education is necessary to keep the business involved in the ever-changing field of waste management as well as to educate employees in fields with high turnover. Recycling guidelines are often made available in multiple languages for both residents and businesses to reach a large spectrum of the population.

Assert Some Control Over Hauler Relationships

Cities identified the importance of having some degree of control over hauling. Control over haulers can take several forms. Some cities, like Los Alamos, NM, serve as the commercial hauler themselves. Other cities, like Ottumwa, IA, require private haulers to acquire a license in order to operate in the city. Taking some control over hauling allows cities to ensure businesses are universally offered commercial recycling. Some cities encourage competition for an exclusive hauler contract, which includes mandatory reporting and tracking. Others contract with multiple haulers for various services and exercise some amount of control in contracts. Auburn, WA contracts with two haulers within city limits. One condition of the contract is that the private haulers must organize outreach and education visits to multi-family units and commercial businesses. Cities serving as the commercial hauler can implement policies, such as lower rates for recycling, which provide monetary incentives for businesses to recycle more material. Regardless of the degree of control, communities have found it crucial to build professional and respectful relationships with area haulers. Shakopee, MN, for instance, meets with haulers regularly to discuss common goals and upcoming changes to gain insight and valuable feedback.

Connect with Youth

School programs are an effective way to engage the entire community in recycling and waste reduction, In Oregon, Portland University has an environmental group that has been instrumental in outreach. The students go door to door to sign up businesses for waste audits and inform them of recycling requirements in the area.

Investigate Options for Multi-Family Units

Multi-family unit recycling is a problem for many communities. Most cities differentiate based on number of units as to whether buildings are commercial customers or residential customers. Some communities have focused efforts on multi-family units with little success. This sector proves difficult for recycling due to contamination levels. In Fayetteville, NC a commercial waste recycling program is being put on hold until the previous multi-family unit program produces more results. Other areas, like Auburn, WA, have had tremendous success, increasing participation to 93% in multi-family units, while overall diversion remains at 18.5%.

Address Space Concerns

Another recurring theme with the cities surveyed was a lack of physical space for recycling and/or compost bins and dumpsters. Richland, WA has written regulations into the building codes for new outdoor enclosure structures that require space for trash, recycling, and compost containers, as has Bellevue, WA. Fayetteville, NC is planning to require interior recycling space in building construction plans in 2016.

Minimize Landfilling of Organics (Composting)

Organic collection varies by community and is an increasingly popular topic among those trying to increase landfill diversion rates. Independent haulers in Boulder, CO provide residential and commercial organic collection. It costs extra for the commercial sector to compost organic waste in Boulder; however the city provides incentives for businesses to voluntarily initiate an organics program, as does the City of Fort Collins, CO. Communities mentioned that permits for composting operations were difficult to attain, as operations and composting processes vary. Some facilities can only accept vegetative materials while others can process meat, eggshells, and bones. Compostable plastics are sometimes accepted but can be discouraged, and a facility can rarely accept diapers and pet waste. Several city waste managers spoke of food bank donation programs for the commercial sector as a priority above composting. Composting operations in most cities focus on large producers: agricultural practices, grocery stores, manufacturing, restaurants, hotels, bars and cafeterias, and large events that serve food.

Address Construction & Demolition Wastes

C&D debris can be included under the commercial waste sector or counted as a separate sector. Materials like concrete, asphalt, metal, drywall and glass are largely inert and do not produce much landfill gases. Some communities treat C&D like MSW and dispose of the majority of the material in the landfill; others have recycling and re-use programs. Aspen, CO provides educational materials in English and/or Spanish with every building permit that it issues. In Boone County, IA, a mandate requires all metals and structural materials to be reused or recycled in a project demolishing 300 tons or more. Several C&D recycling operations are located in or around Boone County and 75% of C&D waste is currently diverted from landfills.

Orange County, CA requires a 50% diversion rate of all C&D materials. Upon receiving a permit to build or renovate there, the county provides the owner or developer of the property with informational materials regarding the C&D recycling requirements. In the event the applicant does not comply with 50% of the total estimated weight diverted, a hold will be placed on the final issuance of the Certificate of Occupancy and it will not be removed until a fine is paid.

Unique Findings

Norton, KS utilizes supervised prisoners to hand sort recyclable materials for baling. This program has proved to be quite successful and cost effective for recycling operations. Newport News, VA has a program for electronic waste (E-waste) processing. Disabled and handicapped people break down e-waste by dismantling and separating materials. U.S. Veterans of the Armed Services, often with physical disabilities themselves, supervise the operations. This program has had such success that there are now multiple E-waste locations in the area.

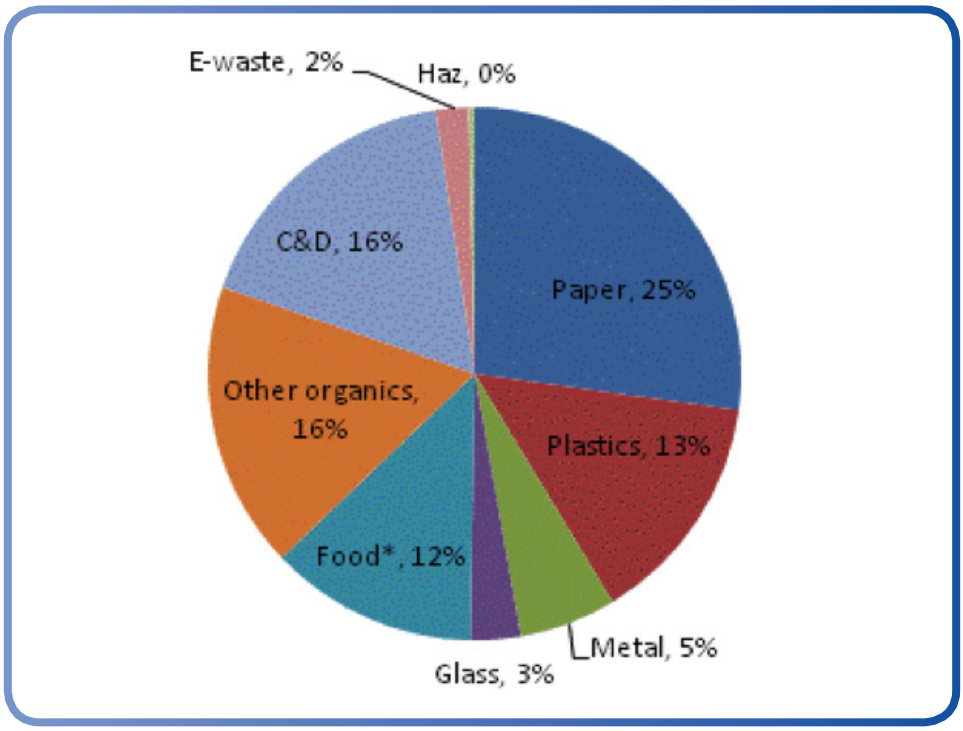
1.7 Commercial Waste Streams

Commercial or ICI (industrial, commercial and institutional) waste compositions from more than a dozen communities around North America were assembled and reviewed. These waste compositions had varying levels of detail; some disaggregated the disposal materials into more than 30 categories, and others reported fewer than a dozen subcategories. The average of the various "high level" categories across all the communities is presented in *Figure 1.7.1* The results indicate that, on average, the commercial stream consists of:

- 25% paper;
- 21% containers (plastic, metal and glass);
- 12% food;
- 16% other organics;
- 16% construction and demolition debris; and
- 1-2% each for hazardous materials and electronics.

These categories comprise the bulk of the waste (more than three-quarters).

Figure 1.7.1 Average Percent of Key Materials from 10 Commercial Waste Comps



Averages and other statistics for subgroups (urban, suburban, etc.) are presented in the figure below, which show substantial variations between the high and low values from different communities (compare minimum and maximum values). Despite the small sample, some patterns based on type of community can be discussed. These patterns are interesting, but are indicative only, given the relatively small sample size.

Figure 1.7.2 Variations in Waste Compositions by Type of Community (small sample)

Waste Stream Subtotal	Average, 10 C&I[22]	Median, 10 C&I	Minimum, 10 C&I	Maximum, 10 C&I	Western towns	Eastern towns	Suburban towns	Rural compositions
Paper	25%	30%	8%	34%	18%	32%	23%	33%
Plastics	13%	12%	10%	19%	13%	13%	13%	13%
Metal	5%	5%	2%	8%	5%	5%	6%	6%
Glass	3%	3%	0%	8%	3%	2%	3%	3%
Food	12%	12%	4%	17%	9%	14%	12%	14%
Other organics	16%	18%	6%	21%	13%	19%	16%	19%
C&D	16%	8%	0%	52%	26%	6%	17%	6%
E-waste	2%	1%	0%	6%	0%	2%	1%	2%
Hazardous Waste	0%	0%	0%	1%	0%	0%	0%	0%
Subtotal Groups	92%	93%	82%	99%	89%	95%	90%	94%

A few communities or states had very detailed waste compositions with dozens of categories, or presented information for individual business classifications. Many of the constituents do not quite parallel the breakdowns from residential sector compositions. Note that the results depend on the local business mix; more detail can be provided by using the waste composition page of the "Commercial Pick" model.[23]

However, communities should note that, to some degree, the largest waste streams remain fairly constant and include paper, plastics, food, other organics, and construction and demolition debris. A detailed waste composition study is not essential to realizing that programs addressing paper (including cardboard) makes sense in most communities. This material represents one-quarter of the commercial stream and is generated in the office sector as well as the offices of all other business types. Programs directed at paper and cardboard would attack a significant share of the waste stream (25% average, and half of the communities had 30% paper). Food scraps programs targeted at grocery, restaurant, and cafeteria sectors have the potential to capture another large remaining stream. Similarly yard debris programs, presumably targeted at the landscaping and similar businesses, could divert a share of the 15-20% of the other organics stream. C&D, depending on the local situation may also represent a significant opportunity. Communities without their own waste compositions may use these as planning-level estimates.

[22] "10 C&I" - Based on 10 observations of commercial and industrial waste streams.

[23] Note that definitions of materials differ somewhat between waste composition studies; this is sometimes due to aggregation of categories to reduce cost, and sometimes potentially based on consultant practices or priorities of the community. Two examples of waste composition definitions are provided within *Appendix E*.

2.0 Using the Commercial Waste Reduction Decision Tool

The purpose of the "Commercial Pick" decision tool is to provide a jurisdiction with a tailored set of program options that can be refined into a local plan of commercial strategies most suited to the community. Using inputs that represent current conditions in each user's community, this tool identifies programs and case studies from similar communities that are implementing successful commercial waste reduction programs. The tool can also be used to run 'what if' scenarios by varying the answers to the initial questions about the community. This allows the user to view which programs could be feasible if the community had different baseline conditions such as sustainability goals or hauler franchising. A few different inputs will produce different results. This iterative process will provide additional potential options that may serve the user community's focus and overall planning. Users are encouraged to experiment with various inputs.

Once the tool identifies programs and case studies, users can review the details of those programs and case studies, related regulations and mandates, and example educational information that successfully have been used by others. It will be up to the community/user to determine exactly which components may work for each community and to create actionable plans that suit the community's specific needs and phase.

2.1 How to Use the "Commercial Pick" Tool

The commercial decision tool – "Commercial Pick" – is a Microsoft Excel based model that assists communities in identifying highly suited programs to reduce commercial waste.

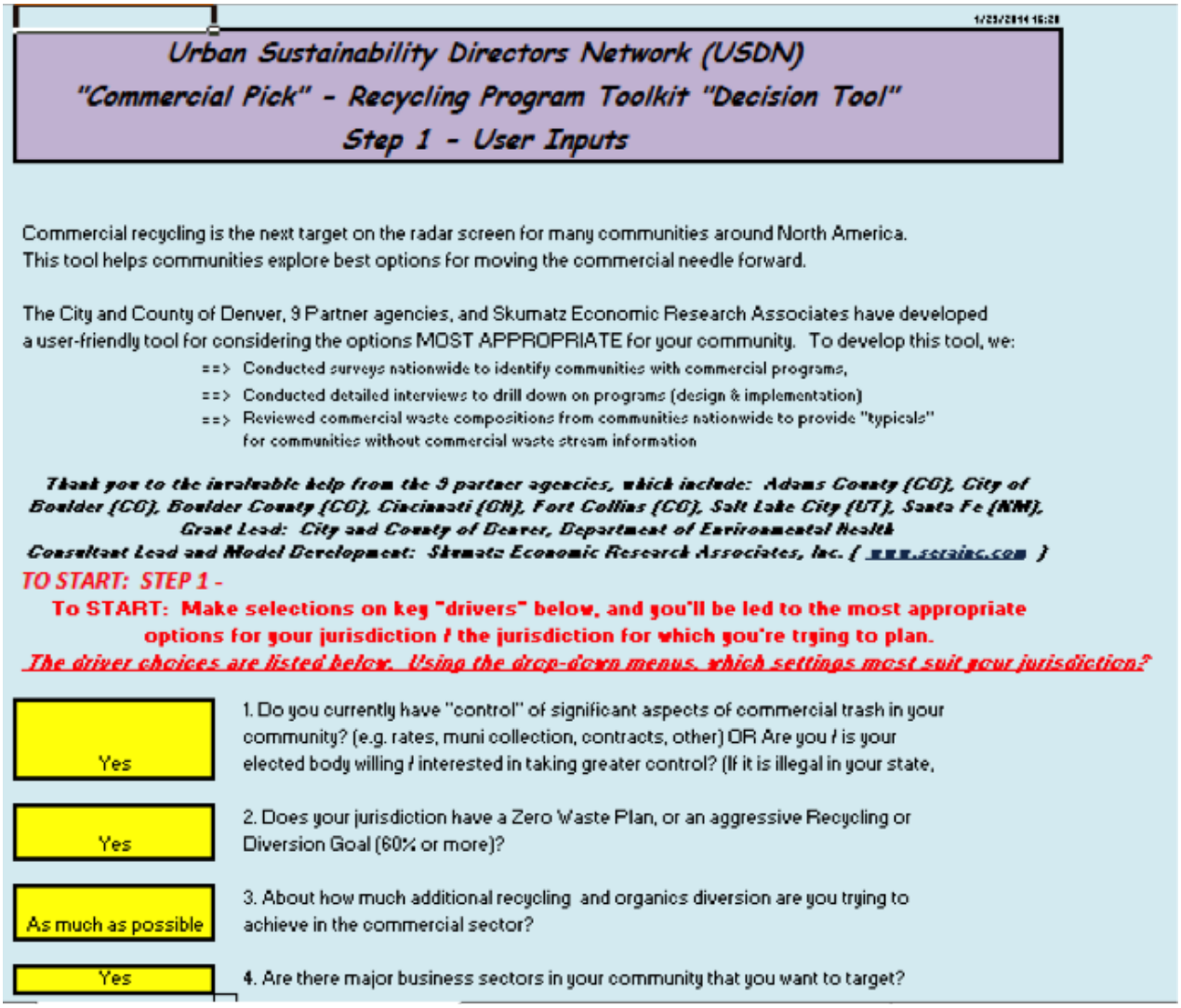
The model asks 23 high-level questions about the user community, which should take no more than 5-10 minutes to complete. Using a scoring mechanism, the tool selects a portfolio of strategies that fits the community characteristics. The tool consists of five key sheets, described below. Screen shots of the first page of each model sheet are also provided below.

