Circularity Assessment Protocol
Minneapolis, Minnesota, USA

University of Georgia
Circularity Informatics Lab
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New Materials Institute
UNIVERSITY OF GEORGIA

The Circularity Informatics Lab at the University of Georgia is committed to information sharing, data analytics, empowering communities, and systems change related to circular materials management.

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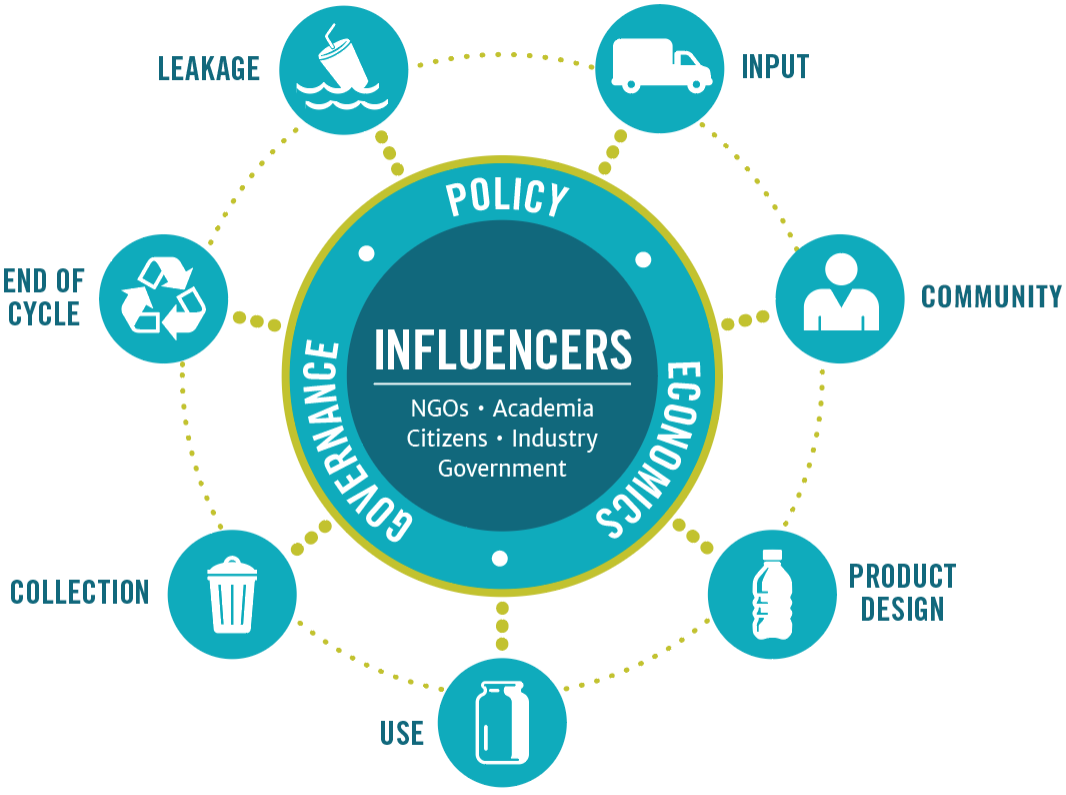
Executive Summary

Developed by the Circularity Informatics Lab at the University of Georgia, the Circularity Assessment Protocol (CAP) is a standardized assessment protocol to inform decision-makers through collecting community-level data on plastic usage. Grounded in materials flow and systems thinking concepts, the CAP uses a hub-and-spoke model to holistically characterize how consumer plastic flows into a community, is consumed, and flows out, either through waste management systems or leakage into the environment. The model, shown below, is comprised of seven spokes: input, community, material and product design, use, collection, end of cycle, and leakage. At the center, the system is driven by policy, economics and governance with key influencers including non-governmental organizations, industry, and government.



In July of 2022, a team from the Circularity Informatics Lab conducted fieldwork in the city of Minneapolis, Minnesota with support from the Mississippi River Cities and Towns Initiative (MRCTI) and the city's local government. This CAP was conducted with the support of the Walmart Foundation. Fieldwork included product and packaging assessments in stores across the city; key stakeholder interviews with government, industry, and non-profit organizations; material type characterizations for consumer plastic items; cost analysis of reusable products and alternatives to plastic available in the city; visual audits of recycling

contamination; identification of public waste and recycling collection bins; and litter transects in three categories of population. Key findings from each spoke are summarized in the table below.

Key Findings

INPUT

Findings: While several producers and manufacturers of common convenience items found in Minneapolis were sourced from countries in Europe, Asia, and the Middle East, the bulk of companies were sourced in the USA, with many located proximally to Minneapolis in Minnesota, Iowa, Michigan, North Dakota, and Wisconsin. Beverage and candy packaging tended to travel the most distance to be sold in Minneapolis, while chips were typically procured from domestic sources.

Opportunities:

- The large percentage of domestic parent companies and manufacturers for top convenience items lend themselves to engaging companies about end-of-life management, product design, alternative materials, and alternative product delivery systems. Minneapolis could lead community initiatives toward working with top local brands and producers that operate locations proximate to the community and Minnesota.
    - Through working with these top brands, the City of Minneapolis could explore resources and potential local industry partnerships that may be available for effective development, implementation, and enforcement of Extended Producer Responsibility (EPR) guidelines and rules that result from those guidelines. Minnesota passed EPR policy in May 2024, the Packaging Waste and Cost Reduction Act, which will implement EPR in a phased approach over time. The product and packaging data contained in this CAP might be helpful in implementing such a policy (e.g., CAP data is being used to inform EPR in California).
    - Deposit Return Schemes may be successful in the area due to the number of manufacturers and parent companies located proximally to Minneapolis itself.

COMMUNITY

Findings: Minneapolis has a very engaged community around circularity, solid waste and plastic pollution reduction. There are a multitude of resources available to businesses and community members alike. The city is engaged with its residents on this topic and proactive in working with the community.

Opportunities:

- This project provided an opportunity for Minneapolis to mentor Athens, GA in their composting pilot program. This shows there are other opportunities to mentor cities in conducting similar programs as those being conducted in Minneapolis.

PRODUCT DESIGN

Findings: Multilayer film and PET were common among typical plastic items sold at convenience stores. Primarily among chip and candy packaging. There was variation in material types used among food vendor packaging; most of the utensils and straws were made from unidentified plastic, while the majority of food containers and cups were comprised of paper products. Significantly less to-go containers are made of Expanded Polystyrene (EPS) or foam than previously studied cities, likely due to Minnesota's Green To Go ordinance.

Opportunities:

- With the wide availability of alternative products in Minneapolis, especially compostable plastics, as well as the access to industrial composting facilities, the city may be able to push for state-level policy and regulations that standardize labeling of various bio-based, biodegradable, and compostable plastics to aid in education efforts.
- Plastic alternatives in the form of bio-based, biodegradable, and compostable plastics are likely to continue gaining momentum in Vicksburg and beyond. By investing in education around identifying product materials and appropriate disposal options early, the city may mitigate challenges with managing these complex products over time.

USE

Findings: There were several product design or delivery systems that reduced the use of single-use plastic in Minneapolis including the Bring Your Own Bag fee, bulk sale of items in retailers, and availability of compostable, refillable, or reusable common household items as opposed to single-use plastic options. Minnesota is one of a few US states that has prohibited local bans or fees on common plastic goods, limiting the opportunities for local communities to implement policy-led strategies for reduction in plastic use.

Opportunities:

- As more complex plastic alternatives are introduced to the waste stream, more education efforts will be needed to combat misleading product labels and encourage appropriate management by individuals and households.
- While reuse schemes were available at some stores, an expansion of those to various areas of the cities remains an opportunity.

COLLECTION

Findings: The City of Minneapolis contracts with MSI to provide curbside trash, recycling, and compost collection to their residents. Minneapolis has implemented curbside composting very early compared to other cities in the U.S., and Hennepin County has seen a 403.5% increase in organics recycling since curbside composting was expanded city-wide. There are a number of drop-off options and locations for Hennepin County residents to dispose of regular garbage, recycling, compost, hard to recycle materials, and household hazardous waste.

Opportunities:

- Minneapolis has an opportunity to mentor other cities regarding the collection of organic materials both in curbside and drop-off scenarios.

END OF CYCLE

Findings: Hennepin County has a diversion goal of 90% of waste being diverted from landfills and waste-to-energy facilities. Most of the waste generated in Minneapolis (62%) is disposed of at waste-to-energy facilities, with the largest percentage of waste going to the HERC facility in Minneapolis. The rest of the waste collected by the city ends up getting recycled (18%), composted (17%), or landfilled (3%). Eureka Recycling, a non-profit organization, is contracted to sort and sell the city's curbside recycling. The two landfills that are used the most by the city and Hennepin County are the Pine Bend Landfill and the Burnsville Sanitary Landfill. Several of the landfills used by the county are currently under expansion or are in need of expansion to support the amount of waste coming into their facilities in the coming years.

Opportunities:

- While Minnesota ranks relatively high for recycling rates in the USA, there are still opportunities to increase recycling and decrease quantities of waste going to waste to energy or landfilling in the city.

Findings: Nearly 2,000 litter items were recorded by the CIL, with tobacco products being the most common material type. Plastic debris characterizations were similar across population areas, however, some differences in concentrations existed likely due to the level of activities and societal activity in each transect location. Illegal dumping is a concern in the region, which mirrors a challenge faced throughout the United States.

LEAKAGE

Opportunities:

- Collecting data and monitoring trends over time can provide insight into waste patterns, community needs, and effectiveness of waste management programs, which Minneapolis already does internally. With continued litter monitoring, the city may be able to identify innovative ways to prevent and abate litter in the community.
- Cigarettes were the top litter item, which could be addressed through education campaigns, litter violation enforcement, and further implementation of cigarette collection receptacles in the city.
- Similar to litter monitoring, recording common locations for observed or reported illegal dumping can help to identify hot spots that can be targeted with resources.
- Additionally, recurring clean-up and drop-off events may help to encourage proactive management of hard-to-recycle items that can be illegally abandoned.

Strengths

- Most products in Minneapolis sampled as part of this project originate from manufacturers and production companies located in the USA, showing that there is a large market in the city for domestic products that can be leveraged for innovation and collaboration with producers and manufacturers.
- There are several funding opportunities and resources through grants, loans, and trust fund programs across the state and federal government as well as nonprofits and private businesses.
- Hennepin County has a progressive zero-waste plan to divert 90% of waste from landfilling and incineration with clear and specific action items to accomplish the goal by 2030.
- Several ordinances exist in Minneapolis to reduce the use of single-use plastics such as the Green To Go ordinance and the Bring Your Own Bag policy which both limit the use of commonly used

single-use plastic products such as EPS to-go containers from restaurants and plastic bags as grocery and convenience stores.

- Through SCORE funding as well as the MPCA, Minnesota, Hennepin County, and Minneapolis have several methods in place to collect and present consistent data on solid waste generation and disposal quantities through the state which aids future diversion efforts.
- There are several outlets for waste collection including city-provided services as well as private companies, which help to reduce the burden on the local government's resources.
- Although not an ideal situation, cigarette butts, as one of the major plastic debris items in the community, provide a clear target for reducing plastic pollution through education and enforcement efforts.
- Minnesota has passed and is implementing EPR policy through the Packaging Waste and Cost Reduction Act.
- Minneapolis served as a mentor to Athens, GA on their pilot composting project. Minneapolis can serve as a mentor city to other cities starting similar circularity programs.

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Introduction

As of 2023, the United States (US) is home to a population of 331 million people (US Census Bureau 2020) and has an average waste generation rate of 2.24 kilograms per person per day, more than twice that of the global rate of 0.74 kilograms per person per day (Kaza et al. 2018). As a high-income nation, waste management in the US is considered advanced due to its well-designed and regulated waste management infrastructure providing high coverage of the country's growing population waste needs. These advanced waste management capabilities are met with some of the highest rates of consumption in the world, with the US generating the largest mass of plastic waste (42 million metric tons in 2016) in the world (Law 2020). The waste in the US is 12% plastic, although the largest percentage of the waste stream is paper/paperboard (23%) and organic materials, like food waste, make up 21.6%. And while nearly 100% of waste is collected in the USA, plastic waste is generally disposed of via landfill (76% by mass), combustion (12%), or recycling (8.7%) (US EPA 2020). However, the US has gained attention in recent years for exporting some of the highest quantities of plastic scrap out of the country for management elsewhere, often to developing countries (Brooks et al. 2018, Law 2020). Further, an estimated 0.28 million metric tons of plastic waste are mismanaged in the USA, with an estimated 0.51-1.45 million metric tons lost to the coastal environments in the US (Law 2020). The focus of this CAP project was to look at how plastic and organic materials circulate through the Minneapolis community.

As one of the largest countries in the world, both in terms of population and land coverage, the USA has substantial variation in infrastructure and development across regions, states, and cities. For example, the city of Seattle generates 0.95 kilograms per capita per day (Kaza et al. 2018) compared to 3.6 kilograms per person per day in Miami (Circularity Informatics Lab 2021). Substantial focus has been given to large cities and states with progressive waste management strategies; however, there is a lack of focus on regions that need assessment to develop appropriate, context-sensitive solutions. In Minnesota, an estimated 3,361,837 tons of MSW was disposed of in 2022 (MPCA 2024).

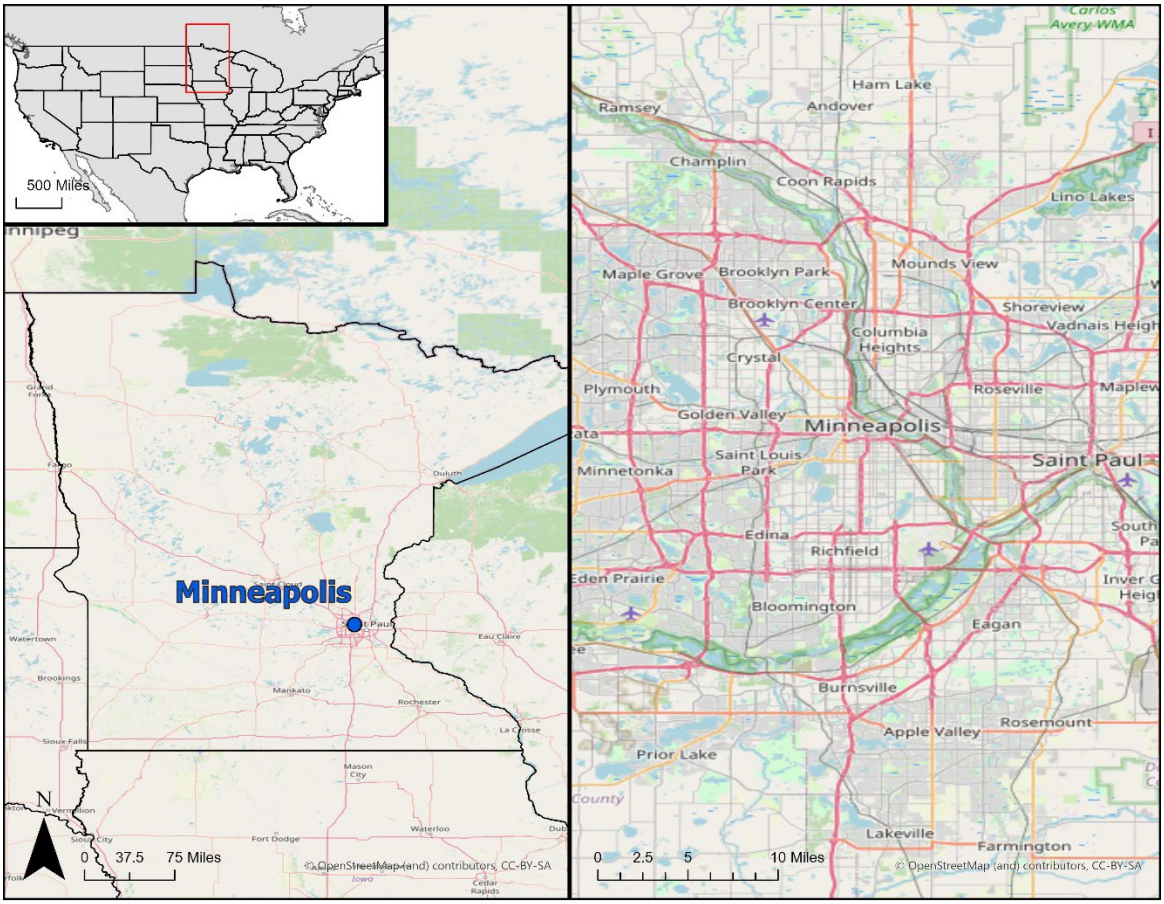
Minneapolis, also known as the "City of Lakes", stands as Minnesota's most populous city. The city has a population of 425,096 and a 1.1% decrease in population from 2020 to 2022 (US Census Bureau 2022). English is the predominant language in the region with the largest racial/ethnic groups comprised of 18.5% Black or African American, 9.9% Hispanic or Latino and 62.7% White (US Census Bureau 2022). Minneapolis was constructed on the homeland of the Dakota people, along with the Anishinaabe, and other native peoples living in the Midwest (Native Governance Center, 2021). It lies by the Mississippi River with St. Paul (its sister city) on the other side of the river. With 22 lakes and lagoons across the city that connect back to the Mississippi River it is important to manage debris from entering the beginning of the United States central river artery (Britannica, 2024). Figure 1 shows the location of Minneapolis in the USA and in Minnesota.

