

Waste Not:

Strategies to Reduce Ann Arbor's MSW & Improve Diversion in the Commercial Sector

University of Michigan | School of Natural Resources & Environment
Master's Practicum report submitted in partial fulfillment of the requirements for the degree of
Master of Science
April 25, 2017

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Acknowledgements

My deep gratitude goes to my inspirational advisor, Dr. Joe Arvai. Joe generously took me under his wing as his Practicum student despite it being his first year in a new city, teaching at a new University, and Directing the Erb Institute. Joe always made time for me no matter how busy his schedule, and provided the simultaneous calm and motivation that I needed throughout this process.

I would like to thank Anya Dale, Sustainability Rep for the University of Michigan's Office of Campus Sustainability. I have had the pleasure of working with Anya on more projects and under more roles than I could count. I am immensely grateful that Anya invited me to join the Resource Management Team, which became a formative experience during my time at Michigan and whose work became the subject of my Master's Research. I admire Anya's vision and passion for pushing the sustainability envelope. I feel lucky to have had the opportunity to work with and learn from Anya, and am blessed to consider her both a mentor and friend.

I am thankful to Bryan Weinert for welcoming me on the Resource Management Team. Bryan helped me scope and re-scope my research, and was a sounding board throughout my Master's Practicum process. I am grateful for Bryan's leadership of the Resource Management Team and his unwavering commitment to making our community more sustainable.

I would like to thank the other members of the Resource Management Team that have helped me throughout this project by sharing their technical expertise, resources, advice, and enthusiasm. The members include: Todd Bukowski, Aaron Burman, Dan Ezekiel, Miriam Flagler, Mike Garfield, Jennifer Hall, Mara Herman, Kirk Lignell, Allison Skinner, Keith Soster, Randy Trent, Andrew Wilhelme, and Jan Wright.

I would also like to thank Jim Frey for being a leader in resource management and in the community. Jim was incredibly helpful during this past year of research and graciously served as both a technical and professional mentor as I navigated my research and career path.

I would like to thank Matt Naud for encouraging me to get involved in local issues and for generously offering his time and vast knowledge of the city.

I am grateful for the Ann Arbor Environmental Commission that tirelessly works towards making Ann Arbor a more sustainable city.

I wish to express my sincere thanks to the Erb Institute and its staff for constantly offering resources and support, and for encouraging and inspiring me to continue pursuing this newfound passion of resource management.

Thank you to my academic advisor, Robyn Meeks, and the wonderful faculty and staff at the School of Natural Resources & Environment for these last three years of education, and for providing me the opportunity and resources to explore the less-conventional Practicum path.

And last, but certainly not least, I would like to thank my friends and family who have been incredibly patient cheerleaders, voices of reason, and proofreaders throughout my life and especially through these last three years of graduate school. In particular, I would like to recognize my mom, dad, sister, and loving partner for whom I am eternally grateful.

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Definitions

Eating & Drinking Places: A subsector of the Retail Trade commercial subsector that Washtenaw County uses to define the foodservice sector. This includes restaurants, grocery, and coffee shops.

Diversion: The process of processing materials through a means that is able recoup value from the material. This term often refers process or rate of material that is kept out of landfill through recycling or composting

Feedstock: Material that enters into a compost stream or recycling stream and dictates the quality and quantity of saleable output.

Hauler: The MSW stakeholder which collects the waste, recycling, or compost and drops it off at a transfer station to be sent to a processor or directly at a processing facility such as a composting facility, MRF, or landfill

Material Recovery Facility (MRF): The facility that receives, sorts, and bales recyclable materials, which it then sells to manufacturers to process into commodity materials and/or new products

Municipal Solid Waste (MSW): The waste that is created in a city or region that must either be disposed of or recycled

Non-standard Recyclables: Materials and products that are recyclable through special programs, but not through typical single-stream or dual-stream collection. These items include flexible plastics, electronics, batteries, textiles, etc.

Processor: The MSW stakeholder that converts MSW into saleable organic material (compost facility), bales of commodities to be sold (MRF), or landfill material

Refuse/Trash: Material that is not considered divertible through the available recycling or composting system or material that is not diverted for any reason.

Reuse: The reduction of MSW material entering the waste stream by prolonging the life of a product or item, or by repurposing the material or item.

Source Reduction: The reduction of MSW material entering the waste stream by reducing the amount of material used:

Tip Fee: The fee charged for processing MSW, generally paid by the ton of MSW that is expected to be processed. This fee is generally incurred at all processing center such as landfills, MRFs and composting facilities

Waste Reduction: Any type of initiative that reduces the quantity of MSW entering the waste stream.

Abstract

Ann Arbor has long been regarded as one of the most progressive and sustainable cities in the United States, however Ann Arbor has not continued to support this perception through action in addressing its municipal solid waste (MSW) and resource management. Ann Arbor's total MSW has increased steadily every year; despite population growth, other comparable cities have seen flat or declining total solid waste.

This study reviewed primary and secondary data in order to develop recommendations for Ann Arbor to more sustainably manage its MSW. The methods employed in this research include a survey of Ann Arbor foodservice businesses and a benchmarking study of U.S. cities that have successfully employed waste reduction and diversion strategies. This study concludes that Ann Arbor's biggest opportunity for waste diversion and reduction lies in its foodservice sector, referred to as "Eating & Drinking Places" per the Washtenaw commercial sector groups. This sector, particularly the downtown area, is facing significant waste management challenges and is interested in new diversion opportunities. In so doing, the sector hopes to adopt more sustainable resource management practices and reduce the cost, space constraints and inconvenience faced as a result of their daily waste.

Keywords: municipal solid waste, MSW, waste reduction, diversion, recycling, compost, trash, Ann Arbor, urban sustainability

1. Introduction

Municipal Solid Waste (MSW) is a source of increasing urban, regional, and international concern. The World Bank's Urban Development and Local Government Unit estimate that global urban populations generate 1.3 billion tons of MSW per year, which has consistently been increasing as a result of population growth and per capita increases in waste generation. Governments' concern about what to do with this waste is mounting as global waste is expected to nearly double by 2025 (Hoornweg & Bhada-Tata, 2012).

Global waste composition, collection and disposal methods vary by national income level and level of development. However, the vast majority of waste – nearly 60% – is estimated to be landfilled regardless of the geographic and economic context (Hoornweg & Bhada-Tata, 2012). The management of MSW can significantly impact the environmental health and safety of residents, local GDP, and employment. United States, along with other developed nations, has the opportunity to lead the large scale adoption of sustainable resource management. Several cities and regions in the United States have demonstrated their interest and value for sustainable resource management by adopting policies and programs that proactively aim to reduce and divert a growing sharing of MSW.

Ann Arbor, while previously a leader in sustainable resource management, has fallen behind municipal leaders in the United States. Over the last two decades, the city has continued to outline goals for sustainable materials management while simultaneously divesting resources from the solid waste program. During this same period, the city has made very little progress in its management of commercial waste, yet constituents continue to value increased opportunities for waste diversion (Summary of Washtenaw County Public Feedback Survey Form Results, 2016).

This report will aim to address how Ann Arbor can more sustainably address its MSW by trying to understand the need and interests of Ann Arbor's constituents and identifying sustainable resource management best practices by benchmarking municipal leaders around the country.

1.1. MSW Management Methods

There are four primary methods of MSW management: disposal, recycling, reuse, and source reduction.

Disposal is considered to be the least sustainable method of MSW management in Ann Arbor. Disposal includes landfills, incinerators or waste-to-energy facilities, and dumps. Since Ann Arbor does not currently manage any of its MSW through incinerators, waste-to-energy facilities, or dumps, this report will assume that all disposed refuse is landfilled and will consider the terms "landfill" and "dispose" interchangeably.

Recycling includes any method by which material is collected, cleaned, and processed into material that can be used in the manufacturing of new products. The term "recycling" will also

be synonymous with the term “diversion” throughout this report, which is intended to signify diversion of MSW from landfill.

Recycling practices include single-stream or dual stream recycling of traditional materials such as metal, plastic, glass and paper products; composting; and specialty recycling. In Ann Arbor traditional recyclables are managed through a single-stream recycling system which collects mixed paper; cardboard; metal; plastic containers, bottles, and tubs numbered 1-2 or 4-7; glass; Tetra Pak and Aseptic packages all in one container. The city’s contractors sort and bale the collected materials at a single-stream material recovery facility (MRF). Recycling is also possible through the collection and processing of specialty recyclables. Ann Arbor has several programs for recycling specialty materials such as electronics, flexible plastics, hazardous materials, etc.¹

The term recycling in this report also refers to the recycling of organic material, which can be recycled through backyard composting systems, vermicomposting, industrial composting through covered or uncovered windrows, and anaerobic or aerobic digesters. Ann Arbor has an industrial, uncovered windrow composting facility where it is able to process yard waste, food waste – including meats, fats, dairy, and compostable disposable-ware (bio-plastics, bamboo, sugarcane/bagasse products, etc.).

Waste reduction is distinct from diversion in that diverted materials enter the MSW stream but are diverted away from the landfill, and source reduction eliminates material from ever entering the MSW stream. Waste reduction can be achieved from two primary methods – material reuse and source reduction.

Material reuse encompasses any method which extends the life of a material or item and prevents it from entering the MSW stream. This can include repurposing materials for an alternative function if the material is not processed through the MSW system. For example, collecting food waste for use as animal feed is considered an example of material reuse in this report.

Source reduction is another common method for MSW management. This can include any method used to prevent waste materials from being generated or wasted such as eliminating or shrinking packaging, implementing consumer education campaigns to raise awareness of waste issues, operational adjustments such as adjustments to material use efficiency or materials tracking systems, smaller portions and trayless dining to prevent over serving, spoilage prevention packaging, etc. (ReFED, Prevention Solutions).

1.2. Benefits of Diversion

Economic Benefits of Waste Diversion

¹ Specialty recyclables will not be the focus of this report, however opportunities for improving the recycling rate for specialty materials is a recommended area of further study.

Commodity Revenues play a significant role in the economics of diversion. Landfill collection and processing is commonly a net cost to the city as the city pays for the hauling and processing (tip fees) for the waste generated within the city. In contrast, cities are able to generate revenue from the sale of commodities generated through the collection and processing of recyclables, which sometimes generates revenue or can help offset the cost of MSW systems.² The value returned from the processing of recyclables is dependent on the composition and quality of the material collected as well as the commodity markets.

The quality of end commodities is determined by the quantity of non-recyclable materials found in the recycling stream, the rate of cross-contamination of materials,³ the technological ability of processing facility to sort feedstock, and the commodity markets, among other variables. Recycling revenues per ton are often highest in communities with a dual or multisort system as these systems tend to have lower quantities of non-recyclable materials in the feedstock, a lower rate of cross-contamination, and fewer instances of miss-sorting since there are fewer materials types.⁴

Material Recovery Facility (MRF) residual rates measure the percentage of collected MSW recyclable feedstock material that was not able to be sorted either because the MRF system was not able to determine how to sort the material or because the material was not considered recyclable within the system and the items were erroneously included in the recycling collection carts.⁵ The residual rate can be used as a proxy for assessing material quality and anticipating bale revenues, and can also be used to assess the success of a recycling program(s).

Reducing Landfill Costs Recycling programs sometimes have a lower collection and processing costs than the disposal alternative. This is particularly true in areas with high landfill tip fees such as cities on the coasts or where land values are expansive. Diverting material to the recycling stream in these areas can sometimes be a net benefit even without considering the revenue from the sale of baled commodities.

Environmental Impacts of Waste Diversion

Greenhouse Gas (GHG) Mitigation Recycling practices reduce the generation of GHG produced through the anaerobic decomposition of materials in landfills - this reduction is particularly significant for organic materials which is a significant contributor to methane emissions from landfills. The use of compost as fertilizer also reduces the need for synthetic fertilizer and mitigates the associated GHG emissions from the manufacturing, transportation of synthetic fertilizer. Land with land applied compost has also been found to have a higher potential for

² Municipal waste costs and revenues are of course dependent on the nature of the hauler and processor contracts. In the benchmarked cities reviewed for this report the cities incurred costs and revenues from at least one sector (commercial or residential) or stream (trash, recycling, or compost).

³ This is a particularly high concern for single-stream collections where broken glass and light-weight or flat plastics can inadvertently contaminate other commodity streams, especially the paper stream.

⁴ Assuming the compared systems are in similar geographic areas with similar materials markets

⁵ For example, plastic bags are not accepted in the traditional single-stream recycling carts, so any plastic bags found in the recycling stream would be included in the residuals calculation.

carbon sequestration than land farmer with synthetic fertilizers (ReFED, A Roadmap to Reduce Food Waste by 20 Percent, 2016).

Energy Use and GHG Reduction Using recycled materials in manufacturing processes displaces the production of virgin materials which are often created through energy-intensive resource extraction and processing. The displacement of raw materials reduces total energy use and GHG generation (ISRI, n.d.).

Improved Soil Health Soil health is improved through the land application of nutrient-rich compost created from the collection and processing of organic waste. Compost has been shown to increase soil water retention and reduce drought risk in water-scarce regions. This effects could, in some regions, also lead to a reduced need for agricultural irrigation (ReFED, A Roadmap to Reduce Food Waste by 20 Percent, 2016).

Job Creation is estimated to be nine to thirty times more in the recycling industry than in disposal alternatives (Zero Waste Creates Jobs, n.d.). Jobs are created both directly and indirectly as a result of increased recycling.

Direct Jobs: Direct jobs are those created directly as a result of the recycling industry itself such as the jobs created in order to construct new facilities, the collection and process of recyclables, and broker of recycling commodities. Resource Recycling Systems (RRS) estimates in its *Recycling in Michigan* report that an average of 6.8 direct recycling jobs are created for every 1,000 tons of diverted material (RRS, Northeast Michigan Council of Governments, DEQ, Public Sector Consultants, 2015).

Indirect Jobs: Indirect jobs are jobs created in the “recycling reliant industries” as a result of the increased availability of secondary materials and a growth in reuse and remanufacturing industries that directly use outputs from recycling operations (Vijayaraghavan, 2011).

Since there is so little virgin material manufactured in Michigan, it expected that the majority of the jobs created as a result of increased recycling would stay in Michigan. The Michigan Recycling Partnership estimates that a 20-30% increase in diversion would “create between 6,810 and 12,986 jobs, generate \$155 to \$300 million in income, \$1.8 to \$3.9 billion in receipts, and about \$12 to \$22 million in state taxes” for Michigan (Michigan Recycling Partnership, n.d.).

Water and Air pollution reduction through the elimination of hazardous waste from landfills, lower nutrient runoff from landfills, and reduced risk of landfill leachate contaminating groundwater (ISRI, n.d.).

1.3. Benefits of Waste Reduction/Reuse

Economic Benefit of Waste Reduction

Lower Business Costs through reduced food loss, reduced packaging and shipping costs, and reduced time spent prepping food through increased efficiency of resource use. ReFED estimates that the U.S. restaurant and foodservice industry could save up to \$1.6 billion in avoided food purchases by adopting source reduction strategies (ReFED, A Roadmap to Reduce Food Waste by 20 Percent, 2016).

Social and Societal Benefits created through food recovery organizations such as Washtenaw County's own Food Gatherers both help feed the communities in which they serve and reduce the disposal of organic waste. ReFED estimates that 383,000 tons of food waste could be rescued in the U.S. each year to feed our food insecure communities. Food recovery efforts also have the potential to reduce the need for government funds for similar programs.

Tax Incentives earned from food donations can reduce the impact of loss from unsold food.

Environmental Impacts of Waste Reduction

Greenhouse Gas (GHG) Mitigation through the reduced anaerobic decomposition of materials in landfills and avoided recycling collection and processing.

Source reduction can also reduce the demand for agricultural products, thus minimizing the GHG impacts from livestock and agriculture, and product shipping. GHG avoided through reduced food demand is estimated to be 10 times as large as GHG avoidance from recycling food waste.

Water use is reduced through decreased food demand. Water nutrient pollution and waste water treatment demand is reduced through reduced agricultural runoff and fertilizer need.

2. Context

2.1. State of Michigan

Michigan has an embarrassingly low recycling rate. Approximately 15-20% of generated MSW is recycled, which is one of the lowest diversion rates in the country and far lower than the national average of about 34% (U.S. Environmental Protection Agency, 2016). Governor Snyder considered this paltry effort in sustainable materials management equivalent to throwing out money, and values an increased effort in our state's materials management. A recent study estimates that the 'money' Michiganders throw out to be equivalent to \$435 million.

In an effort to capture these wasted resources, Governor Snyder vowed in 2012 to double the state's recycling rate in two years. While Michigan has yet to reach that goal, Governor Snyder is still pushing forward dedicated funding and political support (Jaehnig, n.d.). Approximately

\$400,000 in grant funding is left from the original 1-million-dollar state recycling grant budget (Ogden, n.d.).

In addition to supporting individual municipalities the governor is interested in meeting the state's need for more recycling data and improved public education. These issues were shown to be important in a MDEQ convened stakeholder working group. In 2014, the Governor awarded \$250,000 in grants specifically to improve recycling data collection (Improving Recycling in Michigan 2014-15, n.d.). In 2016, the Governor further backed these efforts by signing legislation that requires recycling facilities to register their recycling data with MDEQ (Associated Press, 2016).

Michigan still has significant progress to make in order to reach the national average recycling rate. The state is looking to regions and municipalities to leverage the state grants and improve the state's diversion rates. However, despite the available grant funds the state has not yet implemented any changes that would dramatically alter the materials market outlook for Michigan. Michigan still has a 12 cent landfill tax per ton, compared to other states like Minnesota with a 31.5% tax or Wisconsin's \$13 per ton (State Tipping Tax Puts Strain on Michigan's Solid Waste Management , 2012).

Michigan Landfills

While Ann Arbor has historically been a very sustainably progressive city, it resides within a fairly conservative region with significant influence from the industrial sectors. Being in the Midwest, it is also surrounded by comparatively inexpensive and abundant land. Michigan historically leveraged their low land cost to their advantage to site landfills. There are currently 49 active MSW landfills in the state and they have some of the lowest tip fees in the country, averaging around \$25-\$30, well below the national average of \$40-\$50, and well below the highest tip fees in the country, around \$100-\$150. These low tip fees have led Michigan to see waste as a potential source of revenue through waste imports. Michigan has the third highest volume of waste imports in the country (Kurlyandchik, 2012).

According to Michigan's recent waste characterization study, Michigan landfills have an average of 26 years of remaining capacity (ranging from 1 to 556 years) (Economic Impact Potential and Characterization of Municipal Solid Waste in Michigan, 2016). Michigan has continued to rely on its existing landfills, with some expansions, since 2001, it is estimated that Michigan could grow its landfill capacity by 30-40 percent just through continued expansions (Kurlyandchik, 2012). Despite the abundant capacity, the State of Michigan recognizes the immense potential and value of the landfilled material. The state estimates that if all of the materials disposed in landfills were recovered through recycling or reuse it would create 2,619 additional jobs and an economic impact of \$399 million per year (Economic Impact Potential and Characterization of Municipal Solid Waste in Michigan, 2016).

2.2. Washtenaw County & Regional Context

Washtenaw County

Washtenaw County spans 716.6 square miles and is home to 359,454 people. The City of Ann Arbor is the largest city within the Washtenaw County border. Washtenaw County's current solid waste plan was developed in 1999 and adopted in 2000.⁶ In 2015, the county open the plan for amendments due to the request for landfill expansion put forth by Advanced Disposal. Though Advanced Disposal ultimately retraced their request, the county continued to update its solid waste plan. As part of the preparation process, the county conducted a public feedback survey to incorporate the views of the county's stakeholders into the new solid waste plan (Summary of Washtenaw County Public Feedback Survey Form, 2016). The plan is still undergoing revisions, and the county expects the plan to be adopted in 2017.