2.1 *Cont.*

Worksheet 1: "Opening Page – Start Here"

- **Purpose:** This page asks 23 high-level questions, with easy drop-down response categories, to allow a community to outline its situation and context, which then allows the model to select tailored programs that best match the community.
- **Inputs:** Answers to questions about key community features (population, urban/suburban nature), goals and targets (percentages, target business types or materials), political and administrative situation (authorities available and taken, level of intervention into the commercial market the decision-makers are willing to go, etc.), local economics (tip fees, etc.), and processing capabilities (for recycling, composting, etc.).
- **Outputs:** No outputs on this page.

Figure 2.1.1 Screen shot of Worksheet 1



Urban Sustainability Directors Network (USDN)
"Commercial Pick" - Recycling Program Toolkit "Decision Tool"
Step 1 - User Inputs

Commercial recycling is the next target on the radar screen for many communities around North America.
This tool helps communities explore best options for moving the commercial needle forward.

The City and County of Denver, 9 Partner agencies, and Skumatz Economic Research Associates have developed a user-friendly tool for considering the options MOST APPROPRIATE for your community. To develop this tool, we:

==> Conducted surveys nationwide to identify communities with commercial programs,
==> Conducted detailed interviews to drill down on programs (design & implementation)
==> Reviewed commercial waste compositions from communities nationwide to provide "typicals" for communities without commercial waste stream information

Thank you to the invaluable help from the 9 partner agencies, which include: Adams County (CO), City of Boulder (CO), Boulder County (CO), Cincinnati (OH), Fort Collins (CO), Salt Lake City (UT), Santa Fe (NM), Grant Lead: City and County of Denver, Department of Environmental Health
Consultant Lead and Model Development: Skumatz Economic Research Associates, Inc. (www.serainc.com)

TO START: STEP 1 -
To START: Make selections on key "drivers" below, and you'll be led to the most appropriate options for your jurisdiction / the jurisdiction for which you're trying to plan.
The driver choices are listed below. Using the drop-down menus, which settings most suit your jurisdiction?

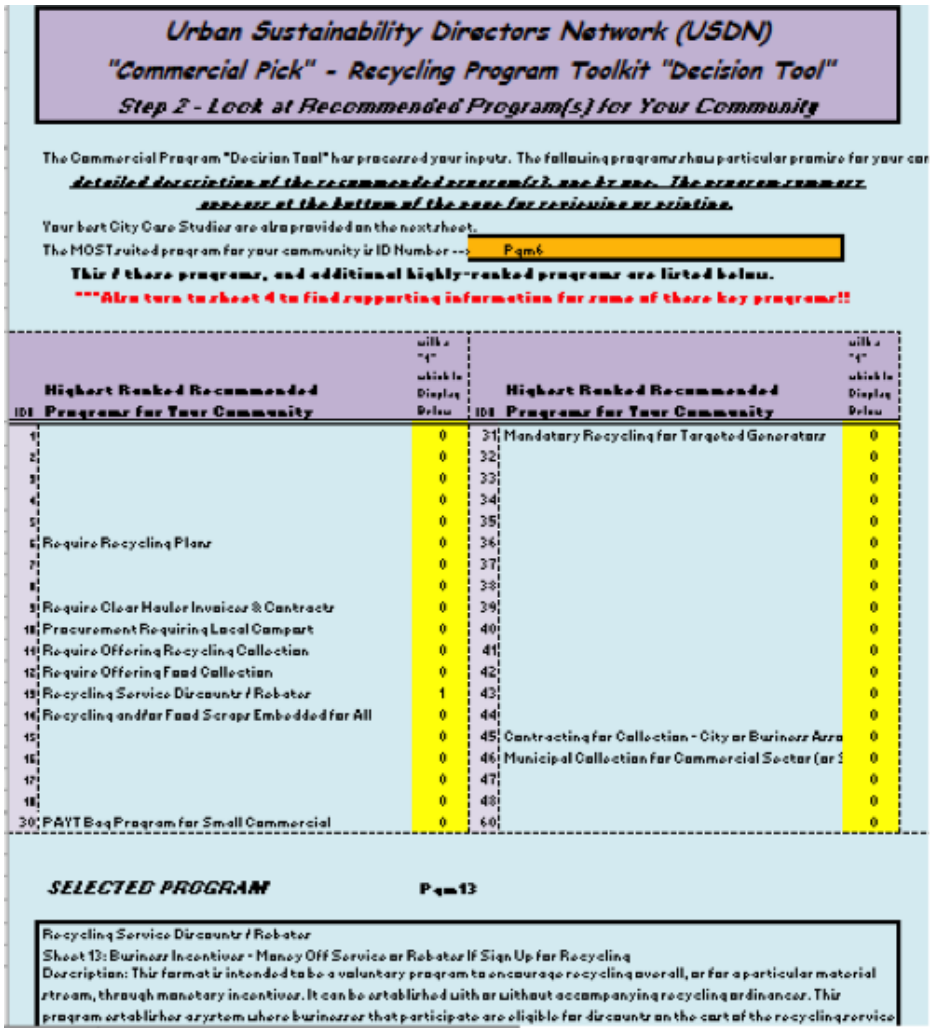
Yes	1. Do you currently have "control" of significant aspects of commercial trash in your community? (e.g. rates, muni collection, contracts, other) OR Are you / is your elected body willing / interested in taking greater control? (If it is illegal in your state,
Yes	2. Does your jurisdiction have a Zero Waste Plan, or an aggressive Recycling or Diversion Goal (60% or more)?
As much as possible	3. About how much additional recycling and organics diversion are you trying to achieve in the commercial sector?
Yes	4. Are there major business sectors in your community that you want to target?

2.1 *Cont.*

Worksheet 2: "Your Program Recommendations"

- **Purpose:** This page provides two sets of outputs for the user community. The first is a list of program names that are well-suited to the community based on their responses from *Worksheet 1*. The page displays the highest ranked program(s), as well as additional programs that were good matches to the priorities and situation. The user then reviews the list of suitable programs, and selects programs of greatest interest on which to display more detailed descriptions. The detailed description discusses the program's name, design, implementation, sectors and materials focus, enforcement options, barriers, relative tonnage and cost impacts, and sample communities with the strategy. If certain types of programs are considered suitable for the community, the worksheet will also direct the user to refer to *Worksheet 4* for additional information.
- **Inputs:** The only user input on this worksheet is to select, one at a time, which of the recommended programs should be displayed in detail.
- **Outputs:** Outputs include the most suited/highest scoring program, a list of high-scoring programs, and the programs for which the detailed description was requested. Note that the high-scoring programs are listed from lowest to highest, with the exception of construction and demolition programs, which are listed last.

Figure 2.1.2 Screen shot of Worksheet 2



Urban Sustainability Directors Network (USDN)
"Commercial Pick" - Recycling Program Toolkit "Decision Tool"
Step 2 - Look at Recommended Program(s) for Your Community

The Commercial Program "Decision Tool" has processed your inputs. The following programs show particular promise for your com
detailed descriptions of the recommended program(s), one by one. The program summary
appears at the bottom of the page for reviewing or printing.
Your best City Case Studies are also provided on the next sheet.
The MOST suited program for your community is ID Number --> Pgm6
This / these programs, and additional highly-ranked programs are listed below.
"""Also turn to sheet 4 to find supporting information for some of these key programs!!

ID#	Highest Ranked Recommended Programs for Your Community	with a "1" which is Display Below	ID#	Highest Ranked Recommended Programs for Your Community	with a "1" which is Display Below
1		0	31	Mandatory Recycling for Targeted Generators	0
2		0	32		0
3		0	33		0
4		0	34		0
5		0	35		0
6	Require Recycling Plans	0	36		0
7		0	37		0
8		0	38		0
9	Require Clear Hauler Invoices & Contracts	0	39		0
10	Procurement Requiring Local Compost	0	40		0
11	Require Offering Recycling Collection	0	41		0
12	Require Offering Food Collection	0	42		0
13	Recycling Service Discounts / Rebates	1	43		0
14	Recycling and/or Food Scraps Embedded for All	0	44		0
15		0	45	Contracting for Collection - City or Business Area	0
16		0	46	Municipal Collection for Commercial Sector (or S	0
17		0	47		0
18		0	48		0
30	PAYT Bag Program for Small Commercial	0	60		0

SELECTED PROGRAM Pgm13

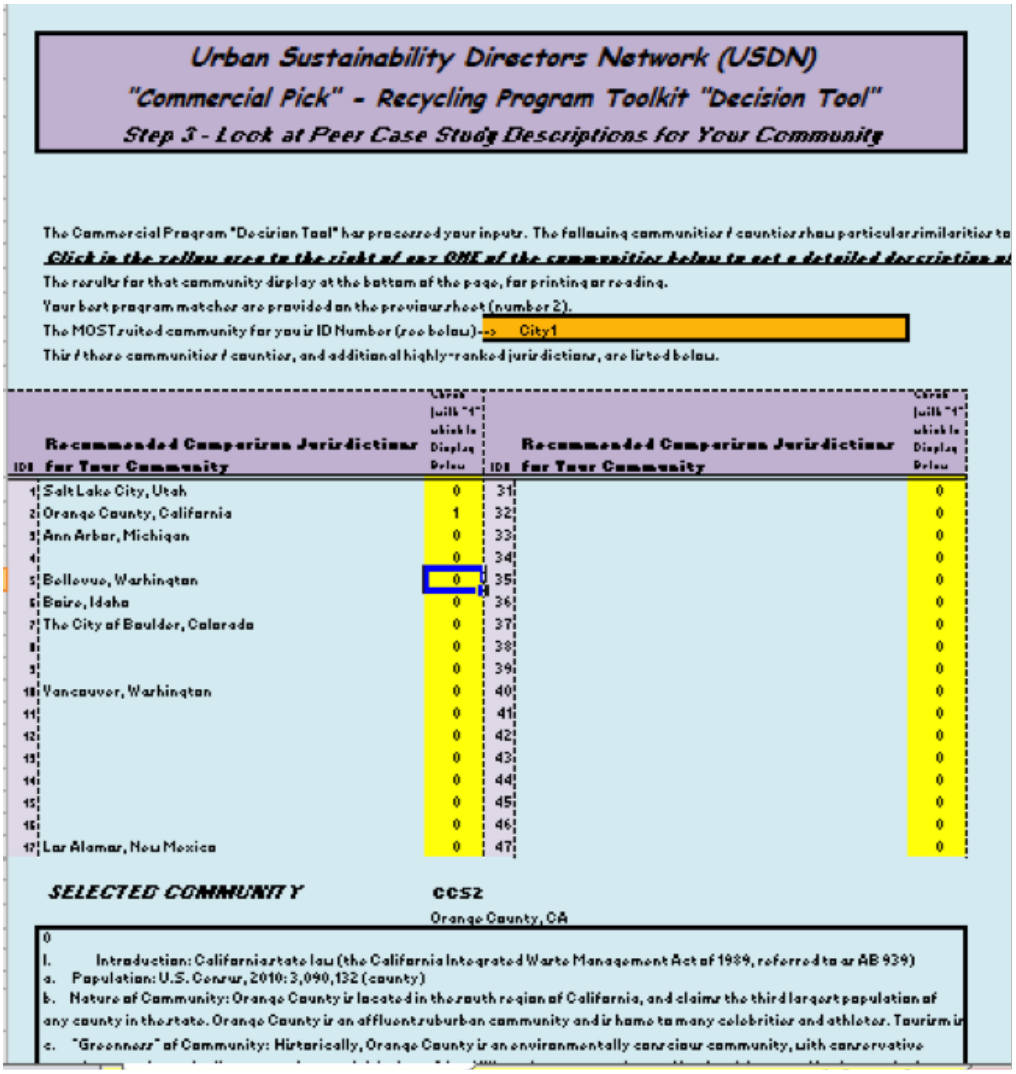
Recycling Service Discounts / Rebates
Sheet 13: Business Incentives - Money Off Service or Rebates If Sign Up for Recycling
Description: This format is intended to be a voluntary program to encourage recycling overall, or for a particular material stream, through monetary incentives. It can be established with or without accompanying recycling ordinances. This program establishes a system where businesses that participate are eligible for discounts on the cost of the recycling service

2.1 *Cont.*

Worksheet 3: "Your Case Studies"

- **Purpose:** This page provides two sets of outputs. The first is a list of community or county case studies that are well-suited to the jurisdiction, based on its responses from *Worksheet 1*. The page displays the highest ranked community case study at the top of the page, as well as additional case study communities that were good matches to the priorities and situation. The user then reviews the list of suitable communities, and selects the detailed case study description to be displayed. The description discusses the community's name, key demographics and solid waste characteristics (landfill fees, etc.), contact information, and other community details.
- **Inputs:** The only user input on this worksheet is to select, one at a time, which of the recommended case studies should be displayed in detail.
- **Outputs:** Outputs include a list of a variety of high scoring/comparable communities, and the community for which the detailed case study printout was requested.

Figure 2.1.3 Screen shot of Worksheet 3



Urban Sustainability Directors Network (USDN)
"Commercial Pick" - Recycling Program Toolkit "Decision Tool"
Step 3 - Look at Peer Case Study Descriptions for Your Community

The Commercial Program "Decision Tool" has processed your inputs. The following communities / counties show particular similarities to
Click in the yellow area to the right of any ONE of the communities below to get a detailed description of
The results for that community display at the bottom of the page, for printing or reading.
Your best program matches are provided on the previous sheet (number 2).
The MOST suited community for you is ID Number (see below)--> City1
This / these communities / counties, and additional highly-ranked jurisdictions, are listed below.

ID#	Recommended Comparison Jurisdictions For Your Community	Check (with "1" which is Display Below)	ID#	Recommended Comparison Jurisdictions For Your Community	Check (with "1" which is Display Below)
1	Salt Lake City, Utah	0	31		0
2	Orange County, California	1	32		0
3	Ann Arbor, Michigan	0	33		0
4		0	34		0
5	Bellevue, Washington	0	35		0
6	Boise, Idaho	0	36		0
7	The City of Boulder, Colorado	0	37		0
8		0	38		0
9		0	39		0
10	Vancouver, Washington	0	40		0
11		0	41		0
12		0	42		0
13		0	43		0
14		0	44		0
15		0	45		0
16		0	46		0
17	Los Alamos, New Mexico	0	47		0

SELECTED COMMUNITY CCS2
Orange County, CA

0
I. Introduction: California state law (the California Integrated Waste Management Act of 1989, referred to as AB 939)
a. Population: U.S. Census, 2010: 3,090,132 (county)
b. Nature of Community: Orange County is located in the south region of California, and claims the third largest population of any county in the state. Orange County is an affluent suburban community and is home to many celebrities and athletes. Tourism is
c. "Greenness" of Community: Historically, Orange County is an environmentally conscious community, with conservative

2.1 *Cont.*

Worksheet 4: "Your SUPPORTING Information"

- **Purpose:** *Worksheet 4* provides additional supporting information for the community, including links to sample ordinances, enforcement information, or additional descriptions for certain types of programs identified on *Worksheet 2*.
- **Inputs:** No inputs are entered on this worksheet.
- **Outputs:** Additional supporting information is provided if mandates, bans, goals, hauler programs, or education programs are identified for the community.