Regarding the city's economy, the key industries in Minneapolis over the past two decades include Healthcare/ Social Assistance making 15% of the workforce, professional, technical, or scientific services (11.8%), retail trade (10.5%) and manufacturing (9.38%) (Data USA 2021). The median household income was 76,332 in 2022 (US Census Bureau 2022), with median individual at $41,998 and a poverty rate of

16.8%. This was above the national average of 11.5%, potentially suggesting more income inequality in the city compared to the average U.S. city.

Minneapolis has notable sustainability efforts within their decennial plan with the current "Minneapolis 2040" plan in place. The plan focuses on a wide range of goals and topics promoting equity, innovation, and sustainable efforts. Part of this plan focuses on waste management promoting environmental justice and implementing a zero-waste plan that hopes to achieve 80% recycling and organics recycling by 2030 (Minneapolis Department of Public Works Division of Solid Waste & Recycling, 2019). Currently, Minnesota prohibits any city from banning plastic bags, which overruled Minneapolis bag ban in 2015, but Minneapolis charges a 5 cents fee for using plastic bags to encourage the use of reusable bags (Clean Water Action Minnesota, 2024). The city of Minneapolis also provides garbage, recycling, and organics or compost pickup either weekly or biweekly, with compost collection being of no extra cost as of April 22nd, 2024. TARE MARKET, with two locations, stands out as one of the few complete zero waste stores, while other nearby stores offer bulk sections for items like nuts, spices, and coffee, but lack refillable cleaning supplies or personal care products.

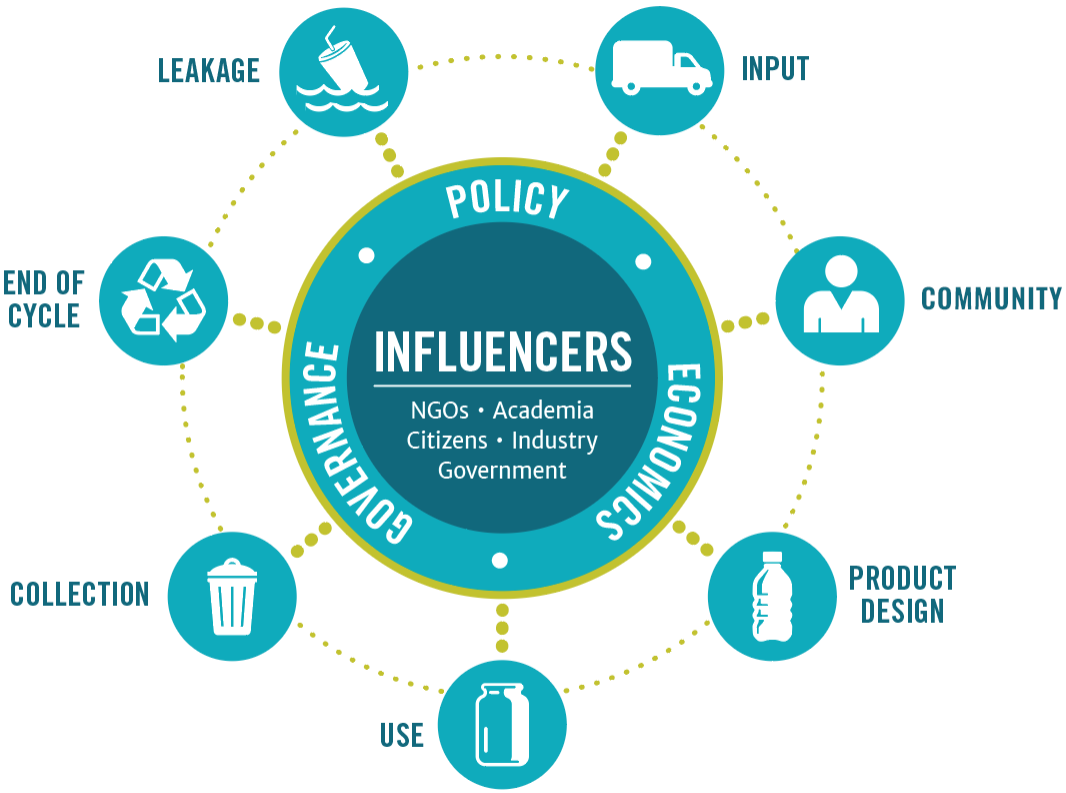
Figure 1: Overview map of survey area



The Circularity Informatics Lab (CIL) at the University of Georgia (UGA) developed the Circularity Assessment Protocol (CAP) in 2018, which is a standardized assessment protocol used to collect community-level data to inform decision-makers (Figure 2). The CAP characterizes seven community components:

1. **Inputs** – What products are sold in the community and where do they originate?
2. **Community** - What conversations are happening and what are the stakeholders' attitudes and perceptions?
3. **Product design** - What materials, formats, and innovations are found in products, particularly packaging?
4. **Use** – What are the community trends around use and reuse of product types?
5. **Collection** – How much and what types of waste are generated? How much is collected and what infrastructure exists?
6. **End-of-cycle** – How is waste disposed? What is the fate of waste once it is properly discarded? How is it treated?
7. **Leakage** - What waste ends up in the environment? How and why is it getting there?

Figure 2: Circularity Assessment Protocol (CAP) hub-and-spoke model.

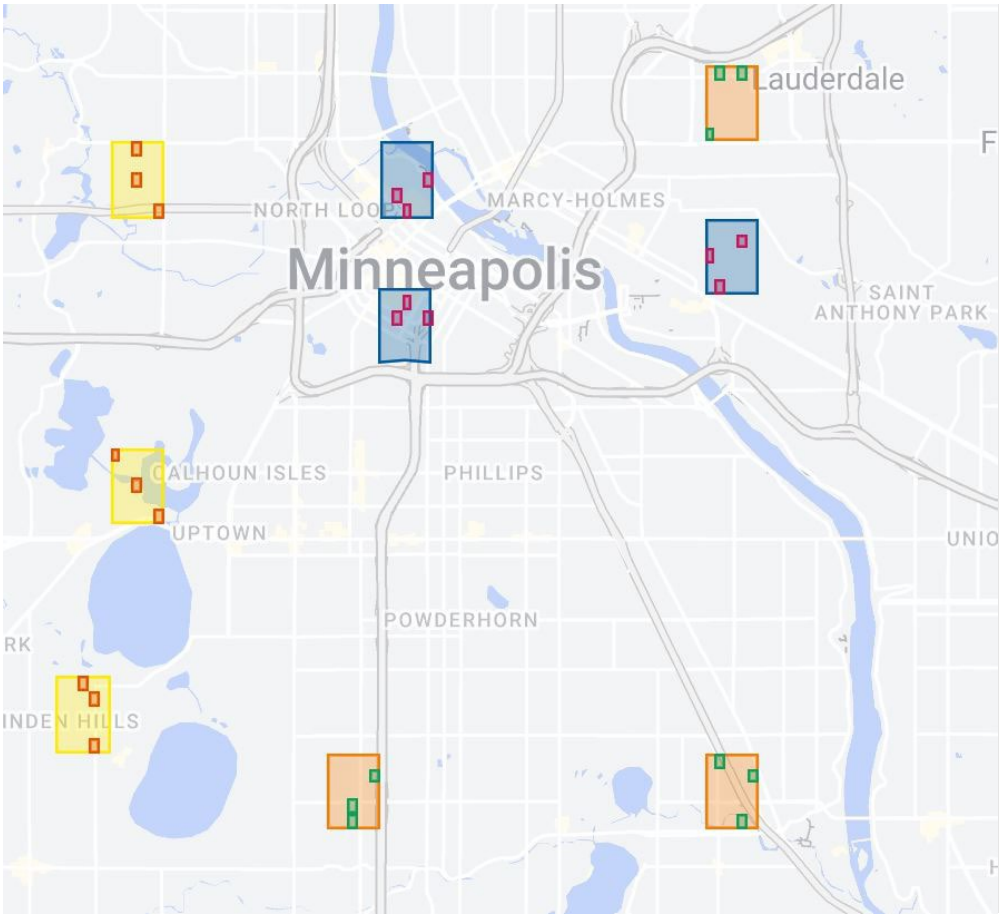


In July of 2022, a team from the Circularity Informatics Lab conducted fieldwork in the city of Minneapolis, Minnesota with support from the Mississippi River Cities and Towns Initiative (MRCTI) and the city's local government. This CAP was conducted with the support of the Walmart Foundation. The CAP report is split into the following sections, which include results and discussion of each: Input, Community, Product Design, Use, Collection, End of Cycle, and Leakage, followed by Opportunities. The intent is for the data in this report to inform ongoing stakeholder engagement around solutions to strengthen the circular economy and waste management in Minneapolis, MN.

Sampling Strategy

To randomly sample various locations in a city, the CAP typically identifies a 10 x 10km area over the city (with the center of the city in the center of the area). In this area, the ambient population is sectioned into three groups, or 'tertiles' (Figure 3). Ambient population count can be described as "where people go" and "societal activity" — it is not population density of where people live. These three areas typically form samples of different land uses and higher and lower trafficked areas of a city.

Figure 3: Population tertiles and survey sites in Minneapolis, MN.



Typically, three 1 x 1 km surveying areas are randomly selected within each population tertile using NOAA's Sampling Design Tool, resulting in nine 1km2 surveying areas. In total, 9 sites were surveyed, three in each of the high, middle, and low population count tertiles.

Input

In 2020, the US and its partner countries in the North American Free Trade Agreement (NAFTA) contributed to 19% of the world's plastic production, having produced about 70 million metric tons of plastic products in 2020. According to the Plastics Industry Association, nearly 22,010 people (about 0.39% of the 2022 state population) in Minnesota are employed in the plastic industry including plastics processing, marketing, support and captive activities; in total, the plastic and plastic dependent industries combined employ about 851,650 people (about 15% of the 2022 state population) (Plastics Industry Association 2024, US Census Bureau 2022). Minnesota is ranked 18th in plastics employment in the country. Given that so many Minnesotans rely on the plastics industry for their livelihood, it is important that any initiatives or policies that move toward circularity also encourage job expansion and circularity training.

To get a snapshot of the characterization, scope, and source of common plastic packaged items that are entering Minneapolis, samples of fast-moving consumer goods (FMCG) in four popular categories were taken within the nine 1 km^2 transects in Minneapolis (Figure 3). The team selected up to three convenience or grocery shops to sample within each 1 km2 transect area, where shops were present and open at the time of surveying. Ten total stores were surveyed for FMCG, only 5 of the 10 stores surveyed sold single-serving convenience products such as chips, beverages, and candy. The 5 other grocery stores surveyed offered products in bulk form; many of the stores offered a bring your own container fill station for these products. In total, 186 unique brands of convenience products were collected and sampled, including 84 beverage products, 64 candy, and 38 chips. Samples of identical brands were not collected multiple times, even when present in multiple stores. Common brands of tobacco products were also visually assessed in stores, although samples were not purchased. In total, 9 brands of cigarettes are included in the input analysis.

For each of the top products documented, the team noted the type of packaging (including polymer, if possible), the brand, and the parent company. From there, the team was able to determine the manufacturing location, which was determined from manufacturing locations listed on product packaging or desktop research, as well as the headquarters location for the parent company of the brand (largely determined by desktop research). It should be noted that manufacturing locations for products in the USA are often difficult to find as companies are not required to provide this information online. Therefore, if the manufacturing location of a product was unable to be found, the parent company location was used as the manufacturing location for the estimations in this study. Manufacturer and parent company distances (Table 1) are intended to estimate the distance in kilometers between the city and the origin of each product.

Top brands of each category are based on a visual assessment of shelf space in a store, conversations with shopkeepers, and repeated occurrence across stores. These top brands consisted of the following:

- **Beverages**: Coca-Cola, Mountain Dew, Pepsi, and Sprite
- **Candy**: M&M's, Reese's, and Snicker's
- **Chips**: Dorito's, Lay's, and Cheeto's
- **Tobacco Products**: American Spirit, Camel, Marlboro, and Newport

Average distances from store to source for each product category were similar for product manufacturers and parent companies. The lowest average distance for both manufacturing location and parent company location was chips. All but one manufacturing location was in the United States for chips, and there was only a total of three parent companies located outside of the United States for chips as well. The one manufacturing location located outside of the United States for chips was Peru, and the three locations located outside of the United States for the chips' parent companies were Peru, Canada, and Mexico. For maximum distances, beverages had the highest for both length to manufacturer and length to parent company with 13,488 km and 9,577 km respectively. Candy was not far behind beverages in regard to maximum distances, with 12,729 km to the furthest manufacturer and 8,782 km to the furthest parent company. All categories of products had very small minimums of length to the nearest parent company and manufacturer, indicating the existence of local to Minneapolis products being sold in the stores surveyed for each category. The brands and parent companies local to Minneapolis and surrounding areas surveyed include the following: Pearson's (Spell Capital), Premium Waters Inc., Target Brands, and Way Better Snacks (Live Better Brands).

Chips had the most domestic products, with 97% of chip products manufactured in the US and 92% of chip parent companies located in the US. Beverages and candy have closer amounts of foreign manufactured products to each other, with beverages having 13% foreign (87% domestic) manufactured products and candy having 23% foreign (77% domestic) manufactured products. A larger percentage of parent companies were located domestically for beverages and candy compared to the manufacturing locations; 8% of beverages parent companies were foreign (92% domestic) and 20% of candy parent companies were foreign (80% domestic).

Of all the product categories manufactured in a foreign country, Mexico had the largest percentage of total manufacturing locations (2.2%), followed by France (1.6%) and Canada (1.6%). For parent companies, the top countries for products were Italy (3.8%), Switzerland (3.2%), and Japan (1.08%). Texas manufactured the most products of those manufactured within the US with 17% of the total manufacturing locations in Texas, followed by Pennsylvania (10%), California (9%), New York (6%) and Illinois (6%). The top states of parent companies located domestically of all product categories were Texas (13%), New York (13%), Pennsylvania (12%), and California (10%). There were several manufacturing locations and parent companies located in Minnesota; 5% of all manufacturing locations and 6% of all parent companies were in the state.

Table 1: Distances between Minneapolis and manufacturer and parent company locations for top FMCG convenience items

	Length Store to Parent Company (km)*				Length Store to Manufacturer (km)			
	Minimum	*Maximum*	*Avg.*	*Median*	*Minimum*	*Maximum*	*Avg*	*Median*
Beverages	2	9,577	2,512	2,163	2	13,488	2,789	2,163
Candy	2	8,782	2,577	1,634	14	12,729	2,536	1,612
Chips	2	6,536	1,616	1,687	2	6,536	1,828	2,176

*Note: Distances were projected using an Azimuthal Equidistant projection. Values have been rounded to the nearest km.

Figure 4: World Map displaying manufacturing locations for top convenience items in Minneapolis

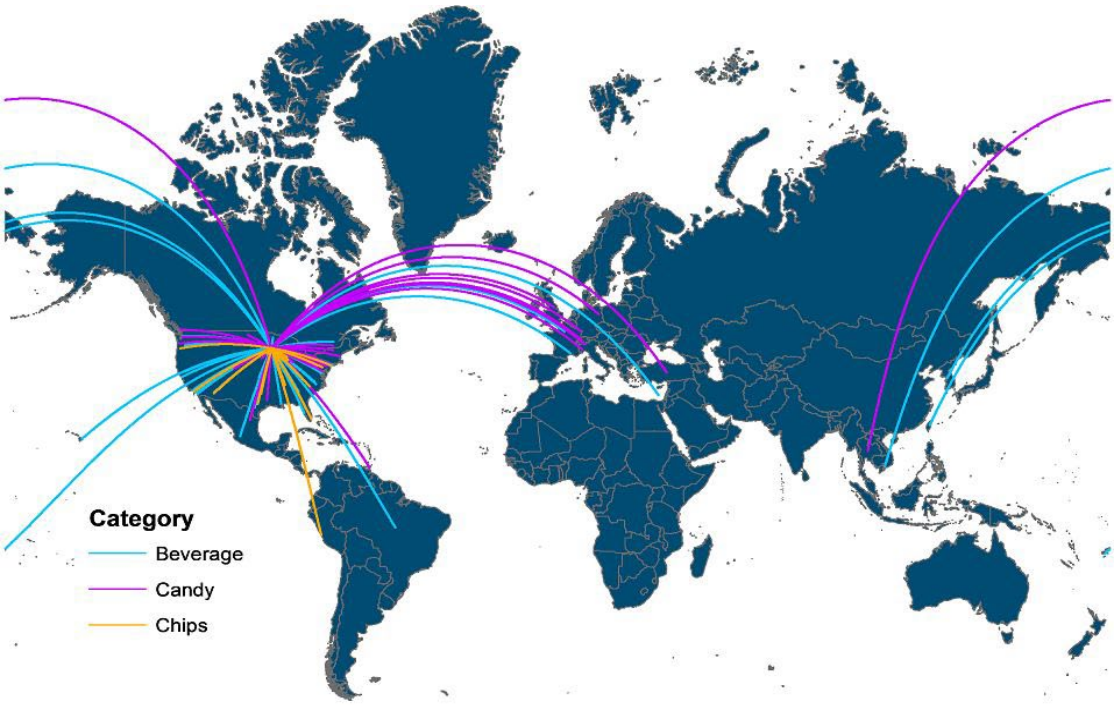
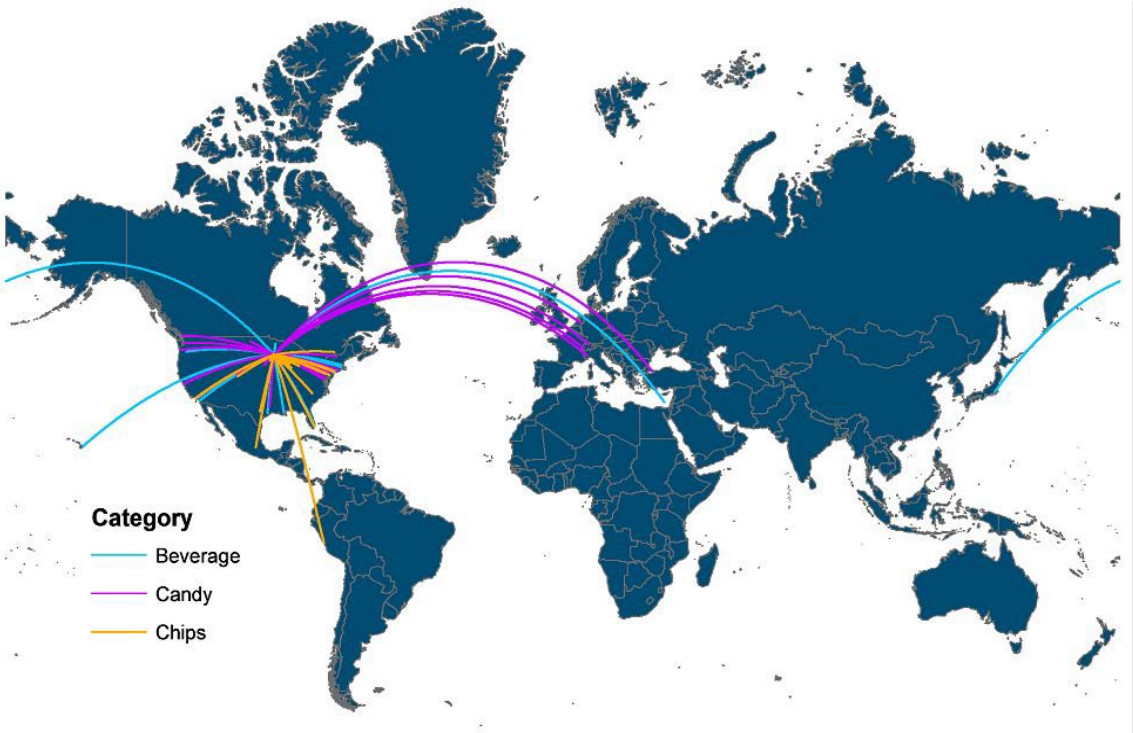