In the time since the last plan was adopted in 2000, Washtenaw County has continued to influence waste diversion and waste reduction through the Washtenaw County solid waste Programs, and has issued interim solid waste assessments and annual reports in addition to providing regular updates through the Washtenaw County Consortium for Solid Waste Management (WCCSWM) inter-governmental meetings (Solid Waste Management & Planning, n.d.).

Washtenaw County has had the fastest growing population in the State of Michigan. It has been consistently growing for the past 30 years at an average rate of 2% per year. Its population is expected to continue to increase through 2030. While there are some benefits to continued population growth, it will likely mean an increase in MSW generation within the county.

Washtenaw County has demonstrated an interest in increasing collaboration among its municipalities, townships, and villages, as well as outside of the county. Washtenaw County has demonstrated this interest through its outlined solid waste goals and interests, as well as through its on-going collaboration with Southeast Michigan Council of Governments (SEMCOG) and its development and continued involvement in the Consortium for Solid Waste Management (WCCSWM).

2.3. Ann Arbor's MSW History

Fueled by the local community, the political environment, and the national environmental movement, Ann Arbor's Ecology Center developed the city's first recycling drop-off collection center in 1970. This led to the incorporation of Ann Arbor's very own recycling non-profit, Recycle Ann Arbor, and their implementation of the first curbside collection program in 1978. Ann Arbor was one of the first U.S. cities to implement a multi-material curbside recycling collection.

Over the following 25 years, Ann Arbor expanded the collection of curbside recycling and specialty recycling streams, and was lauded by local and national organizations for its

⁶ The state requires each county to have an approved solid waste plan.

sustainable materials management efforts (A Brief History of Recycling, n.d.). By 2001, Ann Arbor had five full-time equivalent (FTE) staff members managing the city’s MSW. The following 10 years saw significant investments in waste diversion programs and infrastructure such as the implementation of single-stream recycling and the adoption of a recycling cart to replace recycling bins, a curbside cart for yard waste, and the approval of a solid waste millage. While the programs expanded, the education and information did not expand in concert as the solid waste staff dwindled to 1.5 FTEs by 2009.

Since 2009, the program has lost .5 FTEs, leaving just one individual to oversee all current MSW contracts and programs, measure and evaluate current programs, and identify opportunities for improvement, as well as assess potential expansions and opportunities (The History of Recycle Ann Arbor, n.d.). Despite being a department of one, the city was able to successfully expand identify a new contractor to manage the compost facility and expand the seasonal organics collection to include all food waste.

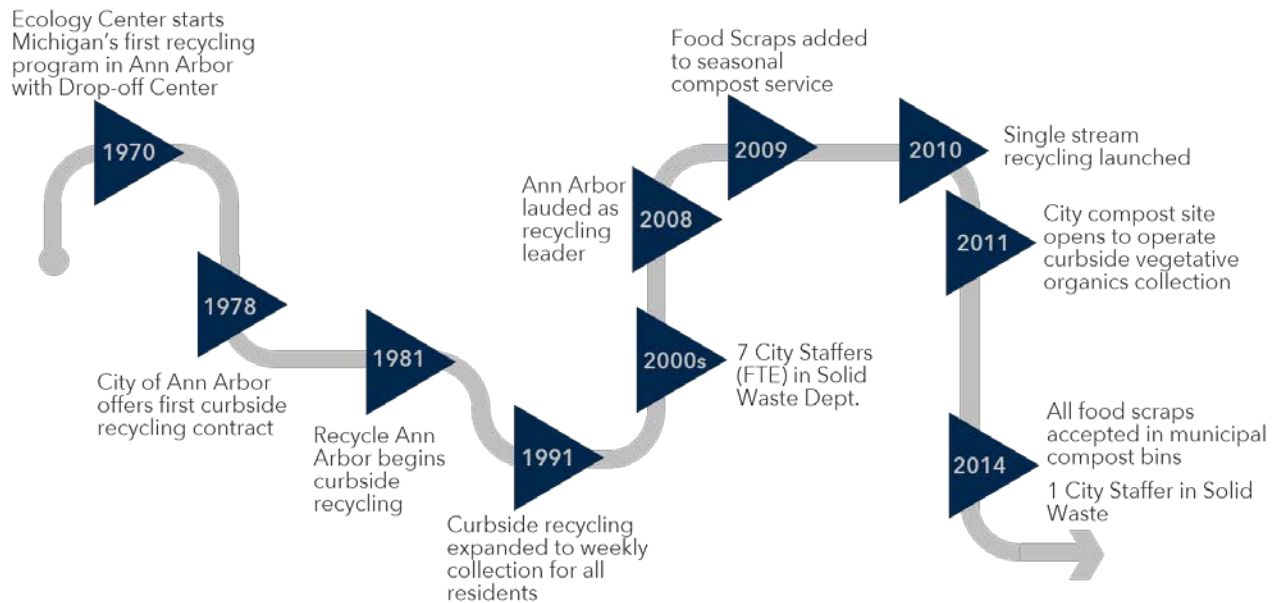


Figure 1: Brief History of Ann Arbor's Resource Management

2.4. Ann Arbor Population Demographics & Diversion Sentiments

Ann Arbor is home to approximately 117,000 residents and 12,000 businesses (United States Census, n.d.), and approximately 47,000 households split nearly evenly between renter and owner-occupied units (Ann Arbor Population 2017, n.d.). The city’s population has an average age of 28, and 50% belong to the Millennial generation. In addition to being much younger than the national average of 37 years old, Ann Arbor residents are also more transient with 23% of the population having spent less than or equal to 5 years in the city (National Research Center Inc. & Leaders at the Core of Better Communities, 2015).

Millennials have been shown to be more interested in and committed to sustainability, particularly in the workplace. This commitment also translates to diversion and waste reduction efforts. In fact, millennials have come to expect workplace sustainability and access to diversion opportunities (Rosengren, Study: More millennials expect workplace sustainability and recycling access, 2017). However, waste diversion systems differ by municipality and region, and the transient nature of 23% of the population is an indicator that as many as 26,910 individuals may be under-informed about the MSW system in their new Ann Arbor home because they have not yet been educated since relocating.

Despite the potential challenges with the transient-nature of the population, there has been demonstrated support for waste diversion among Ann Arbor residents. Residents voted to self-impose the solid waste millage of 3 mils that is currently used to fund the solid waste programs along with recycling revenues. Ninety-three percent of residents also reported that they always or usually recycle at home – 76% and 13% respectively (National Research Center Inc. & Leaders at the Core of Better Communities, 2015).

2.5. Ann Arbor Solid Waste Planning

Ann Arbor adopted their most recent solid waste plan, *Waste Less: City of Ann Arbor Solid Waste Resource Plan Update 2013-2017*, in October of 2013 – nearly a year after it was supposed to be guiding the city’s solid waste planning and expansion. The plan details specific, recommended actions to improve the city’s MSW as well as overarching goals for waste reduction and diversion.

The city’s solid waste plan is nearing the end of its scheduled life, which is proposed to be the end of 2017. And despite the nearly five pages of actions and goals, it is not clear if any of the actions have been implemented - no progress report has been issued since the plan’s adoption. The city is already considering beginning to re-update or write a new solid waste plan since the current plan will expire this year (The Waste Less: Solid Waste Resource Plan Update Advisory Group, 2013).

In 2016, the city also contracted a consulting firm to develop an organics management plan for the city. The planning process included public involvement from the residential and commercial advisory committees and a phone interview conducted among Ann Arbor residents. The final recommendations are expected to be presented at the end of April 2017.

2.6. Overview of Ann Arbor Waste

Residential Sector

Ann Arbor’s residential sector waste consists of the waste generated and collected from single family and multi-family residences in the City of Ann Arbor. Residential sector waste comprises approximately 37% of Ann Arbor’s total MSW (Figure 1).

The residential sector has access to weekly trash and single-stream, curbside recycling collections. In addition, single-family homes are able to opt-in to a weekly, seasonal (spring, summer, and fall) curbside organics collection by purchasing a collection cart through the city for \$25 (Compost, n.d.).

The city adopted a solid waste millage of 3 mills in 2003. This millage is used to fund the solid waste services provided to residents without charging residents any additional fees (The Waste Less: Solid Waste Resource Plan Update Advisory Group, 2013). These services include one free trash and recycling cart for each single family residence, and free weekly curbside collection of trash, recycling, and organics (during the organics collection season).

The City of Ann Arbor does not collect detailed data on the MSW volume or weight collected by household, sector, or stream. This forces waste metrics, diversion rates, and improvements or changes to the rates to be approximated based on the highly aggregated collection data of residents as well as a small portion of business and approximately half of the apartment housing. Based on these estimates, the single-family residential sector has an estimated diversion of nearly 50%, which is much better than the other sectors, but short of the goal of 60% set in the 2013-2017 solid waste plan (Systems Planning: Recycling, n.d.). The multi-family sector diversion rate is known to be lower than the single-family diversion rate, but it is not known more precisely. Lack of precise data also precludes Ann Arbor from knowing the material composition of its MSW.

Commercial Sectors

Ann Arbor's commercial sector is comprised of the businesses located within the city limits. This sector comprises approximately 63% of the city's waste (Figure 1), and is estimated to have an average of 15-20% diversion (Resource Recycling Systems, 2008). The commercial sector is provided free recycling collection through City of Ann Arbor carts or in large recycling dumpsters depending on the businesses' needs and location.

The city issued a commercial refuse franchise in 2009, which grants Waste Management the exclusive right to offer waste services to the commercial sector of Ann Arbor. Refuse collection is paid by the tip, and increases by the size of the container and the number of collections per week.

The city has been interested in exploring opportunities for commercial organics collection since 2008 when the city issued its commercial recycling plan (Resource Recycling Systems, 2008). However, organics collection is not currently publically offered to the commercial sector. A small number of food businesses are offered seasonal organics collection through the city's service, however there is no public protocol for signing up for commercial organics collection nor is there any information about any options for commercial organics collection on the city's website.

The commercial sector is further divided into three subsectors: Manufacturing, Service, and Retail Trade. The majority of the commercial waste is generated (50%) in the Manufacturing subsector (Figure 2), however because the Manufacturing sector has a much higher diversion rate than the two other subsectors, the majority of the landfilled commercial waste is from the Retail Trade subsector (Figure 3).⁷

**Waste by Sector
(Washtenaw County)**

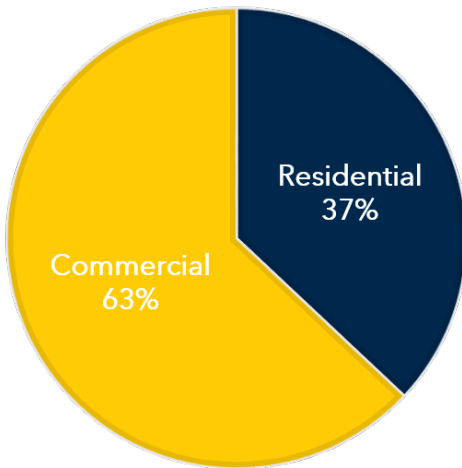


Figure 3: Waste by Sector

**Waste Generated By Subsector
(tons/year)**

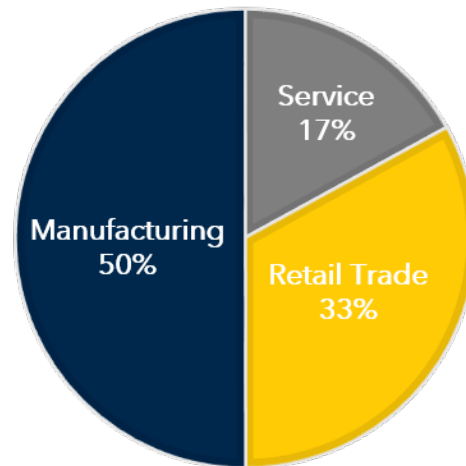


Figure 2: Waste by Subsector

The Retail Trade subsector is further broken down by business type. The “Eating & Drinking Places” had by far the most waste sent to landfill, with an estimated 40,392 tons disposed each year. The Eating & Drinking Places subsector, was also the business type that generated the most total waste in the Retail Trade subsector, generating 55% of the subsector’s waste (Washtenaw County DEIS/DPW Solid Waste Program, 2000).

⁷ As estimated in the 1999 Washtenaw County Solid Waste Plan data. Washtenaw County data is used as a proxy since the City of Ann Arbor does not collect detailed waste characterization information by stream or sector and the county municipalities, townships and villages offer similar single-stream recycling services to their commercial sectors and do not yet offer a diversion stream for commercial organics.

**Waste Disposed By Subsector
(tons/year)**

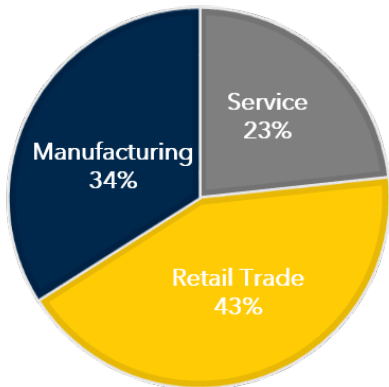


Figure 4: Waste Disposed by Subsector

**Waste Disposed by Retail Trade Subsector
(Washtenaw County)**



Figure 5: Waste Disposed by Retail Trade Subsector

Waste Haulers & Processors

The commercial and residential sectors in Ann Arbor each have separate haulers and processors for each MSW stream. The hauler is the entity responsible for collecting the MSW from each resident or business and depositing it at a transfer station or processing facility. The processor is the entity responsible for managing the MSW after collection. In the case of refuse, this would mean collecting the refuse from the transfer station and bringing it to the landfill. In the case of recycling, this would mean collecting the material from the transfer station, processing the recyclables through the MRF, and then selling the sorted and baled materials to end-user manufacturers for them to process the materials into commodities or new products. In the case of composting, this would mean processing the organic waste into compost and selling the end product. The hauler and processor are occasionally the same stakeholder. Table 1 below details the hauler and processor by sector and stream; Appendix D shows how the stakeholders interact.

City of Ann Arbor Resource Management Contractors			
		Hauler	Processor
Residential	Trash	City of Ann Arbor	Waste Management
	Recycling	Recycle Ann Arbor	Waste Management*
	Organics	City of Ann Arbor	WeCare Organics
Commercial	Trash	Waste Management	Waste Management
	Recycling	City of Ann Arbor (dumpsters) Recycle Ann Arbor (curb carts)	Waste Management*
	Organics**	N/A	N/A
*ReCommunity, prior to June 2016 ** Residential service only offered to select businesses			

Table 1: City of Ann Arbor Resource Management Contractors

3. Research Methods

3.1. Commercial Sector Focus

The commercial sector generates more waste than any other. As such, it offers the greatest room for improvement and was singled out as the area of focus for this waste reduction and diversion strategy research. More specifically, “Eating & Drinking Places” in the Retail Trade commercial subsector was identified as the primary emphasis as a result of:

- Ease of collection and coordination
 - Small number of individual players
 - High concentration of food businesses in the Ann Arbor downtown area, which would make any increase in collections more cost effective
- Greatest opportunity for diversion and reduction expansion
 - No curbside organics collection offered
 - No unified FOG collection system
 - No city-promoted strategies for waste reduction
- Sector most likely to be incentivized to adjust waste practices
 - Waste pick-ups are costly
 - City has already identified some waste challenges within commercial sector
- Influence on overall city culture and behavior

- Commercial sector regularly interacts with the residential populations – particularly the Millennial generation that goes out to eat more than any other generation (Barton, Koslow, Fromm, & Egan, 2012)
- Potential to act as a model and educator for residents

3.2. *Commercial Waste Practices Survey*

Survey Administration

The *Commercial Waste Practices* survey was developed in the Qualtrics survey system over the span of nine months. During that period of time several interviews with stakeholders from the City of Ann Arbor, Commercial Organics Plan team, Downtown Alleys Program, Resource Management Team, food sector businesses, and others were conducted in order to inform the survey questions. The survey intended to touch on every aspect of waste faced by the “Eating & Drinking Places” sector.⁸

The survey was finalized and digitally distributed to 121 Ann Arbor “Eating & Drinking Places” in the winter of 2017. The survey was distributed primarily via email in addition to other online communication systems such as internal website messaging and businesses’ Facebook chat. Distribution was focused on the downtown area. Businesses were identified through the four Ann Arbor Downtown Development Authority (DDA) districts (Kerrytown District Association, n.d.). Business were also identified using larger downtown business maps and listings on local restaurant consolidators such as Yelp.com, Foursquare, and Google. In addition to the online survey, several Ann Arbor food business managers were interviewed in person to collect data the similar data to that collected in the survey - waste management practices, challenges, and interests.

The first survey page introduced the survey with a short preface to set the understanding that the survey responses were going to be used to better understand commercial waste habits, identify challenges with the commercial waste system, and inform recommendations for city’s commercial waste system. In order to mitigate answer priming and self-selection biases, initial communication and survey text did not indicate that the responses would also inform recommendations for improved diversion of MSW. For the same reasons, questions about compost/organics stream were included at the end of the survey.

Survey Goals

The survey was developed to fulfill three primary goals: serve as a waste audit proxy, identify pain points with waste system, and gauge interest in increased diversion opportunities. Questions in the survey were broken out by stream - trash, recycling, grease collection, and compost. The full survey is included in Appendix A.

⁸ The “Eating & Drinking Places” subsector will be also be referred to as the “food business sector”

The waste audit proxy questions were the first questions in each section and asked the respondent questions about the following: the type of collection container and whether it is shared, frequency of collection, the collection hauler, the approximate number of bags of stream-specific MSW produced per day, and the approximate relative contents of each stream. While these quantitative responses were estimated by the respondent, this was believed to be an accurate representation of the waste stream since the individual respondents were regular business managers and dealt with his/her business' waste stream on a daily basis; in addition, and there was no clear incentive to under or over report any recorded metric (Williams, 2015).

Subsequent questions intended to identify pain points with the waste system and interest in diversion. These questions were primarily short answer questions asking directly about the challenges that the business faced with each specific waste stream as well as the waste system overall. Interests in diversion were assessed both through answers to the pain point short answer questions as well as through specific questions about a business' interest compost collection and other diversion opportunities.

3.3. Benchmarking Research

Several cities' MSW systems were benchmarked to uncover how other U.S. cities have surpassed Ann Arbor's waste diversion efforts, uncover best practices, and identify specific practices that Ann Arbor could adopt to improve the city's commercial MSW diversion and waste reduction. The benchmarking research focused on a reviewing:

- City diversion programs for traditional materials – standard recyclables and organics
 - Diversion of other waste materials such as grease and bulky items
- Diversion and waste reduction legislation and enforcement practices
- Education and behavior change strategies
- Stakeholder structure and partnerships
- MSW measurement and monitoring practices

Benchmarking was primarily conducted by municipality. A regional/county benchmarking unit was deemed to be more appropriate if the region or county provided or contracted the waste services for the area instead of an individual municipality.

Due to the language barriers and significant structural differences government policies and MSW systems in other countries, only cities in North America were considered as benchmark cities. Cities and regions were identified as potential benchmarking candidates if they met one of the following criteria:

- Identified by peer cities and institutions as a leader in sustainable materials management
- Aggressive diversion goals or recently realized dramatic improvements in waste diversion
- Comparable to the City of Ann Arbor in one or many of the following ways:
 - College town

- Same geographic region
- Similar population

The cities that were reviewed were narrowed to the set of cities below, which best met the above criteria:

- Austin, TX
- Berkeley, CA
- Boulder, CO
- Emmet County, MI
- Madison, WI
- Minneapolis, MN
- New York City, NY
- Portland, OR
- San Francisco, CA
- Seattle, WA

4. Survey Results

The *Commercial Waste Practices Survey* was sent to 121 businesses through a mix of email, Facebook message, and internal website email. The survey received a response rate of 18.2% percent, and respondents took between 7 and 34 minutes to complete the survey. While certainly lower than ideal, this response rate falls in the range seen in the Ann Arbor National Citizen Survey (National Research Center Inc. & Leaders at the Core of Better Communities, 2015).