Figure 2.1.4 Screen shot of Worksheet 4

Urban Sustainability Directors Network (USDN)

"Commercial Pick" - Recycling Program Toolkit "Decision Tool"

Step 4 - Supporting Materials for YOUR Jurisdiction's Recommendations

For some programs, we have additional information available. For those cases, this sheet provides supporting materials related to your jurisdiction's program recommendations. Print or review your community's results. No user inputs are needed on this sheet.

MANDATES: IF your community's recommendations included mandates, the following are a few examples of their design / enforcement, and materials included.

Juridiction	Program	How Enforced	Materials Cove	Comments	Citations / more info	Links
Albany,,NY	Mandatory recycling for commercial, industrial, mfu's and institutional establishments	If convicted in court, imprisonment for up to 15 days, community service or fine of no more than $325 and not less than $25 (or combination of above)	Glass,Cardboard,Paper,Metal, CansPlastic,		http://www.albanyny.org/Government/Departments/GeneralServices/TrashRecycling/Recycling.aspx	actual regulation at: http://albanyny.gov/_files/Government/GeneralServices/313-11-25.pdf
Boston,,MA	Mandate that commercial haulers offer recycling	Requirement to receive a permit/revocation of permit on 3rd violation; $150 fine for first violation, $300 fine for second violation	Glass,Cardboard,Paper,Metal,Plastic,Yard Waste,C&D,		http://www.cityofboston.gov/images_documents/Commercial%20Trash%20Hauler%20Ordinance_tcm3-10117.pdf	http://www.cityofboston.gov/images_documents/Commercial%20Trash%20Hauler%20Ordinance_tcm3-10117.pdf
Minneapolis,,MN	Commercial and business property owners required to offer recycling	Administrative penalties determined by statute	Glass,Cardboard,Paper,Metal,Plastic,	Commercial property owners must provide: recycling plan; recycling containers; written recycling information and instructions; a recycling collection/storage area	http://www.minneapolismn.gov/regservices/fire/w/CMS1P-082517	http://library.municode.com/HTML/11430/level4/COOR_TIT3FIPOPR_CH174MIFIDEFIPRBU_ARTIVCOBURERE.html#COOR_TIT3FIPOPR_CH174MIFIDEFIPRBU_ARTIVCOBURERE_174.435RECOBU
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

BANS: IF your juridiction's recommendations included the establishment of BANS, the following provides a few examples from elsewhere.

Juridiction	Program	How Enforced	Materials Cove	Comments	Citations / more info	Links
Nashville,,Tennessee	Materials Ban		Cardboard,E-Waste,YardWaste,	E-waste regulation does not go into affect until 2015	http://www.nashville.gov/Public-Works/Neighborhood-Services/Trash-Collection/Commercial.aspx	http://library.municode.com/HTML/14214/level5/CHRELACOTA_TIT10HESA_DIVIGERE_CH10.20WAMA_ARTIGERE.html#CHRELACOTA_TIT10HESA_DIVIGERE_CH1020WAMA_ARTIGERE_10.20.035YAWACOCAELWABASOWACO
	Restrictions on materials: as of 7/11: no yard waste allowed in trash carts,(or dumpsters/compactors etc.) as of 7/13:					

Worksheet 5: "Creating Your Waste Comp"

- **Purpose:** If the user community has not conducted a commercial waste composition or characterization study, this page may be used to either: 1) create a proxy waste composition, tailored to the community's employment profile by major industry type, or 2) find and use a comparable community's waste composition information. This stand-in approach is acceptable since waste compositions typically do not drive the selection of commercial program types or activities.
- **Inputs:** There are two types of inputs: 1) the community or county's employment by sector (or the percentage of employment by sector), and 2) the responses to several high-level questions that help identify a suitable waste composition proxy from among several collected as part of this project's research.
- **Outputs:** A proxy waste composition that can be used to stand in for the community for program planning purposes.

Figure 2.1.5 Screen shot of Worksheet 5

Urban Sustainability Directors Network (USDN)
"Commercial Pick" - Recycling Program Toolkit "Decision Tool"
Step 4 - Optional: Devising Proxy Waste Composition

To create a proxy waste comp for your area (in purple below), you need to FILL IN the employment in the following sectors. In addition, a waste comp from a community "like" yours shows up at the right.
Your commercial waste composition may vary from this computed number if you are a high / low vegetation area,
or if you currently have significant commercial recycling activity or significant organics recovery from the commercial sector already.

OPTION 1: CREATE A WASTE COMP USING YOUR LOCAL EMPLOYMENT

Tell us whether you are filling in EMPLOYMENT or PERCENT OF EMPLOYMENT

Filling in Employment ==>	0
Filling in Percent Employment==>	1

RESULTS BELOW: Computed (Proxy) Waste Comp fo
NOTE your employment percentages don't sum to 1. Your proxy waste comp based on your employmen

OPTION 2: PULLING A WASTE COMP FROM ANOTHER "SIMILAR" COMMUNIT

Option 2: A commercial waste comp from a "comparable" communit
STEP 1: Select your community's characteristics from the list below in ge
Step 2: THEN, based on the business types available at the right, pick up to 5 bu
Select ONE waste comp below, using a "1" to indicate the one

0	0	1	0	0	6	0	0	0
Calif Statewide	Seattle	Alameda	City 4	City 5	City 6	City 7	City 8	City 9 C&D
1	2	3	4	5	6	7	8	9

Please fill in your local employment by sector in the yellow cells

Sector	Employmen	Pct Empl
Agriculture/ Fisheries	300	
Communications	300	
Construction	300	10%
Finance/ Insurance/ Real Estate/	300	40%
Forestry	300	
Manufacturing- apparel/ Textile	300	
Manufacturing-Chemical/ Allied	300	
Manufacturing-Electronic Equipm	300	
Manufacturing-Food/ Kindred	300	
Manufacturing-Furniture/ Fixture	300	
Manufacturing-Industrial Machin	300	
Manufacturing-Instruments/ relat	300	
Manufacturing-Lumber/ Wood Pr	300	
Manufacturing-Other	300	
Manufacturing-Paper/ Allied	300	

OPTION 1

Percent of Total MSW Stream		
Major Categories		Key Subtotals
Paper	29.6%	
Glass	3.3%	
Metal	5.7%	
Plastic	6.6%	
Other Organic	34.2%	
Construction & Demolition	17.0%	
Household Haz Waste	0.2%	
Special Waste	3.2%	
Mixed Residue	0.3%	100.0%
Sub-Categories -- Paper		
Uncoated Corrugated Cardboard	19.9%	
Paper Bags	1.5%	
Newspaper	10.8%	
White Ledger	11.2%	
Color Ledger	0.6%	

		Groups	MfrElect	c	MfrPaper	MfrSone
	300	301	303	306	309	312
1	OCC	8.0%	8.3%	3.5%	2.2%	0.0%
2	High Grade	4.0%	4.6%	1.3%	0.0%	0.0%
3	Newpaper/Magazines	5.7%	3.3%	4.9%	0.8%	0.0%
4	Mixed Paper	5.3%	7.8%	3.5%	2.0%	0.0%
5	Other Paper	11.9%	24.5%	45.4%	10.3%	0.0%
6	HDPE/PET Containers	1.5%	1.2%	1.0%	0.0%	0.0%
7	Film Plastics	7.7%	12.3%	6.9%	22.3%	0.0%
8	Other Plastics	6.5%	6.0%	16.6%	9.3%	0.0%
9	Recyclable Glass	1.8%	0.9%	3.2%	0.0%	0.0%
10	Other Glass	1.1%	2.8%	0.0%	0.0%	0.0%
11	AL Cans	0.3%	0.6%	0.4%	0.0%	0.0%
12	Steel Cans	0.3%	0.4%	1.1%	0.0%	0.0%
13	Other Metal	6.2%	4.1%	0.9%	22.5%	0.0%
14	Yard Waste	5.6%	6.1%	0.0%	0.0%	0.0%
15	Food Waste	9.6%	9.1%	5.1%	0.4%	0.0%
16	Wood Unpainted	7.4%	3.6%	0.0%	7.8%	0.0%

2.2 Basis for Program and Case Study Output Selections

The program and case study selections were based on scoring mechanisms directly related to the community responses on *Worksheet 1*. The program scoring followed rules similar to the following:

- Mandates and bans received points if the community reports they have Zero Waste or other aggressive goals, they already have some bans, or they are interested in aggressive programs.
- Programs related to planning or "setting up" received points for communities in early stages of commercial program development, such as communities without current goals, without control, without interest in aggressive strategies, or without much infrastructure.
- Communities that stated decision makers were unlikely to be inclined to intervene substantially in the commercial sector did not receive points for programs like hauler interventions and bans/mandates.
- Communities willing to take more aggressive roles in assuming authority, intervening in the sector, or who had strong downtown business associations, were potential candidates for contracted service options.
- Landfill-based surcharges or similar strategies were not given points if the community did not have control over the landfills.
- Programs suited to the community's business sectors or target materials of interest were awarded points.
- Communities without existing curbside recycling did not receive recommendations related to commercial expansion and other similar rules.

Community matches were established in terms of:

- Region of the country, population, urban/suburban mix;
- Similar interest in "aggressive" interventions, or "green"-ness;
- Similar tip fees; and
- Similar access to recycling/composting facilities, and markets.

3.0 *Project Supporting Information*

This report and tool were developed to assist jurisdictions in the evaluation and selection of programs that improve recycling and waste diversion among their business sectors. The information is designed for a broad audience of USDN members and potentially communities across the nation. The work involved:

- Review of the literature to identify leading communities, program types and variations, waste compositions, and useful supporting information;
- Detailed surveys that asked about community context and the presence and type of commercial recycling activities so we could analyze driver characteristics;
- Detailed case studies to better understand how programs are implemented and what types of communities implement commercial programs;
- Creation of a decision tool that uses information from long-term experience in the commercial sector, information from the interviews, and the analyses of statistical and survey data to sort among the wide range of programs and identify programs and community/county case studies most suited to communities that are considering moving forward in commercial collection; and
- Development of a website and webinar to introduce the commercial recycling materials to the audience of communities within USDN and across the country.

3.1 *Data Collection*

The project included a substantial amount of primary and secondary data collection. The project team's activities included the following.

- **Research on waste composition studies –** Gathering commercial (and in some cases, C&D) waste composition studies and data from the web, phone interviews, and surveys.
- **Large-scale survey data collection -** Preparing a survey instrument that asked communities about community conditions, drivers for implementing commercial and other programs, and the wide range of types of commercial programs that they have implemented. The survey was advertised through USDN, networked through the partner communities, and augmented with data achieved through outreach to communities in another database maintained by the lead consultant.
- **Detailed follow-up interviews -** Conducting detailed interviews with assigned communities that represented the wide range of programs and community types. Data were collected on community context, driver factors, and the design and performance of key commercial programs in their communities. The communities were identified from among the respondents to the large-scale survey, and selected to include variations in program types and community conditions so a wide representation could be achieved.

These various pieces of data were analyzed to provide the research conclusions, tools, data, and write-ups included in this document (including program and case study descriptions) and the decision tool.

The survey questionnaire for the large scale and the interview guide for the detailed interviews are included in the appendix.

3.2 Data Analysis

Observations and statistical analyses were used to evaluate drivers and programs.

3.2.1 "Driver" Factors, Decision-Makers, and Barriers

Working with data from the respondents to the USDN survey, we conducted a statistical analysis of the factors that were correlated with the presence of commercial programs. The hypothesis was that these factors would represent drivers that identified conditions favorable for, or leading to, commercial program development and implementation. We used both simple correlation and other statistical techniques.[24] Prior to conducting the analysis, we expected the following might help explain communities that had implemented commercial programs:

- Higher tip fees;
- Public versus private ownership of waste facilities;
- City versus. county;
- Hauler arrangements ;
- Market access;
- Solid waste crisis;
- Size of town;
- Type of town (tourist, college, etc)

None of these factors was a strong explanatory factor. *Figure 3.2.1* lists a number of factors that were, and were not, related as a motivator or decision-maker (types of drivers) for the implementation of commercial programs. In this figure, drivers are designated as having correlation factors of at least 0.4[25] or better.

The most important takeaways were that the following three factors were in place in communities with commercial programs:

- State or local waste recycling or diversion goals or plans;
- Local government staff actively pursuing the program; and
- Significant progress in the residential sector already experienced.

[24] We used multivariate regression analysis and methods appropriate for explaining presence/absence of factors – here, appropriately defined as "yes/no" for the presence of commercial programs. A value of 0.4 is at best a weak correlation; a strong positive correlation is 0.8 or above.

[25] None of the data had a correlation greater than 0.5 (note that strong correlations for time series data – data across time - might be 0.8; for cross section data, which this represents, could be lower); two factors slightly below this threshold were included in the table (facility investment and regional planning agency). They had correlations greater than 0.37 and were included to provide a fuller picture of the types of factors that were related to the presence of commercial programs. The next highest correlations on the topic were less than 0.32.

Figure 3.2.1 Key Motivators and Most Important Decision Drivers for Communities with Commercial Programs

Topic	Detailed Factors: Communities with these factors were/were not more likely to have commercial waste diversion recycling programs in place.	Driver	Not Driver
Goals established	The adoption of State, regional or local recycling or diversion goals or Climate Action/Sustainability Plans	✓	
"Green" image	Local "green" image led to an expectation of greater recycling attention in the commercial sector	✓	
Business interest	Businesses expressed interest in recycling	✓	
Residential progress	Significant progress in recycling in the residential sector had already been achieved	✓	
Facility investment	A local recycling facility was invested in, and it needs more tons for continued/increasing success	✓	
Size/urban/suburban	Larger communities were more likely to have commercial programs (they are also more likely to have more businesses)	✓	
Landfill shortage	Shortage of landfill or disposal space did not have a significant effect on the presence of commercial programs		✓
Disposal tip fees	Higher disposal tipping fees were not a determinant in the presence of commercial programs		✓
Region of the country	The region of the country was not significantly related to the presence of commercial programs		✓
Market access	Nearness to a port or recycling market access did not have a significant effect on the presence of commercial programs		✓
Staff activity	Community staff were some of the most important decision-makers in driving action toward introduction of commercial programs, as they often know what is happening in other communities and are in a position to study, design, and advocate for programs.	✓	
Regional planning agency	The presence of a regional planning agency in the area was positively related to undertaking some programs in the commercial sector	✓	
Council/commissioners (elected officials)	Elected councils, commissioners, mayors, etc. were not cited as the key decision-makers in driving introduction of commercial programs		✓
Voters	Introduction of commercial programs was not driven by voters		✓
Haulers	Haulers were not cited as the key decision-makers in driving introduction of commercial programs		✓
Local task forces	Local task forces were not cited as the key decision-makers in driving introduction of commercial programs		✓
State planners	State planners were not considered driver/decision-makers in introduction of commercial programs		✓

3.2.1 *Cont.*

Survey respondents were also asked about the factors that have been barriers in their adoption or introduction of commercial programs. The most common general types of barriers stated included:[26]

- Costs to businesses;
- Politics;
- Program staffing/focused on residential;
- Low tip fees/difficult economics; and
- Lack of mandates.