Figure 5: World Map displaying parent company locations for top convenience items in Minneapolis



A handful of states in the US have implemented Extended Producer Responsibility (EPR) policy legislation that encourages producers of products to bear some responsibility for their end-of-life management, including Minnesota as of May 2024 (Waste Dive, 2024). Generally, EPR legislation requires packaging producers to join a producer responsibility organization (PRO), or stakeholder organization, to develop a plan and manage the program (Sustainable Packaging Coalition 2022). EPR can take many forms, but common approaches throughout the world and the US include product-take-back and deposit-refund schemes as well as waste collection and take-back guarantees (UNEP 2018). The plastics industry in the US tends to oppose EPR schemes arguing that waste management relies on consumer practices and behaviors (Nash and Bosso 2013), and that the schemes can lead to increased costs, food waste, and life cycle impacts (ACC 2021). At current, Minnesota has a total of 5 EPR laws in place: the Mercury Thermostat Stewardship Law of 2014, the Omnibus Environment, Natural Resources and Agriculture Finance and Policy Bill of 2013, the Electronics Recycling of 2007, the Rechargeable Batteries and Products of 1991, and the newest law, the Packaging Waste and Reduction Act (Plastics Industry Association 2024; Waste Dive, 2024). There is an opportunity to partner with manufacturers and parent companies local to Minnesota or in neighboring states shown in Table 2. EPR can be a requirement of the companies doing business in a state no matter where products are manufactured, or companies are located. A full list of parent companies and manufacturers documented across the Minneapolis product surveys is available in the Appendix.

Table 2: Domestic products and materials produced or manufactured in Minnesota or in neighboring states

Neighboring state **Company name**	**Product category**	**Packaging types**
Iowa		
Palmer Candy Co.	Candy	Multilayer film
Michigan		
Faygo Beverages, Inc.	Beverage	PET
Sundance Beverage Co.	Beverage	PET
Sanders Candy LLC	Candy	Film
Minnesota		
Buhl	Beverage	PET
Premium Waters Inc.	Beverage	PET
Pearson's	Candy	Multilayer Film
Angie's Artisan's Treats, LLC	Chips	Multilayer Film
Earl's Foods	Chips	Multilayer Film
Old Dutch Foods Inc.	Chips	Multilayer Film
Target Corporation	Chips	Multilayer Film
Way Better Snacks	Chips	Multilayer Film
Whole Grain Milling Co.	Chips	Multilayer Film
North Dakota		
Dot's Pretzels	Candy	Multilayer film
Wisconsin		
Lund's & Byerly's	Beverage	PET; hard plastic; film
Jackson's Food Co.	Chips	Multilayer film

Community

Minneapolis has a comprehensive solid waste system that includes curbside and drop-off composting, recycling at one of only four recycling non-profits in the nation and residual disposal. While conversations took place with the solid waste office, Minneapolis became a mentor city to Athens for the composting pilot program. The information used as examples from Minneapolis are contained in the Appendix. In this section, an extensive list of resources and information are given, including links to many of the sites that contain more information and resources that can be shared.

- Community Cleanup Programs
- Litter scans (surveys)
    - Followed Keep America Beautiful scan protocols
- CleanSweeps
    - Neighborhoods rent trucks and coordinate community-wide cleanup. City covers disposal costs for coordinated cleanups.
- Voucher Program
    - Residential drop-off program for excess garbage, building materials, appliances, electronics, mattresses, metal items.

- Park and Recreation Board
    - SW&R collection of garbage, recycling and organics at approximately 100 Residential Parks. Have data on number of carts emptied by location. MPRB services regional parks.
    - Partner with MPRB for annual Earth Day litter cleanup. Provide yellow litter bags, grabbers, gloves for volunteers to pick up litter in parks and in their community. SW&R picks up and disposes of materials.
- Special Service Districts
    - Businesses in defined commercial corridors pay for increased services such as litter management.
- Increased pan and broom services in City defined Cultural District's using ARPA funds.
- Zero Waste Plan and Zero Waste Action Plan
- Climate Equity Plan
- Green to Go – to-go container ordinance
    - St. Louis Park, St. Paul and Edina have similar ordinances
- Bring your Own Bag – fee on paper and plastic carryout bags
- Solid Waste & Recycling Division webpage – See Studies and Report section
    - Capture Rate study (will be posted here when made public)
    - Organics sort summaries
    - Resident survey summaries (2018 general, 2020 – COVID waste behavior changes)
    - Multi-unit study
    - Recycling Contamination
    - Litter solutions PPT
    - Organics PPT
- Recycling processor: Eureka Recycling
- Organics processor: Specialized Environmental Technologies

Hennepin County items

- Ordinance 13, amended in 2018 requires:
    - All cities offer organics programs
    - All large generators of organics have organics programs
    - Multi-units must offer recycling
    - All haulers must label exterior containers
    - Note: County has grants for all residents, businesses, organizations to reduce waste, recycle and compost more / better. Let Kellie know if you want more info on these.
- Minimize – reduce plastics grant program for businesses
- Plastic-Free Challenge (Starts Feb 1, 2023)
- Zero Waste Challenge
- Choose to Reuse / Join the Circle
- Fix-It Clinics
- Community Recycling Ambassadors

State legislation

- PFAS ban in food-service packaging (adopted 2021)
- Compostable product labeling (hopeful will pass in 2023)

Other Litter

- Surface Water & Sewers Litter cleanup (see attached excerpt, or view full report)
- Friends of Lake Hiawatha
    - 2022 Earth Day cleanup article
    - 2019 Litter study (by brand)

Repair / Reuse / Zero Waste

- Reuse:
    - Tool Library
    - Toy Library
    - Lots of reuse in furniture, home furnishings, and building materials
- Zero waste stores
    - Tare Market
    - Zero-ish

Local corporations

- Target – Minneapolis, MN
- General Mills – Golden Valley, MN
- Cargill – Minnetonka, MN
- Aveda – Blaine, MN
    - Aveda has worked with Eureka in designing all of their pumps. They have switched all components of their pumps to be #5 plastic. They did this even knowing programs can't educate by brand. General messaging is still all pumps go in the garbage.
- Compostable product manufacturers:
    - NatureWorks – Plymouth, MN
    - Natur Tec – Circle Pines, MN
    - Self-Eco – Stillwater, MN

Product Design

To characterize material types used in common consumer products, samples of common convenience were obtained as described in the Input section. The CIL team sampled stores in each of the nine 1 km^2 transect areas. At least 30 unique forms and brands were purchased to obtain packaging weights. The average weight of both the packaging and the product itself was collected for all samples (Table 3).

Table 3: Average weight of products and their plastic packaging for common convenience items.

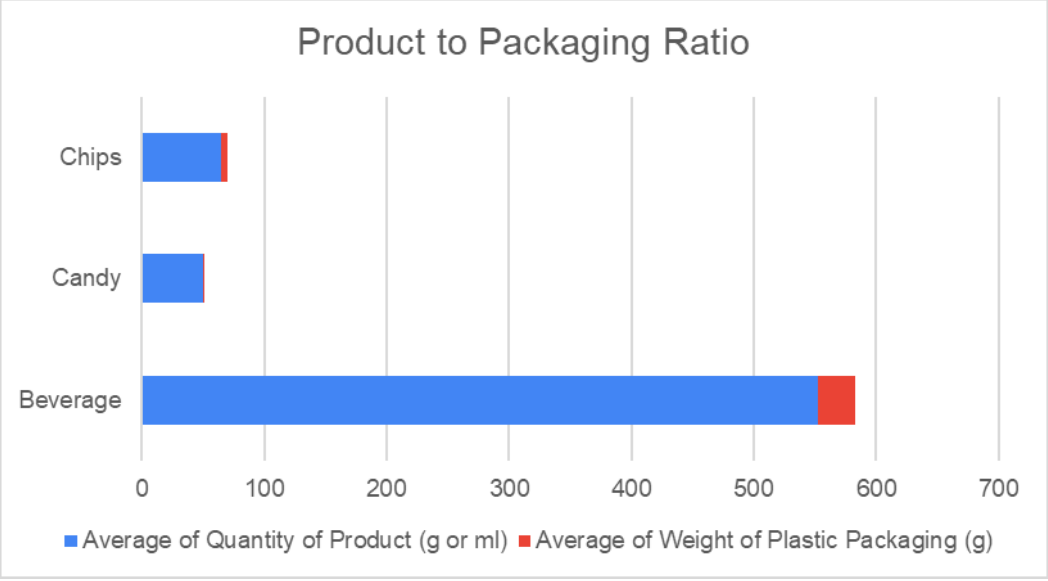
Product Type	Number of Samples	Average Weight of Plastic Packaging (g)	Average Quantity of Product (g or mL)
Beverages	84	30.2	552

Candy	64	1.2	50
Chips	38	5.1	65

In total, 10 convenience and grocery stores were sampled across the transects. Five of the stores were larger grocery stores including Lunds & Byerly's, Linden Hills Co-op, Kowalski's, Cub, and Whole Foods. Five of the stores were convenience stores such as CVS and Walgreens, and gas station markets. 186 samples were taken across all three categories of beverages, candy and chips. Compared to previous CIL characterizations of common convenience items, the weight of plastic packaging is like cities previously studied. Miami, a very culturally different but comparably sized population, had an average weight of 29.96 g of plastic packaging for beverages. Compared to Vicksburg, MS, a smaller city located in Mississippi, beverage packaging weight was 31g which is again similar. However, this study has significantly lower average plastic candy packaging compared to other CAP studies conducted by CIL, with Orlando having 8.78 g, and Vicksburg having 4.2 g.

Considering the ratio of packaging to product (Figure 6), chips had the highest packaging to product ratio with 0.08 g of packaging for every gram of product, compared to candy and beverages which had a ratio of 0.02 and 0.05 g/g respectively. As such, chips were found to generate the most packaging waste per unit of product delivery of the three categories in this study. This differs from the Vicksburg, MS, CAP finding that candy wrappers generated the most packaging waste per unit of product.

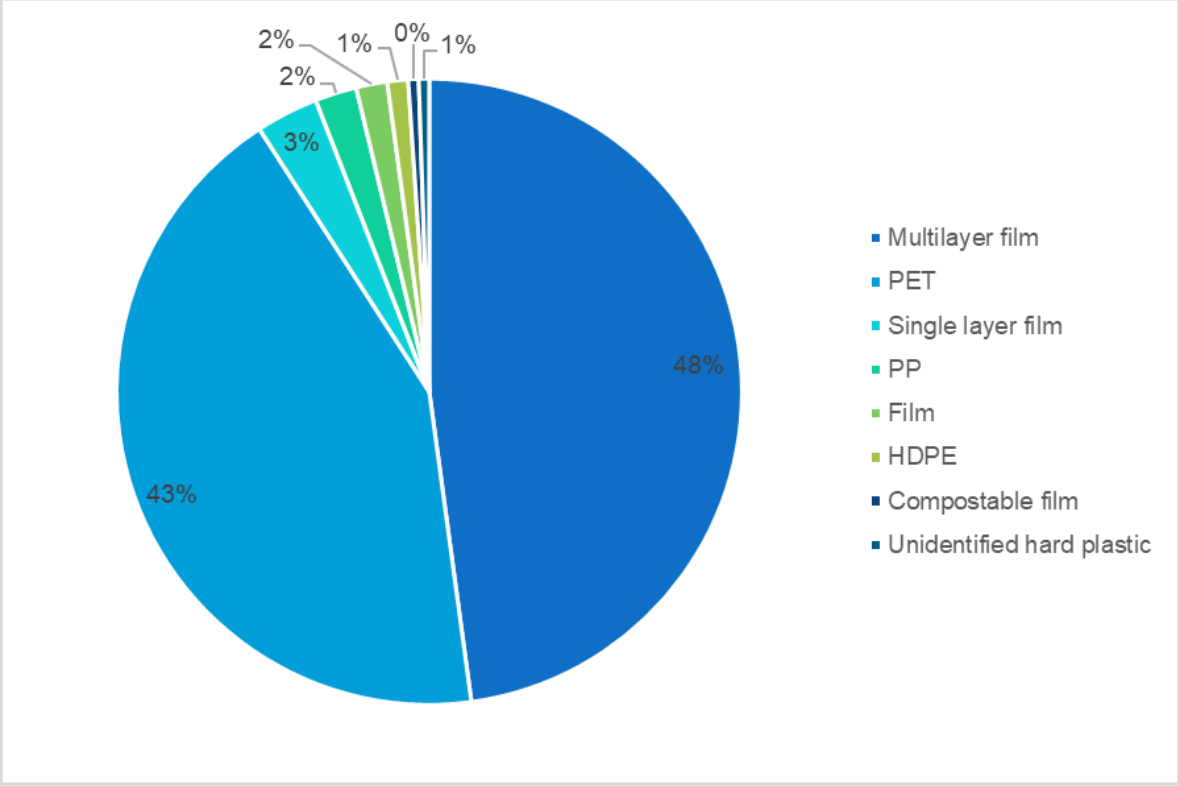
Figure 6: Convenience store plastic to product ratios, shown in grams (not including unknown products or tobacco as there is no weight data for tobacco) in Minneapolis



Multilayer film and polyethylene terephthalate (PET) comprised 91% of convenience item packaging (Figure 7). Beverage packaging had the most mass compared to chip and candy product packaging. This is largely due to the high density of beverage products and the higher density of PET we found most used as packaging. Candy and chips are mostly comprised of multilayer film packaging, which is difficult and costly to recycle due to the varying characteristics that give it a low mass, such multi-material items can be difficult to recycle, as they contain not only different materials but a range of adhesives and additives (Moss 2017) Lightweight, complex, and difficult to recycle packaging materials such as multilayer plastic or multi-material containers should be prioritized for redesign, EPR schemes, deposit models, and other interventions to minimize their likelihood of escaping the waste stream and ending up in the environment. The less than 10% of other materials used for convenience packaging were single layer film (3%), polypropylene (PP, 2%), high density polyethylene (HDPE, 1%), and unidentified hard plastic (1%).

Cigarettes were excluded from our purchasing of samples in this case, but they are typically a standard size and we have previously found an average of about 10 g of plastic packaging to about 15 g of product. This relatively high plastic packaging to product ratio means cigarettes generate larger amounts of plastic waste per unit of product, which is likely driven by the cellulose acetate filters in cigarette butts, which typically weigh about a gram each.

Figure 7: Material breakdown of top convenience items in Minneapolis



In addition to surveying convenience and grocery stores, the CIL team surveyed restaurants in each of the nine 1 km^2 transect areas. Through visual assessments and discussions with restaurant owners, we assessed the material type for to-go food items like containers (including their lids), cups, utensils, and

straws. 27 stores were surveyed across all transects varying from 11 sit-down restaurants, 5 fast food restaurants, 5 counter service sit-down, 2 upscale restaurants, 3 grocery delis, and 1 bakery. In total 73 dining materials were sampled (Table 4, Figure 8).