The first goal of the survey was to collect a self-reported assessment of the businesses' waste streams to better understand the composition and volume of Ann Arbor's food business MSW stream. While many waste fees are paid by the ton, since the commercial sector deals primarily with waste volume and are most comfortable with a visual assessment of their waste streams, volume was used for these assessments. The second and third goals of the survey were to identify pain points and interest in additional diversion opportunities. Below are the results from the survey by waste stream.

4.1. Trash

Trash – Material Characterization

The food business sector produces a large amount of MSW each day, which they dispose of into either a 96-gallon cart, dumpster, or a trash compactor. The businesses surveyed estimated that, on average, they generate 12.86 bags of trash per day. The survey 'audit' showed that the primary components of this waste are pre-consumer food waste, post-consumer food waste, packaging materials, paper towels/napkin, and food-prep gloves. The relative composition is shown in Figure 6.

Commercial Trash Materials

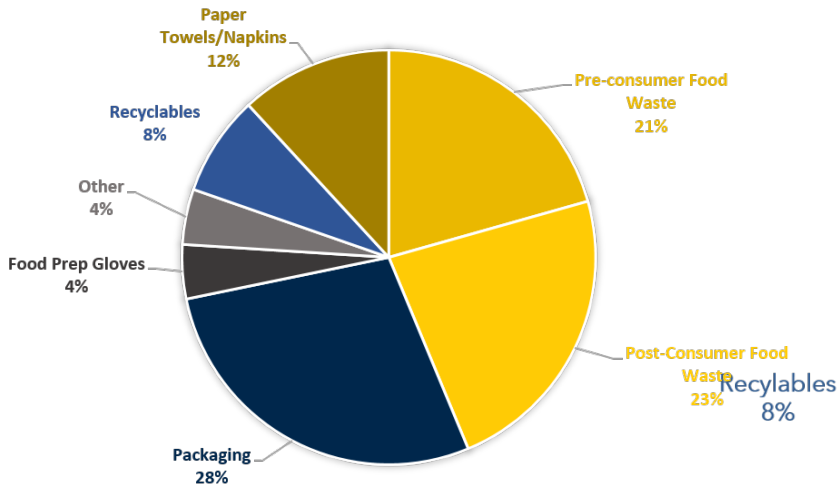


Figure 7: Commercial Trash by Stream

Commercial Trash by Stream

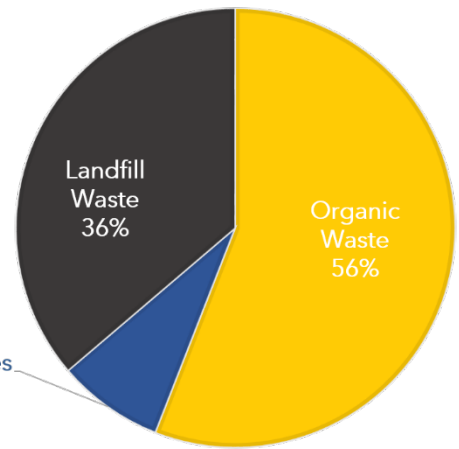


Figure 6: Commercial Trash by Stream

Trash composition can also be rearranged to reflect the relative proportion of divertible materials. This is shown in Figure 7.

While only 8% of the average food business trash stream is estimated to be recyclables, the respondents' estimates varied widely - between 0% and 40%. Twenty-three percent of respondents estimated that 24% or more of their waste was composed of recyclable materials. This is particularly concerning because it indicates either a lack of will or ability to recycle all of the generated recyclable materials. While each respondent indicated that his/her business had access to a recycling container, other responses point to lack of ability as the reason for the uncollected recyclables. These responses will be discussed more in detail in the recycling section.

Even though the percent of recyclables in the trash is low, the annual tons of recyclables landfilled as a result of miss-sorting is estimated to amount to more than 4,258 tons (Table 2).⁹ Recovering these recyclables would increase the amount of recyclables collected in Ann Arbor by approximately 50% over 2015 levels. Assuming a blended value per ton of \$73, which was commensurate with the value recovered in the Midwest region during the fall of 2015, recovering these landfilled recyclables would be worth \$310,846.

⁹ Landfilled recyclable estimates use commercial sector waste totals based on the Washtenaw County 2005 Community Solid Waste Profile data for the City of Ann Arbor.

Estimated Tons of Recyclables Landfilled from Ann Arbor Eating & Drinking Places	
Annual Commercial Sector Waste, Ann Arbor (tons)	225,397.00
Retail Trade Subsector Proportion of Commercial Waste	43%
Annual Retail Trade Sector Waste (tons)	96,212.96
Eating & Drinking Places Proportion of Retail Trade Subsector MSW	55%
Annual MSW Generated in Eating & Drinking Places	53,226.99
Average Proportion (by volume) of Recyclables in Eating & Drinking Places Trash Stream	8%
Estimated Tons of Recyclables Disposed from Ann Arbor Eating & Drinking Places	4,258.16

Table 2: Estimated Tons of Recyclables Landfilled from Ann Arbor Eating & Drinking Places

As shown in Figure 6, the vast majority of the waste in Ann Arbor’s food sector trash stream is estimated to be organic waste (56%). Organic waste was calculated to be the sum of all food waste and soft paper (paper towels and napkin), which are all accepted at Ann Arbor’s municipal compost facility. Additionally, 32% of all businesses surveyed estimate that more than 70% of their trash stream is compostable material. This is a significant opportunity for diversion.

An estimated 29,446 tons of organic waste is landfilled from Ann Arbor’s food business sector. The calculations, shown in Table 3, are the low range of the estimate since Ann Arbor has a lower percentage of manufacturing businesses in its commercial sector than Washtenaw County. Secondly, because survey respondents reported the relative trash composition by volume, the calculation assumes that volume is proportional to weight, however since organic waste is generally the heaviest material by volume this would underestimate the organic material discarded by weight.

Estimated Tons of Organics Landfilled from Ann Arbor Eating & Drinking Places	
Annual Commercial Sector Waste, Ann Arbor (tons)	225,397.00
Retail Trade Subsector Proportion of Commercial Waste	43%
Annual Retail Trade Sector Waste (tons)	96,212.96
Eating & Drinking Places Proportion of Retail Trade Subsector MSW	55%
Annual MSW Generated in Eating & Drinking Places	53,226.99
Average Proportion (by volume) of Organics in Eating & Drinking Places Trash Stream	56%
Estimated Tons of Organics Disposed from Ann Arbor Eating & Drinking Places	29,807.11

Table 3: Estimated Tons of Organics Landfilled from Ann Arbor Eating & Drinking Places

Respondents' mix of collection containers and is fairly evenly distributed among the five options. The majority of these business, approximately 68%, share their collection containers with one or more other businesses. Of those that share their collection container, 93% share the container(s) with more than two other businesses (Table 4).

Trash Collection Containers					
	96 Gallon Curbside Cart	4 Cubic Yard Dumpster	6 Cubic Yard Dumpster	8 Cubic Yard Dumpster	Trash Compactor
Proportion of Respondents Using Trash Collection Container Businesses with Collection Container	18%	14%	32%	14%	23%
Proportion of Respondents Sharing Container	25%	67%	71%	67%	100%
Average Units Per Business	4	1	1	1	1
Approximate Number of Bags Held per Bin (13 gallon)	15	60	90	120	120

Table 4: Trash Collection Containers - Ann Arbor Eating & Drinking Places

The sharing of collection containers was cited as a source of frustration for nearly all of those who were sharing carts/dumpsters. Respondents noted that the carts and dumpsters were frequently over-full. This is not surprising given that businesses reported that they generated an average of 12.86 bags of trash per day and their dumpsters/carts were only pick-up an average of 4.33 times per week. Assuming that all waste is generated uniformly throughout the week, this results in approximately 90.05 bags of waste generated per business and 20.86 bags per business in a cart/dumpster at the time of pick-up.

Given that almost all of those that share a container share it with two or more other businesses, this indicates that at the time of pick-up there are at least 62.59 bags in 67% of the 4-cubic yard dumpsters, which is more than its 60 bag capacity. This is also assuming that the restaurants are using a fairly small, 13-gallon bag, and that trash pick-ups are uniformly spaced throughout the week, which the survey responses indicate is not the case.

Trash – Pain Points & Interests

The primary concern cited by respondents was the lack of available cart/dumpster space for the generated trash. This no surprising given the results from the 'audit' above. Respondents were invited share the challenges that they faced regarding their trash stream. Each of the responses was summarized by theme(s) and number of instances of each cited theme were summed and then graphed as shown in Figure 8 below.

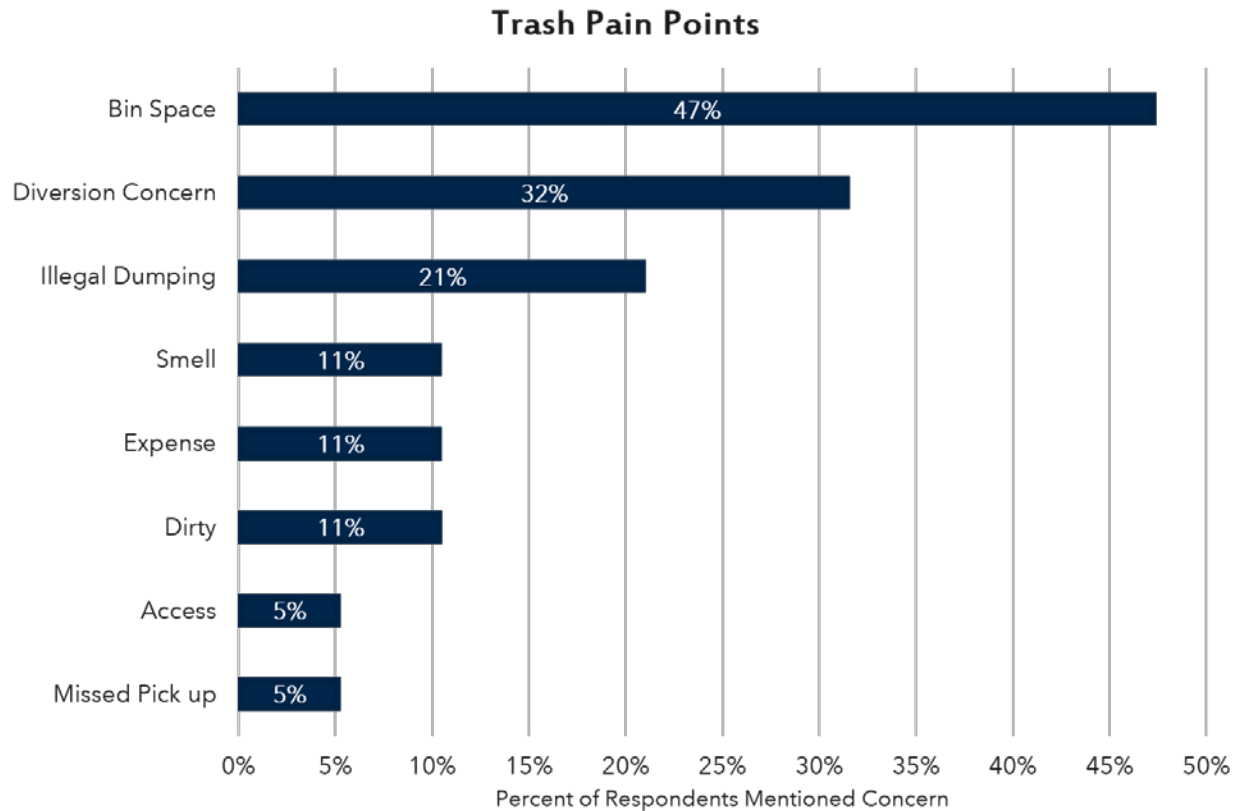


Figure 8: Trash Pain Points - Ann Arbor Eating & Drinking Places

The lack of cart/dumpster space for all of the generated material was indicated as the number one concern of respondents, with nearly half of the respondents mentioning this concern. Some of those who mentioned illegal dumping as a concern seemed to indicate that this was a concern because the illegal dumping took up cart/dumpster space, however those comments were not definitively about space constraints were not categorized as such. The comments referencing cart/dumpster space as a challenge mentioned wanting a larger cart/dumpster, more frequent collection, weekend collection, waste being piled in the alley, or their current cart/dumpster overflowing.

The second-most frequently cited concern was diversion. Respondents mentioned that they wanted a way to collect compostable material and were frustrated that so much compostable and recyclable waste was being thrown into the trash. This was a telling result given that up to this point none of the survey language included any explicit mention of diversion, recycling or composting. This indicates that diversion is a top-of-mind concern for businesses managers in the downtown Ann Arbor, and that there is evidence of potential champions for an organics diversion pilot.

4.2. Recycling

Recycling - Material Characterization

Similar to the trash stream, businesses dispose of their recycling into a 96-gallon cart or dumpster. The businesses surveyed estimated that, on average, they generate 12.95 bags of recycling per day, which is slightly above the estimated trash generated per day.

The commercial recycling system accepts the same recyclables as the single-stream residential system, however the characterization is quite different than the average residential stream. The survey 'audit' showed that the primary components of the recycling stream are fiber products – cardboard and paper. The relative composition is shown below in Figure 9.

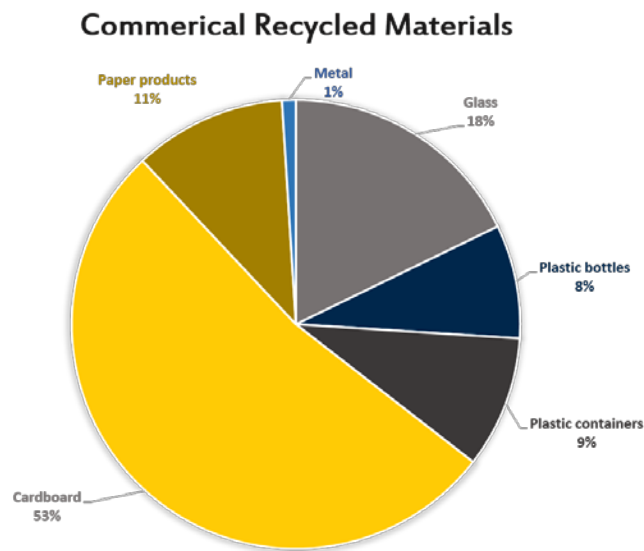


Figure 9: Ann Arbor Eating & Drinking Places Recycled Materials

Old corrugated cardboard (OCC) makes up an estimated 53% of the recyclables collected, which is much greater than the estimated proportion of 15-20% in the residential recycling stream. This relative dominance of OCC and paper products, which in the food business sector may be dominated by cartons – a high value commodity, presents a major opportunity for recycling in the commercial sector.

Though the recycling markets have recently been depressed, they hit their low in 2015 and markets have since picked up. Commodity values are rising as the demand for secondary materials strengthens. Packaging fiber, in particular, is seeing a rise in demand from foreign markets as well as in domestic markets such as the Midwest. The average price for OCC over the last 5 years was \$112.50 per ton, a \$39.50 premium over the blended value per ton realized from the single stream facilities in 2015 (RRS, Northeast Michigan Council of Governments, DEQ, Public Sector Consultants, 2015). Figure 10, shows the price of OCC and other paper products between 2011 and 2015.

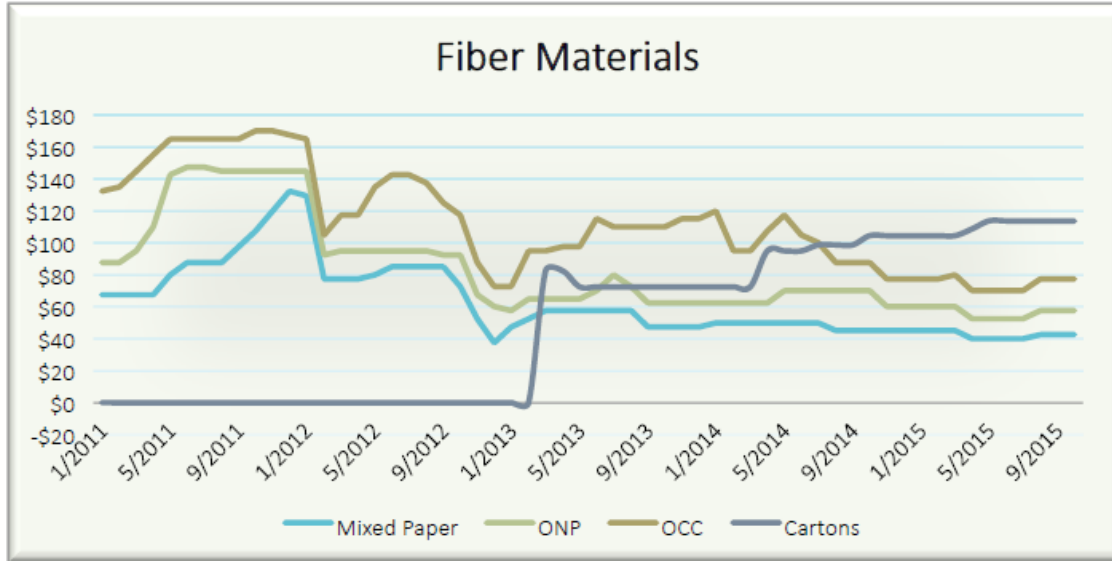


Figure 10: Fiber Market Historical Prices per Ton

Segregated secondary material such as cardboard and paper products, can also be sold directly to a mill as an input, which can command a higher bale price than a recycling facility would receive if the OCC and paper products were first sent to a transfer station or MRF where there is a higher risk of contamination and increased processing costs. Given the nature of the food business sector relative to other businesses in Retail Trade, Service, and Manufacturing, it is expected that other business in the commercial sector would have an even higher proportion of OCC in their recyclables and less packaging materials.

The Ann Arbor food business sector is even more space-constrained with regard to their recyclables. The increase in proportion of businesses that share a collection system (73%) further exacerbates the space constraint. Respondents averaged slightly more bags of recyclables per day, 12.95, with an average of one fewer pick-ups per week and a smaller average collection container size. Respondents estimated that their recyclables were picked-up 3.55 times per week on average, which would indicate that there are approximately 25.5 bags of recyclables per business in a given cart/dumpster at the time of pick up (Table 5).

Recycling Collection Containers					
	96 Gallon Curbside Cart	2 Cubic Yard Dumpster	4 Cubic Yard Dumpster	6 Cubic Yard Dumpster	8 Cubic Yard Dumpster
Proportion of Respondents Using Collection Container Businesses with Collection Container	50.0%	13.6%	9.1%	22.7%	13.6%
Proportion of Respondents Sharing Container	81.8%	66.7%	50.0%	80.0%	100.0%
Average Units Per Business	4.10	2.33	3.00	1.80	1.67
Approximate Number of Bags Held per Bin (13 gallon)	15	30	60	90	120

Table 5: Ann Arbor Eating & Drinking Places Recycling Collection Containers

Recycling – Pain Points & Interests

Based on the findings from the survey ‘audit’ it was not surprising to find that the majority of those that took the time to list their concerns with the recycling system cited cart/dumpster space constraints as their primary concern. (Figure 11).