A few respondents mentioned problematic regulations, and a few others mentioned they had no barriers.

There has been a long-standing opinion that higher tip fees and favorable economic factors drive program adoption, and here, communities reported their perceptions that low tip fees were a barrier to program introduction. However, note that high tip fees were not found to be statistically related to whether or not a community had introduced commercial programs.

When asked more specifically about the barriers that needed to be addressed in order to spur commercial program implementation, the top-mentioned included:

- Education;
- Money; and
- Ordinances/laws.

Ordinances/laws were most strongly correlated with the presence of commercial programs, showing a factor of almost 0.4.

Other, less common, barriers to get past that were mentioned by a few respondents included: separate recycling fees for the commercial sector, enforcement, getting to the right person at the business, container space, business involvement, containers and incentives.

The most common source of program funding, or planned source, was user fees (commercial or residential). All the other sources were mentioned far less frequently, but included tip fee surcharges, solid waste fund taxes, or grants. Some also mentioned franchise or hauler fees. The most common other source mentioned was the general fund.

[26] Other, less common, comments included: apathy from businesses (who may have access, but don't use it), lack of control / not the city's business, small community, and container space limitations at the business.

3.2.2 Types of Commercial Programs in Respondent Communities

Based on a priori research in the commercial sector and interviews and discussions with partners, we identified a number of classes of commercial programs. The review of the survey was used to identify the relative frequency of mentions for each program class; this is also presented in *Figure 3.2.2*.

At the highest level, strategies can be categorized into three types

- **Programs:** Programs tend to be services or recycling opportunities offered by or designed by the local government, and can consist of options such as making small commercial entities eligible for the residential sector's curbside recycling, or providing technical assistance to businesses on how to recycle better. Programs can also be mandatory or voluntary. An example of a mandatory programs might be the requirement for all restaurants and bars that serve food to recycle all their beverage containers or potentially lose their liquor license; a voluntary program example would be an option for businesses to request technical assistance or a waste audit related to recycling.
- **Policies or regulations:** Policies or regulations are generally passed by a governmental or regulatory body, or by an entity overseeing a facility, and stipulate behaviors or activities that must be undertaken. In some cases they may be as simple as policies requiring tracking and reporting of tons, or about where materials may or may not be taken, or how they will be priced. In other cases, they require specific behaviors or service options. For example, no bin/no barrel policies require that trash may only be collected if recycling is put out as well. Policies or regulations tend to be mandatory and affect all relevant establishments in the community covered by the regulation.
- **Incentives:** Incentives are strategies that affect the economics of decision making about solid waste management. These types of strategies may include subsidized tipping fees at public facilities that increase the cost of MSW and decrease the tipping fee for organics or C&D to encourage more separation of the materials. Another example might be an incentive from the community that reduces various fees, such as franchise fees, to haulers that meet specific recycling goals from their commercial customers. The first example is a mandatory incentive; the second is voluntary.

There is not a perfect distinction between these categories, but the categories work to generally classify options for communities.

Figure 3.2.2 Frequencies of Types of Commercial Programs (among Survey Responses)

Frequency of Types of Commercial Programs	Examples	Most commonly reported	Somewhat commonly reported	Least commonly reported
Outreach/tips (voluntary)	Outreach/tips on who supplies services, how to recycle, peer information exchange, information on contract negotiation	✓		
Reporting/tracking-related programs (usually mandatory)	Data reporting on waste generation, recycling, or diversion from routes or sites as required of haulers, sites, or facilities	✓		
Goals for businesses or haulers (voluntary or mandates)	Minimum waste diversion goals or participation requirements	✓		
Recycling mandates on some business types (mandatory)	Required participation in recycling programs by some or all business types; certain materials must be recycled or otherwise diverted from the waste stream; filing recycling "plans" required by ordinance (closely related to material bans)		✓	
Requirements to offer recycling to some or all business types (mandatory)	Provision of recycling and composting services must be offered by haulers/ businesses (all businesses or targeted business types)		✓	
Construction/demolition programs (usually mandatory)	"Deposit" programs; requirements to recycle on-site; extra points in contracts for recycling		✓	
Grants, technical assistance, awards/recognition (voluntary)	Business grants; technical assistance on product substitution to reduce waste generation; business assistance targeted at specific waste generators such as recycling within office buildings; or composting of restaurant wastes		✓	
Programs for small businesses (usually voluntary)	Making small businesses eligible for curbside programs or drop-offs; business aggregation to collectivize recycling or composting services		✓	
Incentives for haulers, businesses, or special tip fees/surcharges (voluntary or mandatory)	Financial incentives to haulers for achieving program participation or percentage goals; differential tip fees or surcharges based on materials; city pays businesses for several months of new recycling service subscriptions			✓

Figure 3.2.2 Cont.

Procurement programs (voluntary or mandatory)	Procurement of recycled/ composted materials in order to create market demand	Most commonly reported	Somewhat commonly reported	Least commonly reported
Hub and spoke activities[27]	Aggregation of materials at regionally-distributed drop-off facilities with minimal processing; bringing materials to a centralized hub for processing; and aggregation for better prices/economies			✓
Material bans directed at commercial (mandatory)	Ban disposal of materials at landfills or ban collection (closely related to recycling mandates)			✓
City conducting/intervening in/ organizing commercial collection (generally mandatory)	Franchising waste hauling; contracts for collection; and other interventions			✓
Market development & other (voluntary or mandatory)	Community helping with creation of markets and/or market development[28] for materials that would otherwise be disposed; creation of waste exchanges; city develops or partners on establishment of missing infrastructure			✓

Note that least commonly reported doesn't mean the programs are bad or poorly suited. In fact, some of these can be the most effective programs of all in terms of encouraging waste diversion practices. The infrequency most likely results from the fact that many communities have not been interested in getting that aggressive in intervening in the commercial sector, or they have not gotten there yet. Recall that the sample of respondents is not a statistical representation of the communities in the US. It represents those that responded to the survey, and will tend to include more communities with commercial strategies than the general population of communities nationwide. When asked about commercial programs they have considered, but not yet implemented, the most commonly mentioned programs were commercial food scrap composting, bans and mandates.

[27] Voluntary versus mandatory classifications do not make sense for this infrastructure approach.

[28] Procurement mandates can be more effective then voluntary programs.

3.2.2 Cont.

When commercial programs are in place, or under consideration, they have most frequently targeted the following sectors and materials.

Most frequently-targeted commercial sectors	Most frequently-targeted materials
• Multifamily • Schools • Restaurant • Retail • Offices • Small businesses	• Office paper • Cardboard • Plastic • Electronic waste (e-waste) • Containers (metal, plastic and glass) • Plastic film • Compostable

Agriculture was rarely a focus in respondent communities. Wood pallets were mentioned, but less frequently than other materials.

Highest participation is likely to result for programs focusing on targeted materials. Programs that focus on, for instance, capturing food scraps from groceries, or bottles and cans from bars, tend to capitalize on materials that are appropriate for a business, and may perform better than programs that paint the sector with a broad brush.

3.2.3 Commercial Programs, Strengths/Weaknesses, and Relative Performance

Each of the program classifications listed in *Figure 3.2.3* has myriad variations. We identified a number of these variations, and list them below. They are further described in *Attachment A.*

One of the key activities of the project was to describe, and assess, a host of commercial programs uncovered in the project research. We list the programs, by group or category, below. In addition, two key *Figures, A.1* and *A.2* (included as an *Attachment A* because they are too large to include here), provide valuable information on the relative performance features for the programs. Their contents are described below.

- ***Figure A. 1*** provides the relative performance for commercial sector tonnage impacts, relative cost to the jurisdiction, and relative cost-effectiveness to the jurisdiction. The figure also provides relative costs for the hauler and the community's commercial sector. The last two columns identify the degree to which the program can be a driver for change in commercial sector recycling and diversion, and the general phasing for when the program might be considered as communities move forward in waste diversion, with "1" meaning preliminary steps, and "6" meaning steps for more mature waste diversion portfolios/communities. We highlight the best performances for the various performance metrics, with yellow highlighting the most important factors for jurisdictions, and blue for factors that affect the jurisdiction's government less directly.

3.2.3 Cont.

- ***Figure A. 2*** summarizes the strengths and weaknesses of the strategies, as well as auxiliary benefits or co-benefits. Some examples include job creation, or fewer vehicle miles traveled (which affects air emissions as well). Note these are benefits beyond direct GHG reductions from the tonnage diversion.

To provide relative performance information, we relied on a variety of sources including: detailed interviews, performance of similar programs in the residential sector, and consultant/planning judgment.[29]

Programs with high tonnage diversion and low (jurisdiction) costs are expected to provide high cost-effectiveness. Those with low (direct) tonnage impacts will not be highlighted; however, in some cases, these are essential programs for an early phase that will help define next steps or phases. In most cases, the programs ranked high for drives change in *Figure A.1* are those that change the rules or playing field (collection, pricing, incentives, or other elements) for waste diversion, rid the system of a key barrier (like extra costs for recycling services beyond trash hauling), or otherwise serve as a driver for moving waste diversion forward.

Although cost information, cost-effectiveness, and benefit-cost information were among the most requested by communities that expressed interest in the outcomes of this project, the information is simply not available from virtually any communities with commercial programs. This derives from key contributing factors, which are essentially fatal flaws in gaining this information.

- Few communities are responsible for collection of or even measure tonnages from the commercial sector. Virtually none conduct evaluations to measure the tonnages attributable to specific programs or activities.
- Few communities track the costs associated with commercial programs, as a group or by individual program. A few cases noted they may track combined costs (residential and commercial) but cannot or do not separate the two. Virtually none track the cost to businesses (many do not know rates in the commercial sector at all) or to haulers.[30]

Detailed descriptions of individual programs, along with implementation information, and additional data are provided in *Appendix D.*

[29] Many costs for the community are marked as "low" because the community cost consists of the staff time associated with developing and implementing ordinances that are issued by the community. Variations in enforcement costs can affect these costs on-going, with more aggressive enforcement increasing tons diverted and costs.

[30] Note that we usually ascribed costs to haulers as low, because we assumed haulers would pass their costs along to their customers.

Figure 3.2.3 *Listing of Programs Included in the Model*

Program Identification Number	Program Type	Program Type Name	Short Description
1	Community preparation	Establish Recycling Committee	Establish recycling committee, speakers bureau, attendance at meetings
2	Community preparation	Educate Elected Officials	Educate elected officials about solid waste issues, comparisons to other communities, program opportunities, etc.
3	Community preparation	Tracking & Goals	Measure/estimate current recycling, set goals
4	Community preparation	Adopt Zero Waste (ZW)/Aggressive Goal	ZW goal, sustainability plan
5	Requirements through ordinance	Ordinances / Space for Recycling	Ordinance for "space for recycling" or "recycling in lease"
6	Requirements through ordinance	Require Recycling Plans	Require businesses to fill out simple recycling plans, identifying key potentially-recyclable streams, and alternatives to disposal
7	Requirements through ordinance	Licensing with Reporting	License all haulers and require commercial tonnage reporting (for garbage, recycling, compost) required
8	Requirements through ordinance	Business Diversion Goals	Businesses (or businesses in certain sectors) must reach diversion goals/rates & dates or face fines
9	Requirements through ordinance	Require Clear Hauler Invoices & Contracts	As part of hauler license or ability to provide service in the area, require clarity of bills, invoices, contracts (clear statement of costs, prices for services and volumes provided, contract terms)
10	Procurement	Procurement Requiring Local Compost	Procurement initiative, specifically requiring use of local compost as soil amendment, in construction, in parks, etc.
11	Require to offer	Require Haulers to Offer Recycling	Hauler license requires OFFERING recycling to customer businesses

Figure 3.2.3 *Cont.*

12	Require to offer	Require Haulers to Offer Food Scraps Composting	Hauler license requires OFFERING food waste collection and composting service to commercial customers
13	Business incentives	Recycling Service Discounts/Rebates	Business incentives - money off recycling if businesses sign up for recycling
14	Business incentives	Recycling/Food Waste (FW) Embedded for All	All businesses must pay for recycling and/or food scraps collection if used or not (all embedded in trash bill)
15	Hauler goals	Hauler Incentives for Meeting Goals	Financial incentives or other incentives (e.g. contract extensions) for meeting goals.
16	Hauler incentives	Two-Tiered Disposal Rates for Haulers Meeting Goals	Financial incentives include lower franchise fee, varying tip fees, lower taxes/fees, etc. Two-tiered rates for qualified haulers at landfill / transfer station; lower fees for those haulers meeting goals, offering desired programs, etc.
17	Incentives	Taxes on Some Waste Streams	Taxes on trash stream, omitted on recyclables to lower the effective cost for recyclables and increase the differentials
18	Incentives - business	Require Incentive Rates	Require incentive rates charged by haulers for recycling and composting service; each service must be offered for less than the same volume of trash service
19	Incentives - business	PAYT Bags for All Commercial	PAYT (Pay As You Throw) bag programs for all trash service, making "more" trash more costly than "less" trash -- translating to the smallest businesses. Small businesses may especially benefit from this, as they are often on the smallest dumpster service (one cubic yard collected once weekly) and must pay for service they may not be using. PAYT bags give them more flexibility in the bill, and more incentive to recycle

Figure 3.2.3 *Cont.*

20	Outreach/Technical assistance (TA) recognition	Education on Bidding & Contracts	Education on bidding and contracts so businesses understand the options available from haulers, and the conditions that are more favorable to recycling
21	Outreach/TA/ recognition	Business Outreach	Outreach/information/tips/materials/videos on recycling, potentially with peer-to-peer information by business type or for key materials
22	Outreach/TA/ recognition	Business Recognition	Recognition on website, other venues for recycling, meeting graduated criteria (more stars for those with greener practices)
23	Outreach/TA/ recognition	Social Marketing	Outreach/social marketing/neighborhood sweeps engaging/informing commercial sector in recycling and composting options
24	Outreach/TA/recognition	Door-to-Door Food Scraps Outreach	Outreach on food scraps recycling door-to-door
25	Outreach/TA/recognition	Business Technical Assistance	Technical assistance/audits for materials, diversion, right-sizing (and bidding)
26	Market development	Market Development	Market development, including grants for businesses, co-location of waste and re-use businesses, subsidies for business plans, business redevelopment zones, helping design specifications for recycled product or use of recycled product, outreach to users to familiarize with recycled goods that can replace virgin materials
27	Small businesses	Curbside for Small Businesses	Small businesses added to curbside recycling program; no fee or small fixed fee charged
28	Small businesses	96 Gallons of Recycling for All Businesses	All businesses get 96 gallons of recycling service embedded in trash rate; larger businesses may pay extra for larger containers or multiple 96's