Table 4: Products and material types surveyed in restaurants and food vendors in Minneapolis

Product	Material Type	Number of Observations
To-Go Containers (including lids if applicable)	Cardboard	7
	Coated Paper	4
	Paper	4
	PP	4
	Foam	3
	Unidentified Plastic	2
	Aluminum	1
	PET	1
Cups	Paper	5
	PET	5
	Unidentified Plastic	2
	Coated Paper	1
	Compostable Plastic	1
Straws	Unidentified Plastic	9
	Paper	3
	PP	1
Utensils	Unidentified Plastic	16

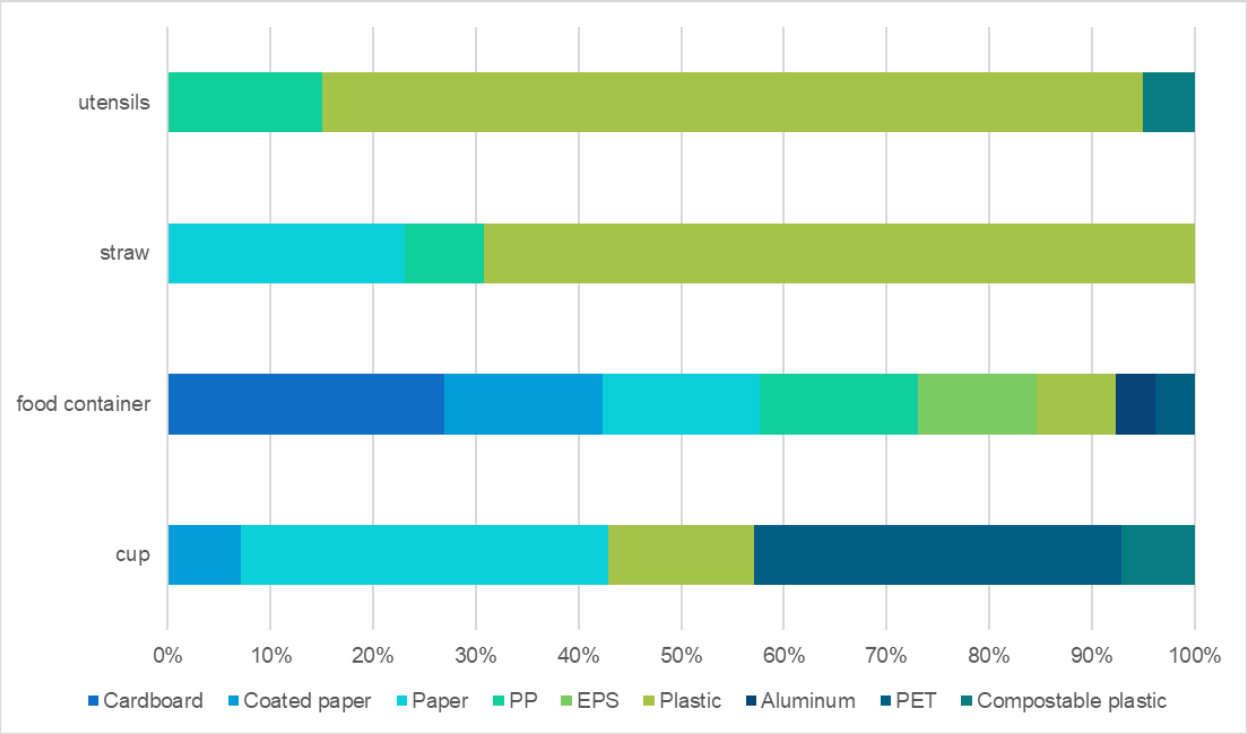
	PP	3
	Compostable Plastic	1

Figure 8: Example to-go containers from Minneapolis, MN

Utensils and straws were mostly comprised of non-compostable plastic, which was often unidentifiable. Only 23.1% of food containers and 4.1% of all to-go packaging were made of Expanded Polystyrene (EPS) or foam. EPS is a material often found in debris and litter due to its lightweight and transient nature and is notably not able to be recycled in most single-stream recycling facilities. This percentage of EPS is significantly lower compared to Orlando, FL which had 26.2% of all to-go packaging made from EPS. This is likely due to Minnesota's Green To Go ordinance which requires businesses preparing food for immediate consumption to use reusable, recyclable, or compostable packaging (City of Minneapolis, 2024). Items exempt from this rule include utensils, straws, stir sticks, foods pre-packaged by the manufacturer, producer or distributor, and plastic films less than 10 mils thick. In total, 66% of the to-go materials sampled in Minneapolis were made from plastic (Figure 9).

The Minnesota Pollution Control Agency (MPCA) provides state grants to promote recycling development projects. In Minnesota, the plastics industry has been seeing a downturn in using recycled plastics as materials for new plastics, and a resurgence of virgin plastic being created by manufacturers due to cost. An ongoing grant from the MPCA has $5.3 million available (as of April 2024) to support projects using any type of recyclable material as opposed to virgin materials, under the conditions listed on the MPCA website (MPCA 2024). As of May 2024, the Packaging Waste and Reduction Act was signed into law by Governor Walz. This Act contains a shared responsibility model requiring producers to pay half of recycling costs starting in 2029 then increasing their share of costs incrementally until 2031 when producers will pay at least 90%. Producers include brands, packaging manufacturers or distributors, depending on the scenario (Waste Dive, 2024).

Figure 9: Material breakdown of to-go items surveyed in Minneapolis, MN



Use

Throughout the transects, the CIL team surveyed what types of bags businesses provided at check-out. A total of 12 bag types were assessed across 8 businesses consisting of convenience and grocery stores (see example in Figure 10). Across the retailers, four (50%) offered plastic bags only, two (12.5%) offered paper bags only, and two (12.5%) offered plastic, paper, and reusable bags. Additionally, none of the vendors offered compostable plastic bags. Currently, Minnesota has a 'ban the ban' law in place which prevents cities and municipalities from banning single use plastic bags in their communities (Minnesota Legislature 2023). To combat the circulation of single use plastic bags while also following the Minnesota laws, Minneapolis requires retailers to charge $0.05 per carry out bag at checkout; the fee charged goes back to

the retailer to be used towards the cost of bags or donated to charity; the fee is not taxable. Certain transactions are exempt from the fee such as:

- Produce and bulk good bags
- Restaurant carryout bags
- Drycleaning bags
- Newspaper and doorhanger bags
- Litter clean-up bags
- Secondhand bags
- Personal belonging bags
- Flower wrap bags
- Prescription drug bags
- Bags brought by a customer
- Bags in packages with multiple bags

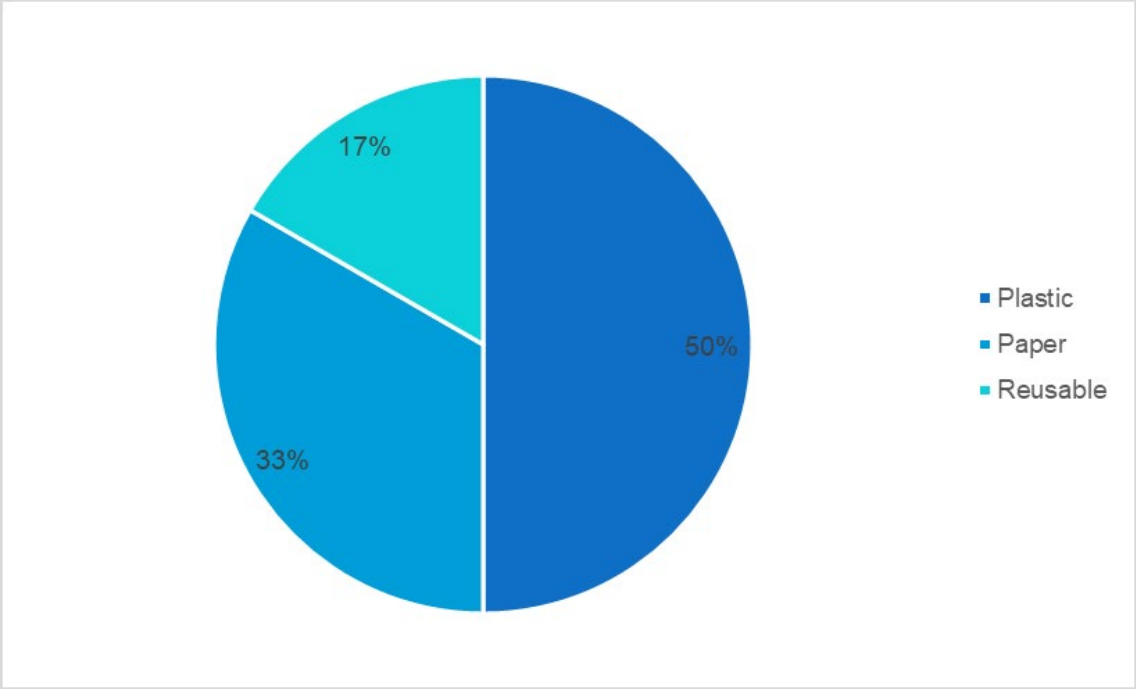
Due to the pandemic, this fee was not implemented until October of 2021 (City of Minneapolis 2021). At every location the CIL team sampled, except for one, the cost of a plastic or paper bag was $0.05. Three of the plastic bags surveyed were labeled with information for how to recycle the bag. While this labeling does provide some direction to customers regarding disposal options, it may be superfluous if customers have limited awareness of which stores are participating.

Figure 10: Example of plastic bag from convenience store in Minneapolis

Alternative options for plastic bags were common among the businesses surveyed. Of the bags surveyed, 33% were paper and 17% were reusable (Figure 11). Two of the grocery stores surveyed offered reusable

bags as an alternative to plastic or paper bags, costing either $1.99 or $1.50 apiece. All the stores that offered paper or reusable bags as an alternative were larger grocery stores; all but one of the four stores to offer exclusively plastic bags were convenience stores, suggesting that the decision to provide alternatives may be cost-prohibitive for smaller retailers.

Figure 11: Material breakdown of bags surveyed from convenience and grocery stores in Minneapolis



In addition to plastic bags, other common plastic items and their respective alternatives were examined by price, material, and disposability. Most of the stores surveyed in Minneapolis had ample alternative options to single-use plastic items, so much so that price comparisons are difficult to make to single-use plastic items. Most of the plastic packaging found in the stores surveyed fell under the alternative use categories of reusable, refill items, or plant-based compostable plastics. Reusable and refill items were generally much more expensive than recyclable and compostable items. For example, metal reusable straws were $2.99 USD each compared to compostable paper straws that cost an average of $0.083 USD each. Of all the item types, reusable plastic storage bags (e.g. zipper sandwich bags) were the most expensive largely due to the use of more expensive synthetic materials (i.e. silicone and ethylene0vinyl acetate (EVA). The least expensive items were compostable items: paper baking liners, bamboo bowls, paper coffee filters napkins, and paper and plant-based straws (Table 5).

Minneapolis has the advantage of having an active industrial composting facility and collection throughout the city to ensure proper disposal of ‘compostable’ plastics, but it is worth noting that misleading nomenclature and public information can cause confusion due to confusing labeling on different types of plastic, particularly when it comes to ‘compostable’ items. Based on the CAP survey,

plastic items labeled as compostable were typically designated as made of natural and organic material like bamboo, plant material, fiber, corn starch, and sugar cane. Plastics marketed as biodegradable do not necessarily degrade in the natural environment as they do in laboratory conditions, with many biodegradable items requiring specific conditions provided in industrial composting facilities. Bio-based plastics can be chemically identical to fossil-fuel-based plastics but can be confused for compostable or biodegradable. These items can also be mistaken as recyclable (Moss 2017). These subtleties can lead to consumer confusion due to uncertainty around material types and categories as well as ambiguity around appropriate management. Recent studies highlight the challenges associated with bio-based and biodegradable plastics driven by the combination of inadequate legal provisions for effective collection and treatment, unharmonized waste collection infrastructure, and social attitudes and awareness around consuming, sorting, and managing these materials (Stasiškienė et al. 2022). There were many varying alternative items available in Minneapolis, the most in any of the cities where CAP was completed for this work (Table 5 and Figure 12).

Table 5: Average price per count/item or per ml/g of items sold in stores by product, material type, and disposability (n is equal to the number of representative samples contributing to an average)

Material	Reusable	Compostable	Refill	Recyclable	Alt Material/ Delivery
Baking Liners					
Paper		$0.042/ct			
Bowls					
Bamboo		$0.095/ct (n=2)			
Paper		$0.22/ct (n=2)			
Plant-based		$0.20/ct (n=2)			
Cleaning Bottle					
Glass	$10.99/item (n=2)				
Cleaning Solution Concentrate					
Glass			$3.50/item		
Paper			$3.99/item		
Coffee Filters					
Paper		$0.048/ct			
Cups					

Aluminum				$0.60/ct	
Bamboo		$0.36/ct			
Compostable Plastic		$0.36/ct (n=2)			
Paper		$0.31/ct (n=3)			
Plant-based		$0.35/ct (n=7)			
Food Wrap/Storage					
Cotton and Beeswax	$6.49/item (n=2)				
Silicon	$3.40/item				
Hair Conditioner Bar					
Paper					$7.79/item
Hand Sanitizer Bottle					
Plastic	$7.99/item				
Hand Sanitizer Solution					
Plastic			$9.99/item		
Kombucha					
Glass			$0.0053/ml		
Napkins					
Plant-based		$0.065/ct			
Paper Towel Roll					
Plant-based	$9.79/item				
Plates					
Bamboo		$0.16/ct (n=2)			
Paper		$0.26/ct (n=6)			
Plant-based		$0.25/ct (n=5)			

Produce Bag					
Fabric	$4.99/ct				
Quart Bag					
Paper		$0.24/ct (n=2)			
Sandwich Bags					
Paper		$0.12/ct		$0.13/ct	
Shampoo Bar					
Cardboard					$11.99/item
Snack Bags					
Paper		$0.10/ct			
Silicon	$13.49/item (n=2)				
Straws					
Metal	$2.99/item				
Paper		$0.083/ct (n=2)			$0.048/ct
Plant-based		$0.066/ct			
Tea Bags					
Cotton	$1.10/ct				
Fabric	$0.14/ct				
Trash Bags					
Compostable Plastic		$0.22/ct			
Plant-based		$0.51/ct (n=2)			
Utensils					
Compostable Plastic		$0.14/ct (n=2)			
PLA		$0.12/ct			
Plant-based		$0.13/ct (n=5)			
Average	**$4.76**	**$0.20**	**$4.37**	**$0.37**	**$6.61**

In addition to the wide availability of alternative packaging to single-use plastic items in stores, two of the Minneapolis retailers surveyed offered common household goods in bulk. Items such as hand soap, water, honey, oil, vinegar, nuts, rice, beans, pasta, granola, candy, nuts, fruits, seeds, herbs, spices, tea, and coffee were available for purchase by the pound if you brought your own container (Figure 13). The sale of package-free products, or bulk, is an effective solution to combating single-use packaging in common products sold in large retailers. As found in a study conducted in Europe in 2024, bulk products are typically not easy to manage in-store, have critical storage issues, and cost more in average, but in the long-term, they may both improve customer loyalty and the retailer's brand image and attract new consumer segments (De Canio et al. 2024).

Figure 12: Example of alternative products found in stores in Minneapolis

One common approach to reducing plastic consumption is through policy efforts that disincentivize their use such as plastic bans or fees. As mentioned earlier, Minnesota currently has a ban in place that prevents any political subdivision to place a ban on the use of paper, plastic, or reusable bags for packaging of an item purchased from a vendor (Minnesota Legislature 2023). This 2017 law revoked the law put in place by the Minneapolis City Council in 2015 to ban the use of plastic bags at grocery and retail stores (Clean Water Action 2024). Although plastic bag bans can be relatively non-invasive among consumers' day-to-to patterns, in the United States there are several examples of governments seeking to 'ban the ban'. Along with Arizona, Florida, Michigan, Wisconsin, Idaho, Missouri, Indiana, Mississippi, and Iowa, Minnesota has incorporated the outlaw of plastic bag bans (UNEP 2018). In terms of upstream management of plastic waste, this law undermines opportunities for material to become waste in the first place, which can be accomplished through reducing consumption of plastic products that in many instances can be easily replaced or avoided entirely like straws, bags, and many food containers. In

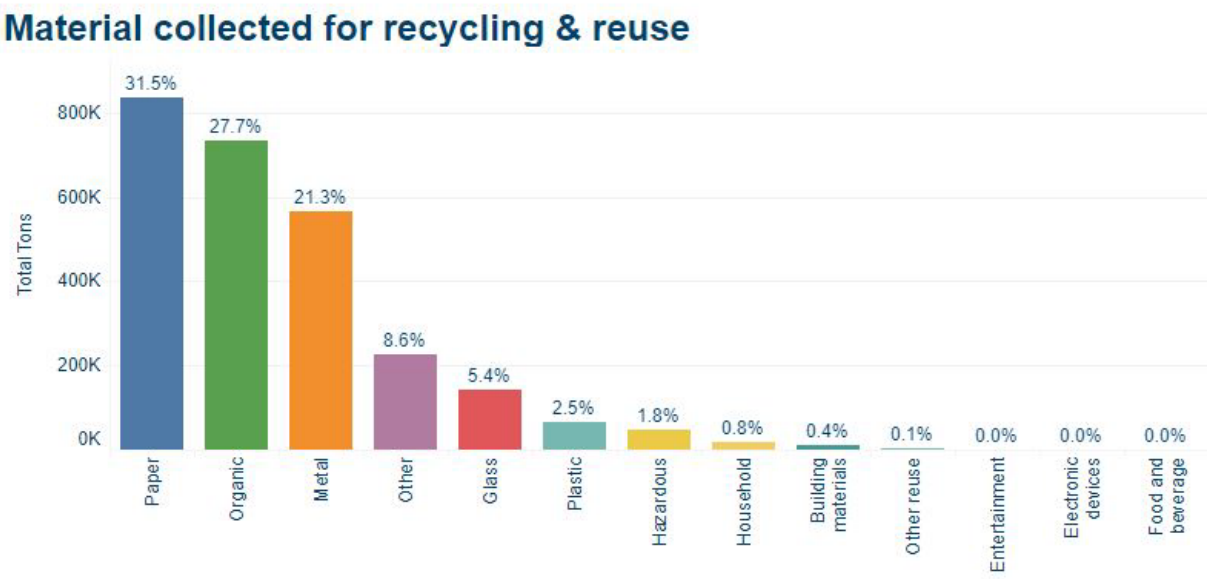
addition to the mandatory bag fee enacted in Minneapolis, another step that private businesses could take would be to explore cost-effective alternatives to bags or simply ask their customers to bring their own for a small discount on their purchase.