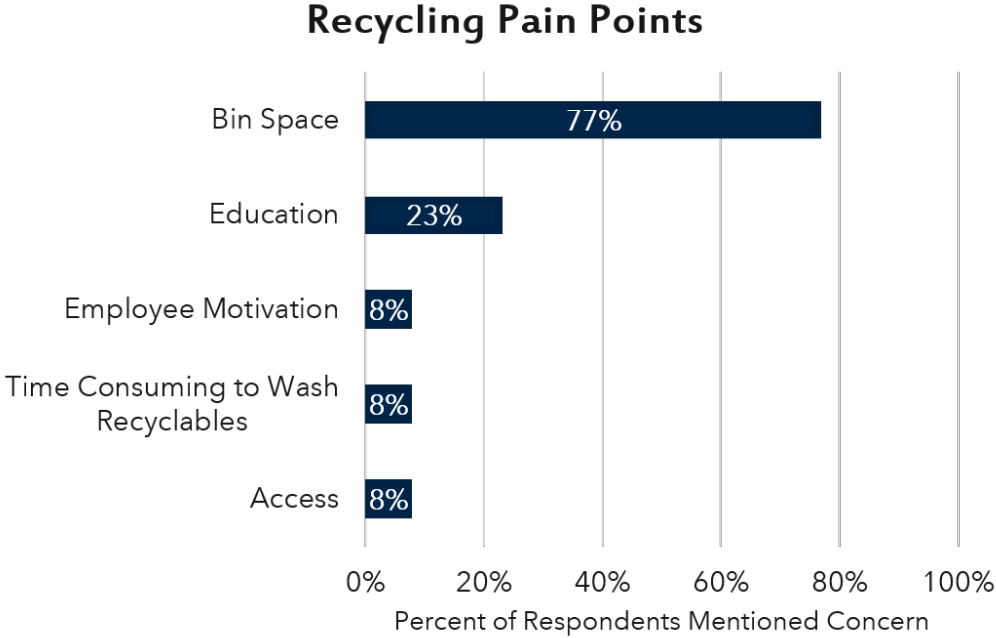


Figure 11: Ann Arbor Eating & Drinking Places - Recycling Pain Points

4.3. Fat, Oils, and Grease Collection (FOG)

There are four standard methods of commercial grease collection: an outdoor bulk container – much like a grease dumpster, a heated outdoor container, or an indoor pumped collection. Grease traps may be used in addition to any of these systems, but they do not replace a larger collection system/container. Of the surveyed population, 81% indicated that they used some sort of grease collection system, and of those that collect grease for disposal, 63% used an

outdoor bulk container for collection.¹⁰ Given that no businesses included FOG in their response to trash composition questions, it can be assumed that all of the business that discard FOG are using a collection system.

The motivation for FOG collection was recorded through a short answer question. Businesses self-reported that their primary motivation for disposing of their FOG through a FOG collection service was because of their interest in recycling and environmental concern with other disposal methods. Other motivations are shown in Figure 12.

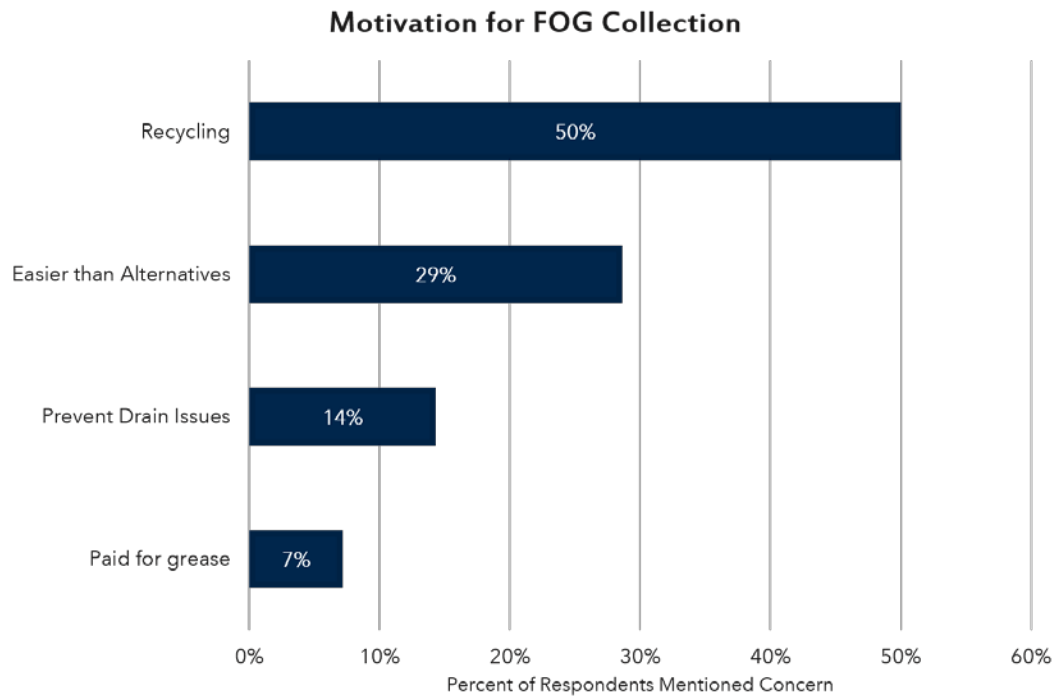


Figure 12: Ann Arbor Eating & Drinking Places - Motivation for FOG Collection

Many Ann Arbor residents and city staff who work on sustainability and waste issues believe that many of these businesses are being paid for their FOG material. However, this is not likely the case based on the responses received. There was only one business that directly mentioned being paid for their FOG material. Additionally, only 22% of the businesses knew the name of their FOG hauler, compared with more than 90% of the businesses who knew that the city or Waste Management was the trash hauler. This indicates that most businesses do not have a close affiliation with their hauler and likely do not interact with their FOG hauler much, if at all. This would lead one to believe that the majority of businesses are not paid by their FOG hauler.

¹⁰ Additionally, all of the respondents that stated that they did not collect their FOG were business such as grocery stores and restaurants that do not serve many, if any, fried foods. The survey did not ask respondents whether or not they disposed of any FOG.

Of the four of the surveyed businesses did know their hauler, and each reported a different hauler: Quality Redemption, Mahoney, Evergreen Grease Service, and B&B. Detroit Grease dumpsters have also been seen in the downtown alleys (Appendix E).

This lack of familiarity with the FOG system is also further reinforced by city staff's lack of familiarity with the haulers and processors. The city website waste information does not include any information about FOG collection or best practices. City staff estimates that there are 7-8 FOG collection companies that collect grease in the downtown area, however none of the FOG haulers are required to report to the city so the city does not have an accurate count on the number of haulers serving the city or metrics around their collections (Coleman, 2016).¹¹

4.4. Compost/Organics

Of the business that responded to the survey, 86% stated that if the city offered a compost collection system they would be want to participate without hesitation, and an additional 7% stated that they would be interested in participating in compost collection if the space constraints, cost, and operational burden of a compost system were manageable. There was resounding interest in a compost collection, however businesses also cited several concerns with the potential additional stream. To assess what concerns businesses had with the implementation of a compost collection program businesses were asked to select all of the concerns that resonated with them from a list of pre-identified concerns as well list up to two write-in concerns that they might perceive as barriers to implementing a compost system.

Consistent with the previous short answer responses, space - both indoor and outdoor - ranked as a top concern along with concerns around cost of implementation and additional collection (Figure 13). Among the short answer responses to the question "If you are interested in a City of Ann Arbor compost collection, what would the program need in order for you to be willing to participate?" respondents most often cited reliable and frequent pick-ups as well as accessible and clean bins/dumpsters.

¹¹ No explicit guidelines or requirements were seen through the City site and resources.

Concerns About Organics Collection

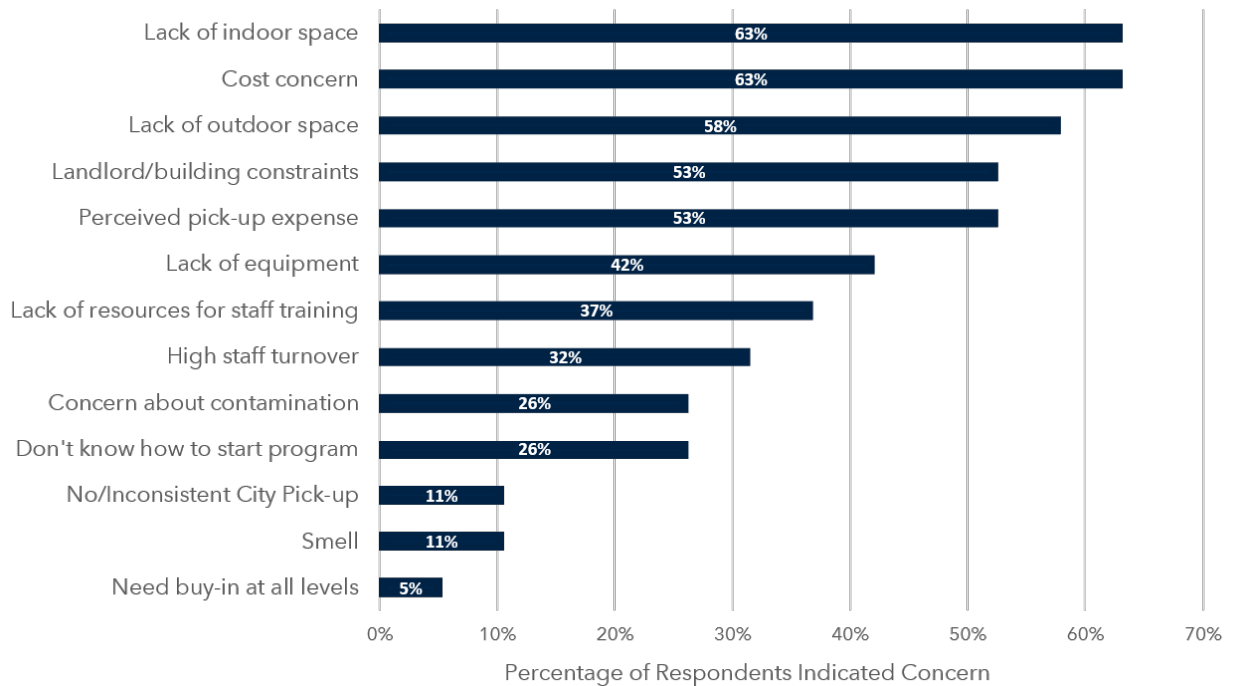


Figure 13: Ann Arbor Eating & Drinking Places - Concerns About Organics Collection

Four of the survey respondents already did some compost collection. Three opted into a small collection through the city’s seasonal, residential collection service. However, they noted that the pick-up schedule combined with their bin capacity constraints were not able to meet all of their needs for organic waste diversion. The fourth business partnered with a farmer who picks-up a portion of his business’ organic waste.

5. Benchmarking Analysis

Waste reduction and diversion practices from the following cities were analyzed in order to identify best practices in the commercial sector: Austin, TX; Berkeley, CA; Boulder, CO; Emmet County, MI; Madison, WI; Minneapolis, MN; New York City, NY; Portland, OR; San Francisco, CA; Seattle, WA.

The following best practice themes emerged as common among most or all of the benchmarked programs:

1. Consistent & Dependable Access to Diversion Opportunities
2. Incentive Alignment & Partnership
3. Education & Engagement
4. Local Leadership & Staff Resources
5. Transparent Tracking & Measurement Systems

6. Sufficient & Reliable Funding

5.1. Consistent and Dependable Access to Diversion Opportunities

Consistent and dependable access to diversion opportunities is defined as being able to procure sufficient service for recycling and/or organics. Sufficient service for all generated divertible material requires that the diversion stream infrastructure be at least large enough and/or collected frequently enough for all divertible materials to be diverted through the appropriate diversion stream. In other words, a business would be able to request city service or contract with a private hauler for a recycling cart or dumpster big enough to hold all of the business' recyclable material between pick-ups. In order for waste diversion to be considered cost neutral, additional service for recycling and/or organics collection must be provided free of charge or at a charge at least offset by the reduction in trash costs.

The methods for achieving consistent and dependable access differed widely based on the waste system within each city. Benchmarked cities had different strategies for hauling and processing commercial waste – some used the same system for their residential and commercial sectors, others required businesses to privately contract with a separate hauler, some municipalities organized their city into franchised zone(s), and others used a variation on these strategies. Despite the variety of hauling structures, all but one benchmarked city, New York City, touted that adopting diversion streams and increasing the amount of MSW diverted lowered business waste costs.

Those businesses that were required by their city to select their own hauler either selected a hauler from the open market, a list of approved haulers for the city or area, or an approved hauler for the franchise zone in which the business was located. In all cases, the cities implemented legislation or processes to ensure that collection of traditional recyclables and/or organics was also in place.

Some municipalities and regions shaped waste cost structures to favor diversion options over trash. Emmet County and San Francisco as well as others have done this by offering free or very low cost recycling and organics collection through a municipal or municipally contracted service. Cities like Seattle have kept the cost of diversion options low by controlling the solid waste rate-setting process or including rate requirements in the hauler approval process (Seattle Public Utilities 2017-2019 Solid Waste Rate Study, 2016).

Alternatively, or sometimes in addition, cities have opted to issue legislation to further ensure that diversion options are accessible to all businesses. These laws either require that each business have easily accessible and convenient diversion infrastructure onsite or ensure that diversion options were less expensive than trash pick-ups. Specific legislation will be discussed in more detail in the discussion of incentive alignment number 2, *Incentive Alignment & Partnership*.

While economic structures and legislation strategies have been shown to increase diversion in the majority of the benchmarked cities, the strategies must actually create perceived and real change in order to affect diversion rates. For example, legislation that requires adequate and accessible diversion infrastructure at every business is only as effective as its enforcement. Ann Arbor has seen this issue since their adoption of the commercial recycling requirement in 2009 – without enforcement businesses are not compelled to comply and many are not even aware of the legislative mandate.

This mismatch between public sector intentions and private sector action is also seen in New York City. While New York City has been dramatically changing its waste system by expanding diversion opportunities and adopting legislation, it has not yet managed to have a significant effect on the commercial sector. Based on the analysis of the other benchmarked cities I believe that this is true for two primary reasons with regard to *Consistent and Dependable Access to Diversion Opportunities*. New York City has lower rates for recycling and organics collection than trash; however, recycling and organics collections are an additional cost on top of the trash costs since businesses are not easily able to lower their trash collection costs as a result of diverting material away from their trash stream. The city also does not have control over the commercial waste costs since unfranchised, and largely unmanaged, private haulers collect commercial waste.

New York City has adopted diversion ordinances. These include requirements for all businesses to divert standard recyclables as well as diversion requirements large generators of materials such as textile and food waste. These mandates have proved ineffective because there is no city enforcement. The threat of potential enforcement is also ineffective at influencing behavior since the threatened penalty is much lower than the additional cost that one would need to undertake to comply with the diversion regulations (Transform Don't Trash NYC, New York City).

5.2. Incentive Alignment & Partnership

The waste systems in benchmarked cities rely heavily on aligning financial and psychological incentives of all waste system stakeholders in order to maximize waste diversion and reduction potential. The following are examples of the mechanisms that these cities have employed to align incentives.

Legislation

There are two primary kinds of waste legislation – behavioral and infrastructure-based legislation. Behavioral ordinances regulate what may or may not be disposed within the city. Cities like Seattle, Portland, and San Francisco employ this style of legislation by mandating that recyclables and organic waste be diverted into their proper bin. These ordinances can also include contamination bans such as prohibiting businesses or individuals from disposing of non-organic material in the compost bin (Project Coordinator at Recology, 2017). Infrastructure legislation ordinances specify the kind, quantity and quality of diversion infrastructure that

must be in place. For example, an infrastructure ordinance could require that diversion infrastructure be onsite at each business, that the diversion infrastructure capacity be at least as large as half of the total waste collection capacity, or that educational material be present on each bin.

Solid waste ordinances like these have often been labeled as “mandates/bans”, and are often perceived as being politically risky. However, the tested efficacy and precedence for this type of ordinance has made these strategies mainstream, particularly in America’s progressive, sustainability-minded cities.

Studies have shown that enforced ‘mandate/ban’ ordinances have delivered somewhere between 10-30 tons of diversion per dollar spent on enforcement (Urban Sustainability Directors Network, 2013). While the potential is substantial, in order for these ordinances to be effective at improving diversion they must be enforced. Many of these written ordinances also include defined penalties for infractions. The benchmarked cities have favored phased-in enforcement by issuing ‘warnings’ and providing educational material to those that are not in compliance with the ordinance. San Francisco began issuing fines several years after initially passing the ordinance and publicized the future fines well in advance of beginning financial enforcement. Even after the end of the legislative grace period, San Francisco still issues warning(s) before issuing any fines, and couples enforcement with education and outreach. Fines are only levied on repeat offenders (Platt, 2016).

Ordinances such as those described above also can lead to reduced diversion costs per ton by leveraging the scale created through wide-scale adoption of diversion programs. Cost reduction achieved through scale would be realized by different stakeholders depending on the solid waste payment structure, and could potentially negatively affect a trash hauler or processor. A discussion of how the benchmarked cities effectively managed this change is included below in the *Partnerships* section.

The majority of current ‘mandates/bans’ ordinances that have been adopted in benchmarked cities have been treated as a psychological motivator thus far, with the potential to leverage the financial penalties at a later date. Even in some cities where there are no explicit penalties that accompany the legislation, legislation and the promotion of the new legislation can influence behavior change by encouraging proactive behavior or attracting business that already wanted diversion services and did not know how to implement changes to their waste systems (Urban Sustainability Directors Network, 2013).

Pay-As-You-Throw (PAYT)

Consistent and dependable diversion opportunities were defined above as opportunities of reliable access to sufficient service that is cost neutral. While consistent and dependable diversion opportunities provide the option for increased diversion, they do not inherently incentivize a business to produce less waste and/or divert more waste. Pay-As-You-Throw (PAYT) strategies have been implemented across the county as a way to directly incentivize more diversion and less trash.

PAYT has been widely adopted through volume-based pricing, weight-based pricing, fee for pick-up, etc. All of the benchmarked cities have implemented some variation of PAYT in the commercial sector. The most common PAYT pricing seen was charging for waste service based on the size of the trash collection container and the number of tips needed per month, and offering recycling and/or compost service at a lower rate than trash service. Lisa Skumatz and her colleagues have seen that the key element for affecting behavior change in the commercial sector is offering no-charge diversion service. This requires that the price of recycling be embedded in the price of trash collection, so that businesses do not pay directly for recycling services (Skumatz, D'Souza, & BeMent, 2015).

The benchmarked cities varied in how they implemented their PAYT system. The City of Minneapolis imposes a significant tax of 31.5% on all trash fees, which makes trash significantly more expensive than recycling or compost, which are not subject to the waste tax (City of Minneapolis, n.d.). The City of Seattle offers free recycling service up to a specific volume and ensures that the haulers that offer organics collection set the rates below the trash rates. Seattle's organics collection rates are currently set at approximately 32% below the trash rates (Seattle Recycling Programs, 2015) (Seattle Organics Report, 2015).

San Francisco incentivizes diversion nearly exactly as Skumatz et al. would recommend. The city offers free recycling and organics services to all businesses in the city¹², and only charges businesses for their trash collection. In addition, San Francisco's rate structures offer businesses the opportunity to reduce their trash bill by as much as 75% by generating more recyclables than trash (Rates, n.d.). Madison, Wisconsin has adopted a similar PAYT model with its new organics collection program in the residential and commercial sectors (Johnson, 2016). The city offers the service for free to all businesses located in the pilot area.

Contracts

The benchmark cities also used contracts to influence the behavior of service providers within their commercial sector. PAYT models mentioned above can create some friction with trash haulers if their contracts dictate that their revenue is dependent on the quantity of trash that they collect. Under these quantity-based contracts, diverting material from the trash stream into the recycling or compost streams directly affects hauler revenue.¹³ This problem is compounded if the waste hauler is also the waste processor. The benchmarked cities dealt with this issue in different ways, but all have managed to create a partnership structure with their service providers and have attempted to financially incentivize both the individual businesses and the haulers to maximize diversion their efforts.

¹² The City does place a cap on the volume of recycling or organic waste that can be collected for free.

¹³ This assumes that the hauler is a private sector contractor. If the hauler is a city department, reducing the volume of waste collected and processed would directly reduce the city's trash cost.