Figure 3.2.3 *Cont.*

29	Small businesses	Free Carts for Small Businesses	Free recycling carts provided to small businesses
30	Small businesses	PAYT Bags for Small Commercial Businesses	PAYT bag program for small commercial, so those with service less than 1 cubic yard can pay less for less trash
31	Mandates and bans	Targeted Mandatory Recycling	Mandatory recycling required for selected commercial generators (delineated by type of business, trash size in cubic yards (CY), large employee thresholds; criteria can start at high levels and phase in lower over time)
32	Mandates and bans	All Beverage Containers - Mandatory for Selected Businesses	Businesses generating beverage containers must recycle containers; enforced with possible loss of liquor license
33	Mandates and sans	Mandatory Recycling Commercial-Wide	Mandatory recycling for all commercial generators (it can be phased in over time); may be enforced by hauler or city, etc.
34	Mandates and sans	Targeted Commercial Food Scraps Program	Commercial food scraps collection and recycling (pilot, then full-scale) for selected business types (grocery, restaurant, etc.)
35	Mandates and sans	PAYT/Embedded Commercial Recycling	PAYT trash rates (rates by trash volume) that embed the cost of recycling needed, covering all businesses. The requirement may be open (whatever recycling is needed) or limited (recycling equal to 1/2 the trash volume, equal to the trash volume, 1.5x the trash volume, etc.)
36	Mandates and sans	No Bin No Barrel	No trash may be collected if recycling is not set out for collection
37	Mandates and sans	Material Bans	Material ban from collection OR disposal from commercial generators. May be enforced at transfer station or disposal site or required of haulers

Figure 3.2.3 *Cont.*

38	Policy & incentives	Taxes/Surcharges on Disposal Fees	Taxes or surcharges on disposal stream and Municipal Solid Waste (MSW) to increase tipping fee relative to recycling or compost streams (tip fees)
39	Policy & incentives	ADFs on Selected Products	ADFs (advance disposal fees)/deposits on some products to encourage (fund) proper disposal
40	Policy & incentives	ADF/Single Use Bag Fee or Ban	Fee placed on single-use shopping bag at the business (or ban on single-use bags). Fee proceeds usually split with retailer and city, and city portion funds oversight and related recycling/litter/clean-up programs
41	Policy & incentives	ADFs /Recycled Content Requirements	Recycled content requirements for some products (e.g. newspapers printed in town) to drive demand for recycled product
42	Collection & contracting	Targeted Food Scraps Programs	Community contacts small sample of businesses with food scraps and designs a small-scale commercial food scraps program or develops partnerships that will result in sufficient food along a route to lead to cost-effective collection by haulers
43	Collection & contracting	Starting/Subsidizing Food Collection	Community helps run pilot to demonstrate food collection, or to start permitted facility, or provides incentive for businesses using food collection
44	Collection & contracting	Starting/Subsidizing Recycling Collection	Community helps set up recycling pilot or run pilot to demonstrate food collection, or to start permitted facility, or provides incentive for businesses using food collection
45	Collection & contracting	Contract for Commercial Collection	City or business association or others organize to issue RFP and contract/franchise/ district for commercial collection for all businesses or businesses in a specific zone
46	Collection & contracting	Municipal Collection for Commercial	City takes over collection for commercial (all businesses or specific geographic zone)

Figure 3.2.3 *Cont.*

47	Partnerships and facilities	Cooperative collection	Community identifies small businesses that may not have sufficient quantities for cost-effective hauler recycling collection, and arranges for collection route from multiple businesses, or establishes a convenient centrally-located recycling container for collection
48	Partnerships and facilities	Commercial Drop-off Recycling	Businesses allowed/encouraged to use recycling drop-off at transfer station or drop-off location
49	Partnerships and facilities	Hub and Spoke Assistance	Hub and spoke incentives/grants/ partnerships to aggregate tonnages from outlying areas, reduce duplication of processing facilities, and make recycling accessible to outlying areas
50	Partnerships and facilities	Partnerships on Facilities	Partnerships on local needed facilities
51	Partnerships and facilities	Dirty MRF	Sector's waste is collected as trash, and easy recyclables sorted out at a mixed waste facility/"dirty MRF" (Material Recovery Facility)
52	C&D	C&D: Higher Permit Fees	Community establishes higher permit fees for C&D (Construction & Demolition debris) projects not recycling or meeting recycling thresholds
53	C&D	C&D Deposit Program	Community collects a "deposit" (higher for larger projects) with the C&D permit application, and all or part of the deposit is rebated based on the amount of recycling that occurred at the site (with weight slips or other documentation required)
54	C&D	C&D On-Site Sales	Obtaining C&D permit requires on-site sale at the building site, or contact of a dismantler before the construction phase can begin

Figure 3.2.3 *Cont.*

55	C&D	Discounted/Higher Rates for C&D	Discounted disposal rates are provided for those C&D projects that recycle or reuse threshold/qualifying amounts on the project. Alternatively (or in addition) higher rates than trash rates are charged for C&D to encourage its separation and recycling
56	C&D	Developer Incentives	Incentives that are attractive to developers (higher development ratios, lower set-backs, etc.) if they use recycled or recyclable materials, recycle on-site, or meet other desired behaviors in construction
57	C&D	C&D Material Ban	Ban C&D materials from the landfill

Appendix D identifies the implementation design options and steps associated with each of the individual programs included in this report.

3.3 Contacts

If you have additional questions or comments regarding this report or tool for commercial recycling, please feel free to contact the project lead or lead consultant, whose contact information follows. Our best wishes as you tackle "the other half" of the MSW stream!

- **Project Lead: Celia VanDerLoop and Diane DeLillio,** Department of Environmental Health - Environmental Quality, City and County of Denver, 200 W. 14th Ave., Dept 310, Denver, CO 80204, 720-865-5448, Celia.vanderloop@denvergov.org; Diane.DeLillio@denvergov.org.
- **Consultant Lead: Lisa A. Skumatz, Ph.D.,** Skumatz Economic Research Associates, Superior, Colorado, Skumatz@serainc.com; 303/494-1178.

Attachment A: Detailed Descriptions of Commercial Programs

An analysis of the relative performance of programs was conducted by SERA staff. These results – including cost-effectiveness and strengths and weaknesses – are presented in *Figures A.1 and A.2*, respectively.

Figure A.1: Relative Performance of the Commercial Program Options Included in the Model (Yellow and Blue for especially high performance)

ID row	Program Type	Name	Short Description	Relative Tonnage Performance	Relative Cost to Jurisdiction	Cost-Effective-ness	Relative cost to Com'l Sector	Relative cost to Haulers	Drives Change	Phase
1	Community preparation	Establish Recycling Committee	Establish recycling committee, speakers bureau, attendance at meetings	None	Low	NA	None	None	M	1
2	Community preparation	Educate Elected Officials	Educate elected officials	None	Low	NA	None	None	M	1
3	Community preparation	Tracking & Goals	Measure / estimate current recycling, set goals	None	Low	NA	None	LM	H	1
4	Community preparation	Adopt ZW/Aggressive Goal	ZW Goal, sustainability plan	None	Low	NA	None	L	H	1
5	Requirements through Ordinance	Ordinances / Space for Recycling	Ordinance for "space for recycling" or "recycling in lease"	Low/Med	Low	L	L	L	L	2
6	Requirements through Ordinance	Require Recycling Plans	Require recycling plans	Low/Med	Low	L	M	L	M	2
7	Requirements through Ordinance	Licensing with Reporting	License with commercial tonnage reporting (for garbage, recycling, compost) required	None	Low	NA	None	LM	M	2
8	Requirements through Ordinance	Business Diversion Goals	Businesses (or businesses in certain sectors) must reach diversion goals / rates & dates or face fines	Med	Low	M	M	L	MH	3
9	Requirements through Ordinance	Require Clear Hauler Invoices & Contracts	As part of hauler license or ability to provide service in the area, require clarity of bills, invoices, contracts (clear statement of costs, prices for services and volumes provided, contract terms)	Med	Low	H	L	LM	H	2
10	Procurement	Procurement Requiring Local Compost	Procurement initiative, specifically requiring use of local compost as soil amendment, in construction, in parks, etc.	Med	Low	M	LM	None	MH	3
11	Require to offer	Require Haulers to Offer Recycling	Hauler license requires OFFERING recycling to customer businesses	Low/Med	Low	L	MH	LM	LM	2
12	Require to offer	Require Haulers to Offer Food Scraps	Hauler license requires OFFERING food waste to commercial customers	Low/Med	Low	L	MH	LM	LM	2
13	Business incentives	Recycling Service Discounts / Rebates	Business incentives - Money off recycling if businesses sign up for recycling	Low/Med	Med	L	M	None	LM	3
14	Business incentives	Recycling / FW Embedded for All	All businesses must pay for recycling and/or food collection if used or not (all embedded in trash bill)	High	Low	H	M	LM	H	3
15	Hauler goals	Hauler Incentives for Meeting Goals	Financial incentives or other incentives (e.g. contract extensions) for meeting goals. Financial incentives include lower franchise fee, varying tip fees, lower taxes/fees, etc.	High	Low	H	LM	LM	H	4
16	Hauler incentives	Two-Tiered Disposal Rates for Haulers Meeting Goals	Two-tiered rates for qualified haulers at landfill / transfer station; lower fees for those haulers meeting goals, offering desired programs, etc.	Med/High	Low/Med	MH	LM	LM	H	4
17	Incentives	Taxes on Some Waste Streams	Taxes on trash stream, omitted on recyclables to lower the effective cost for recyclables and increase the differentials.	Med	Low	M	LM	L	M	4
18	Incentives - Business	Require Incentive Rates	Require incentive rates charged by haulers for recycling and composting service; each service must be offered for less than the same volume of trash service.	Med/High	Low	MH	MH	L	MH	4

Attachment A: Cont.

ID row	Program Type	Name	Short Description	Relative Tonnage Performance	Relative Cost to Jurisdiction	Cost-Effective-ness	Relative cost to Com'l Sector	Relative cost to Haulers	Drives Change	Phase
19	Incentives - Business	PAYT Bags for All Commercial	PAYT bag programs for all trash service, making "more" trash more costly than "less" trash -- translating to the smallest businesses.	Med	Low	M	H	MH	M	5
20	Outreach / TA / Recognition	Education on Bidding & Contracts	Education on bidding & contracts so businesses understand the options available from haulers, and the conditions that are more favorable to recycling.	Med	Low/Med	M	L	M	MH	2
21	Outreach / TA / Recognition	Business Outreach	Outreach / information / tips / materials / videos on recycling, potentially with peer-to-peer information by business type or for key materials.	Low/Med	Med	L	L	L	L	2
22	Outreach / TA / Recognition	Business Recognition	Recognition on website, other venues for recycling, meeting graduated criteria (more stars for those with greener practices)	Low/Med	Med	L	L	L	L	3
23	Outreach / TA / Recognition	Social Marketing	Outreach / social marketing / neighborhood sweeps engaging / informing commercial sector in recycling & composting options.	Med	Med/High	LM	L	L	M	2
24	Outreach / TA / Recognition	Door-to-Door Food Scraps Outreach	Outreach on food / door-to-door	Med	Med/High	LM	L	L	M	3
25	Outreach / TA / recognition	Business Technical Assistance	Technical Assistance / Audits for materials, diversion, right-sizing (& bidding)	Med	Med/High	M	L/M	L	M	3
26	Market Development	Market Development	Market development, including grants for businesses, co-location of waste and re-use businesses, subsidies for business plans, business redevelopment zones, helping design specifications for recycled product or use of recycled product, outreach to users to familiarize with recycled goods that can replace virgin materials.	Low	Med/High	L	L	L	L	6
27	Small businesses	Curbside for Small Businesses	Small businesses added to curbside recycling program; no fee or small fixed fee charged.	Med	Med	L	L	LM	MH	4
28	Small businesses	96 Gallons of Recycling for All Businesses	All businesses get 96 gallons of recycling service embedded in trash rate; larger businesses may pay extra for larger containers or multiple 96's.	Med/High	Low	M	M	M	MH	4
29	Small businesses	Free Carts for Small Businesses	Free recycling carts provided to small businesses	Med	Med	LM	L	M	MH	4
30	Small businesses	PAYT Bags for Small Commercial businesses	PAYT bag program for small commercial, so those with service less than 1 cubic yard can pay less for less trash.	Med	Low	MH	M	LM	MH	4
31	Mandates and Bans	Targeted Mandatory Recycling	Mandatory recycling required for selected commercial generators (delimited by type of business, trash size in CY, large employee thresholds; criteria can start at high levels and phase in lower over time)	High	Low	H	M	L	H	5
32	Mandates and Bans	All Beverage Containers - Mandatory for Selected Businesses	Businesses generating beverage containers must recycle containers; enforced with possible loss of liquor license.	High	Low	H	M	L	H	5
33	Mandates and Bans	Mandatory Recycling Commercial-Wide	Mandatory recycling for all commercial generators (it can be phased in over time); may be enforced by hauler or city, etc.	High	Low	H	M	L	H	5
34	Mandates and Bans	Targeted Commercial Food Scraps Program	Commercial Food Scraps (Pilot, then Full-scale) for selected business types (grocery, restaurant, etc)	High	Low	H	M	L	H	5

Attachment A: Cont.