Figure 13: Example of bulk refill/bring your own container stations found in Minneapolis

Collection

In 2022, the state of Minnesota generated 3,361,837 tons of mixed municipal solid waste (MPCA 2024). This includes garbage, solid waste from commercial, industrial, and solid waste used in waste to energy processes. Minnesota has a history of exporting some municipal solid waste to Wisconsin; the Wisconsin Department of Natural Resources reported 266,987 tons of MSW from Minnesota in 2017. The average Minnesota resident generates an estimated 2.81 kilograms of waste per person per day (MPCA 2024) and 1025 kilograms per year, which is only slightly higher than the national waste generation rate (2.2 kilogram per person per day) (Kaza et al. 2018). The state composted 13.9% of organics of all waste generated in 2022 (MPCA 2024) and recycled 31.3% of all waste. The materials recycled were composed of 31.5% paper, 27.7% organics, 21.3% metal, 8.6% other, and 2.5% plastic. Plastic recycling accounts for 66,374 tons of the 1,918,568 tons recycled (Figure 14).

Figure 14: Material Breakdown of Minnesota's recycling and reuse for the entire state in 2022 (MPCA 2024).



Typically, waste is collected via curbside bins, dumpsters, or drop-off points. Trucks then transport waste to their final disposal site or to transfer stations or sorting facilities that temporarily store waste for further transport over longer distances. Effective plastic waste management at the city level requires not just efforts toward waste reduction, but also consistent collection services. At present, successful collection of plastic waste relies heavily on behaviors at the household and individual level. As such, efforts toward education and incentivization strategies can help encourage behavior that helps waste infrastructure run smoothly. In Minneapolis, waste collection is provided to households within the city limits via the City of Minneapolis Solid Waste and Recycling Program. Minneapolis Solid Waste & Recycling serves 107,000 residential dwelling units, 200 larger residential/ commercial properties and neighborhood parks within its limits. Half of the located services are attended to by the City of Minneapolis Solid Waste and Recycling staff and half are attended to by Minneapolis Refuse Inc. (MRI), a consortium of private garbage haulers contradicted through the city for collection (City of Minneapolis 2024). Garbage and compost are collected weekly, and recycling is collected biweekly. There is no extra cost to residents to participate in compost collection. A yard waste pickup program operates bi-weekly mid-April to mid-November. Minneapolis Solid Waste and Recycling also manages 500 containers placed throughout the city (Figure 15).

Apart from the listed collection services, residents can receive vouchers enabling them to dispose of additional garbage, large items, scrap metal, building materials, and tires at the Minneapolis South Transfer Station at 2850 20th Ave S, Minneapolis, MN 55407 (City of Minneapolis 2024). This facility is only open to city customers for drop-off. Hennepin County provides a list of drop-off locations for hard to recycle items such as appliances, batteries, electronics, latex paint, fluorescent light bulbs, mattresses and more on their website. The guide directs residents to local businesses that accept recyclable items and

drop off recycling centers and transfer stations around the county (Hennepin County 2024). Many stores offer plastic bag recycling receptacles with recycling partners such as A1 Disposal, Coborn's, Cub Foods Econofoods, Family Fare Fresh Thyme, Hornbacher's, Hyvee, Kohl's, SpartanNash, Sun Mart being a few businesses in Minnesota (How2Recycle 2023). There are two locations in Hennepin County that accept loads of C&D material to be recycled, Atomic Recycling in Minneapolis and Dem-Con in Shakopee; these facilities can provide roll-off boxes to keep at site as well as providing drop-off services for materials such as asphalt, metals, and wood (Hennepin County 2024).

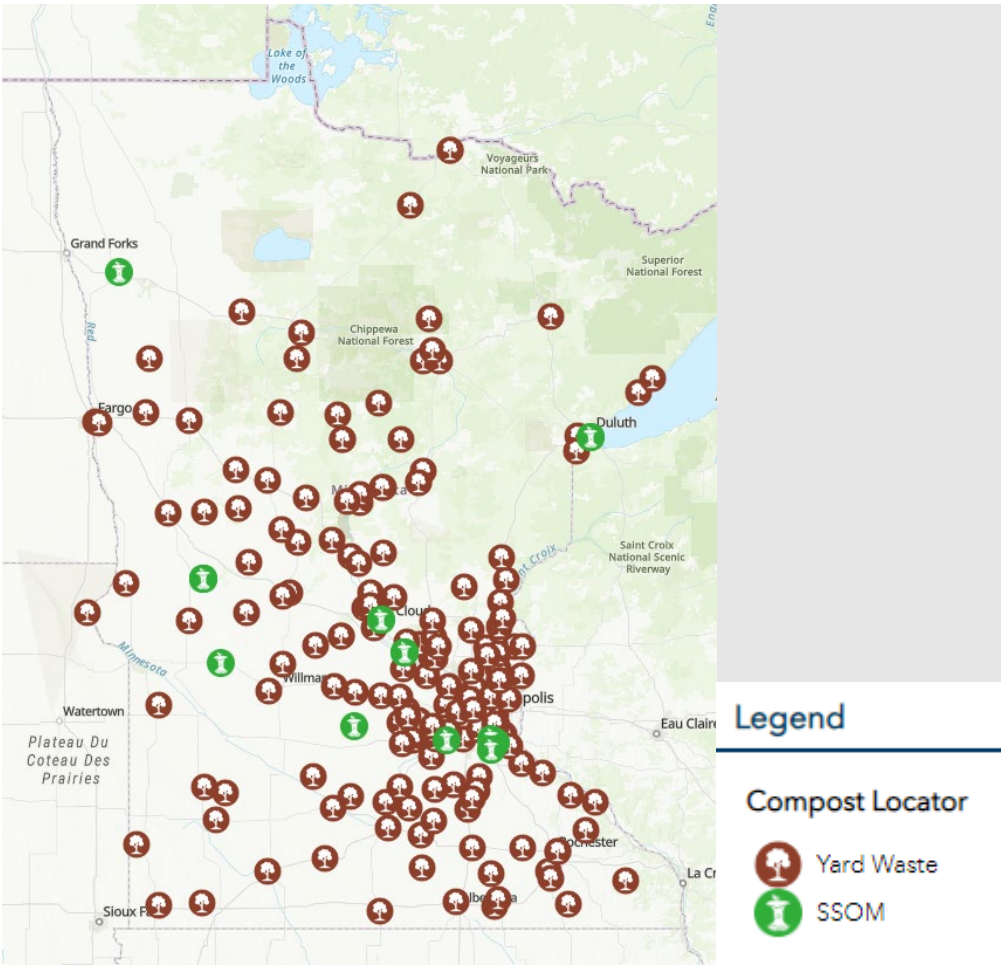
Figure 15: Waste Receptables in Minneapolis (Photo Credit: CIL)

Curbside recycling is collected in One-Sort Recycling carts, or single stream, that takes paper, plastics, glass, metal, cartons, and cardboard cans (City of Minneapolis 2024) (Figure 15). Items are loose in containers, and the City of Minneapolis lists non-recyclable items under their recycling services per category of material. Plastic bags, scrap metal, textiles and paint are a few items not recyclable through curbside. In 2016, Hennepin County also had three active sites for residents to drop-off their recycling: Minnetonka/Hopkins Recycling Drop-off Center, Maple Grove Recycling Drop-off Center, and Plymouth Recycling Drop-off Center (Hennepin County 2016).

Curbside composting is collected with compostable bag liners in carts that allow food scraps, BPI certified compostable products, coffee grounds, hair clippings cotton balls and other items listed on the City of Minneapolis Accepted Organics website (City of Minneapolis 2024) to be composted. According to a local news source, the program began in 2008 where in its first-year 32% of eligible residents signed up, diverting 825 tons of food waste (Rachal 2022). The curbside composting program expanded into 11

more neighborhoods by 2010, which then in 2015 citywide curbside composting began making it one of the first U.S. cities to do so (Cassel 2024). From 2015 to 2022, organics recycling in Hennepin County increased 403.5 % (MPCA 2024), with Hennepin County diverting 168,311 tons of compost from landfills in 2022. Curbside Compost is not available in many locations outside the county, but there are facilities throughout the state that take yard waste and source separated organic material (SSOM) (Figure 16-17).

Figure 16: Minnesota Pollution Control Agency Compost Facility Locater (MPCA 2024).



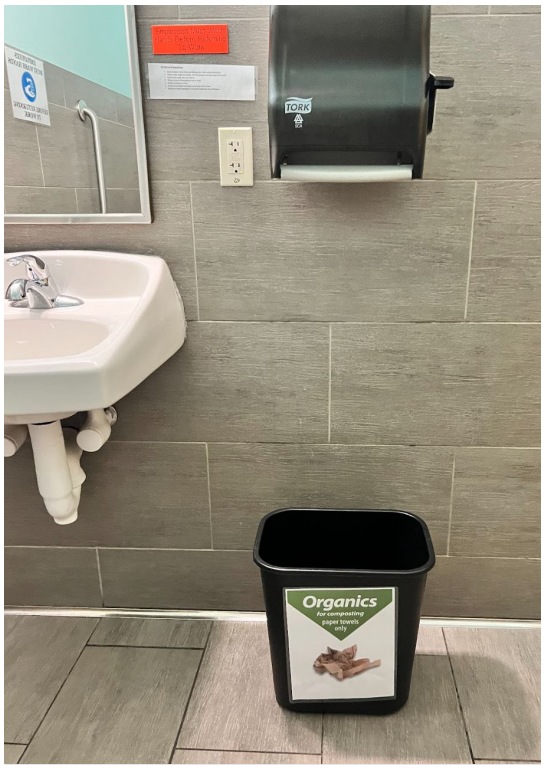
As of 2016, Hennepin County offered yard waste drop-off at the following facilities as well (Hennepin County 2016):

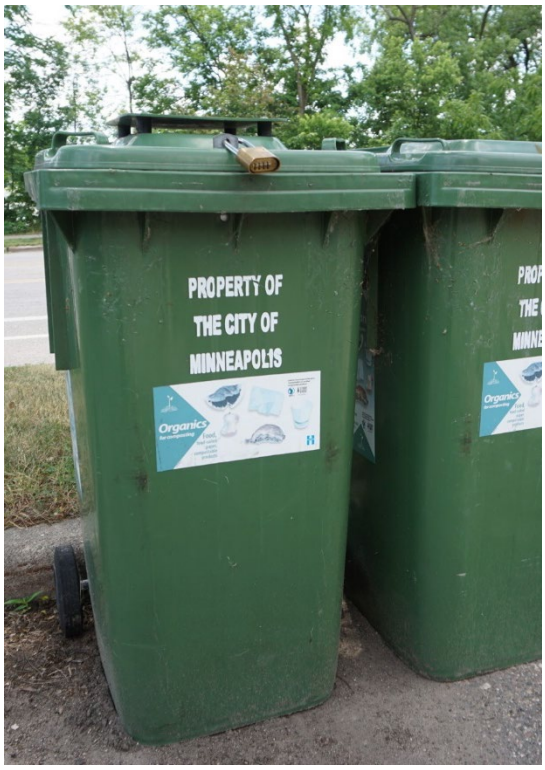
- SKB Malcolm Transfer Station
- Maple Grove Yard Waste Site (privately owned)
- The Mulch Store in Minnetrista
- City of Plymouth Yard Waste Site
- City of Minnetonka Public Works

- St. Louis Park Brush Drop-off Site
- City of Medina Yard Waste Site

Events requiring permits from the city must adhere to specific waste management guidelines. This entails providing a one-to-one ratio of garbage to recycling containers, with both types placed adjacent to each other (City of Minneapolis 2024). Block events, parades, and races fall under this requirement. However, an event can be exempt from this regulation if a zero-waste plan is submitted and sanctioned by the City.

Figure 17: Compost Bin in Public Restroom and compost receptables (Photo Credit: CIL)





Hennepin County Drop-off Facilities such as the Hennepin County Recycling Center/Transfer Station in Brooklyn Park and the South Hennepin Recycling and Problem Waste Drop-off Center in Bloomington accept household hazardous waste (Hennepin County 2016). Household hazardous waste must be transported in sealed and labeled 5-gallons or less containers, in an upright position, in a plastic lined box (Hennepin County 2024). Hennepin County also holds household hazardous waste collection weekend events throughout the year where participants drive with waste stored in the trunk of their vehicle, bed of a truck, or trailer (Hennepin County 2024). Items are limited to those that can be loaded by a single individual so staff can easily assist in unloading most items from vehicles without residents needing to get out of their vehicle. Events include residents arriving by bicycle or on foot. All participants must have proof of residency in the county to participate. According to Hennepin County, of the hazardous waste received, a high percentage is recycled, fuel-blended, or taken from product exchange shelves for reuse,

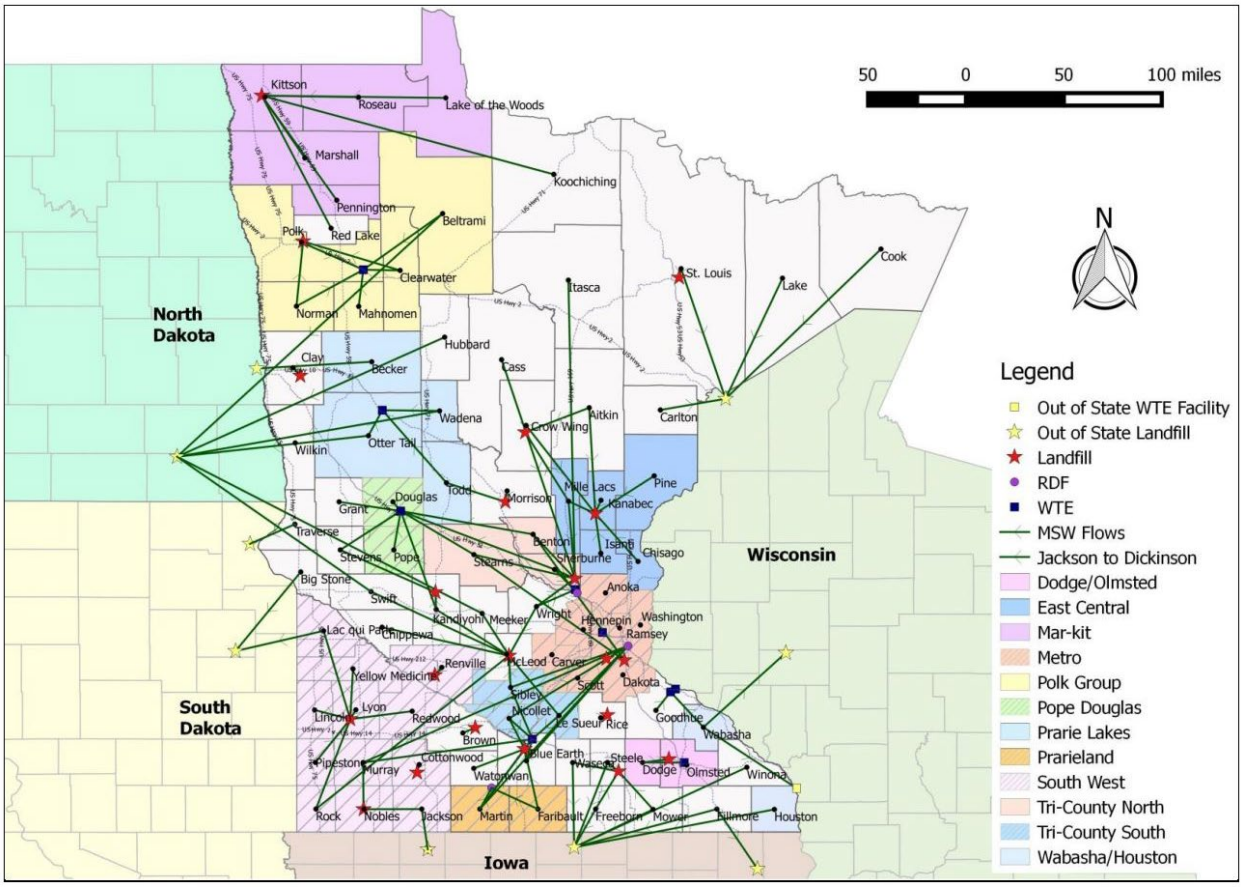
and approximately 10 to 15 percent of the household hazardous waste (HHW) cannot be reused, recycled, or fuel-blended and is then managed at hazardous waste incinerators or landfills (Hennepin County 2016).

The state of Minnesota has economic incentives set in place to encourage circular solid waste management practices. MCPA has ongoing grants, one-time grants and assistance loans available for recycling, and organics management organizations for the state. One ongoing grant incentivizes communities outside of the twin cities metro area to promote waste reduction, reuse, recycling and composting in smaller cities in Minnesota and tribal communities (MPCA 2024). Hennepin County also offers Green Partner grants to support organizations that promote composting, encourage recycling, provide environmental education and other environmental stewardship services (Hennepin County Minnesota 2024).