Multi-Stream Contracts

Cities such as Seattle and San Francisco have issued contracts with waste haulers to haul more than one stream of waste so that a diversion away from trash does not necessarily reduce the total service that the contractor is providing to the city. Seattle's haulers collect both trash and organics, and San Francisco's hauler collects trash, recycling, and organics. Multi-stream collection enables the city to encourage haulers to become partners in improving the city's diversion.

Decoupling Revenue from Service Volume¹⁴

Cost-of-Service Contracting: A cost-of-service contract is essentially a contract that does not tie the contractor's revenue to the volume of waste generated – the contractor receives a service fee that is independent of the quantity of waste that is collected. For waste haulers that are not also tied to the community through recycling or organics collection, implementing a cost-of-service contract can encourage the hauler to work with businesses to reduce their waste through education, communication, right-sizing bins, and/or providing additional services such as developing waste diversion strategies for local businesses. Cost-of-service contracts can also buffer haulers from the impact of reduced trash as a result of behavior change from PAYT programs (Contracting Best Practices: Separate Compensation from Rates, n.d.).

Capping Contractor Revenue: A capped revenue contract is a standard quantity-based contract with a revenue maximum. This encourages a hauler to reduce the amount of waste that is generated in the city until the contractor maximizes their revenue earned per ton collected. The City of Seattle encourages implementing this strategy with a gradual cap reduction (URS Corporation, Herrera Environmental Consultants, Inc, Norton-Arnold Company, 2007).

Pay-for-Performance Metrics: The benefit of contracts with private haulers is that the contract can include very specific requirements such as pay-for-performance clauses that increase or decrease contractor fees based on performance metrics. Performance metrics can include tying pay and/or bonuses to diversion rates, outreach goals, innovations, residual rates, etc. (URS Corporation, Herrera Environmental Consultants, Inc, Norton-Arnold Company, 2007, pp. 79-85).

Decoupling Trash Stream Hauling and Processing Contracts: As discussed above, trash haulers are commonly compensated based on the volume of waste that they collect. Trash processors are also commonly paid on a volume basis, so those that are both haulers and processors for the same material stream are doubly incentivized to keep trash volumes high. Decoupling contracts for the processing and collecting of waste can help increase a waste hauler's interest in improving diversion. Decoupled waste hauling and processing contracts was common in a majority of the benchmarked cities.

¹⁴ This strategy is especially important if the trash hauler is involved in the collection of recycling or organics streams.

Partnerships

Partnerships are especially important in cities that contract their waste services to private haulers. These communities, unlike cities with their own solid waste collection departments, cannot rely on internal information sharing mechanisms and must work with their contractors to ensure that their goals are aligned with those of the city.

San Francisco has done an incredible job of managing their partnership with their waste, recycling, and organics hauler, Recology. Recology and the City of San Francisco are not only aligned on the goal of moving San Francisco towards zero waste, but they are also in constant communication (Project Coordinator at Recology, 2017). The City of San Francisco views Recology as an integral partner in their efforts and they each, as well as their other smaller partners, play an important role in the success of the city's waste diversion and waste reduction programs. The city provides oversight, research and outreach while the Recology develops infrastructure; provides collection, processing and reporting; and both Recology and the city work together on education and outreach. The depth of their partnership is further demonstrated by the use of both logos on all of the zero waste program materials (Project Coordinator at Recology, 2017).

This sense of partnership and trust – fueled in part by the company's long history of working with the city of San Francisco – enables both Recology and San Francisco's Department of Environment to develop long-term plans for the future of the programs as well as monitor on-going programs and services. The Dept. of Environment and the Recology senior program manager meet weekly to oversee performance, review tasks and resolve outstanding issues (Project Coordinator at Recology, 2017).

While the other benchmarked cities did not have partnerships that were as deeply ingrained as that of San Francisco and Recology, they did have strong partnerships that were demonstrated through their commitments to collaboration and data sharing. This was most common in communities that partnered with regional waste authorities like Emmet County Recycling Composting & Waste Disposal. Partnership models were more difficult in benchmarked cities where the commercial sector often had many haulers for each stream; the dilution of dependence on a few key partners made it more difficult to develop strong partnership and communication

5.3. Education & Engagement

In order for businesses to participate in waste diversion and reduction they must first know that the programs and services exist and how to participate. In order to further foster commitment to waste reduction and diversion initiatives cities must inspire, encourage, and/or mandate participation. Each of the reviewed benchmarked cities devoted resources to develop easy to access and understand information about diversion and waste reduction opportunities and offer consistent, proactive outreach and support.

Website

At a minimum, waste diversion and reduction initiatives should offer comprehensive educational materials about how to adopt waste diversion and reduction practices and any local requirements. This basic information is commonly stored on city websites, as well as sometimes on the websites of the city's contractors. In addition providing this general information, the information must be easily accessible (RRS, Northeast Michigan Council of Governments, DEQ, Public Sector Consultants, 2015).

All the benchmarked cities had clear websites with easy-to-access business-specific information and resources. Two cities' websites in particular stood out – the City of Portland and New York City. Their websites, shown in Figures 14 and 15, clearly indicate to business owners what they can recycle and compost, ordinance requirements, and offer resources to help businesses divert and reduce their waste.



Figure 14: City of Portland Planning & Sustainability Website

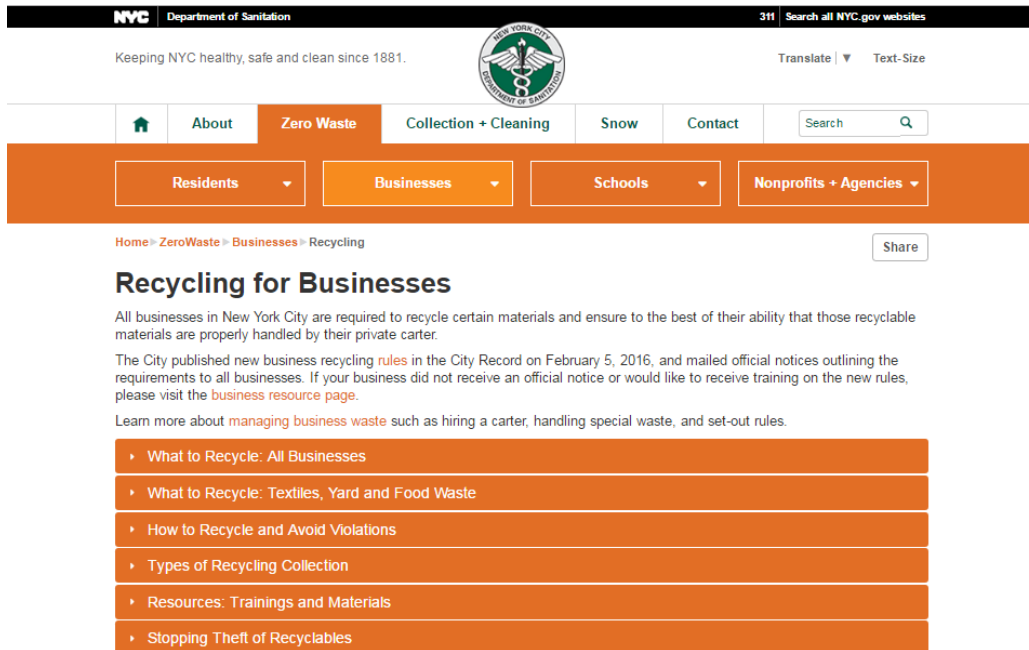


Figure 15: New York City DSNY Website - Recycling for Businesses

Resources

In addition to clearly laying out business-specific information, the benchmarked cities’ websites included a vast array of linked and downloadable resources. The resources included information such as: printable signs for waste stream bins, tools to customize signs specific to the waste produced within the business, video tutorials and ‘how-to’ guides, links to outside resources and campaigns such as the EPA food waste resources and the Love Food Hate Waste sites, easy to read informational sheets about waste ordinances that affect businesses, detailed FAQs, and many others.

These resources aim to make it easier for businesses to reduce and divert their waste, educate staff on diversion practices, comply with ordinances, and learn about potential program expansions. All benchmarked city websites also included information about one-on-one support for business waste audits and recommendations.

Showcasing Best-in-Class & Behavior Change Tools

Benchmarked cities also used their sites to showcase businesses that have won city awards for sustainability leadership in the community. Highlighting positive behavior on a city website is very inexpensive and increases both morale and sense of community purpose. Furthermore, commending business leaders encourages other businesses to follow suit (Joseph, n.d.).

Benchmarked cities also leveraged their websites to capture the benefits of another behavior change tool, written commitment. The two most common forms of written commitment were pledges and diversion plans. Pledges were all voluntary, while most diversion plans were required by the city.

New York City offers a good example of a zero waste pledge offered on its Department of Sanitation (DSNY) website. The online pledge is written for individuals, but could be easily adapted for the commercial sector. The online pledge requests the individual's physical and email addresses,¹⁵ asks them to select from a list of commitments that they would like to make through the pledge (for example, "I pledge to recycle my metal, glass, and plastic; and paper & cardboard"), and allows individuals to select a gift from the offered incentives.¹⁶ Upon completion of the pledge, the individual is invited to share his/her commitment on social media and invite others to complete the pledge. Submitting the pledge automatically registers individuals to receive information about waste reduction and waste diversion efforts (Zero Waste Pledge, n.d.).

Cities such as Minneapolis and Austin provide a great example for diversion plans. Both cities require businesses to submit a waste diversion plan to the city each year outlining what diversion infrastructure they have, how they plan to educate staff members about diversion and waste reduction, explanation of contingency plans, etc. (City of Minneapolis, 2011). This ensures that, even if these plans are not enforced, that businesses are taking the time to consider how they plan to manage, divert, and reduce their waste.

Some cities such as Portland and Austin also created engagement through a sustainable business certification (Zero Waste Professional Certificate Program, n.d.). For example, through the Portland program businesses are able to certify as a basic-level, silver, or gold sustainable business through the City of Portland. Certification allows businesses to use the city's "Sustainability at Work" certification their marketing material and includes them on the city's website as a certified business (Sustainability at Work, n.d.).

Social Media

In addition to providing clear, accurate, and accessible information online, the benchmark cities leveraged their presence in social media to convey and solicit information within the residential and commercial communities. In order to effectively engage in the social media sphere, the benchmarked communities often created Facebook pages or Twitter handles for the specific departments such as the Department of Environment in San Francisco or Emmet County Recycling as shown in Figures 16 and 17 below.

¹⁵ The pledge includes address verification to confirm that individuals correctly entering their address.

¹⁶ Gifts have included items such as reusable bags, coffee mugs, water bottles, and flexible cutting boards.



Figure 17: Emmet County Recycling Facebook Page



Figure 16: SF Environment Twitter Page

Social media platforms make clear and brief messaging more visible and offer a new avenue from which to repeat the message. Media researchers believe that consumers, or in this case businesses, need to be presented with a message multiple times before they are influenced (Pilcher, 2014). These platforms provide easy ways to share a public service announcement or alert their constituents without relying on the city’s constituents to visit the city’s website or for the coverage to be included in local media (7 Ways Local Government Can Use Social Media, n.d.).

Cities have also leveraged their social media platforms as a way to listen to the conversation in their community and develop a two-way conversation with their constituents. Cities can listen to location-specific conversations by using social media’s geotagging feature. Cities also use this feature to develop predictive models for health code violations using posts on Yelp and other comment-heavy sites. Similar data could be analyzed to improve waste services – for example, social media could predict waste generation based on traffic flows or use social media to monitor what businesses might need more support in their waste diversion (Goldsmith, 2016).

Outreach

City programs kept local businesses engaged with waste initiatives through regular communication with the commercial sector. Cities proactively offered individual guidance and support for improving waste diversion and reduction. And education was regularly communicated to businesses, with an emphasis on reaching out to those businesses that were not diverting all of their divertible materials. San Francisco proactively reached out through both written educational materials and in-person visits to those businesses that were not meeting their diversion potential (Project Coordinator at Recology, 2017).

5.4. Local Leadership & Staff Resources

In each of the benchmarked cities, city staff and residents developed a zero-waste culture. In order to champion that culture, benchmarked communities dedicate several executive staff members to oversee outreach efforts, coordinate recycling programs, develop resources and materials to help businesses and individuals divert waste, and assess program success. Active and passionate staff members were seen as an essential component to the most successful programs (RRS, Northeast Michigan Council of Governments, DEQ, Public Sector Consultants, 2015). The various numbers of executive staff members by program are shown below in Figure 18.

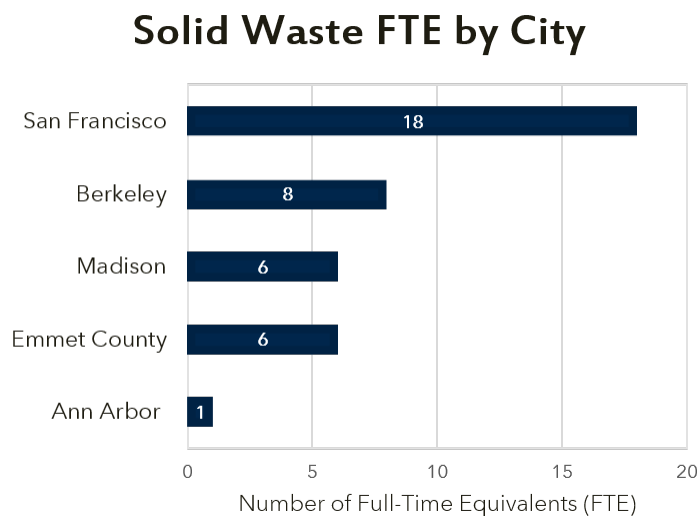


Figure 18: Executive Solid Waste Staff Resources by City¹⁷

The benchmarked cities varied significantly in terms of population, however they each had at least six individuals on staff managing the solid waste programs (excluding the ground staff). The investment in staff members enabled the department to use resources to strengthen the programs' participation, funding, regulation and oversight and contracts.

Staff resources are necessary to meet the minimum department needs of drafting and managing contracts with service providers as well as manage the outreach and coordination to area residents and businesses. Some cities have transformed contract management into partnership building through consistent communications and by developing a shared sense of purpose in the zero waste mission (Project Coordinator at Recology, 2017). Additional roles are necessary in order to develop true resource management programs and engage the community in increasing the city's diversion rate.

¹⁷ Data reflective of accessible staff information.

Emmet County, for example, has dedicated two individuals to manage the materials markets in the area (RRS, Northeast Michigan Council of Governments, DEQ, Public Sector Consultants, 2015). These individuals are able to communicate with potential community partners and stakeholders to connect collected and sorted materials within the community to partners that are able to use them. This develops the business case for processing the recyclable materials and support the city's economic development by providing cheaper inputs to area businesses, while reducing the city's waste costs.

Staff in benchmarked cities have also played a role in managing social media platforms, educational efforts, and securing grant funding from the state and federal government as well as from non-profits who are interested in pushing the progress of sustainable materials management.

5.5. Transparent Tracking & Measurement Systems

Benchmarked cities were committed to collecting and analyzing data from their waste diversion and reduction initiatives. The goal of municipal data efforts was to quantify and qualify the baseline waste generation and diversion, assess the success of waste reduction and diversion programs, and evaluate new opportunities for reducing and diverting waste. Most commonly collected data included: number of participants by sector and subsector, quantity of waste generated by stream and sector, changes in waste quantities over time, the nature and quantity of complaints or request.

The solid waste industry as a whole has been criticized for years for its lack of consistent, accurate, and reliable data – and sometimes for not having any data at all (Staley, 2015). Solid waste experts exclaim regularly that without data it is “hard to know what needs fixing, not to mention where to start fixing it” (Miri, 2013). Many cities, including all of those benchmarked in this research, have shown their support for increased data capture and sharing by investing in open data platforms, technology updates, and IT staff. They believe that understanding where their programs are succeeding and where the programs fall short is a critical piece in evaluating and improving programs.

The City of Austin has been collecting data on its waste systems since 2004, and has begun offering this data to its residents on its open data platform. The city further supports this platform with policy stating that there is no “copyright, patent, trademark, or other restriction on government information” and by requiring city officials to continually “research new data technologies and seek feedback from the public” (Kanowitz, 2016).

Their extensive volume and organization of their open datasets as well as their supportive policy led Open Data Census to give Austin's open data a near perfect accessibility score on accessibility (Kanowitz, 2016). The city manages and updates several waste related datasets daily. These datasets include fields such as load type, load weight, drop off site, and route type (Waste Collection & Diversion Report (daily), n.d.). Austin holds that “If you don't know where

you stand, it's hard to make progress toward goals and outcomes." Further, they believe that solid waste data will enable and engage the city's staff and departments to continue to improve their programs in order to reach the city's zero waste goals (McCandless, 2016).

In 2016, Austin expanded their commitment to open data with the launch of their sustainability dashboard. The city and its partners built the citizen-facing dashboard with the intention of developing a sense of trust among the community and engaging citizens in the city's goals (McCandless, 2016).

The City of Madison also recently adopted a data-focused approach with the launch of its open data platform in 2013. The city cited New York City's massive open data undertaking as their inspiration for developing their own. Madison plans to leverage this open data initiative to make all city data accessible through the platform, but they simultaneously recognize that this will be a slow and concerted effort in order to digitize existing data, expand current data collection, and develop the platform to make the data publicly available for every city sector. The city's CIO believes that the city has an obligation to share its data with the public that funds its collection (Wood, 2013).

The City of Madison indicates that the data efforts are partially to promote transparency within government, but they also cite the economic benefit that they expect data sharing to provide. They expect that open data platform will return benefits such as fewer data requests since the data will already be public, as well as heightened public engagement and support around city services such as shoveling out fire hydrants in the winter (Wood, 2013).

San Francisco, New York City and other benchmark cities also have impressively granular, near-real time public data available through their open data portals (New York City to Mandate Open Data, 2012). The City of San Francisco's data is less accessible through their own open data portal. Instead, it seems to rely on the state's Cal Recycle data program (CalRecycle, n.d.).

Cities have also begun to view increased technology and data collection within the waste sector as a way to reduce costs. Cities such as Emmet County use technology like RFID tags to measure the weight of waste in each bin. This helps the county better understand who is participating, map waste trends over time, measure the impact of different educational and promotional efforts, and target program management in areas that need it most.

Other cities such as New York City have used technology to send real-time information to MSW collectors so that trips are only made when the bin is full, which reduces costs, traffic congestion, and pollution. The Compology system that New York City is using on some of its public space bins has been touted as being able to reduce waste hauling costs as much as 40% (Shueh, 2016). And if bin servicing is only a cost to the city upon collection, then it is in the city's best interest to help reduce the waste generated in order to decrease the frequency and cost of collection.

5.6. Sufficient & Reliable Funding

While many governments would like to take the more sustainable option when it comes to waste management, landfilling is still often the least expensive option MSW management per ton for the short term. Reducing the total tons generated, however, is still the most cost-effective and immediate way to reduce the total cost of a city's MSW.

The benchmarked cities used a variety of tools to fund their waste programs. While recycling and composting has historically been a financially attractive solution to many coastal cities due to the high landfill fees, inland areas such as Ann Arbor have often had to defend the additional costs incurred from diversion. And cities that provide free diversion services to their commercial have found themselves needing to find a sustainable source of funding to support the diversion programs in order to keep those services free.

San Francisco has incentivized its haulers through a PAYT model to charge its commercial sector while also encouraging diversion and reduction. PAYT programs allow for a component of price discrimination for waste services – offering less expensive services to those that are less expensive to serve because they require less waste to be picked up. This encourages waste reduction, which makes the pick-up routes more efficient as trucks are able to pick up from more locations before they are full and fewer bins need to be pick-up at each site, which reduces the time spent per pick-up location.