ID row	Program Type	Name	Short Description	Relative Tonnage Performance	Relative Cost to Jurisdiction	Cost-Effective-ness	Relative cost to Com'l Sector	Relative cost to Haulers	Drives Change	Phase
35	Mandates and Bans	PAYT / Embedded Commercial Recycling	PAYT trash rates (rates by trash volume) that embed the cost of recycling needed, covering all businesses. The requirement may be open (whatever recycling is needed) or limited (recycling equal to 1/2 the trash volume, equal to the trash volume, 1.5x the trash volume, etc.)	High	Low	H	M	L	H	5
36	Mandates and Bans	No Bin No Barrel	No trash may be collected if recycling is not set out for collection.	Med/High	Low	MH	M	H	MH	5
37	Mandates and Bans	Material Bans	Material ban - from collection OR disposal from commercial generators. May be enforced at transfer or disposal site or required of haulers.	High	Low/Med	H	LM	MH	H	5
38	Policy & Incentives	Taxes / Surcharges on Disposal Fees	Taxes or surcharges on disposal stream / MSW to increase tipping fee relative to recycling or compost streams (tip fees).	Med	Low	M	LM	L	M	4
39	Policy & Incentives	ADFs on Selected Products	ADFs / deposits on some products to encourage (fund) proper disposal	Low	M	L	L	L	LM	6
40	Policy & Incentives	ADF / Single use bag fee or ban	Fee placed on single use bag at the business (or ban on single use bags). Fee proceeds usually split with retailer and city, and city portion funds oversight and related recycling / litter / clean-up programs.	Low	LM	L	L	L	LM	6
41	Policy & Incentives	ADFs / Recycled Content Requirements	Recycled content requirements for some products (e.g. newspapers printed in town) to drive demand for recycled product	Low	H	L	L	L	M	6
42	Collection & Contracting	Targeted food scraps programs	Community contacts small sample of businesses with food scraps and designs a small-scale commercial food scraps program or develops partnerships that will result in sufficient food along a route to lead to cost-effective collection by haulers.	Med	M	L	M	LM	M	5
43	Collection & Contracting	Starting / subsidizing food collection	Community helps run pilot to demonstrate food collection, or to start permitted facility, or provides incentive for businesses using food collection.	Low/Med	M	L	M	LM	M	4
44	Collection & Contracting	Starting / subsidizing recycling collection	Community helps set up recycling pilot or run pilot to demonstrate food collection, or to start permitted facility, or provides incentive for businesses using food collection.	Low/Med	M	L	M	LM	M	3
45	Collection & Contracting	Contract for Commercial Collection	City or business association or others organize to issue RFP and contract / franchise / district for commercial collection for all businesses or businesses in a specific zone.	Med/High	M	MH	L	M	H	6
46	Collection & Contracting	Municipal Collection for Commercial	City takes over collection for commercial (all businesses or specific geographic zone)	Med/High	MH	M	L	M	H	6
47	Partnerships and Facilities	Cooperative collection	Community identifies small businesses that may not have sufficient quantities for cost-effective hauler recycling collection, and arranges for collection route from multiple businesses, or establishes a convenient centrally-located recycling container for collection.	Low	LM	L	L	L	LM	4
48	Partnerships and Facilities	Commercial Drop-off Recycling	Businesses allowed / encouraged to use recycling drop-off at transfer station or drop-off location	Low/Med	LM	H	L	L	LM	2
49	Partnerships and Facilities	Hub and Spoke Assistance	Hub and spoke incentives / grants / partnerships to aggregate tonnages from outlying areas, reduce duplication	M	M	LM	L	L	M	4

ID row	Program Type	Name	Short Description	Relative Tonnage Performance	Relative Cost to Jurisdiction	Cost-Effective-ness	Relative cost to Com'l Sector	Relative cost to Haulers	Drives Change	Phase
			of processing facilities, and make recycling accessible to outlying areas.							
50	Partnerships and Facilities	Partnerships on Facilities	Partnerships on local needed facilities	M	M	M	L	L	MH	4
51	Partnerships and Facilities	Dirty MRF	Sector's waste is collected as trash, and easy recyclables sorted out at a mixed waste facility / "dirty MRF".	Med/High	MH	M	L	LM	M	6
52	C&D	C&D: Higher Permit Fees	Community establishes higher permit fees for C&D projects not recycling or meeting recycling thresholds.	Med	L	M	L	L	M	5
53	C&D	C&D Deposit Program	Community collects a "deposit" (higher for larger projects) with the C&D permit application, and all or part of the deposit is rebated based on the amount of recycling that occurred at the site (with weight slips or other documentation required)	High	L	H	L	L	H	5
54	C&D	C&D On-Site Sales	Obtaining C&D permit requires on-site sale or contact of a dismantler before the construction phase can begin.	Med	L	M	L	L	M	5
55	C&D	Discounted / Higher Rates for C&D	Discounted disposal rates are provided for those C&D projects that recycle or reuse threshold / qualifying amounts on the project. Alternatively (or in addition) higher rates than trash rates are charged for C&D to encourage its separation and recycling.	Med	LM	M	L	L	MH	5
56	C&D	Developer Incentives	Incentives that are attractive to developers (higher development ratios, lower set-backs, etc.) if they use recycled or recyclable materials, recycle on-site, or meet other desired behaviors in construction.	Low/Med	MH	LM	L	L	MH	5
57	C&D	C&D Material Ban	Ban C&D from the landfill.	Med/High	L	MH	L	L	H	6

Figure A.2: Strengths and Weaknesses and Auxiliary Benefits Associated with the Commercial Program Options Included in the Model

Figure A.2 provides a summary overview of the strengths and weaknesses of each program in turn. More detail on each program is provided in Appendix B. Note that, in many cases, a change to how businesses must address their waste will increase their operating costs; if recycling is cheaper in a community, economics would suggest it would already be fairly widespread in the sector. This issue should be expected by communities implementing programs.

ID	Program Type	Name	Key Strengths / Opportunities	Key Barriers / Weaknesses	Auxiliary Benefits/Co-Benefits
1	Community preparation	Establish Recycling Committee,	Begins dialog on commercial recycling; Engages citizens / businesses that are interested; Provides an avenue for community to examine options and receiving input and advice on options and move beyond residential recycling.	No direct tonnage savings; Volunteer-type committees can struggle to keep useful involvement; Staff time would be needed for recruitment / management.	None
2	Community preparation	Educate Elected Officials about Com'l Recycling	Staff and elected officials begin a dialog on commercial recycling; Provides background to elected officials to take temperature prior to presentations on program options by staff; Allows staff to begin to examine the local commercial context.	No direct tonnage savings.	None
3	Community preparation	Tracking Recycling, Establishing Goals	Provides data for a baseline for recycling / diversion in the commercial sector; Provides an indication of the state of current recycling (which can be an impetus for change or setting goals); Provides an opportunity to understand some of "current practices" in the commercial sector; Fairly straightforward to require via ordinance or license or other means.	No direct tonnage savings; May take community legal review to determine the best way to acquire / exercise the authority; Measuring / reporting commercial tonnage is complicated when hauler routes include commercial plus other sectors, or cross community boundaries, but estimates can be used' Some (minimal) change to hauler practices may be needed to comply.	None
4	Community preparation	Adopt Community ZW/Aggressive Goal	Developing a goal and crafting a plan to meet goals encourages stakeholders to talk / cooperate and encourages consideration of potential options; Setting an aggressive goal with specific strategies and timelines along with enforcement can have a significant (follow-on) effect when implemented; Many examples in other communities.	Plans themselves don't lead to direct tonnage savings; Facilities and various support infrastructure may be missing / may need to be developed and funded; Public support / public process and political support needed to implement and fund Plan.	None
5	Requirements through Ordinance	Ordinances / Space for Recycling, Recycling in Leases	Removes an important and widespread barrier to commercial recycling / expansion; Addresses a structural problem (opportunity to recycle in the building) that would otherwise persist for the life of the building; Easy to implement; Low cost to community (ordinance); Inexpensive to design into new buildings; Flexible – can be designed to cover new and remodeling, large or small, etc. as needed; Many examples in other communities.	Does not directly lead to tonnage savings; Does not require recycling / participation so attributable tons low (but removes barrier to recycling); Additional cost for existing / remodeled buildings; Needs collection / processing infrastructure for tons freed up for programs.	Low GHG
6	Requirements through Ordinance	Require Commercial Recycling Plans	Requiring businesses to think about recycling through developing a plan can move some toward implementation; Easy to implement; Low cost to community (easy forms; seldom strongly enforced) and to businesses; Many examples in other communities; Can be flexibly designed to target sectors or material streams, include simple checklists or more complex plans, and informal or more formal filing to meet needs of the community.	Does not directly lead to tonnage savings; Does not require recycling / participation so attributable tons low (but removes education barrier to recycling); Needs design decisions / development of forms and filing / enforcement requirements; Follow-on will add collection costs to many (not all) businesses; Needs collection / processing infrastructure for tons freed up for programs.	
7	Requirements through Ordinance	Licensing with Tonnage Reporting Required	Provides data for a baseline for recycling / diversion in the commercial sector; Provides an indication of the state of current recycling (which can be an impetus for change or setting goals); Provides an opportunity to understand some of current players, capabilities, and "current practices" in the commercial sector that is useful information for planning; Fairly straightforward to require via ordinance or license or other means.	No direct tonnage savings; May take community legal review to determine the best way to acquire / exercise the authority; Measuring / reporting commercial tonnage is complicated when hauler routes include commercial plus other sectors, or cross community boundaries, but estimates can be used; Some (minimal) change to hauler practices may be needed to comply.	None
8	Requirements through Ordinance	Business Diversion Goals	Flexible - May be voluntary or mandatory, sector-wide or targeted to business or material types or size; Goals can be ramped up for continued progress; Mandatory results in significant recycled tons (if enforced); Jumpstarts commercial sector recycling; Limited examples in other communities; May be fairly costly to enforce.	Can be difficult to measure / enforce, especially if collection is not provided by community or via contract; Must determine if local authority is available; Need political support; Not very effective if not enforced; Businesses may be resistant and see this as an additional cost.	Med GHG
9	Requirements through Ordinance	Require Clear Hauler Invoices & Contracts	Addresses important barrier to additional recycling because businesses often do not know the service they are subscribed to or the contract terms; If businesses are inspired to negotiate or re-bid for additional recycling service they can achieve savings and recycle more (more opportunity and more incentive); Lower costs likely because clarity of service on invoice supports comparison shopping (impeded with current obscure invoice information); Inexpensive for community to implement / enforce; Fits / benefits all business types.	Haulers may be unhappy / uncooperative with better educated commercial customers and perceived threat to status quo customer base (and community interference); Customers may still not change behaviors / inertia and may not increase diversion tons; Community may not have authority; Some businesses don't have (local) control over their service contracts.	Med GHG
10	Procurement	Procurement Requiring Local Compost	Requiring use of recycled content compost in governmental supplies / contracts (road construction), municipal parks, and revising building codes requiring the product for soil amendment can be very effective in stimulating demand for a locally-generated product that otherwise can have market problems; Can assure tonnage demand that stimulates development or expansion of needed processing capacity; Easy to implement; Low cost for community to implement; More tonnage diversion is stimulated if the requirement specifies use of "local" compost.	Requires local infrastructure for collection and processing; Assuring consistent / reliable product quality; There also may be state or regional laws requiring open purchasing policies; Costs may be higher than other product; If collection programs aren't robust enough there may be supply issues.	Med GHG; some job creation incl. locally

Figure A.2: Cont.

ID	Program Type	Name	Key Strengths / Opportunities	Key Barriers / Weaknesses	Auxiliary Benefits/Co-Benefits
11	Require to offer	Require Haulers to Offer Recycling	Can attract diversion from businesses wanting service; Can help build demand for infrastructure construction; Builds (requires development of) capacity in hauler capabilities for the service; Lets businesses know service is available (especially if annual requirement); Enforcement can be done with fines or license revocation, etc; Can transition to later mandates if needed (collection and processing infrastructure developed "seeded").	Enforcement important (especially making sure haulers are offering service) but can be easily checked if requirements are low (e.g. only requiring having it on website or bill, etc.); Does not require favorable pricing, and does not mandate use, so usage may be low; Collection and processing capacity needed; Small haulers may not have capability initially and may complain; Need support from decision-makers.	Low/Med GHG, Low Job Creation, incl. local haulers
12	Require to offer	Require Haulers to Offer Food Scraps	Can attract diversion from businesses wanting service; Can help build demand for infrastructure construction; Builds (requires development of) capacity in hauler capabilities for the service; Lets businesses know service is available (especially if annual requirement); Enforcement can be done with fines or license revocation, etc; Can transition to later mandates if needed (collection and processing infrastructure developed "seeded").	Enforcement important (especially making sure haulers are offering service) but can be easily checked if requirements are low (e.g. only requiring having it on website or bill, etc.); Does not require favorable pricing, and does not mandate use, so usage may be low; Collection and processing capacity needed; Small haulers may not have capability initially and may complain; Need support from decision-makers.	Low/Med GHG; Some job creation, incl. local haulers
13	Business incen-tives	Recycling Service Discounts / Rebates	Kick-starts businesses into recycling by providing short term discounts or rebates for signing up for service; Can increase tons and start recycling by additional businesses; Can be targeted by businesses type, size, etc; Examples in other communities; Fairly low cost program (depending on how designed); Can be used for recycling or food scraps; Every community should have this authority.	Finding funding; Advertising needed; Need collection and processing capacity; Must make payment and other arrangements with hauler (unless municipal collection); Space for recycling at business site; Voluntary / no requirement, and short term subsidy only, so may result in lower tons.	Low/Med GHG, some job creation
14	Business incen-tives	Recycling / Food Scraps Embedded for All Businesses	Significantly increases tonnage diverted; No separate charge for diversion programs assures the cost of trash plus diversion is not more than trash alone, which significantly increase incentives for more recycling / organics diversion; Universal service spreads the cost of recycling / food scraps programs and reaches economies of scale / lower program costs; Low cost to community / user funded; Hauler costs are covered by user fee changes and expands their business.	Space constraints at some businesses; Costs increase for many businesses; Need collection and processing capacity; Resistance from businesses; Needs support from decision-makers; Significant up-front investment in containers, etc. for haulers, and on-going staffing needs; Doesn't require use of the service (but economic incentives are strong).	High GHG, medium job creation, including local haulers
15	Hauler goals	Hauler Incentives for Meeting Goals	Financial and other incentives (extensions of contracts / franchises, reductions in fees, etc.) are effective at encouraging haulers to meet goals – and increase recycling; Examples in other communities; Not costly for community; Can be adjusted over time to encourage increasing diversion; Can be self-funding if rates are set appropriately.	Enforcement is needed (especially tracking tons, diversion compliance, etc.); May be revenue shortfalls (in franchise fees, etc.) if rates not set appropriately; Need processing capacity for additional tons diverted; Community may not have authority or haulers in a situation to easily influence; Need elected official support.	High GHG, medium job creation, including local haulers
16	Hauler incen-tives	Two-Tiered Disposal Rates for Haulers Meeting Goals	Discounts (or avoidance of surcharges) on MSW disposal fees can be provided to communities or haulers meeting targeted goals, encouraging diversion to meet those goals; Pricing can be set to achieve desired behavior/ higher tons; Clear and long-lasting signals; If the authority exists, can be fairly easily implemented; Successful examples in other locations; Tiers can be adjusted over time; Additional tiers can be added as rewards for meeting higher goals; Self-funding once rates are readjusted.	Community may not have authority or own the landfills / disposal / diversion sites; If available, haulers or communities may choose to take materials elsewhere, undermining the incentive; Depending on options, significant price differential may be needed to modify behavior; May need funding if designed as direct subsidy; Need processing capacity for diverted tons.	Med/High GHG, low job creation
17	Incen-tives	Taxes on Some Waste Streams	Can realign economic incentives to change behavior and divert tons; Relative pricing can be set to affect / divert significant tonnages; Clear and long-lasting signals; If the authority exists, can be fairly easily implemented; Successful examples in other locations.	Community may not have authority or own the landfills / disposal / diversion sites; If available, haulers may choose to take materials elsewhere, undermining the incentive.	Med GHG, low job creation
18	Incen-tives - Business	Require Incentive Rates for Recycling / Compost service	Requiring discounts for recycling or composting service relative to trash service will encourage greater separation and tonnage diversion; Price signals (economic incentives) change behavior long-term and provide clear motivation; Price signals can be crafted to deliver high tonnage diversion; Should be self-funding once rates are re-calculated to recover revenue requirements.	In most communities, program will require subsidies between waste streams pricing, which can be complicated (unless contract or municipal service); Must have authority; must have collection and processing capacity; Short term risk to haulers (or service providers) until rates are re-calculated to cover subsidies.	Med GHG, some job creation
19	Incen-tives - Business	PAYT Trash Bags for All Businesses	Provides recycling incentive for small businesses that cannot reduce trash bill beyond smallest dumpster service level; In place in other jurisdictions; Easy to understand; Can put bags in dumpsters or other containers; Self-funding / user fees; Bag prices can be set to encourage recycling; More recycling is encouraged if recycling cost is embedded in PAYT bag fees.	Can be inconvenient / inefficient for large businesses (best for small); Enforcement system needed for bag compliance; Businesses must have bags on hand when needed; Need distribution system for bags; Recycling program must be convenient and available to these businesses; Illegal dumping may be a concern; Community must have authority. Must have collection capability and processing facility available to handle material stream; If not collected in dumpsters, collection cost will increase for many businesses (and litter from broken bags may result); Must have local hauler(s) available to deliver the program (unless community is interested / able).	Med GHG, medium job creation incl. local haulers
20	Outreach / TA / Recog-nition	Education on Bidding & Contracts	Addresses important information gap for businesses who often do not know the service they are subscribed to or the contract terms; Businesses implementing suggestions on bidding and contracts may achieve savings and recycle more (more opportunity and more incentive); Lower costs likely for customers implementing recommendations; Inexpensive to deliver the program (outreach, websites, etc.); No special authorities needed; Fits all business types.	Haulers may be unhappy / uncooperative with better educated commercial customers and perceived Community interference; Customers may still not change behaviors / inertia and may not increase diversion tons; Some businesses don't have (local) control over their service contracts.	Low/Med GHG, low job creation

Figure A.2: Cont.