End of Cycle

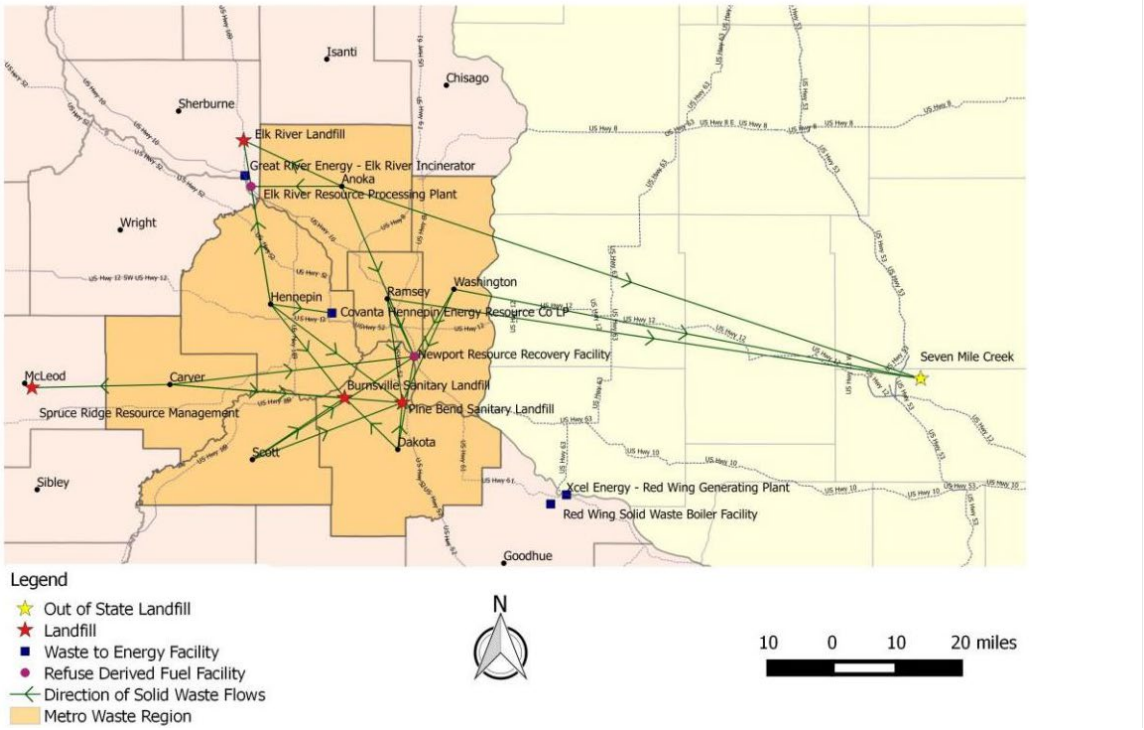
In Minnesota, both privately and publicly owned waste-to-energy facilities, transfer stations, MRFs, and landfills operate to process waste from the community. In total, the state of Minnesota utilizes 146 transfer stations, 3 refuse derived fuel (RDF) processing facilities, 8 in-state and 1 out-of-state waste-to-energy facilities, and 21 in-state and 8 out-of-state landfills as of 2015 (MPCA 2015). The state of Minnesota has the following classifications for landfills in the state: Demolition Landfills (for construction and demolition debris), Mixed Municipal Solid Waste Landfills (for garbage from residential, commercial, industrial and community activities), Industrial Landfills (for industrial waste such as asbestos and treated wood), Hazardous Waste Landfills (for any material that may pose a hazard to human health or the environment), and Transfer Stations (an intermediate facility to temporarily store waste awaiting further transportation) (Minnesota Department of Transportation 2010). A map of the waste flows in the state from 2015 can be seen in Figure 18, excluding the Metro area. The Minnesota Pollution Control Agency (MPCA) is heavily involved in supporting local solid waste efforts and provides ample information on recycling, composting, and solid waste management for the state (MPCA 2024).

Figure 18: Municipal Solid Waste Flow in Minnesota - All County Flows (Excludes Metro Flows) 2015 (MPCA 2015)



Minnesota defines the seven-county metropolitan area that encompasses Minneapolis/Saint Paul and surrounding areas as the "Metro" (MPCA 2015) and waste flows in the metro area are shown in Figure 19. The state of Minnesota Legislature has set a goal for Metro Area counties to recycle a minimum 75% (by weight) of total MSW they generate by 2030 and a goal for Greater Minnesota counties to recycle a minimum of 35% (by weight) of total MSW they generate by 2030. In 2021, Minnesota as a whole had a combined organics and recycling rate of 42.2%, a combination of a 45.2% recycling rate for Metro counties and a 38.3% recycling rate for Great Minnesota counties (MPCA 2023); this leaves about 57.8% of MSW going to waste-to-energy facilities or landfills in the state in 2021. The aggressive push for more recycling and composting access in the state comes from the environmental benefits of reducing greenhouse gas emissions, the jobs created from boosting the recycling and composting sector, as well as the limited remaining capacity of many landfills in the state (Minnesota Department of Administration 2024).

Figure 19: Mixed Municipal Solid Waste Flow in Minnesota – Metro Area 2015 (MPCA 2015)



The Metro region is governed by the MPCA's Metropolitan Solid Waste Management Policy Plan and overseen by the Solid Waste Management Coordinating Board, which coordinates the waste management strategies of six counties in Minnesota: Anoka, Carver, Dakota, Hennepin, Ramsey, and Washington. This region of Minnesota relies primarily on waste-to-energy and refuse-derived-fuel plants to process their waste, followed by private landfills located in the region, and lastly some waste is transferred out-of-state to Wisconsin (MPCA 2015). Counties in Minnesota retain control of solid waste management plans, which are updated every 6 to 10 years (Eunomia 2021). In Hennepin County, where Minneapolis is located, there are 10 facilities that accept drop-off for items such as trash, bulky items, carpet, and remodeling debris according to the county website; a link to the map of these drop-off locations from the county can be found in the Appendix (Hennepin County 2024). The county has introduced a progressive zero-waste goal of 90% waste diversion from the landfill as recently as 2023. This plan has no set date to reach their goals, but has identified the following areas of focus to reach their goals, including 62 specified actions that fall under these categories (Hennepin County 2024):

- Increase the recovery of recyclables and organics
- Address harder to recycle materials such as bulky items and construction debris
- Reduce consumption and increase circularity
- Bolster and expand end markets
- Encourage or incentivize behavior change
- Look upstream to reduce waste by influencing what is sold into the regional market

The city of Minneapolis provides statistics for the recent 5 years of waste management from waste to energy to recycling to composting (Table 6). Trends are relatively stable with a slight increase in waste to energy and decrease in recycling (this could have to do with mass of items, e.g., more plastics in the recycle stream making it lighter).

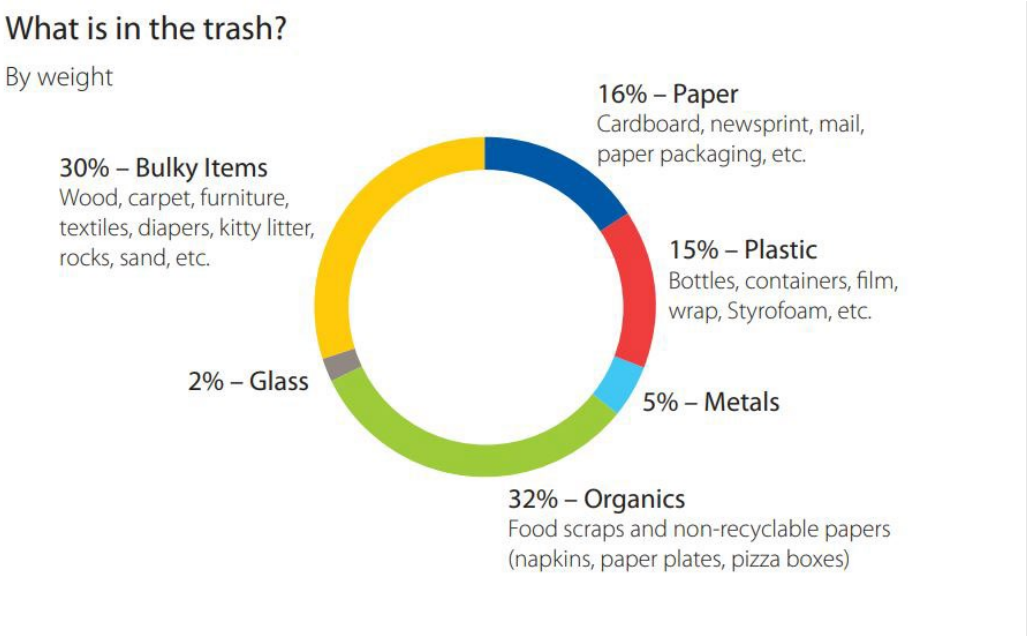
Table 6: Solid Waste Statistics for Waste Collected by the City of Minneapolis (City of Minneapolis 2024)

Annual Overview	2019	2020	2021	2022	2023
Management Method	**Percentage**	**Percentage**	**Percentage**	**Percentage**	**Percentage**
Waste to Energy	58.41%	58.89%	61.22%	61.81%	61.69%
Recycling	20.05%	20.12%	19.41%	18.99%	18.18%
Composted	17.77%	17.70%	16.07%	16.13%	17.14%
Landfilled (C&D)	3.77%	3.29%	3.25%	2.96%	2.99%
Total Diversion:	**37.82%**	**37.82%**	**35.48%**	**35.12%**	**35.32%**

Waste-to-energy Facilities

Minneapolis is home to the Hennepin Energy Recovery Center (HERC), a waste-to-energy facility that is part of the county's integrated waste management system The energy produced at the facility is sold to Xcel Energy which then powers close to 25,000 homes; a portion of the steam produced provides heating and cooling to the downtown Minneapolis district energy system and Target Field (Hennepin County Minnesota 2024). The ash produced from incineration is screened and recovers over 16,000 tons of scrap metal annually. According to a local news source, as of 2023, Hennepin County generates about 800,000 tons of garbage annually that is not recycled or composted; about 45% of that leftover garbage is burned at HERC. The rest of the 800,000 tons, about 440,000 tons, gets sent to other waste-to-energy facilities or landfills. In 2022, about 30% of the total waste generated in Hennepin County was sent to waste-to-energy facilities, 29% to recycling facilities, 28% to landfills, and 13% to organic composting (MPCA 2024). The typical waste composition of the waste that gets sent to HERC can be seen in Figure 20. As of 2023, the tipping fee at the HERC was $69/ton (Hennepin County Board of Commissioners 2023).

Figure 20: Composition of Trash Received at HERC (Hennepin County 2024)



There is pushback against this facility and other waste-to-energy facilities due to air pollutants emitted during the incineration process, creating environmental justice issues within the community, but waste to energy facilities like HERC are being prioritized in the state as a preferable option to landfilling in order to reach their zero-waste goals (Kraker 2023). Because of the pushback seen in the Minneapolis community, the Minnesota State Legislature has ruled as of 2023 that the HERC can no longer be considered a source of renewable energy (Hazzard 2023). In their zero-waste plan, Hennepin County acknowledges the HERC's impact on the community and lays out action plans to address these issues. These action items include upgrading the current infrastructure of HERC to minimize community impacts in the short term and establishing milestones to eventually phase out the use of the HERC between the years of 2028 to 2040 as the county progresses towards its' zero waste goals (Hennepin County 2024). There are concerns over increased costs to residents and households due to increased tipping fees at landfills compared to lower tipping fees at the HERC (Hennepin Board of Commissioners 2023).

In 2015, Hennepin County sent 133,016 tons (about 18% of the waste destined for either a waste-to-energy facility or a landfill) of waste to the Elk River Processing Plant, another waste-to-energy facility located in Elk River, Minnesota (MPCA 2015, Table A4 in the appendix) The facility has since closed due to several factors including financial instability, lack of ample garbage coming into the facility, and the inability to find a buyer of the facility (Marohn 2018). As of 2016, Hennepin County sent the most waste to the HERC facility (337,729 tons), followed by the Great River Energy facility (Elk River Processing Plant) in Maple Grove, MN (120,705 tons) (Hennepin County 2016). Another waste-to-energy facility that Hennepin County sent waste to in 2016 was the Newport Resource Recovery Facility in Newport, MN (2,486 tons) (Hennepin County 2016).

Of the waste collected by the City of Minneapolis and MRI, or Minneapolis Refuse Inc., in 2023, about 62% got sent to a waste-to-energy facility (Table 6). This waste includes residential collection routes, cleanups & events, drop-offs at the South Transfer, and litter containers; the total amount of waste disposed of at a waste-to-energy facility from the City of Minneapolis and MRI in 2023 was 80,426 tons (Table 7).

Table 7: Solid Waste Statistics for Waste-to-Energy Facilites for Waste Collected by the City of Minneapolis (City of Minneapolis 2024)

Waste to Energy					
Material (in tons)	**2019**	**2020**	**2021**	**2022**	**2023**
Residential Collection Routes	78,507.61	86,089.08	83,630.77	76,484.90	77,116.49
Cleanups & Events	1,887.92	1,541.53	1,786.71	1,775.03	1,760.70
Drop-off (South Transfer)	1,415.83	1,748.60	1,367.84	1,282.49	1,260.91
Litter Containers	248.87	258.50	285.67	264.23	287.48
Total Waste to Energy Disposal	**82,060.23**	**89,637.71**	**87,070.99**	**79,806.65**	**80,425.58**

Municipal Solid Waste Landfills

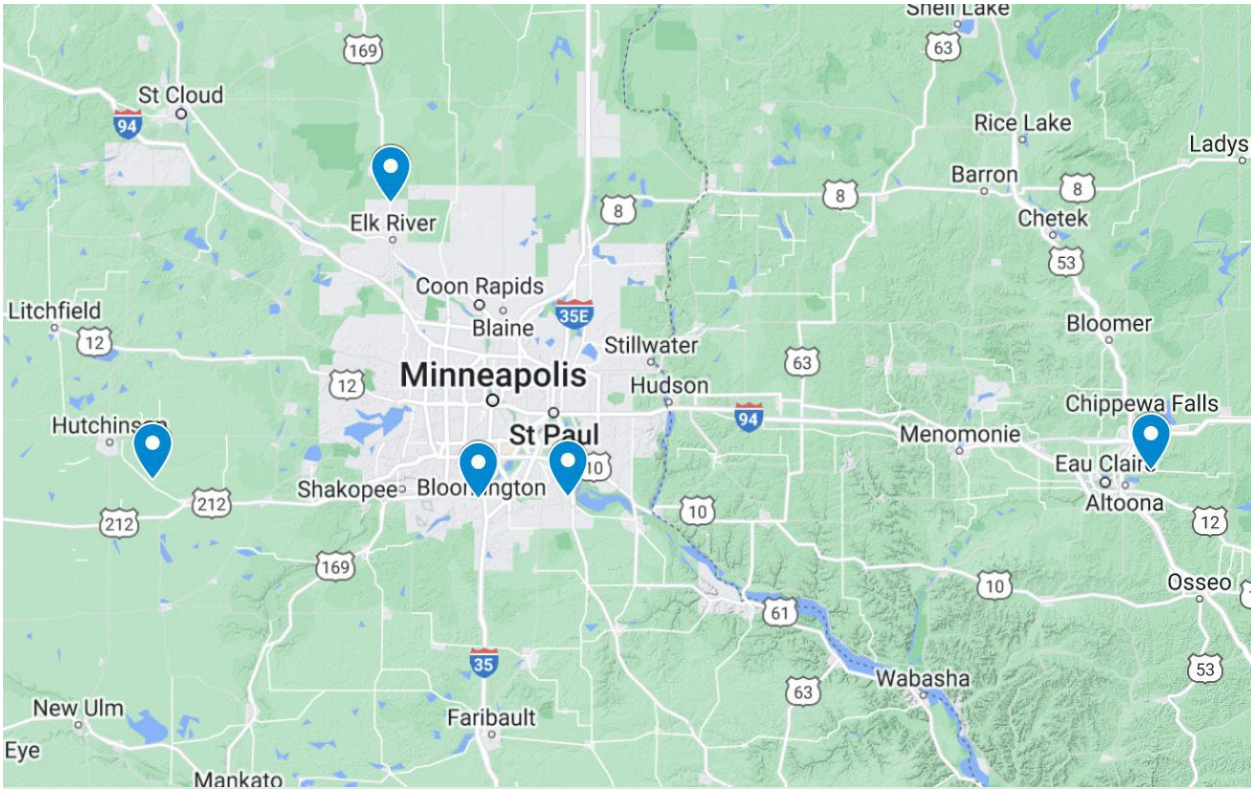
An adequate volume of waste is needed to justify the establishment and investment in local waste management infrastructure. After collection, the municipal solid waste in Minneapolis gets combined and transported with the waste from the neighboring city of St. Paul before reaching its destination. With a combined population of 728,272 people as of 2022 (US Census Bureau 2022), the Twin Cities generate enough waste to warrant the need for many forms of waste disposal located inside and outside of the cities' limits. As previously mentioned, about 30% of the municipal solid waste generated in Hennepin County currently gets burned at the HERC facility; the remaining waste is sent to privately owned landfills in the surrounding areas. Specifics on the amount of waste sent to landfills by the City of Minneapolis collections can be seen in Table 6 and 8.

Table 8: Solid Waste Statistics for Landfill Disposal for Waste Collected by the City of Minneapolis (City of Minneapolis 2024)

Landfill					
Material (in tons)	**2019**	**2020**	**2021**	**2022**	**2023**
Total Construction Landfilled	5,294.36	5,004.49	4,628.94	3,830.21	3,777.78
Cleanups & Events	n/a	n/a	175.19	373.95	120.67
Total Landfill	**5,294.36**	**5,004.49**	**4,804.13**	**4,204.16**	**3,898.45**

Most of the leftover waste generated in the Twin Cities goes to two landfills: Pine Bend Landfill in Inver Grove Heights, MN (operated and owned by Republic Services) and Burnsville Sanitary Landfill in Burnsville, MN (operated and owned by Waste Management) (MPCA 2015). In 2022, Hennepin County sent 357,157 tons to landfills, about 28% of the total municipal solid waste generated in the county (MPCA 2024). In 2015, Hennepin County also sent waste to the Elk River Landfill in Elk River, MN, the Spruce Ridge Landfill in Glencoe, MN, and the Seven Mile Creek Landfill in Eau Claire, WI; specifics on the amount of waste sent to these facilities in 2015 can be seen in Table A4 in the appendix. The landfills utilized by Hennepin County in 2015 range from 17-96 miles away from the city center of Minneapolis (using Google Maps), with the location in Wisconsin being the furthest distance away as well as the least used landfill of the facilities mentioned (Figure 21).