The PAYT model works for San Francisco because of their close partnership with Recology and because of their single-hauler model. Because Recology is the hauler for all three of the city's MSW streams, diversion from waste to recycling or compost does not reduce the hauler's revenue. Recology has also been an engaged partner in the education and enforcement of the city's diversion ordinances since they earn the revenue from all collected fines, which helps pay for the city's collection service. Aside from some revenue from fines, the trash fees, and revenue from recyclables and compost fund the entire program (Gonzalez, 2015).

The biggest costs for any recycling program is collection, which makes densely populated cities less costly to service per ton of material. Emmet County faces low-density communities, yet they are able to completely fund their programs through the support of their 15 donors and have even managed to secure several state and national grant such as the State of Michigan's Community P2 Grants and The Recycling Partnership. These grants amounted to more than \$200,000 in grant revenue and made it possible to expedite the expansion of their recycling programs (Emmet County, Michigan, receives funding from The Recycling Partnership, 2016) (Community P2 Grant Summaries, n.d.).

Despite the potential for fully funding programs through user fees, levied fines, and grants, it is possible that overall cost of commercial MSW will increase. Potential cost increases will need to be borne by either the commercial sector (weighted equally, or by relative waste production) or the city. This issue will be particularly acute in years when recycling markets are depressed, as in 2015 (Urban Sustainability Directors Network, 2013). However, the number of MSW landfills in the United States is dropping. Landfill expansion proposals are increasingly contentious and

expensive, as are closure and monitoring costs. Indeed, cities that pay to offer more diversion options today may avoid future expenses from landfill closures and rising tip fees.

6. Recommendations for Ann Arbor

The *Commercial Waste Practices Survey* and benchmarking analysis led to the following recommendations for improved waste diversion and reduction in Ann Arbor's commercial Eating & Drinking Places. These recommendations follow the themes identified in the best practices benchmarking:

1. Consistent & Dependable Access to Diversion Opportunities
2. Incentive Alignment & Partnership
3. Education & Engagement
4. Local Leadership & Staff Resources
5. Transparent Tracking & Measurement Systems
6. Sufficient & Reliable Funding

6.1. Consistent & Dependable Access to Diversion Opportunities

The *Commercial Waste Practices Survey* demonstrated that while the surveyed businesses are interested in diverting their waste they do not have the infrastructure or service necessary to divert all of their traditional recyclables or organic material. The following strategies to make diversion opportunities consistent and dependable in Ann Arbor's commercial sector, which would increase the potential rate of diversion.

Recycling

While some businesses divert all of their recyclables, others have a trash stream with up to 40% recyclable material. The biggest constraint on commercial diversion is bin space. Each business in the 23% of respondents that were unable to divert between 24-40% of their traditional recyclables cited bin space as limiting factor. Evidence of this space constraint is also demonstrated by the self-reported number of recycling containers and pick-ups relative to the volume of recyclables generated (Table 5).

It is clear that in order for the downtown Ann Arbor Eating & Drinking Places to divert all of their recyclables they will either need to reduce their consumption of recyclable material, get access to larger recycling receptacles, increase the frequency of their recycling pick-ups, or change their recycling behavior to make their use of bins more efficient.

Behavior Change Strategies

Of course, the least costly of these alternatives is to encourage businesses to use bin space more efficiently. Ann Arbor could provide easy-to-access information on methods of improving efficiency. Businesses that divert their recyclable in rolling carts may be unable to practically fit

their OCC in these bins, making them appear full. I recommend that city increase communication between the commercial sector businesses and the recycling hauler in order to determine if this is an issue based on on-the-ground information and then assess solutions based on the collected information.

Improved Collection Through Sorting

The *Commercial Waste Practices Survey* identified that Eating & Drinking Places' recycling is composed of 53% cardboard (OCC). The incredible volume of OCC generated from the Eating & Drinking Places sector (and likely the commercial sector overall) offers an opportunity to increase the revenue earned from recycling while improving access to diversion streams. This could be achieved by implementing a separate stream for collecting commercial OCC. The additional collection service could reduce the strain on the recycling bin space and potentially provide the city an opportunity to reduce program costs through the increased revenue earned from sorted OCC over the blended-bale value of commercial recyclables. This additional collection would also reduce alley mess from overflowing bins — a concern for the city, residents, and businesses (Appendix E).

I recommend that the city submit an RFI to solicit information about potential cardboard collection systems that would return a higher revenue and address the issue of overflowing recycling bins. This RFI should also be promoted among local paper mills, which could be interested in collecting and/or receiving OCC directly from the recycling stream without requiring a transfer station. There are several paper mills within 100 miles of Ann Arbor that would likely be interested in this material stream (Paper Manufacturers in Michigan, n.d.), (Associated Press, 2016).

Increased Pick-up

After a review of the OCC pick-up RFI's, if it is deemed infeasible to divert OCC into its own material stream with a separate pick-up, then it is recommended that the city increase its frequency of single-stream recyclables collection. While the goal of increased diversion could be achieved by increasing the number or size of collection carts/dumpsters available to businesses, businesses frequently cited outdoor space constraints as a primary concern. Therefore, it is assumed that they would be less able or interested in accommodating additional cart or dumpsters — particularly in downtown areas. Thus, it is recommended that collection be increased based on businesses' needs. The data collection necessary to obtain information about which businesses will need additional collection will be discussed in Section 6.5.

FOG Collection

The city estimates that there are seven or eight FOG haulers servicing downtown area businesses. Each trucks is incredibly heavy; similar garbage trucks can weigh as much as 33,000 pounds when empty and cause the equivalent of 1,429 cars' worth of damage to the pavement (Transform Don't Trash NYC, New York City). The high number of FOG haulers in the downtown area creates additional strain on the streets without providing additional diversion.

Furthermore, the city lacks any regulation to monitor FOG collection. The city is not able to hold haulers accountable for spills, collection frequency, service, material processing, etc. The lack of hauler accountability has led to frustrations from illegal dumping of improper materials in the FOG collection containers and alley spills that are not cleaned (Olitzky & Hall, 2016).

I recommend that the city do one of the following in order to better control the FOG collection:

1. Issue an Ordinance to Control FOG Collection

The city should amend the City Code Chapter 26 to include specific requirements for FOG collection.¹⁸ These requirements should include, at a minimum, the following:

- Types of allowable containers
- Location of allowable containers
- Spill requirements
 - Requirement to report any spill to the city
 - Standards and best practices for cleaning the spill

This type of ordinance would need to be applied to businesses and require that businesses contracting with an FOG collector ensure that their collection service meets these requirements (Frey, 2017). In order to make it feasible for businesses to comply with this ordinance, easy-to-read information about the specific requirements should be distributed to businesses and available on the MSW page of the city's website.

Ann Arbor could begin with this option and expand into options 2 or 3 at a later date, using the ordinance expansion as a way to assess licensing or franchise contracts.

2. FOG Vendor Licensing Ordinance

An FOG vendor licensing ordinance would amend the City Code Chapter 26 as mentioned above, and would require that all FOG haulers be licensed through the city. The licensing process would confirm that all FOG haulers operating in the city meet the ordinance requirements; the ordinance enforcement would fall directly on the FOG hauler. This proposal would not limit the number of haulers that would be able to operate in the city, but would ensure that the city was in control of the collection processes and could be a source of revenue for the city's MSW management by requiring an annual registration with an application fee. In addition to the requirements outlined for ordinance amendments above, licensing should include:

- Registration of the hauling vehicle and confirmation that the vehicle meet an emission, pollution, and safety standard
- Registration of all collection containers servicing and the customers that each container serves

¹⁸ The City included that amending Chapter 26 Solid Waste City Code to better “coordinate with waste diversion and safe solid waste disposal” in its 2013-2017 solid waste plan, however there no evidence that this Code has been reviewed since 2011.

- Reporting:
 - Collection volumes and frequencies by container
 - Contamination by container
- Required spill clean-up equipment on each vehicle

The city could also chose to apply this approach while restricting the number of available registered haulers in order to reduce additional pollution and monitoring costs (Frey, 2017).

3. FOG Franchise

The third option to increase Ann Arbor’s control on FOG collection would be to zone the city into one or more areas and issue a FOG collection license to one hauler per franchise zone. Zoning would be a more long-term contract than the aforementioned licensing approach, but could include all of the same adjustments to the city ordinance outlined in options one and two. Since value of collected FOG material is so high, this franchise could be charged a franchise fee, similar to what would collected annually in a licensing model. Due to the economies of scale, it is likely that the franchise and licensing fee potential for the city is higher with fewer licenses or franchise zones (Frey, 2017).

Issuing FOG regulations through licensing or franchising will offer the city more control over the FOG system, a potential source of revenue, potentially improve the appearance and cleanliness of the city alleys, more information around the city’s diversion, and provide the city an avenue for increased communication with the commercial sector. Increased control will also allow the city to communicate the regulations around FOG disposal to haulers and businesses, as this information is not regularly communicated with either sector and is not readily communicated on the city’s website.

Organics Collection

There is a very high demand and need for organics diversion in the Ann Arbor Eating & Drinking Places sector. 93% of the surveyed businesses were interested in an organics collection, and an average of 56% of their trash materials are compostable. Several businesses expressed interest in joining an organics pilot; they identified specific employees that would be champions for organics diversion within their business.

I recommend that the city begin an organics pilot with a select group of businesses in the Ann Arbor area in order to develop an organics collection strategy that could expand to scale to the entire commercial sector. Five businesses were identified as excellent candidates for piloting organics collection: Avalon Bakery, Zingerman’s, The Lunch Room, The People’s Food Co-op, Sweet Heather Anne, Grizzly Peak, and Spencer. Zingerman’s, The Lunch Room, Grizzly Peak, and The People’s Food Co-op are unique because already receive some organic collection service from the city or another hauler. Since these businesses are already committed to diverting organic waste, they will more easily adjust to the new system; they are also willing to communicate with the city to provide feedback on the collection system. This feedback process

will be integral to adapting the system to business needs before a larger scale rollout is undertaken.

As demonstrated in the benchmark cities and in the data collected from the Eating & Drinking Places sector, it is important that this collection be cost effective for businesses and the most successful programs make diversion options free and easy to implement in the commercial sector. Successful programs have also issued diversion mandates/bans as well as fines for enforcement. Since diversion infrastructure is not adequate to support all of the divertible material from the traditional recyclables or organics stream, it is not recommended that enforcement begin before the diversion infrastructure is able to capture all potential divertible materials with regards to space constraints and types of materials. In addition, enforcement should follow a significant education and outreach push; this is further discussed in section 6.3.

As recommended in the adopted 2017 budget, the city should pilot the commercial program as soon as possible so that the program can be tested and adjusted before a decision would need to be made to expand the collection to year-round (FY 2017 Adopted Budget, n.d.). The city should pilot the commercial program using the same hauler as the residential sector at least until the program is prepared to expand to the entire commercial sector.

6.2 Incentive Alignment & Partnership

Contracting

The City of Ann Arbor has many opportunities to improve its incentive alignment and partnership. However, contracting remains a significant constraint on incentive alignment. Ann Arbor's public sector trash contractor, Waste Management, is both the hauler and processor of trash, and is paid based on quantity of waste collected and processed (Table 1). As a result, Waste Management is incentivized to grow its revenue by picking up more waste.

I recommend that the city decouple these contracts so that the waste contractor is not doubly incentivized to increase trash volumes. Second, I recommend that Ann Arbor attempt to eliminate volume-based revenue by drafting a non-weight-based contract or have a capped revenue contract. This will enable Ann Arbor not only to decrease its volume of MSW, but also to build a partnership with its waste hauler. The capped contract with a decreasing cap, as seen in Seattle, would offer the city the most potential to develop a partnership with its waste hauler as the incentives will be most closely aligned under this structure.

Building a partnership with the waste hauler and increasing communication will offer the city an opportunity to learn from the hauler's on-the-ground experience and tailor educational material and outreach to address business- and sector-specific challenges. San Francisco's partnership and weekly communication with Recology is a great example of a valuable and effective contractor partnership.

Communication

The city should adopt specific and measureable goals for its solid waste programs — such as an acceptable level of residuals or a bale quality standard — and build communication standards to help the city best address these goals. Stating goals will require the city to name each of its stakeholders in the MSW systems and identify how communication could improve processes and learnings. The city should then set expectations for communication frequency and style. This could be as simple as standard data requirements from haulers on a daily basis, and a weekly call to assess the performance of a new or existing initiative. Expectations for communication will be especially important for a successful adjustment to the recycling service or the adoption of an organics collection as recommended above.

Taking a standard for residual rates as an example, the city did identify residuals as something to monitor and review in its 2013-2017 solid waste plan, however it did not set a specific level of acceptable residuals. Identifying an acceptable threshold for residuals as well as a goal for residual levels will ensure that the city's partners are meeting expectations and will allow the city to target communications around addressing a concern or goal. Communicating regularly with the recycling hauler and processor, in this example, would enable the city to identify how a residual rate could be reduced. For example, would improve sorting technology or addressing the material flows have more impact on the residential rates? Further communication with the purchasers of baled recyclable could provide insight into whether the materials are meeting outlined quality thresholds or goals and offer more insight into how the recycling process or education could be improved.

Variable Pricing

The city can also leverage variable pricing within the commercial sector to encourage increased diversion. The city can offer diversion options for free; this leveraging can be further reemphasized by developing a system similar to that of San Francisco, which offers discounts to businesses with higher levels of diversion.

Community Partners

University of Michigan

The University of Michigan is a significant resource within Ann Arbor. The University has developed goals for waste reduction and diversion and is in the process of implementing organics collection across the campus. As part of these efforts, the University is developing educational materials, updating the structure of its Office of Sustainability, and increasing its impact on the city (Sustainability Goals - Waste Prevention, n.d.).

The city should develop a more defined partnership with the University to identify opportunities to collaborate on developing and promoting material market sites, waste reduction case studies, opportunities for further research and piloting, etc.

Washtenaw County and Regional Partners

Washtenaw County has been dedicated to solid waste diversion and reduction and has established a significant presence in the community. The county has crafted waste reduction and diversion resources, collected data on material streams, and developed inter-governmental partnerships. Ann Arbor should leverage the Washtenaw County resources and identify ways to work together, particularly on scalable initiatives such as education and data collection. Additionally, Ann Arbor should join both the Washtenaw County Consortium for Solid Waste Management (WCCSWM) and the Michigan Recycling Coalition to learn from other community partners and identify opportunities for collaboration. These regional communities would also likely be great partners for developing a new MRF contract and system.

Food Rescue Providers

Food Gatherers is an incredible asset to Washtenaw County and Ann Arbor. In 2016, Food Gatherers collected 3.8 million pounds of food and was able to distribute 2.8 million pounds of that food to food banks in the community. Food Gatherers provides a service that rivals those in other, much larger, communities. However, they are burdened with the volume and expense of the waste that they generate from their operations (Spring, Reed, & Shell, 2017).

In 2016, Food Gatherers discarded 948,220 of undistributable food and was forced to send approximately 600,000 to landfill. Food Gatherers was able to divert a small portion through their aerobic digester and their organics collection service that uses organic waste for animal feed. However, much of the food that they must discard is packaged and the human resources that would be necessary to de-package the food products makes diverting the majority of the 600,000 landfilled pounds unfeasible for the organization (Spring, Reed, & Shell, 2017).

In addition to the incredible diversion challenge, as a non-profit Food Gatherers' efforts are constrained by their costs and donation revenue. In 2016, the organization spent approximately \$30,000 just to discard its landfill, recycling, and organic waste.¹⁹ This \$30,000 is directly taken from the organization's mission efforts – providing nutritious food to food-insecure communities in Washtenaw County (Spring, Reed, & Shell, 2017).

The city has an opportunity to help serve one of its most valued partners by adjusting the Chapter 26 R:2:2.12 section to allow Food Gatherers to receive free collection service or support Food Gatherers in meeting the 509(a)(2) requirement for free waste service (City of Ann Arbor Attorney's Office, 2011).

¹⁹ This includes \$12,000 for trash pick-up, \$11,000 for digester costs (not including energy use), and \$7,000 for organic material collection. This does not include the additional \$45,000 for 1.5 FTE and more than \$430,000 for 9 FTE volunteers.

6.3. Education & Engagement

Easily Accessible Information

Education & Engagement is the city's the biggest opportunity for improvement. The first opportunity for the city is to develop a MSW website or web section with a focus on zero waste. Several benchmarked cities focused their web communications around the concept of zero waste; those that did not explicitly use the language of zero waste to set the tone of their MSW resources emphasized recycling and organics collection. Ann Arbor could easily adjust the language of its site to list "trash" last in the list of services on the "Trash, Recycling & Compost" page. It could also go a step further and reconfigure the site to offer more information and resources to businesses and residents with easy-to-find navigation (Trash, n.d.).

Separating Commercial Sector Information

Since Ann Arbor has only one commercial waste hauler for its commercial waste it can easily adopt the best practices from city websites developed around sharing information about a single hauler. This would allow Ann Arbor to separate the MSW information on its site into business and residential information. This separation will allow Ann Arbor to offer more comprehensive information without confusing the two groups with sector-specific information; Ann Arbor will also be able to more effectively promote new commercial resources and information to the relevant audience. The City of Portland page for *Business – Commercial Garbage, Recycling and Composting* demonstrates how a business-specific section of the MSW information can promote offerings such as "Business Recycling Assistance" in order to make waste diversion and reduction easier for the commercial sector (Figures 14 and 15). On the proposed business-sector MSW page, Ann Arbor should include all businesses related information even if this requires duplicating some resources from the residential page. This increases the likelihood that the business sector visitors are able to find the resources and information that they need.

Ordinance Updates & Info

The business sector page should offer easy-to-read fact sheets and announcements pertaining to solid waste ordinances as seen on the Portland and San Francisco's websites. Both cities have several ordinances and include the pertinent information in a fact sheets and FAQ format so that it is easy for businesses to understand what pertains to them and what they need to in order to comply. An example of one of these fact sheets is included below in Figure 21.

 SF Environment FACTSHEET	SAN FRANCISCO FOOD SERVICE AND PACKAGING WASTE REDUCTION LAW
<p>Who has to follow the new law? The law applies to anyone who sells or distributes food ware, packing materials, and other specified products, or anyone packaging products for sale within San Francisco.</p>	
<p>What are the requirements of the new law? As of January 1, 2017, the law bans the sale or distribution of the following products made, in whole or in part, from polystyrene foam (so called Styrofoam™ and expanded, extruded or blown polystyrene):</p>	
	<ul style="list-style-type: none"> • Food ware including cups, plates, clamshells, and other containers • Meat and fish trays (as of July 1, 2017), and egg cartons • Packing materials* including peanuts and shipping containers, and their use to pack within San Francisco products sold • Coolers, ice chests or similar containers* • Pool or beach toys* • Dock floats, mooring buoys, or anchor or navigational markers*
<p>* Unless they are wholly encased within a more durable material</p> <p>The law also requires that packing materials and disposable food ware sold or distributed must be accepted as compostable or recyclable in San Francisco's collection programs.</p>	

Figure 19: Example Ordinance Fact Sheet - San Francisco

Ann Arbor did successfully pass a recycling ordinance for the commercial sector in 2009 and per Chapter 26 2:5.4 businesses are required to separate their recyclables and they are required to have enough recycling containers to contain their generated recyclable materials (City of Ann Arbor Attorney's Office, 2011). Despite having passed this fairly progressive legislation, the business with whom I spoke did not know of this legislation and it is not listed anywhere on the city's *Recycling* section of their *Trash, Recycling & Compost* page or anywhere else within that section.

Organics Collection

There is currently no information about the commercial sector at all in the *Compost* section of the *Trash, Recycling & Compost* page. While it is true that the City does not currently offer commercial organics collection it is developing a plan for how it could expand this offering to the commercial sector and this ongoing planning process should be mentioned to business owners through the *Trash, Recycling & Compost* page as well as other channels. The news that the service is under consideration could spark additional interest from the commercial sector or encourage the sector to offer input on the development of the collection. Additionally, even though the city does not currently offer organics collection to most commercial sector businesses, the city could point those businesses to the alternative private organics collections services in the area by including their information on the website until the commercial sector organics service is offered. The City of Madison, which is still slowly rolling out its organics collection program, has included the names and web links to organics haulers in the area that can provide commercial service until the city is able to expand its service to the entire city.