ID	Program Type	Name	Key Strengths / Opportunities	Key Barriers / Weaknesses	Auxiliary Benefits/Co-Benefits
21	Outreach / TA / Recog-nition	Business Outreach – Information and tips	Outreach / awareness can increase recycling; Message can be targeted (material, business type, etc.); Many different outreach methods available; Relatively inexpensive; Used in many other communities; Can have hauler or community deliver.	Generally quite modest tonnage impacts; Most impacts short-term; Can be costly per ton; Hard to engage business sector – multiple decision-makers, etc.	Low GHG
22	Outreach / TA / Recog-nition	Business Recognition Program	Diverts tons; Low cost incentive; Graduated programs can provide incentive to keep businesses improving practices; Opportunity for recognition of many forms (social media, decals, advertising, etc.); Can progress over time as standard business practice evolves; Can be incorporated with multiple streams (water, etc.) to increase cost effectiveness and impacts; Many examples in other communities; businesses seem to care and change practice to distinguish themselves in the market; Can be simple to set up; Can target specific industries (by streams, problems, etc).	Must establish program design/ parameters and recruit / advertise; Must have staff to certify / inspect and check back; Need small, continuous source of funding; Non-mandatory an may affect small number of businesses.	
23	Outreach / TA / Recog-nition	Commercial Outreach / Social Marketing	Diverts tons; Outreach that focuses on tailored motivators and barriers can provide better impact per contact; Prompts and other elements for program can lead to a new expectation about business behaviors; Can divert significant tons.	Needs more specific research and tailored materials than traditional outreach (potentially higher cost); Not a mandatory program so tons less; Need collection / processing capacity; Uncertain how long the effects last.	Med GHG, some short term jobs
24	Outreach / TA / Recog-nition	Door-to-Door Outreach on Com'l Food Scraps Diversion	Door-to-Door approach tends to divert more tons per contact and tonnage effect lasts longer; Allows tailored discussion of motivations and barriers for specific business.	Door-to-door approach is costly per business visited (although cost per ton can be less expensive); Language can be an issue; Time consuming; Need funding for tailored collateral materials / handouts; Cost may only allow outreach to smaller share of businesses each year; Must have collection capability and processing facility available to handle material stream.	Med GHG, some job creation
25	Outreach / TA / recog-nition	Business Technical Assistance / Audits	Diverts tons through targeted behavioral and facility changes; Addressed information gaps that are barriers to recycling; Can be low cost or efficient program per ton diverted; Can target specific business types (or materials) appropriate to the community; Multiple design available (neighborhood sweeps, business or size focus, delivered by consultant or community staff, etc); In place in many communities; Best targeted at small to medium businesses.	Needs funding source; Staff training (or RFP for consultants) needed; Difficult to include large businesses (expertise level critical); Information only / doesn't mandate recycling and practices may fall off over time; Program needs significant recruitment and follow-up efforts.	Low/med GHG, some job creation
26	Market Develop-ment	Market Develop-ment Initiatives	Addresses the "big picture", trying to increase local demand and supply of recyclables, and generate jobs, economic activity, etc.; Could attract materials from other areas.	Historically difficult to enact successfully; Needs careful design.	Low to none, unless businesses pick up; then can be larger GHG and local jobs
27	Small busi-nesses	Small businesses eligible for Residential Curbside Recycling Service	Diverts tons; Allows small businesses to get service at cheaper rate than may otherwise be available; Addresses potential cost barrier for small businesses to recycle (service and containers); May provide option for smaller recycling container that may fit better in limited trash enclosures than recycling dumpsters; Self-funding through (embedded) use fees; If free, Recycling plus trash is not more expensive than trash service, and more tons result..	Lack of storage space; Best if businesses near residential neighborhoods; Provides same recycling mix as residential service (positive and negative); Enforcement needed (for volumes / compliance and potential contamination); Needs political support; Community needs authority; Must have collection capability and processing facility available to handle material stream.	Med GHG, some job creation, including local haulers
28	Small busi-nesses	96 Gallons of Recycling for All Businesses	Diverts tons; Addresses potential cost barrier for small businesses to recycle (service and containers); May provide option for smaller recycling container that may fit better in limited trash enclosures than recycling dumpsters; Allows larger businesses to potentially contract for larger volumes but provides "starter" volumes for all businesses and encourages participation (they are already paying for the service); Self-funding through (embedded) use fees; Recycling plus trash is not more expensive than trash service.	Lack of storage space; Need to clarify contracting procedures for those needing more than 96 gallons of (embedded) service; Enforcement needed (for volumes / compliance and potential contamination); Needs political support; Community needs authority; Must have collection capability and processing facility available to handle material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able).	Med GHG, medium job creation, including local haulers
29	Small busi-nesses	Free Recycling Carts for Small Businesses	Diverts tons; Addresses potential cost barrier for small businesses to recycle / compost; May provide option for smaller recycling container that may fit better in limited trash enclosures than recycling dumpsters; If free cart and free service option selected, more tons will result.	Lack of storage space; Finding funding for the program, unless haulers are required to provide containers (if food scraps are considered, special containers may be needed, and collection frequency will need to be adjusted); Pricing incentives will be needed to encourage real participation / trash plus recycling may still be more expensive than trash; Needs political support; Community needs authority. Must have collection capability and processing facility available to handle material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able).	Med GHG, some job creation, including local haulers

Figure A.2: Cont.

ID	Program Type	Name	Key Strengths / Opportunities	Key Barriers / Weaknesses	Auxiliary Benefits/Co-Benefits
30	Small businesses	PAYT Trash Bags for Small Commercial businesses	Provides recycling incentive for small businesses that cannot reduce trash bill beyond smallest dumpster service level; Impacts a large number of firms (although they are small, so tonnage affected is less than proportional); In place in other jurisdictions; Easy to understand.	Enforcement system needed / important, and program must be clearly defined (size of business, etc.); Businesses must have bags on hand when needed; Need distribution system for bags; Recycling program must be convenient and available to these businesses; Illegal dumping may be a concern; Community must have authority. Must have collection capability and processing facility available to handle material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able).	Med GHG, medium job creation, including local haulers
31	Mandates and Bans	Targeted Mandatory Recycling / Selected Generators	Commences a program to capture a potentially large recyclable waste stream and community can select highest volume generators; Program can expand to other generators over time; Mandates draw large tons; Economies of scale in program, once mandatory; Self-funding.	Must have collection capability and processing facility available to handle material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able); Enforcement needed; Potential resistance from businesses / will cost businesses more and space may be a barrier; Needs political support; Community needs authority.	High GHG, med job creation incl. local haulers
32	Mandates and Bans	All Beverage Containers - Mandatory for Selected Businesses	Commences a program to capture a potentially clear recyclable waste stream from a targeted set of generators; Mandates draw large tons; Economies of scale in program, once mandatory; Self-funding; Can piggyback on existing systems for enforcement (revocation of liquor license for non-compliance); Examples in other locations.	Must have collection capability and processing facility available to handle material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able); Enforcement needed; Potential resistance from restaurant and bar sector/ will cost businesses more (and space may be an issue); Needs political support; Community needs authority.	High GHG, medium job creation including local haulers
33	Mandates and Bans	Mandatory Recycling Commercial-Wide	Commences a program to capture a potentially-large waste stream; Mandates draw large tons; Economies of scale in program, once mandatory; Dedicated and assured tonnage stream helps fund development of necessary processing infrastructure; Self-funding; Examples in other locations.	Must have collection capability and processing facility available to handle a potentially-large material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able); Enforcement needed; Potential resistance from business community / will cost businesses more (and space may be an issue); Needs political support; Community needs authority.	High GHG; medium= high job creation including local haulers
34	Mandates and Bans	Targeted Commercial Food Scraps Program	Commences a program to capture a potentially-large waste stream; Mandates draw large tons; Allows targeting of businesses with greatest potential tons; Economies of scale in program, once mandatory; Dedicated and assured tonnage stream helps fund development of necessary processing infrastructure.	Must have collection capability and processing facility available to handle a potentially-large and sometimes-complex material stream; Must have local hauler(s) available to deliver the program (unless community is interested / able); Enforcement needed (identifying food-generating businesses isn't always simple); Post consumer food programs can have contamination and will need enforcement; Potential resistance from business community / will cost businesses more; Needs political support.	Medium GHG: Medium job creation (including local haulers and composters)
35	Mandates and Bans	PAYT / Costs for Commercial Recycling Embedded in trash rate	Significant impact on recycling tonnages from strong economic signal; Examples in other locations / communities; Piggy-backs on existing incentive-based trash fee system; Near universal participation decreases recycling cost per businesses (economies of scale); Embedded recycling option provides incentive to maximize recycling; Can be crafted with limits on recycling vs. trash container sizes to limit risk to haulers; "Voluntary" participation avoids mandates (but mandatory pay).	Need collection and processing capacity for the new tons; Space at businesses for new containers may be tight; Need support from businesses, elected officials, public; Costs to non-recycling businesses (and some recycling businesses) will increase; Enforcement and exceptions need to be worked out; Risk to haulers in initial rate-setting since recycling sizes will be unknown.	High GHG; Moderate-high job creation (including local haulers)
36	Mandates and Bans	No Bin No Barrel	Unambiguous program / clear signal; Potential to reduce significant tons (mandatory, so it diverts more tons than voluntary options); Self-funding; Easily implemented by community (if they have authority);	Defining the level of recycling needed to comply; Setting up enforcement mechanism (community or hauler, steps, etc.); May pose hardship on businesses for cost or space for recycling; Small generators or self-haulers or those using drop-offs may need special rules.	Low to medium GHG and job creation (haulers)
37	Mandates and Bans	Material Bans	High impact on tonnage diversion (for all sectors); Low cost to implement; Options on where to enforce (collection vs. disposal, facility or curb, etc.); In place in many other locations; Can easily target specific materials; Additional materials can be added easily; Extends landfill life.	Enforcement required to be successful, and can be complicated (for haulers or community enforcement entity); Need sufficient processing capacity / facilities; May pose hardship on businesses for cost or space for recycling.	High GHG; Moderate-high job creation (including local haulers)
38	Policy & Incentives	Taxes / Surcharges on Disposal Fees	Can realign economic incentives to change behavior and divert tons; Can be set to affect significant tonnages; Clear and long-lasting signals; If the authority exists, can be fairly easily implemented.	Community may not have authority or own the landfills / disposal sites; If available, haulers may choose to take materials elsewhere, undermining the incentive.	Medium GHG; limited effect on jobs.

Figure A.2: Cont.

ID	Program Type	Name	Key Strengths / Opportunities	Key Barriers / Weaknesses	Auxiliary Benefits/Co-Benefits
39	Policy & Incentives	ADFs on Selected Products	Leads to recycling and provides funding system for specific hard-to-recycled target products; Decreases illegal dumping and encourages proper disposal / management; Encourages use of less toxic or less hard-to-recycle substitutes; User-specific (can avoid fee if use substitutes); Equitable; Self-funding; Flexible (can be charged / designed multiple ways); In use in other communities; Encourages changes in design / management / disposal behavior all up the chain from manufacturing through consumer; Can set fees appropriate to change behavior; Possibility of revenues from uncollected deposits.	ADFs are generally on products that are not extremely high volume, but are high cost / high environmental cost / hard-to-recycle; Needs administrative system for audit, enforcement, and fees (can select products to minimize); Requires special study to be conducted to identify the attributable costs ("nexus" study, unless results are borrowed from another community); Retailers are affected; Public and elected official support needed. Substitution to other items (or reduction in purchase) can reduce community sales tax; Some concerns about cross-border transit of deposit items.	Minimal GHG, job impact
40	Policy & Incentives	ADF / Single use bag fee or ban	Both bans and fees significantly decrease use; Associated environmental benefits (streams, litter, etc.); Targets a hard-to-recycle commodity (with well-known substitutes); Many communities have implemented nationwide; Programs can be made to be attractive to retailers (revenue sharing) and to elected officials (well-selected exemptions).	Does not reduce many tons (plastic bags are not heavy); Must set up auditing / administrative system and fee-collection system (for administration and clean-up, etc.) – or ban enforcement personnel / system; Needs special study to be conducted to identify the attributable costs ("nexus" study, unless results are borrowed from another community); Retailers are affected; Public and elected official support needed.	Minimal GHG, job impact
41	Policy & Incentives	ADFs / Recycled Content Requirements	Implementing recycled content requirements in products (e.g. newspapers, etc.) increases demand for recycled content product and the underlying recycled commodities, "closing the loop"; If implemented widely (state or national level), can have a very strong impact on tons, perception, practices, economies of scale.	Tonnage impacts are unlikely to be directly local (recycling markets are international), but increases demand; Community may or may not have authority to implement; May cost more for those affected.	Low GHG, job impact
42	Collection & Contracting	Targeted food scraps programs	Commences a program to capture a potentially-large waste stream / provides bridge to privatization and user-fee funding; Works out kinks in design / delivery before going full-scale, which is especially important in food scraps (including processing changes); Diverts targeted tons; Allows targeting of businesses with greatest potential tons; Community can help recruit participants; Piloting and partnering allows opportunities to explore efficiencies of delivery including relationships with haulers, container manufacturers, and finding limited opportunities for co-location where it makes sense (e.g. potentially sharing bins between, for example, neighboring restaurants in a district, etc.). Community and hauler may explore options for grants, etc.	Must have collection capability and processing facility available to handle a potentially-large material stream; Must have willing partners and program participants, especially interested haulers; Recruitment efforts are needed, often with the assistance of the community; Program must be attractive enough to garner sufficient participation to be cost-effective; Post consumer food programs can have contamination and will need enforcement or the program can start by targeting other groups.	Medium GHG (methane is potent GHG); moderate local job creation
43	Collection & Contracting	Starting / subsidizing food collection	Jump start a program to capture a potentially-large waste stream / provides bridge to privatization and user-fee funding; Works out kinks in design / delivery before going full-scale, which is especially important in food scraps (including processing changes); Helps address start-up costs; Diverts targeted tons; Flexibility in the design of how this is implemented – with / without private sector, grants vs. subsidies vs. other, targeted businesses, etc.	Requires initial funding and coordination, and plan for on-going funding source or transition to self-funding (or funding arrangement); Must develop initial design (including allowed materials, business targets), and monitor / solve problems for full-scale program; Encouraging businesses to participate if trash plus recycling costs more than trash only; Need appropriate collection capacity and processing infrastructure; Partnerships will need interested haulers.	Medium GHG (methane is potent GHG); moderate local job creation
44	Collection & Contracting	Starting / subsidizing recycling collection	Jump start a program to capture a potentially-large waste stream / provides bridge to privatization and user-fee funding; Works out kinks in design / delivery before going full-scale; Helps address start-up costs; Diverts targeted tons; Flexibility in the design of how this is implemented – with / without private sector, grants vs. subsidies vs. other, etc.	Requires initial funding and coordination, and plan for on-going funding source or transition to self-funding (or funding arrangement); Must develop initial design, and monitor / solve problems for full-scale program; Encouraging businesses to participate if trash plus recycling costs more than trash only; Need appropriate collection capacity and processing infrastructure; Partnerships will need interested haulers.	Low GHG; minimal job creation
45	Collection & Contracting	Contract for Commercial Collection	Potential for strong diversion depending on how programs and incentives are set up; Community gets strong control and authority and has flexibility in incentives and services needed to achieve tonnage diversion through the contract arrangement; Economies of scale in collection with single- or geographically-concentrated hauler(s); Less wear and tear on roads; If there wasn't widespread recycling before, job creation results; Easy for tonnage reporting / tracking / measurement; Easier to implement other program s (authority / control); User fees pay for the program.	Getting the authority to issue RFP; Must develop / advertise / issue / evaluate RFP and negotiate competitive contract; Need strong support from elected officials / haulers will object.	Medium GHG; potential job creation depending on design

Figure A.2: Cont.