Figure 21: Locations of Landfills Utilized by Hennepin County in 2015



According to a local news source, four of the landfills used by the Twin Cities, including Pine Bend Landfill, Burnsville Landfill, Rich Valley Landfill, and Dem-Con Landfill, must be expanded in the coming years as of 2021 in order to continue receiving trash from the Twin Cities. An expansion of 5.6 million tons total would only last the Twin Cities 7 more years of use going forward. The alternative would be to transport the trash to the landfills that are further away, which would result in higher costs and more fuel burned (McLaughlin 2021). As of 2022, the Minnesota Pollution Control Agency approved the expansion of the Burnsville Sanitary Landfill, extending the life of the landfill until 2062. In addition to Burnsville, the Pine Bend Landfill is increasing its capacity by 2.4 million tons, and the Dem-Con Landfill in Shakopee has also applied for a permit to increase its capacity by 627,244 tons (MPCA 2024).

Transfer Stations

The state of Minnesota defines a transfer station as "an intermediate waste facility in which waste collected from any source is temporarily deposited to await transportation to another waste facility" (Minnesota Legislature 2023). In 2016, the following Transfer Stations were in use and located in Hennepin County (Hennepin County 2016):

- Republic Flying Cloud
- Brooklyn Park Transfer Station
- WM Maple Grove
- SKB Malcolm
- Minneapolis South

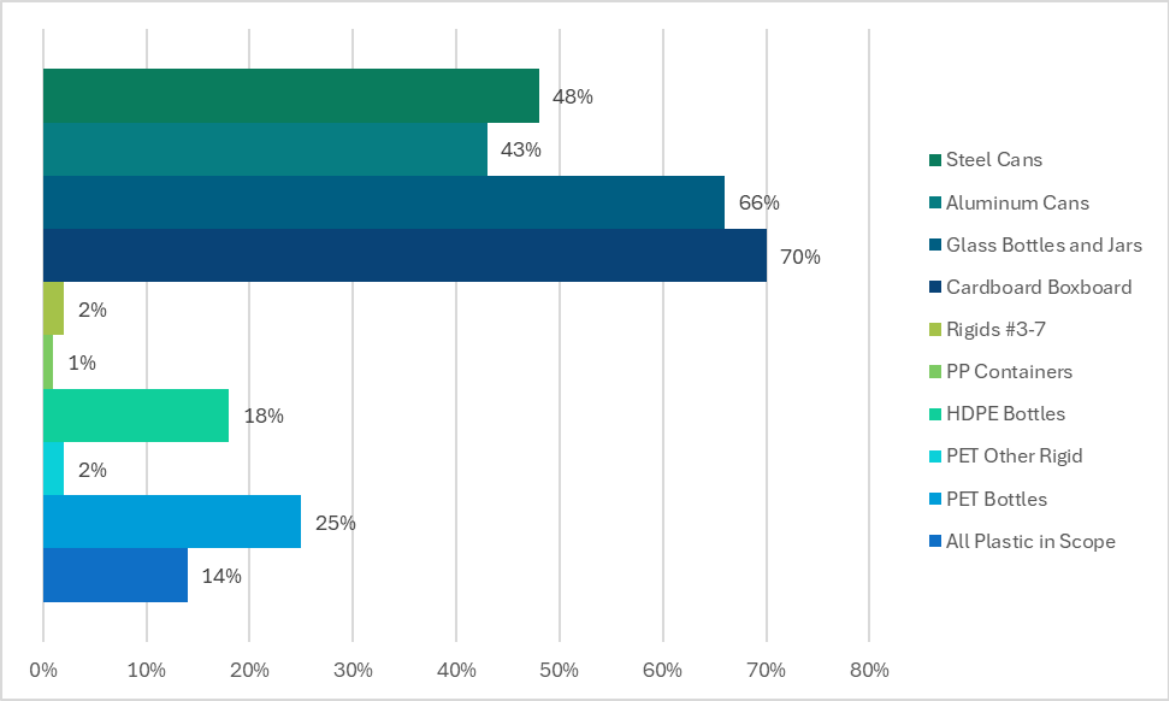
- Broadway Resource Recovery (Atomic)
- Commercial Container
- Veit
- Tubs

Three transfer stations were utilized the most by Hennepin County in 2015: Brooklyn Park Recycling and Transfer Station (131,460 tons), BFI Flying Cloud Transfer (85,742 tons), and Waste Management – Maple Grove Transfer (65,480 tons) (MPCA 2015). More information on the transfer stations used by Hennepin County in 2015 and the specific waste flows through these facilities can be seen in Table A4 in the appendix. There are 3 active municipal solid waste transfer stations in Hennepin County that also accept drop-off: Dem-Con Transfer Station in Shakopee, Freeway Transfer, Inc. In Burnsville, and the Minneapolis South Transfer Station in Minneapolis (Hennepin County 2024).

Recycling

A 2016 Minnesota law requires all commercial business owners to ensure facilities under their control collect three or more materials for recycling (Minnesota Legislature 2023). As of 2021, Minnesota ranks 7th in the country for recycling rates with an overall 60% of materials getting recycled. The materials included in this ranking are rigid plastic packaging, glass bottles and jars, aluminum cans, steel cans, cardboard and boxboard. Of the materials recycled in this study done by Eunomia, 70% were cardboard and boxboard, 25% PET bottles, 18% HDPE bottles, 2% other rigid PET, 2% rigid plastic #3-7, and 1% PP containers (Eunomia 2021, Figure 22).

Figure 22. Material – Specific Packaging Recycling Rates for Minnesota (Eunomia 2021)



The State Legislature Minnesota defines a Recycling Facility as "a facility at which materials are prepared for reuse in their original form or for use in manufacturing processes that do not cause the destruction of the materials in a manner that precludes further use" (Minnesota Legislature 2023). Table 9 contains Solid Waste Statistics for Recycling for Waste Collected by the City of Minneapolis. The City of Minneapolis contracts with Eureka Recycling, a non-profit, to sort the single stream recycling collected curbside into 15 different categories and press them into bales to be sold. According to the City of Minneapolis, 69% of these recyclables are made into new products in Minnesota and 95% of the recyclables stay in the upper Midwest (City of Minneapolis 2024). The Eureka MRF processes on average 400 to 450 tons of recycling every day. Though Eureka handles the recycling collected by the City of Minneapolis, there are about 7-8 total MRFs in the Twin Cities area that accept recycling as well (Eureka Recycling 2019). One of the larger facilities servicing the Twin Cities area is Dem-Con; this facility accepts single stream recycling as well as several C&D materials to be recycled. They process 400 tons per day of household and commercial recyclables (Dem Con 2024). As of 2016, these 8 MRFs existed in the metro area (Hennepin County 2016):

- Waste Management in Minneapolis
- Allied in Minneapolis
- Eureka Recycling in Minneapolis
- Allied in Inver Grove Heights
- DemCon in Shakopee
- Randy's Sanitation in Delano
- Dick's Sanitation (Recycle Minnesota) in Lakeville
- Tennis Sanitation in Saint Paul Park

Eureka Recycling has an excellent virtual tour video on YouTube (snapshots below)
https://www.youtube.com/watch?v=_pGEzIxaS7Q

Table 9: Solid Waste Statistics for Recycling for Waste Collected by the City of Minneapolis (City of Minneapolis 2024)

Recycling					
Material (in tons)	**2019**	**2020**	**2021**	**2022**	**2023**
One-Sort	25,362.36	27,367.54	25,249.47	22,690.55	21,602.32
Mattresses	1211.87	948.73	836.59	651.31	590.85
Appliances & Scrap Metals	943.6	1,738.21	1,121.89	928.2	1,066.60
Total Recycling	**27,517.83**	**30,054.48**	**27,207.95**	**24,270.06**	**23,259.77**

Other Recycling					
Material (in tons)	**2019**	**2020**	**2021**	**2022**	**2023**
Construction Recycled	138	84.00	72.04	39.1	120.68
Batteries	21.9	0.56	0.00	0	0
Tires	105.41	127.53	131.93	147.69	171.34
Electronics	381.18	364.29	228.08	133.74	146.42
Total Other Recycling	646.49	**576.38**	**432.05**	**320.53**	**438.44**

In addition to facilities that sort one-source recycling, there are many private businesses and facilities that process hard to recycle materials, scrap metal, C&D materials, and electronics in Minneapolis and Hennepin County. At Second Chance Recycling in Minneapolis, mattresses are taken apart and separated into separate materials to be recycled and turned into other products (Second Chance Recycling 2022). There are several private scrap metal recyclers located in Hennepin County; these include Express Metals in Hopkins, K&K Metal Recycling in Minneapolis, Leder Brothers in Minneapolis, and Re-Alliance in Minneapolis (Hennepin County 2024). The following businesses can recycle appliances in Hennepin County as well: A+ Plus Appliance in St. Paul, B & E Recycling Station in Elk River, Certified Recycling in Burnsville, J.R.'s Advanced Recyclers in Inver Grove Heights, and Metro Appliance Recycling in Otsego. There are also three C&D material recovery facilities within Hennepin County that can sort and process mixed materials and commonly recover 50 to 75% of materials by weight; they are Atomic Recycling in

Minneapolis, Dem-Con Recovery & Recycling in Shakopee, and Veit Como Recycling & Transfer in Minneapolis (MPCA 2024). Several private electronics recyclers exist in the Minneapolis area as well; these include, but are not limited to, Electronics Recycling of Minnesota, Free Greek Twin Cities (a charitable organization or 501(c)(3) organization), OceanTech, and Repowered. Hennepin County also provides an extensive list of Hazardous Waste Management Companies (no hazardous waste disposal landfills exist in MN).

Organics

With the introduction of residential organics collection in Minneapolis in 2008, came the need to process the organics at an industrial composting facility. According to the Minnesota Composting Council, there are 7 source-separated composting facilities in the state of Minnesota: Creekside Organic Material Processing in Hutchinson, MFS Farms in Good Thunder, Shakopee Mdewakanton Sioux Organics Recycling Facility in Shakopee, Specialized Environmental Technologies' Empire Processing Facility in Rosemount, Swift County Compost / Recycling Facility in Benson, Tri-County Organics LLC in St. Cloud, and WLSSD Source Separated Compost Facility in Duluth. All these locations except two are tested and included in the USCC's STA program (Minnesota Composting Council 2024). Only the locations in Shakopee and Rosemount are within 30 miles of Minneapolis according to Google Maps. Table 10 contains Solid Waste Statistics for Composting for Waste Collected by the City of Minneapolis.

While industrial composters can be useful for processing compostable plastic items, introducing those products in the waste stream (e.g., compostable plastic cups or bags) requires public education efforts, as these items are frequently confused with recyclable plastic items. Because compostable plastics are not equivalent to traditional plastic items that are able to be mechanically recycled, compostable items ultimately contaminate the recycling stream when they are incorrectly sorted. Composting facilities in Minnesota will currently only accept BPI certified compostable items that are used in food service such as plates, bowls, cups, utensils etc. the Minnesota Composting Council's website gives residents a guide on what is compostable and what is not; the website mentions that anything that is labeled biodegradable, compostable in an industrial facility, earth friendly, etc, without the BPI label, will not be accepted at composting facilities in the state (Minnesota Composting Council 2024).

Table 10: Solid Waste Statistics for Composting for Waste Collected by the City of Minneapolis (City of Minneapolis 2024)

Composted					
Material (in tons)	**2019**	**2020**	**2021**	**2022**	**2023**
Source Separated Organics	5,301.82	6,087.81	5,837.88	5,358.52	5,214.83
Yard Waste - Residential	19,660.57	20,853.88	17,045.74	15,528.13	17,129.07
Total Compostable Material	**24,962.39**	**26,941.69**	**22,883.62**	**20,886.65**	**22,343.90**

Funding Opportunities

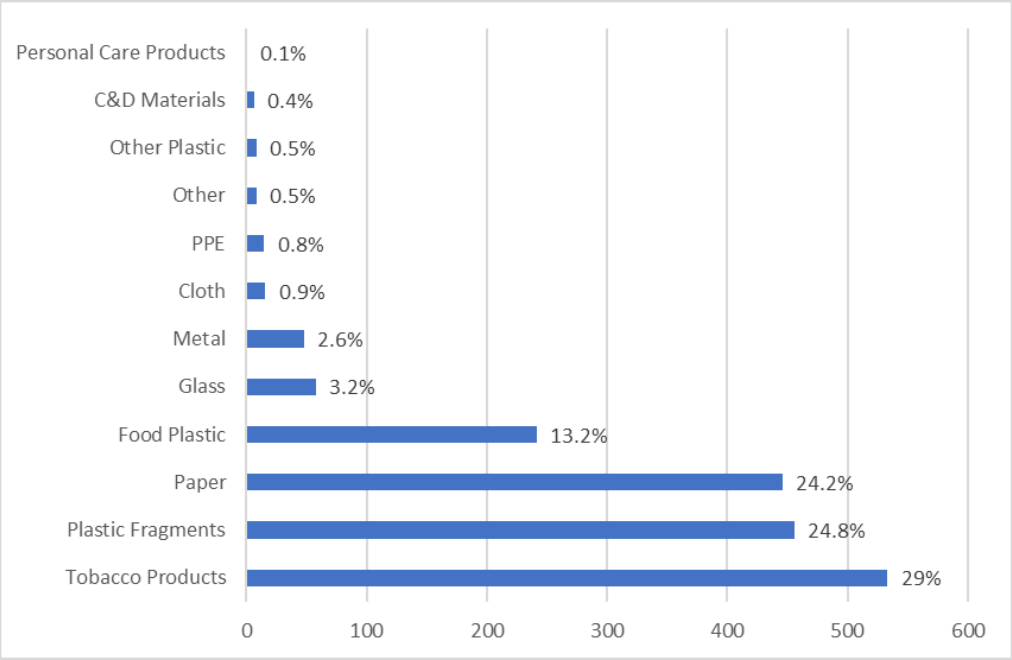
There are several potential funding outlets for targeting end-of-life management in Minneapolis. For example, the Minnesota Pollution Control Agency has ongoing and one-time grants available that focus on reducing the environmental impact of materials and solid waste across Minnesota (MPCA 2024). Two of the ongoing grants can be applied to recycling efforts in Minneapolis such as: the Greater Minnesota Waste Reduction, Reuse, Recycling, and Composting Grants and the Statewide Recycling Market Development Grants; another ongoing grant focuses on preventing food waste and encouraging food rescue (MPCA 2024). For help with C&D waste, the MPCA has allocated about $2 million to support projects that focus on sustainable building and materials management strategies that focus on reducing waste and increasing deconstruction, salvage, and reuse (MPCA 2024). There are several more one-time grants focusing on waste reduction such as: the Statewide Organics Management Grants, the Statewide Waste Reduction and Reuse Grants, and the Statewide Wood Waste Management Grants. Additionally, through the SCORE laws, funding is provided to all counties in Minnesota for recycling programs and to support waste reduction and management of household hazardous wastes and problem materials. Information is collected through the programs funded through Score to summarize waste management efforts in the state, including funding and costs, waste reduction activities, recycling, composting, household hazardous waste programs, and problem materials collection. This information is then used to calculate the cost of managing waste and recycling in Minnesota (MPCA 2024).

Leakage

A spatially stratified random sampling method generated survey areas for conducting transects, which were selected within nine 1-square kilometer areas and were distributed across three groups of population count (upper, middle, lower) across Minneapolis. These population counts were based on the Oak Ridge National Laboratory's LandScan global ambient population data for 2021 (Sims et al. 2022) (shown previously in Figure 3). Litter items were recorded using the open-source Debris Tracker mobile application ('app') (Jambeck and Johnsen 2015). A full list of items available in the app and their associated material categories can be found in the Appendix. Litter was examined based on abundance, proportion of material and product types, and product densities across all transects and aggregated across the three population groupings.

In total, 1,980 litter items were recorded across twenty-seven 100 m^2 transects in nine different square kilometer areas sampled in July 2022. Across all surveyed transects, tobacco products were the most prevalent litter item by item type, representing 29% of all items recorded (Figure 23). The second largest category was plastic fragments (24.8%) followed by paper (24.2%), food plastic (13.2%), glass (3.2%), and metal (2.6%). The remaining categories represented 3% or less of all litter items. The total percentage of common plastic items (the sum of food packaging plastic, other plastic, PPE, plastic fragments, and personal care items) found was 39% of the total items.

Figure 23: Count and percentage of all surveyed littered material for Minneapolis, MN



By individual product types, cigarettes were the most recorded item making up 28.3% of the total count, followed by paper (15.2%), hard plastic fragments (12.7%), film fragments (10.7%), and plastic food wrappers (8%) (Table 11). This data aligns with other cleanup events in Minnesota including the 2022 International Coastal Cleanup, in which cigarettes were the most documented item found in Minnesota

(42%) followed by food wrappers (5%) (Ocean Conservancy 2022). Common food packaging, like candy wrappers and chip bags, have low packaging-to-product rations (Figure 24), which are generally less valuable for recycling compared to plastic bottles made of PET, which only comprised 0.8% of the litter recorded in Minneapolis, suggesting that there may be effective collection of plastic beverage bottles for disposal or recycling currently in the community.