Soliciting Feedback

A separate business sector page is also a great way to invite the commercial sector to provide feedback on the city services or invite them to be part of the planning process for service expansions. For example, in addition to saying that the commercial sector organics plan is still in the planning process the business sector page could offer opportunities to share feedback about the preliminary recommendations throughout the process.

FOG Collection

The current recycling page does not have any information about FOG collection or disposal. The commercial sector page should have information about how grease should be disposed, per Chapter 28 and 26 of the Ann Arbor Code as well as how a business can contract a FOG collection hauler. Additional information could include licensed haulers in the Ann Arbor community, recommendations of what to look for in a FOG hauler, types of FOG collection systems, and educational information that could include info graphics and easy to read material about topics such as why it is important not to dispose of grease in the drain.

Making Requirements Easy to Read

How-to information for recycling and composting should be included in both the commercial and residential sections of the web page and they should be easy to read. While some information may be included that is sector specific, much of the guiding information about what is and is not accepted will be the same on both pages.

How-to information such as what to recycle or compost should be easy to read and quickly comprehend, and should be one of the easiest things to find on the page. The current “Recycling Guide” is located mid-way through the Recycling tab on the A2gov.org site. The guide offers a long list of materials in bullet paragraphs that is difficult read or scan. The bulleted list under “Yes” includes both items and directions for recycling; and the acceptable materials that are included in the list are not separated by material type. “Glass” is located within a bullet about metal cans, and both plastics and metals have two bullet sections each.

In addition to listing what is accepted in the recycling, there is a list of what is not accepted in the recycling. While not inherently a poor practice, the title of each list is not descriptive enough for a quick reader to differentiate the two lists. The Recycling Guide also does not match the information provided on the recycling hauler’s guide, which would easily confuse some individuals. The Recycle Ann Arbor guide includes items such as “paper cups” in the list of not acceptable items, but the city does not list them in their not acceptable list (All Together Now: Ann Arbor Recycling, n.d.). The city also does not address the concern around flat plastics, which are not able to be properly sorted at the MRF and are the source of some recycling residuals. The city guide also mentions that paper products should be “placed in a clear plastic bag”. If that is still the preferred practice for the city and its recycling haulers and processors, then this should be more clear on the website so that individuals are able to easily spot this requirement (Recycling, n.d.).

In addition to providing information about what materials are accepted in the traditional single stream collection, the city site should offer additional information about less standard recyclables such as textiles and hazardous waste. While the city has linked some of these items within the list, the city should link resources for each of these or provide an alternative list for reusable items and non-standard recyclables (circled in the best practice Figure 20, below). The difference between a best practice example recycling information and the Ann Arbor recycling guide is shown below in Figures 19 and 20.

If your business, however, is located within the [Downtown Development Authority \(DDA\)](#) region, or if your business has a recycling dumpster only (no carts), please contact the Customer Service Center by email at customerservice@a2.gov.org.

Recycle guide

Yes:

- Mixed paper – newspapers, magazines, catalogs, junk mail, office paper, cardboard (including pizza boxes, minus the pizza), frozen food and cereal-type boxes, milk cartons, juice boxes, shredded paper (placed in a clear plastic bag).
- Metal cans, lids, glass bottles and jars
- Scrap metal up to 1 cubic yard, 20 pounds per piece
- Rinsed plastic bottles, containers and tubs labeled 1, 2, 4, 5, 6 and 7
- Larger plastic items like laundry baskets, milk crates, lawn chairs and buckets may also be recycled so long as they fit into the cart with the lid closed.
- "Aseptic" and "Tetrapak" packages. These are typically containers/boxes that are used for juice, soy milk, chicken broth, almond milk, etc.
- Keep lids on glass, metal and plastic recycling containers.

No:

- Plastic bags, Styrofoam
- #3/PVC plastic
- Biodegradable plastics (marked "PLA" or "BPI")
- Batteries
- Light bulbs
- Toxic materials such as motor oil
- Medical waste and syringes
- Hardcover books
- Ceramics or Pyrex dishes
- Electronics
- Trash
- Textiles
- Wood or construction debris

Figure 21: City of Ann Arbor Recycling Guide

San Francisco Department of the Environment

Residents Business Contact

中文 English Filipino Español

Search

SF Environment

How to Recycle and Compost

Put items in the right bin with these recycling and composting guidelines.

Recycle / Compost / Safely Dispose / Landfill / Give Away

RECYCLE

Recycle

Recycle plastic, metal, glass, and paper. Empty containers prior to recycling.

- **Plastic:** rigid and hard plastics only (empty buckets, cups, yogurt containers)
- **Metal:** cans, tins, party trays, aluminum foil
- **Glass:** bottles, jars (no bakeware, glassware, or dishware)
- **Paper:** junk mail, cardboard, newspaper, magazines. Put shredded paper in a paper bag, staple it closed, and label it "shredded paper"

Figure 20: Recycling Guide Best Practice Example - San Francisco

Reuse, Repair & Non-standard Recycling Resources

The standard recycling guide should direct businesses to where they can learn more information about reuse/donation options as well as recycling streams for non-standard recyclable materials. These resource should also be given their own stand-alone page. These resources should include:

- Local general donation non-profits such as the Reuse Store, the Ann Arbor PTO, Kiwanis, etc.
- Non-standard recycling options such as the Whole Foods and Best Buy take-back programs
- Local repair centers for electronics, mending, bicycle repair, etc.
- General resale centers such as the University of Michigan Property Disposition Center, Craigslist, Next Door, Freecycle, etc.
- Refill centers for fire hydrants, ink cartridges, etc.
- Food donation centers such as Food Gatherers, local food banks

- General resources for finding other recycling options such as Earth 911, Recycle Nation, etc.

Washtenaw County has developed and published 116 pages worth of recycling, reuse, and repair resources in their *Turning Trash Into Treasure* guide. Ann Arbor should promote this resource and work with Washtenaw to digitize this into a searchable online resource.

Resources and Tools

Source Reduction

Source reduction is the most cost-effective strategy for waste. Source reduction reduces both MSW costs as well as business loss from perishing ingredients, unwanted material, re-prepping ingredients, managing the additional waste, etc. Ann Arbor's city site should offer tools for helping businesses complete waste assessments and identify opportunities for source reduction — tools such as LeanPath or the Conserve program offered by the National Restaurant Association. The city could also consider adopting its own solution for waste tracking and analytics similar to the system that was developed by the public agency, StopWaste in order to absorb the risk and subsidize the cost of source reduction in Alameda County, California (ReFED, *A Roadmap to Reduce Food Waste by 20 Percent*, 2016).

Diversion Calculator

If the city were to determine that offering free organics and recycling collection in the commercial sector were no longer feasible it could instead offer a diversion calculator similar to the one developed for Seattle. The diversion calculator allows businesses to determine that their waste costs will be based on the expected need from each stream. This tool could also be useful to help businesses decide whether they should contract a private hauler for the organic materials based on the expected reduced need for trash service (Recycling, n.d.).

Tools

The city should also offer tools and templates that are standard in the benchmarked cities such as recycling, compost, and trash signs or customizable signs; educational tutorials and videos; information about the benefits or reusable-ware over disposable-ware, etc. The city should also encourage businesses to suggest tools and templates that they would like the city to develop on their behalf as well as invite businesses to share tools and templates that they are using to reduce their waste.

Highlighting Waste Reduction & Diversion Achievements

The city should encourage the adoption of a zero-waste culture by highlighting waste reduction progress and planning in the website's news section. This should include recent updates on organics management plans, changes to the MRF or recycling management, and recipients of Washtenaw County's Waste Knot awards, among other things. The current news page, as of this writing, two of the top three new items were for past events.



Figure 22: Ann Arbor Website - News Page

Proactive Outreach & Education

Historically, the City of Ann Arbor had more outreach and support for local businesses and residents and was present at events such as the Kerrytown Farmer’s Market and fairs to answer questions about programs and offer advice. Since 2001, the city staff has regrettably dramatically decreased, leaving less opportunity for the city staff to interact with individuals as part of their regular role.

Given the realities of the currently very lean city solid waste department, it is recommended that the city leverage the recommended partnership with its haulers to distribute educational materials directly to businesses. This could include educating businesses about source reduction resources, opportunities for participate in the city’s organics pilot, and new educational material available on the city website. Programs that include more frequent mailings and distributed information have higher diversion rates (RRS, Northeast Michigan Council of Governments, DEQ, Public Sector Consultants, 2015).

Social Media

The city has developed social media channels on Facebook and Twitter, however when compared to other cities’ platforms they appear underleveraged by way of number of posts per day and content of the posts. The Facebook page is primarily dominated by area residents posting information among themselves about the city. The city should leverage this platform to listen to conversations and post questions to solicit citizen feedback.

Twitter sits on the opposite side of the conversation spectrum. While the city can see and respond to posts in which users tag the city, the city does not frequently post information about ongoing city initiatives through this portal and instead posts information such as local weather, water main issues, and construction. The city should consider developing a Twitter handle for the zero waste initiatives similar to that of the Ann Arbor Parks & Recreation

Department handle @A2Parks, which posts and promoted new park projects, the weekly farmers market, the city golf courses, etc. An @A2ZeroWaste or similar handle is recommended to promote waste issues, recycling, reuse, and repair initiatives.

Data & Information Gathering

Data, which will be discussed more thoroughly in section 6.5., should be easily accessible to the public through a standard portal such as the *Trash, Recycling & Compost* Page.

In addition to city collected data, the city should solicit feedback on waste diversion and reduction by leveraging the current city tools such as the Ann Arbor Fix It app. A similar app, also developed by SeeClickFix has been incredibly successful in Detroit. The app has helped offered residents a way to point out community issues to the city, such as potholes or fallen trees. Residents are also able to receive a response on their issue in a timely manner and see the issue resolved (Sovereign, 2017). Further, citizens can answer each other's comments and issues, which reduces the response time for the individual and keeps citizens engaged with the city development (Murray, 2017). Since Ann Arbor already has a similar application, the city could leverage this resource to address business concerns and quantify and qualify the concerns over time.

6.4. Local Leadership & Staff Resources

Successful waste reduction and diversion programs have dedicated and passionate resource management staff that support programs and push for leadership within both the city government and the community. The city has approved the funding for a new solid waste staff member and should hire him or her immediately to assist with program expansion, education, creating resources and tools, developing stakeholder partnerships.

One person is simply unable to oversee all of Ann Arbor's MSW contracts, diversion programs, education, data collection and simultaneously evaluate opportunities for expansion and improvement. A staff of one is not only inadequate for the changes necessary, but also signals indifference towards progress in sustainable materials management. If the city is dedicated to improving its diversion rate and becoming a more sustainable city, it must commit the staff resources commensurate with the change it wishes to make.

6.5. Transparent Tracking & Measurement Systems

The city has significantly and successfully expanded its sustainable waste management practices since their beginnings in the 1970s, however the city's data collection has not kept pace. The city has collected some data on the residential sector, but has virtually no publicly available data collected for the commercial sector MSW. Data collection is imperative in order for Ann Arbor to be able to understand the current system, identify areas for improvement and areas of success, and focus its resources where they are most needed.

Cities around the country such as the benchmarked cities and others have significantly increased their investment in data collection and have overwhelmingly begun to make this data

more publicly accessible through tools like open data platforms. New York City aims to host all of its data online; Madison is following suit, and cities like Austin are even developing citizen-facing platforms to effectively share the data with its constituents in a user-friendly tool.

Ann Arbor developed a data catalogue in 2010, yet it still has very little information and no current information about MSW collection data or other statistics (Data Catalog, n.d.) (Vielmetti, 2010). Though Ann Arbor does not have the benefit of state-developed data collection platforms, it does have a county partner interested in increasing its data collection efforts and a Governor that has verbally committed to increasing the state data collection on MSW. I recommend that the city partner with Washtenaw County to submit a data collection grant to the state that would meet the interests of the Governor and could serve as a tool for the rest of the state's communities. This grant should include a proposal for new data collection standards and methods and investigate opportunities for additional technological improvements to enhance data collection efforts by improving the ease of collection and granularity of information, as well as potentially reduce costs by using data to adjust collection.

Data collection should also include tracking the quantity and quality of collected materials by sector and subsector, participation levels in different diversion streams, number and nature of complaints registered, number and location of distributed containers, regular assessments of MRF residual rates and rates of miss-sorting, in addition to other metrics that the city believe would be valuable in evaluating program performance and diversion.

Once collected, Ann Arbor should share this data through the City of Ann Arbor website on its *Trash, Recycling & Compost* page and open data portal. This data distribution will offer Ann Arbor the opportunity to build trust within the community through data sharing and transparency as well as invite citizens and student to develop innovative waste solutions based the city's actual waste data.

6.6. Sufficient & Reliable Funding

Funding is an important part of a successful sustainable materials management program. There are significant costs to waste diversion, disposal, education, and municipal program management. However, there are also opportunities for Ann Arbor to reduce its MSW program costs and increase revenues returned through additional diversion and licensing fees.

Currently the city collects the majority of its program revenues from solid waste millage. Despite recent budget surpluses, the program is facing increasing budget pressure and expects to see deficits in the near future. While millage revenue is dependent on the housing market, contract costs are not. The city should aim to expand its funding sources in order to reduce its vulnerability on the housing market.

Cost-Neutral Program Improvements

The City of Ann Arbor should begin by reevaluating its trash contracts in order to incentivize increased diversion by aligning contractor incentives with those of the city. The city is already expecting to need to renegotiate its landfill contracts in the coming 1-2 years and can leverage Seattle's example to encourage waste reduction and diversion.

Ann Arbor should develop an active social media tool to promote its expanded waste reduction and diversion initiatives. The city should look to the Parks & Recreation department as a model and use this tool as a way to promote new initiatives, information about program expansion, promote tools and resources, etc. A Twitter handle would allow the city to leverage the platform while still controlling the primary, public-facing conversation.

The Ann Arbor Fit It mobile app and website has the potential to increase the city's data gathering without incurring significant costs. The city should employ this tool to better understand commercial waste issues and directly address those that are highest priority to the commercial sector.

Opportunities for Decreased Costs

Ann Arbor should promote source reduction and reuse tools through its website. This could include partnering with an organization like LeanPath to develop a customized tool for Ann Arbor Eating & Drinking Places or promoting the National Restaurant Association's Conserve program through the website and social media. The city should reach out to businesses currently generating the most waste and encourage them to try a source reduction tool.

Opportunities for Increased Revenue

In decoupling its trash contracts, the city should consider sending its trash to the Arbor Hills landfill. Arbor Hills landfill charges a small fee for every ton that is processed at landfill, which goes directly towards Washtenaw County's budget for waste diversion programs and education (Krcmarik, 2017). Ann Arbor should work with the County to negotiate a collaborative educational effort in exchange for sending its waste to the Arbor Hills site. This will also work to decouple the hauling and processing contracts.

I recommend that the city review opportunities for collection of separated OCC and selling the baled material to a recycler or directly for a mill for a higher price than the current blended ton value from single stream recyclables. If the city were to sell bales at the 5-year average price of \$112 per bale, the city would likely be able to significantly increase its recycling revenues will capture more recyclables in the recycling stream. Assuming that Food Gatherers produces an average of one bale of OCC per day at about 1,000 pounds per vertically compounded bale, the city could be able to cover the organizations MSW costs without impacting its finances.

I recommend that the city review options to license or franchise a FOG hauler. Implementing a licensing or franchise system would be a low upfront cost to the city and could become a

regular source of revenue for the city. Increased FOG control also has the potential to reduce costs incurred from sewer clogs and overflows that can occur as a result of FOG spills.

Opportunities for Low Cost Program Expansion

The city could also be able to increase education while keeping its costs low by adjusting hauler incentives and creating partnerships through which to promote educational material. The city should also expand the educational and resource materials available on its website, greatly increasing the commercial sector's information access without significantly affecting costs.

Through this education and outreach effort I recommend that the city invest resources in strategies and tools to help the Ann Arbor Eating & Drinking Places identify opportunities for source reduction, which will reduce the waste costs to business and potentially offer the city an opportunity to capture a portion of the cost reductions.

Additional staff resources should be devoted to developing materials markets throughout the city and region. The city should work with the Washtenaw County and the Michigan Recycling Coalition to develop these markets, which will lower costs, broaden the reach, and increase the impact of these diversion initiatives.

7. Conclusions & Recommended Next Steps

All around the United States, cities are witnessing contentious and increasingly expensive landfill expansions. Some of these expansions, like the recent proposal for Arbor Hills, are too contentious to execute. As landfill capacity shrinks and our MSW grows, it is ever more important to develop sustainable solutions for our waste to be managed in the decades to come. Developing these material streams and systems now will boost the city's job creation and strengthen the city's economy as the city decreases commercial sector waste and makes resource management more affordable over time.

The City of Ann Arbor has an incredible opportunity to recapture its leadership in sustainable resource management. As Ann Arbor's trash contracts near expiration and MRF contracts are renegotiated, the city is faced with the opportunity to change its internal and contractual structures to align city and stakeholder goals towards waste diversion and waste reduction.

The *Commercial Waste Practices Survey* demonstrated the need and interest for increased diversion infrastructure within Ann Arbor's commercial food sector. It also presented opportunities for the city to regain control of its waste streams, data, and education. Doing so allows Ann Arbor to continue to engaging the commercial sector and ensuring adequate funding for diversion programs going forward.

Ann Arbor Waste System Areas of Opportunity.

As the city moves forward and pilots these new opportunities for diversion, it should begin to invest more time engaging with the commercial sector as well as including their input into the design adaptation of new programs and resources.

In conjunction with the implementation of these recommendations, I recommend that city adopt a data platform to measure the city's progress and track new opportunities. And in order to develop a materials baseline, the city should conduct a waste characterization study to capture the initial waste generation and diversion, measure the progress from new initiatives, and identify additional opportunities for improvement and material market development. Implementing these recommendations will dramatically reduce Ann Arbor's MSW, improve its diversion rates, and allow it to capture the value in its MSW.

Appendix

Appendix A | Survey Questions

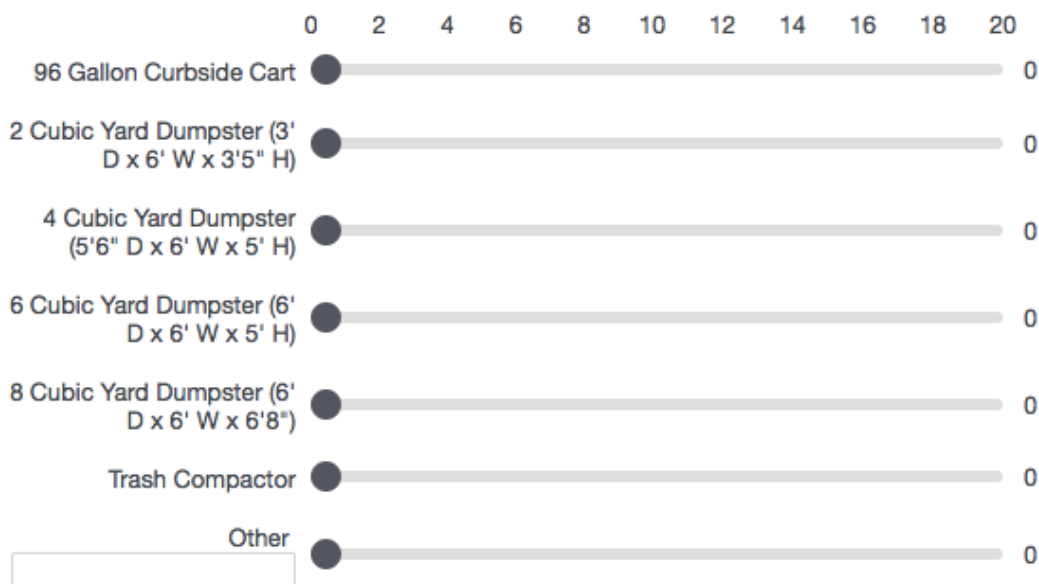
Thank you very much for taking the time to complete this survey! This survey will be used to better understand commercial waste habits, identify Ann Arbor commercial waste challenges, and ultimately inform changes and improvements to the commercial waste collection systems.