ID	Program Type	Name	Key Strengths / Opportunities	Key Barriers / Weaknesses	Auxiliary Benefits/Co-Benefits
49	Partnerships and Facilities	Hub and Spoke Recycling Collection Assistance	Makes collection, processing, and marketing more cost-effective for rural areas; Efficient use of facilities; Shares costs; Can keep facility costs reasonable because material processing can be tailored to market needs; Increases diversion tonnage options for small and rural areas.	Getting communities and other partners to cooperate; Negotiating, developing, and funding a central hub facility; Distances for transporting materials; Population density barriers; Facilities needed for multiple materials, and materials without the facilities cannot be collected; Sharing the authority can be difficult (varying sizes of partners, etc.); Must carefully craft agreements (public and private).	Low GHG, low job creation
50	Partnerships and Facilities	Partnerships on Recycling / Composting Facilities	Provides a feasible way to address infrastructure gaps; Financial savings by sharing the cost; Uses the capabilities of each entity (operators operate, etc.); Good for small / rural areas with lower material volumes; Does not directly lead to tonnage diversion / necessary support.	Facilities can be expensive (communities might prefer to encourage flows through other programs that lead to private facility development of facilities); Sharing the authority can be difficult (varying sizes of partners, etc.); Must carefully craft agreements (public and private).	n/a
51	Partnerships and Facilities	Dirty MRF-Post collection separation of recyclables	Doesn't require behavior change by hard-to-change customers; Provides option to pull out specific and high-value materials; Can be effective at recovering fairly high tons with careful routing and relatively simple equipment; Increases diversion rate.	Concerns about cleanliness and quality of materials to market; Doesn't change behaviors so requires on-going program.	Medium GHG, moderate job creation
52	C&D	C&D: Higher Permit Fees	Directly affects C&D; Low cost; Simple to implement; Fees can be varied until desired behavior is achieved.	Requires local options / infrastructure for what the community wants done with the C&D instead of disposal; Enforcement of loads and practices.	Low GHG, low job creation
53	C&D	C&D Deposit Program	High impact on C&D; Well-demonstrated program elsewhere; Begins to guarantee a flow, which helps support development of infrastructure; Provides an unanticipated revenue from unclaimed deposits; Leverages on existing enforcement mechanism (permit process); Pricing can be varied to accomplish the required goals; Low cost.	Required C&D recycling infrastructure / markets; Requires enforcement and administration.	Medium GHG; some job creation potential
54	C&D	C&D On-Site Sales	Allows for reuse as well as recycling and (attempts to) clearly identifies value of materials; Job creation for dismantlers.	Lack of skilled dismantlers / knowledge of safe and effective de-construction (technical as well as hazardous materials); Complexity and storage concerns for recovered materials (takes a lot of space); Must set up program and decide thresholds for requirement, etc.	Low GHG, low job creation
55	C&D	Discounted / Higher Rates for C&D	Direct affects C&D tons; Economic incentive is clear; Cleaner loads may be provided; Low cost to community; Incentives can be set / adjusted to provide the desired behavior.	Enforcement / inspection; Facilities may not be owned by the community, making implementation and enforcement more complicated; Disposal rates need to be recomputed to cover the subsidy.	Low GHG, low job creation
56	C&D	Developer Incentives for C&D, Recycling	Addresses a point in time that has consequences for the life of the building (100 years?); Includes flexible incentives designed to appeal to builders; Can be designed to address recycling, recyclability, re-use, design and ongoing operations; Directly affects C&D, as well as other materials in the future (in-house recycling); Not all incentives must be direct financial incentives (design concessions, etc.)	Local markets may not make it feasible / lack of suitable recycled content materials; Costs for building can be higher; Incentives may not be carefully constructed enough to avoid unintended consequences (complicated / may end up with clever builders taking advantage of compounding incentives); Might be difficult to enforce for actions taken (and rewarded) beyond what builder would have done anyway.	Low GHG, low job creation
57	C&D	C&D Material Ban	Affects tons directly; High impact; Low cost to implement / enforce for community, especially relative to tons recovered.	Requires enforcement; requires infrastructure to deal specifically with C&D; Potential illegal dumping if rules / options unclear or costs prohibitive.	Med/High GHG, some job creation

Attachment B: Definitions

- **Advance Disposal Fees (ADF):** These are fees, generally embedded into the purchase price of a product, that reflect additional costs associated with the proper disposal of the material or product (e.g. incorporating environmental costs, or costs for treatment as hazardous waste, etc.). Deposits are one form of ADFs.
- **Carters:** Private firms that provide collection of trash or other solid waste streams (e.g. recycling, compostables/ organics). See also "haulers".
- **Commingled programs:** Commingled Programs allow residents to mingle all recyclables in a single curbside container, which are then sorted at centralized processing facilities. Source-separated recycling programs require residents to sort their recyclables prior to curbside collection. Separation is usually based on categories of materials that will be bought and sold in the marketplace (glass, plastic, aluminum, paper, etc). Single stream is an extreme example of commingled recycling, providing collection of all recyclables in one mixed container.
- **Composition/characterization:** The results of a statistically-reliable sorting-type study that provides parentages of individual materials within the waste stream under study (e.g. newspaper, glass jars, etc.). Compostable plastics and biodegradable plastics are often separated from typical compost procedures as material composition and decomposition timelines vary.
- **Compostables:** The combination of yard waste and food scraps generated as part of municipal solid waste (MSW). These materials can be composted, and are sometimes called "organics".
- **Construction and Demolition (C&D):** A waste stream focused on the waste generated as a side effect of the construction or demolition of buildings and other projects. This is sometimes called CDL for construction, demolition, and land clearing.
- **Diversion, Diversion Rate:** The percentage of waste generation tonnage (in this case commercial) that is recycled, composted, or reduced from landfill disposal.
- **E-Waste or Electronics Waste:** A waste stream including computers, printers, and other electronic wastes. These materials are banned from disposal in multiple states.
- **Embedded:** The term used to indicate that the cost of the recycling program delivered is included (or embedded) in the service cost charged for trash. There is no separate cost for recycling. Requiring embedded rates provides a financial incentive to recycle more so the trash size (and potentially the trash bill) can be reduced and bill savings realized.
- **Generation/Waste Generation:** The total tons of waste sector material (in this case commercial) that is produced, including that which is disposed, recycled, composted, or otherwise reduced. This figure is used as the "denominator" and diversion percentages are computed using this figure.
- **Greenhouse Gas (GHG):** Air emissions that speed climate change; their relative contribution is most commonly measured in metric tons of carbon equivalent or metric tons of carbon dioxide equivalent (MTCE or MTCO2E).
- **Haulers:** Private firms that provide collection of trash or other solid waste streams (e.g. recycling, compostables/ organics). See also "carters".
- **High Density Polyethylene (HDPE, or #2):** Refers to a plastic product in which the ethylene molecules are linked in long chains with few side branches. Examples of products made from HDPE include milk jugs, detergent bottles, margarine tubs, and garbage containers.
- **Hub and Spoke:** Collection of recyclable materials at a set of well-placed/well-distributed drop-off sites in a broad (usually rural) geographic area, each of which has limited or no processing, and the materials are then collected and aggregated to process and market jointly for better volumes and economics.
- **Materials Recovery Facility (MRF):** Refers to a facility where recyclables are sorted into specific categories and processed, or transported to processors, for remanufacturing. A "clean" MRF accepts recyclable materials that have been separated from the waste stream prior to arriving at the facility. A "dirty" MRF separates the recyclable materials from the waste stream through various sorting procedures.

- **Municipal Solid Waste (MSW):** Refers to wastes from residential, commercial, institutional, and industrial sources collected as a normal part of a municipal waste stream, such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets, cafeteria wastes and miscellaneous inorganic wastes. Excludes solid wastes from other sources, such as construction and demolition debris, auto bodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in municipal waste landfills or incinerators.
- **Metric Ton of Carbon Dioxide Equivalents (MTCO2E):** a measure of the amount of greenhouse gas (GHG) emissions. MTCE is a similar measure, using carbon equivalents.
- **Multifamily Units (MFU):** Households residing in apartment buildings; programs for this sector usually lag behind recycling in single family households (SF).
- **OCC:** Generally, old corrugated cardboard. Corrugated cardboard has a wavy center layer and is sandwiched between the two outer layers. Material may be uncoated (recyclable) or have a waxed coating on the inside or outside (not recyclable). Examples include shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons.
- **Organics:** The combination of yard waste and food scraps generated as part of MSW. These materials can be composted, and are sometimes called "compostables".
- **Partnerships:** This term is usually applied to the development of processing or disposal facilities. Communities may develop and operate capacity independently, or it may opt for a partnership with the private sector/private business. One example might be a case in which the community builds a MRF, but lets a competitive bid for operation of the facility by a qualified private company.
- **Pay as you Throw (PAYT):** A system by which bills for trash service (or sometimes, the combination of trash and recycling) that charges more for higher volumes of service. The system is believed to provide an incentive for recycling (or otherwise diverting materials from the trash and disposal stream).
- **Polyethylene Terephthalate (PETE or PET #1):** Refers to a thermoplastic material used to manufacture plastic soft drink containers and rigid containers. PETE has a high melting point, is clear in its natural state, and has a relatively high density.
- **Plans:** A set of multiple programs or strategies that are designed as a "package" or "portfolio" brought before decision-makers or implementers for delivery and roll-out to the commercial sector to achieve commercial recycling or diversion (combined recycling, composting, waste prevention).
- **Plastics #3-7:** Typically if a plastic piece is recyclable and recoverable, a number centered in the recycling symbol is molded into the plastic. The number corresponds with the category of plastic. PETE is #1, HDPE is #2, and PVC is #3. Plastic numbers 4, 5, 6, and 7 represent different chemical formulations for plastic products.
- **Polyvinyl Chloride (PVC, #3):** The family of plastic copolymers, also known as vinyl. PVC is used to make products such as pipes, bottles, upholstery, and automotive parts.
- **Portfolios:** A set of multiple programs or strategies that are designed as a "package" or "Plan" and brought before decision-makers or implementers for delivery and roll-out to the commercial sector to achieve commercial recycling or diversion (combined recycling, composting, waste prevention).
- **Program:** A single initiative (policy, incentive, education, etc.) that is introduced to encourage, or make conditions more favorable for, commercial recycling or waste diversion (composting, waste prevention). Used interchangeably with "strategy" in this report.
- **"Rates and Dates":** The common/popular parlance for setting waste diversion goals (rates) for a particular year (dates). An example might be a community with a goal of 50% by the year 2020.
- **Recycling Rate:** The percentage of waste generation tonnage (in this case commercial) that is recycled.
- **RFP or Request for Proposals:** A Request for Proposal (RFP) is issued by a public or private entity to solicit another entity to provide services to be conducted under a contract. It is similar to a request for bid (RFB) except it has more flexibility, allowing the respondent some flexibility in how the service will be provided. The proposals are evaluated based on evaluation criteria including service and cost, and a contract awarded to the winner.

- **Right-Sizing:** Reviewing (and renegotiating with service providers or haulers) the collection service needs of a commercial generator to optimize the number, size, and collection frequency for various services (trash, recycling, organics). This commonly follows technical assistance (TA) or introduction of recycling programs which usually lead to reductions in trash container volumes and increase recycling container service volumes.
- **Single Stream Recycling:** Collection of all types of eligible recyclables in one container (usually large, commonly 96 gallons), rather than separated into two or more containers. A subset of "commingled" programs.
- **Source separated:** Source-separated recycling programs require residents to sort their recyclables prior to curbside collection. Separation is usually based on categories of materials that will be bought and sold in the marketplace (glass, plastic, aluminum, paper, etc).
- **Strategy:** A single initiative (policy, incentive, education, etc.) that is introduced to encourage, or make conditions more favorable for, commercial recycling or waste diversion (recycling, composting, waste prevention). Used interchangeably with "program" in this report.
- **Technical Assistance (TA):** A program by which professionals that are knowledgeable about recycling and/or composting guidelines conduct audits or walk-throughs of specific businesses and offer suggestions on revised behaviors, processes, or procedures to increase diversion, reduce MSW, and where possible, reduce MSW management and business operational costs.
- **Tipping fee:** This is the cost per ton (or per cubic yard) charge for disposal of solid waste at a landfill, or other disposal site. It is also applied to deposits of other materials. For example, a tipping fee can be applied at a recycling facility and can be positive or negative, depending on the region and facility, or can be applied at an organics composting site.
- **Transfer Station:** A facility at which MSW and solid waste is aggregated from individual collection trucks, and transferred into truck bodies appropriate for hauling to a disposal site (for MSW) or other processing facilities (for recycling, etc.). Some minimal processing may occur at the facility. In addition, transfer stations often allow the public or self-hauling businesses/residents to deposit materials at the site, usually for a fee for MSW, and sometimes free for recyclables.
- **Unit Based Pricing:** See Pay as You Throw (PAYT).
- **Universal Wastes:** EPA defines universal wastes as batteries, pesticides, mercury-containing equipment, and bulbs/lamps.
- **Waste Reduction/Waste Prevention/Source Reduction:** Changes in behavior or processes and practices that reduce generation of waste; waste does not occur in the first place and does not need to be disposed, recycled or composted. Examples include commercial processes that reduce packaging, or lead to fewer trimmings, or dual sided copying to reduce paper use, etc.
- **Zero Waste:** Zero Waste is a goal to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. In practice, Zero Waste is a comprehensive set of programs and policies designed to achieve zero landfilled tonnage, "or darn close".