If you own or manage multiple businesses within the City of Ann Arbor, we would really appreciate it if you could complete the survey once for each business. To do this, please complete the survey once then clear your browser's history (or open a different browser) and click the emailed link again to complete the survey for an additional business.

The survey contains very few mandatory questions, so if you don't feel like you can answer or estimate the response to any of the questions, you are welcome to continue on with those that you can answer.

As mentioned in the email, 5 respondents will be selected at random to win a Zingerman's brownie and a Recycle Ann Arbor sticker. To be considered in the drawing, please be sure to include your name and a method of contact at the end of the survey. *(We promise not sell your information - we wouldn't know how even if we wanted to.)*

What type and how many of each type of **trash** container do you use? (Not including recycling or compost containers)



Do you share **trash** containers? If so, please list all the business with whom you share a **trash** container.

- No, we are the only business that uses our trash container(s)
 - Yes, we share our trash container(s) with:
 - Other
-

What days is your **trash** picked up? Please check all that apply. (Not including recycling or compost)

- Mondays
 - Tuesdays
 - Wednesdays
 - Thursdays
 - Fridays
 - Saturdays
 - Sundays
 - Do Not Know
-

Who picks up your **trash**? (Not including recycling or compost)

- City of Ann Arbor
 - Private Hauler (please list hauler)
 - Both the City of Ann Arbor and a Private Hauler (please list hauler)
 - Do Not Know
 - Other
-

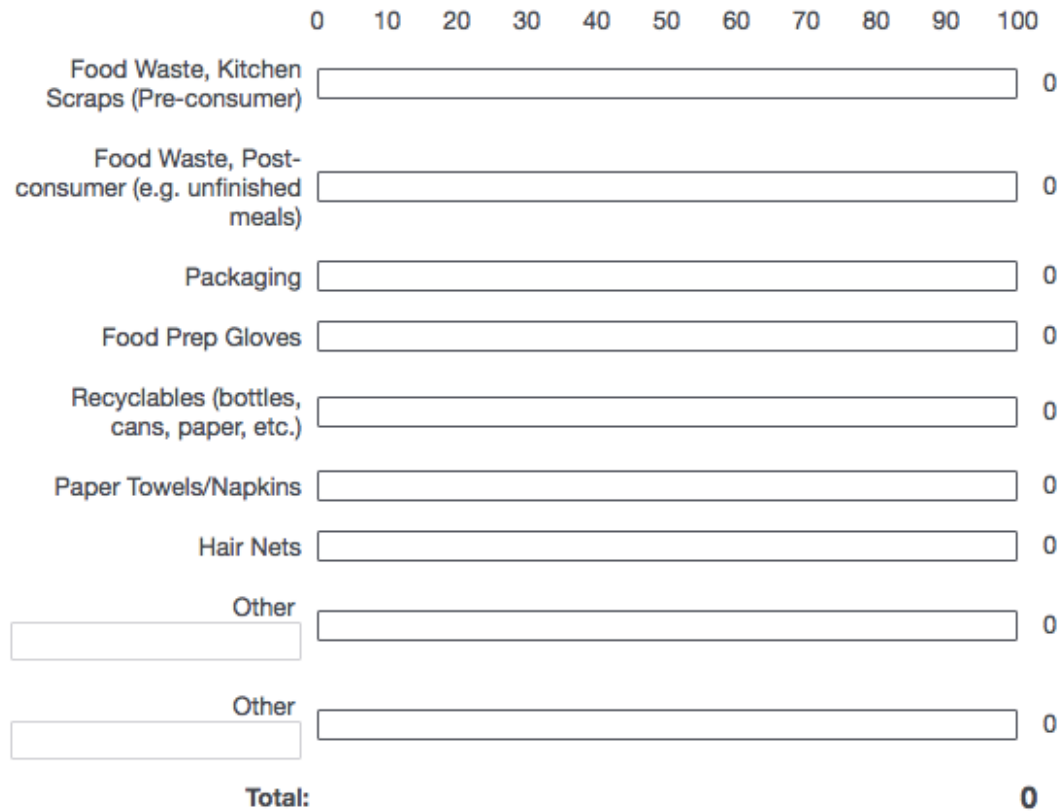
Approximately how many bags of **trash** does your business produce per day? (Not including recycling or compost bags)



Please estimate the relative contribution (%) of waste types in your **trash**.

(Not including recycling or compost)

Drag the bar for each category in order to complete the chart with the representative trash material percentages.



What challenges do you currently face regarding your **trash** system, if any?

In the following questions the word "**recycling**" is used to refer to refuse that is recycled by curbside pick-up or specialty recycling pick-up or drop-off *i.e. not trash or compost*.

Do you share **recycling** containers? If so, please list all the business with whom you share a **recycling** container.

- No, we are the only business that uses our container(s)
- Yes, we share our recycling container(s) with:
- Other

What days is your **recycling** picked up? Please check all that apply. (Not including trash or compost)

- Mondays
- Tuesdays
- Wednesdays
- Thursdays
- Fridays
- Saturdays
- Sundays
- Do Not Know

Who picks up your **recycling**? (Not including trash or compost)

- City of Ann Arbor
- Private Hauler (please list hauler)
- Both the City of Ann Arbor and a Private Hauler (please list hauler)
- Do Not Know
- Other

Approximately how many bags of **recycling** does your business produce per day? (Not including trash or compost bags)

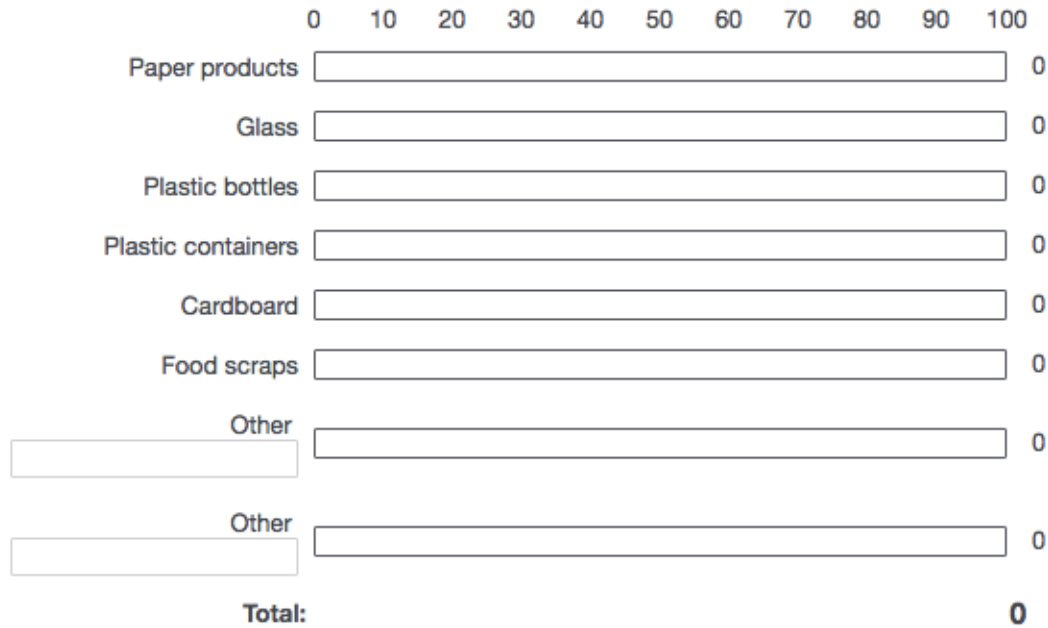
Note: If your recycling is not bagged, please estimate the volume in number of bags.



Please estimate the relative contribution (%) of waste types in your **recycling**:

(Not including trash or compost)

Drag the bar for each category in order to complete the chart with the representative recycling material percentages.



What challenges do you currently face regarding your **recycling** system, if any?

Do you have a **grease** collection system?

- No
- Yes, bulk container outside
- Yes, heated outdoor container
- Yes, indoor pump collection (do not need to transport grease waste)
- Other

If you have a **grease** collection system, who is your hauler?

If you have **grease** collection, what is your motivation for disposing of your grease through a grease collection system?

If you have a **grease** collection system, do you share your collection container with another business?

- Yes, we share with the following business(es):
 - No
 - Don't Know
 - Other
-

The following questions will ask information about your **alley**. If you do not have an alley or do not use your alley for waste please mark "N/A" for these questions.

Do you know who owns/manages your alley?

- Yes
 - No
 - I think I do, but not sure
 - N/A
-

Do you know what to do if there is something blocking the alley and prohibiting trash/recycling/compost/grease pick up? If yes, please briefly explain.

- Yes
 - No
 - N/A
-

Do you think there are any abandoned dumpsters or waste containers in your alley that don't belong to a business or aren't being used?

- Yes
 - No
 - It is very likely, but I am not sure
 - I don't think so, but I am not sure
 - N/A
-

The following page of questions will ask about your interest in and experience with **compost**. **Compost** refers to a collection of organic matter for use as animal feed or to be decomposed into soil. This commonly includes plate scrapings, fruit/vegetable peels, spoiled food, egg shells, etc.

Does your business currently **compost**?

- Yes, pre-consumer waste
 - Yes, post-consumer waste
 - Yes, both pre-consumer and post-consumer
 - Yes, but not sure what type is collected
 - No
 - Other
-

Who is your current **compost** hauler?

How many bags of **compost** do you produce per day? (Not including trash or recycling)

Note: If your compost is not bagged, please estimate the volume in number of bags.



What type, size, and number of **compost** container(s) do you use?

- Dumpster (share approx. size in cubic feet)
 - Rolling Cart (share approx. size in gallons)
 - Other
-

What is accepted in your **compost**? Please select all that apply.

- | | |
|---|---|
| <input type="checkbox"/> All fruits and vegetables | <input type="checkbox"/> Bones |
| <input type="checkbox"/> Compostable plates, cups, utensils | <input type="checkbox"/> Egg shells |
| <input type="checkbox"/> Meats | <input type="checkbox"/> Yard waste (grass, leaves, tree trimmings, etc.) |
| <input type="checkbox"/> Napkins & paper towels | <input type="checkbox"/> Tea bags and coffee grounds with filters |
| <input type="checkbox"/> Dairy | <input type="checkbox"/> Food-soiled paper and paper scraps |
| <input type="checkbox"/> Fats & Greases | <input type="checkbox"/> Other |
-

What day is your **compost** picked up? Please select all that apply. If your compost is not collected weekly, please briefly explain with the "Other" choice.

- | | |
|-------------------------------------|--------------------------------------|
| <input type="checkbox"/> Mondays | <input type="checkbox"/> Saturdays |
| <input type="checkbox"/> Tuesdays | <input type="checkbox"/> Sundays |
| <input type="checkbox"/> Wednesdays | <input type="checkbox"/> Do Not Know |
| <input type="checkbox"/> Thursdays | <input type="checkbox"/> Other |
-
- Fridays

What motivated your business in starting a **composting** program? How has this impacted your business?

Would you be interested in expanding your business' **composting** program?

- Yes, expand to include pre-consumer waste
- Yes, expand to include post-consumer waste
- Yes, expand to:
- No
- It depends

If the City of Ann Arbor began a commercial **compost** collection would you be interested in participating?

- Yes
- No
- It depends

If you are interested in a City of Ann Arbor **compost** collection what would this program need in order for your business to be willing to participate? (e.g. collection specifics, containers, programing, etc.)

Has your business previously had a **compost** program that was discontinued? If yes, please describe the program and why it was terminated.

Would you be interested in starting a **composting** program in your business?

- Yes, pre-consumer waste
- Yes, post-consumer waste
- Yes, all compostable materials
- No
- It depends
- Other

What do you think the barriers are to **composting** in your business? *(Select all that apply)*

- Don't know how to get a program started
- Perceived pick-up expense
- Lack of resources for staff training
- High staff turnover
- Landlord/building constraints
- Cost concern
- Lack of equipment
- Lack of indoor space
- Lack of outdoor space
- Concern about contamination
- Other

Would you be interested in starting a **composting** program in your business?

- Yes, pre-consumer waste
- Yes, post-consumer waste
- Yes, all compostable materials
- No
- It depends
- Other

What do you think the barriers are to **composting** in your business? *(Select all that apply)*

- Don't know how to get a program started
- Perceived pick-up expense
- Lack of resources for staff training
- High staff turnover
- Landlord/building constraints
- Cost concern
- Lack of equipment
- Lack of indoor space
- Lack of outdoor space
- Concern about contamination
- Other

Why is your business interested in implementing a **compost** stream? How do you think this would impact your business?

Would you be interested in sharing a **compost** collection bin with other businesses?

- Yes
- No
- Maybe, it depends

If the City of Ann Arbor began a commercial **compost** collection would you be interested in participating?

- Yes
- No
- It Depends

If you are interested in a City of Ann Arbor **compost** collection what would this program need in order for your business to be willing to participate? (e.g. collection specifics, containers, programing, etc.)

What changes or additions to the current commercial waste management system would make it better or easier for your business?

Please share any additional questions or comments.

May we get your business contact information? *(Necessary if want to be considered for the organics collection pilot and give-away prize)*

Business Name*	<input type="text"/>
Business Address	<input type="text"/>
Name of Best Contact	<input type="text"/>
Contact Email	<input type="text"/>
Contact Phone	<input type="text"/>

Please upload a photo of your outdoor trash, recycling, and/or compost containers. (Optional) These can also be emailed to LaroseCL@umich.edu

Please upload a photo of your indoor trash, recycling, or compost bins. (Optional) These can also be emailed to LaroseCL@umich.edu

Thank you very much for your time! If you have any questions or would like to follow-up directly with our team please email [Caroline Larose \(LaroseCL@umich.edu\)](mailto:Caroline Larose (LaroseCL@umich.edu)).

Commercial Waste Practices Survey Respondents

Anon
Ashley's
Avalon Cafe and Kitchen
Blank Slate Creamery
Frita Batidos
Grizzly Peak
Knight's Steak House
Miss Kim
People's Food Co-op
Rush Nightclub
Salads UP
Sava's
Seva Restaurant
Slurping Turtle
Sparrow market
Sweet Heather Anne
Taste Kitchen
TeaHaus
The Blue Leprechaun
The Last Word
The Lunch Room
Zingerman's Deli

Appendix C | IRB Exemption

To: Caroline Larose

From:

There are no items to display

Cc:

Caroline Larose
Joseph Arvai
Robyn Meeks

Subject: Notice of Exemption for [HUM00117178]

SUBMISSION INFORMATION:

Title: Material Flows: Strategies to Reduce Ann Arbor's Municipal Solid Waste and Improve Diversion
Full Study Title (if applicable):
Study eResearch ID: [HUM00117178](#)
Date of this Notification from IRB: 7/5/2016
Date of IRB Exempt Determination: 7/5/2016
UM Federalwide Assurance: FWA00004969 (For the current FWA expiration date, please visit the [UM HRPP Webpage](#))
OHRP IRB Registration Number(s):

IRB EXEMPTION STATUS:

The IRB HSBS has reviewed the study referenced above and determined that, as currently described, it is exempt from ongoing IRB review, per the following federal exemption category:

EXEMPTION #2 of the 45 CFR 46.101.(b):

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Note that the study is considered exempt as long as any changes to the use of human subjects (including their data) remain within the scope of the exemption category above. Any proposed changes that may exceed the scope of this category, or the approval conditions of any other non-IRB reviewing committees, must be submitted as an amendment through eResearch.

Although an exemption determination eliminates the need for ongoing IRB review and approval, you still have an obligation to understand and abide by generally accepted principles of responsible and ethical conduct of research. Examples of these principles can be found in the Belmont Report as well as in guidance from professional societies and scientific organizations.

SUBMITTING AMENDMENTS VIA eRESEARCH:

You can access the online forms for amendments in the eResearch workspace for this exempt study, referenced above.

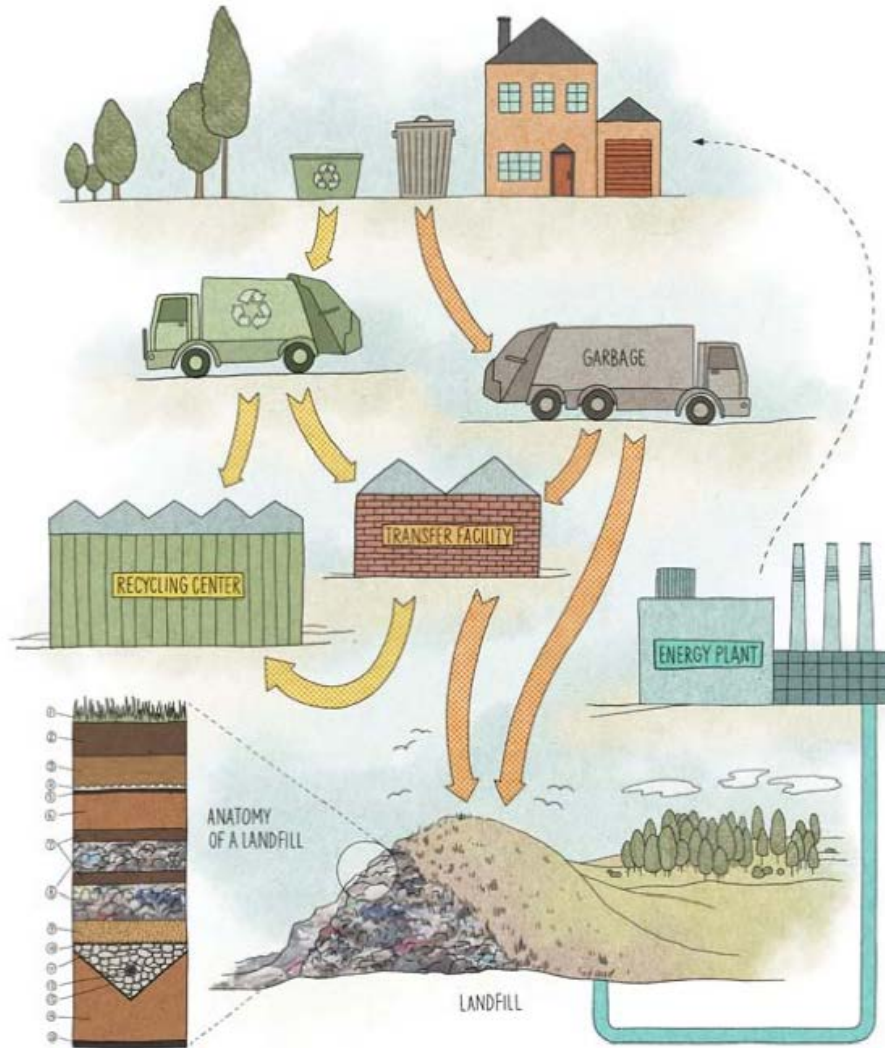
ACCESSING EXEMPT STUDIES IN eRESEARCH:

Click the "Exempt and Not Regulated" tab in your eResearch home workspace to access this exempt study.



Thad Polk
Chair, IRB HSBS

The Anatomy of a Landfill



Source: Hour Detroit, "Waste Matters: The State of Michigan's Trash"
Illustrator: Marco Cibola

Appendix E | Ann Arbor Commercial Waste Stream Images

Example Cardboard Collection Containers in Ann Arbor Alleys



Example: Overflowing Recycling



Example: FOG Collection Containers



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