Table 11: Count and percentage of total transect count of debris items by item type

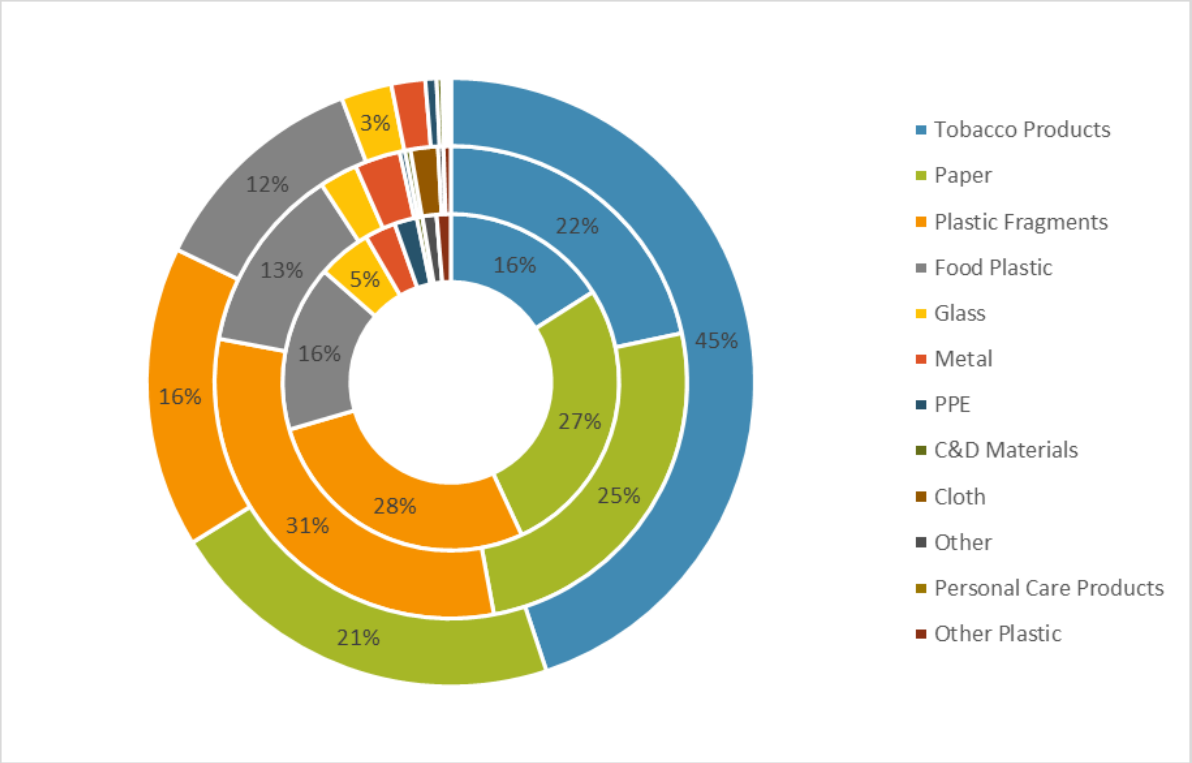
Item Type	Count	Percent of total
Cigarettes	520	28.3%
Paper	279	15.2%
Hard Plastic Fragments	234	12.7%
Film Fragments	197	10.7%
Plastic Food Wrapper	148	8.0%
Other Paper	131	7.1%
Glass or Ceramic Fragments	58	3.2%
Plastic Bottle Cap	29	1.6%
Straws	26	1.4%
Corrugated Cardboard	25	1.4%
Foam Fragments	25	1.4%
Aluminum Foil	18	1.0%
Foam or Plastic Cups or Lids	16	0.9%
Plastic Bottle	15	0.8%
Aluminum or Tin Cans	12	0.7%
Fabric Pieces	11	0.6%
Disinfectant Wipes	8	0.4%
Cigarette Packaging	7	0.4%
Metal Bottle Caps or Tabs	7	0.4%
Face Masks	7	0.4%
Total (top 20)	**1,773**	**96.4%**

When examining the litter characterization based on the population count, some similarities and distinctions can be seen between the three groups. All three population areas saw a similar amount of paper litter ranging from 21-27% of the total litter found in the tertiles; this was the second most littered material in all three population categories. The top four littered items by material type in all three population areas were the same (in no order): tobacco products, paper, plastic fragments, and food plastic. The fifth most common material for both the upper and lower areas was glass, and for the middle population area, it was metal. The high population area had the largest percentage of tobacco products found with 45%, followed by the middle (22%), and low (16%). The top litter material found in the middle and low population tertiles by percentage was plastic fragments, while the top litter material found in the high population tertiles was tobacco products. All three population areas had a similar amount of food plastic litter, ranging from 12-16% of the total litter found within each population profile.

The variation in proportions of litter types across the three population count groups can provide insight into material use and disposal patterns that differ across the areas. For example, the high prevalence of

littered tobacco products in the high population count area could suggest more people smoking or a lack of infrastructure for proper disposal in comparison to that of the middle and lower societal activity aareas. Similarly, the large proportion of plastic fragments in the middle and low population areas is notable given the challenges related to collecting, managing, sorting, and disposing or recycling those items given their size. The high prevalence of paper products littered in all three areas may suggest there is a lower percentage of plastics or higher percentage of paper in use in all three areas. Considering plastic use is encouraged to be less, it would make sense to have alternatives, like paper, also leaking out. The big difference being that will typically biodegrade over time.

Figure 24. Composition of surveyed litter items by material type across the high (outer), middle, and lower (inner) population areas in Minneapolis, MN



When aggregated across all surveys, Minneapolis has an average litter density of 0.68 items per square meter. This number is lower on average compared to the other cities in the USA that CAP has conducted, such as: 0.55 items/m2 in Cape Girardeau, MO, 0.77 items/m2 in Blytheville, AK, 1.12 items/m2 in Orlando, and 1.10 items/m2 in Vicksburg, MS. Additionally, like the variation seen in litter composition, litter density also differed between the three population count areas in Minneapolis. The highest litter density was found in the middle population count areas with 0.89 items/m2, while the lowest was in the lower population county areas with 0.41 items/m2 (Table XX). This differs from litter densities by population found in other USA cities. In Vicksburg, MS, a much smaller city compared to Minneapolis, the low population area had the highest litter density with 1.46 items/m2. Alternatively, in Orlando, FL, a populous city more comparable to the size of Minneapolis, the CIL team found the high population area to have the highest litter density with 1.73 items/m2.

Table 12: Top litter items, total item count, total plastic composition, and litter densities for population tertiles in Minneapolis, MN

Population tertile	Top five litter items by material type	Total item count (n)	Total plastic composition (%)	Litter density (count/m^2)
Upper (2,234 – 33,276 persons/sq km)	1. Tobacco Products 2. Paper 3. Plastic Fragments 4. Food Plastic 5. Glass	668	29	0.74
Middle (1,162 – 2,234 persons/sq km)	1. Plastic Fragments 2. Paper 3. Tobacco Products 4. Food Plastic 5. Metal	803	45	0.89
Lower (0-1,162 persons/sq km)	1. Plastic Fragments 2. Paper 3. Tobacco Products 4. Food Plastic 5. Glass	369	47	0.41

Litter density may be lower in the lower and upper population count areas due to increased access to waste infrastructure (e.g., receptacles) and more frequent waste collection and cleaning. In contrast, the middle population area may have less infrastructure to support disposal of common items. Additionally, less uniformity of land use and activity in middle population areas may contribute to more variation in litter abundance.

Across all transects, cigarettes were the most documented items, yet they were only the top item in the upper and middle population areas, comprising of 44% and 21% of the upper and middle population areas respectively, while they were the third most documented items in lower population areas, or 13%. All three populations areas had, in no order, paper, hard plastic fragments, film fragments, and cigarettes in their top five items found. The upper and lower population areas had plastic food wrappers as the fifth most found item, while the middle population area had other paper as the fifth most found items. The variation in items seen across the three population groups may be driven by the abundance and types of activity in each category as well as the access and proximity to waste management infrastructure. For example, the high prevalence of plastic fragments in the middle and lower population areas may reflect that litter that is purposely or accidentally released from vehicles, and with less pickup and collection, have a longer exposure to the elements, leading to fragmentation over time. Even though in Minnesota, there are four statutes outlawing littering ranging in context from waterways to highways and public transportation; the punishments for littering in these contexts have varying degrees of severity from minimum $400 fines, to misdemeanors, or potential jail time (NCSL 2024).

Table 13: Count and percentage of top five debris items by item type and population area

Population category		
Item type	**Item count**	**Percent of category total (%)**
High		
Cigarettes	298	44%
Paper	90	13%
Hard Plastic Fragments	56	8%
Film Fragments	52	8%
Plastic Food Wrappers	52	8%
Middle		
Cigarettes	172	21%
Hard Plastic Fragments	137	17%
Paper	122	15%
Film Fragments	102	13%
Other Paper	81	10%
Low		
Paper	85	19%
Film Fragments	67	15%
Cigarettes	58	13%
Hard Plastic Fragments	48	11%
Plastic Food Wrappers	46	10%

There was some evidence of illegal dumping observed in Minneapolis during the CAP leakage surveys. Illegal dumping is not isolated to Minneapolis, or Minnesota, but is a pressing challenge throughout the USA. Despite widespread access to waste and recycling collection throughout the USA, it is estimated that 0.14-0.41 million metric tons of plastic waste are illegally dumped throughout the country annually (Law 2020). Compounding the environmental and aesthetic impacts illegal dumping contributes, it can also be a costly endeavor for municipalities to clean up and prevent (Kaza et al. 2018). For example, the cities of Sacramento, California, Austin, Texas, and Fort Worth, Texas budget $40,000, $70,000, and $90,000, respectively, to raise awareness about illegal dumping (Waste360 2023). In Minneapolis, the responsibility

for cleaning up illegally dumped material falls to the property owner; there is an option to report the illegal dumping to the city so they can provide low to no cost disposal options, provide prevention tips, collect evidence and photograph the material, and attempt to identify the violator and take legal action (City of Minneapolis 2024). If the violator of illegal dumping is identified in Minnesota, they are guilty of a petty misdemeanor according to the Minnesota Legislature (Minnesota Legislature 2023). The city can address the issue of dumping through investment in bulk waste collection infrastructure (e.g., bulk waste dumpsters) and the continuation of programs (e.g., education campaigns, free dump coupons, and neighborhood drop-off events) which may help to directly address problems in the community associated with the harmful practice. According to an online news source, the Minneapolis Public Works Department secured a $4 million federal grant to reopen the North Transfer Station, a waste and recycling facility that is hoped to address long-standing issues with illegal dumping in the surrounding area (Medina 2023). The city plans to contribute $3 million to the transfer station as well; it is set to open in 2026.

Given the proximity to the Mississippi River and the public visibility lent to Minneapolis by it being a populous destination city located near a large international airport and the Mall of America, there are some efforts in Minneapolis and Hennepin County to provide service to areas that are suffering from unmanaged litter and dumping. The city of Minneapolis used to host an annual litter clean-up event called "Litter Be Gone" in an effort to change community behavior in terms of littering and reduce the amount of litter around the city, but due to the pandemic and lack of funding, the event was discontinued after October of 2020 (City of Minneapolis 2022). From these events, the city was able to gather data on amount of litter collected, the average amount of litter collected per volunteer, and number of volunteers who participated in events amongst other financial data.

The City of Minneapolis has many other programs in place to prevent litter and encourage residents and local businesses to participate in the fight for litter prevention. One such initiative by Clean City supplies litter bags, gloves, and litter grabbers to anyone who reaches out about one-time or ongoing litter clean-up events; it is simply called the litter clean-up supply request. The Clean City Classroom is a curriculum created for grades K-6 to teach students about proper disposal of materials including litter prevention, waste reduction, recycling, composting, and beautification in Minneapolis. Annual litter scans are also conducted to identify focus areas for cleaning and to track changes in the amount of litter in the city; these are visual surveys rating the presence of litter in predetermined areas on a scale between 1-4. This data is kept and used internally to help various neighborhoods address littering issues (City of Minneapolis 2022). In addition to these initiatives, the Solid Waste and Recycling Division of Minneapolis offers the following programs for residents to volunteer and get involved in keeping their communities clean: Earth Day Cleanup, Adopt-An-Ash Receptable, Adopt-A-Litter Container or Recycling Container, Adopt-A-Block, and Adopt-A-Street/Highway.

Opportunities

CIL found the following opportunities to expand and enhance circularity in Minneapolis based on the findings of this report. These opportunities are categorized based on the seven spokes of the CAP model. Stakeholder engagement with the partners of this project should take place to further expand, refine and prioritize these opportunities based on local context, impact, feasibility, and cost. It is important to note that the opportunities listed below are individualized based on the findings, but solutions cannot happen in a vacuum and are most impactful when strategically combined within a holistic system framework.

Input

- The large percentage of domestic parent companies and manufacturers for top convenience items lend themselves to engaging companies about end-of-life management, product design, alternative materials, and alternative product delivery systems. Minneapolis could lead community initiatives toward working with top local brands and producers that operate locations proximate to the community and Minnesota.
    - Through working with these top brands, the City of Minneapolis could explore resources and potential local industry partnerships that may be available for effective development, implementation, and enforcement of Extended Producer Responsibility (EPR) guidelines and rules that result from those guidelines. Minnesota passed EPR policy in May 2024, the Packaging Waste and Cost Reduction Act, which will implement EPR in a phased approach over time. The product and packaging data contained in this CAP might help implement such a policy (e.g., CAP data is being used to inform EPR in California).
    - Deposit Return Schemes may be successful in the area due to the number of manufacturers and parent companies located proximally to Minneapolis itself.

Community

- Minneapolis has a very engaged community around circularity, solid waste and plastic pollution reduction. This project provided an opportunity for Minneapolis to mentor Athens, GA in their composting pilot program. This shows there are other opportunities to mentor cities in conducting similar programs as those being conducted in Minneapolis.

Product Design

- With the wide availability of alternative products in Minneapolis, especially compostable plastics, as well as the access to industrial composting facilities, the city may be able to recommend state-level policy and regulations that standardize labeling of various bio-based, biodegradable, and compostable plastics to aid in education efforts.

Use

- As more complex plastic alternatives are introduced to the waste stream, more education efforts will be needed to combat misleading product labels and encourage appropriate management by individuals and households.
- While reuse schemes were available at some stores, an expansion of those to various areas of the cities remains an opportunity.

Collection

- Minneapolis has an opportunity to mentor other cities regarding the collection of organic materials both in curbside and drop-off scenarios.

End of Cycle

- While Minnesota ranks relatively high for recycling rates in the USA, there are still opportunities to increase recycling and decrease quantities of waste going to waste to energy or landfilling in the city.

Leakage

- Collecting data and monitoring trends over time can provide insight into waste patterns, community needs, and effectiveness of waste management programs, which Minneapolis already does internally. With continued litter monitoring, the city may be able to identify innovative ways to prevent and abate litter in the community.
- Cigarettes were the top litter item, which could be addressed through education campaigns, litter violation enforcement, and further implementation of cigarette collection receptacles in the city.
- Similar to litter monitoring, recording common locations for observed or reported illegal dumping can help to identify hot spots that can be targeted with resources.
- Additionally, recurring clean-up and drop-off events may help to encourage proactive management of hard-to-recycle items that can be illegally abandoned.

Glossary

CAP: Circularity Assessment Protocol

CIL: Circularity Informatics Lab

EPR: Extended Producer Responsibility

EPS: Expanded polystyrene

FMCG: Fast moving consumer goods

HDPE: high density polyethylene

MPCA: Minnesota Pollution Control Agency

MSW: municipal solid waste

PET: polyethylene terephthalate

PP: polypropylene

SUP: single-use plastic

UGA: University of Georgia

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Table A1: Full List of Debris Tracker Litter Items and Associated Material Categories

Material	Items
C&D Materials	Aggregate & Brick Bolts, Nails, and Screws Building Materials Lumber Other C&D
Cloth	Clothing Towels or rags Fabric Pieces Other Cloth
E-Waste	Batteries E-Waste Fragments Wire Other E-Waste
Fishing Gear	Buoys and Floats Fishing Line Other Fishing Gear Plastic Net or Net Pieces Plastic Rope
Glass	Glass Bottle Glass or Ceramic Fragments Other Glass
Metal	Aluminum Foil Aluminum or Tin Cans Foil to-go container

	Metal Bottle Caps or Tabs Metal Fragments Other Metal
Organic Waste	Food Waste Other Organic Waste
Other	Other Popsicle or lollipop Stick
Other Plastic Products	Bulk Bags Flip Flops or shoes Plastic String, Tape, or Packing Straps Rubber Bands Trash bag Tires Balloons Plastic toys or balls Car Parts Hard plastic jugs or containers Other Plastic
Food-Related Paper	Paper cups Paper food box or container Paper plates or bowls Compostable paper cups Paper food wrapper Compostable food box or container Napkins Other Food-Related paper

Paper	Office paper and newspaper Tags, tickets, and receipts Corrugated Cardboard Paper fragments Other Paper
Personal Care Products	Blister Pack or other pill packaging Cotton Buds Ear plugs Personal Care Product Sachet or packet Toothbrushes Toothpaste or Other Product Tube Flossers Feminine products Needles and syringes Other Personal Care Product
Food-related plastic	Foam cups Plastic cups Compostable plastic cups Cup Lids Plastic Bottle Aseptic cartons Mini alcohol bottles Plastic Bottle Cap Plastic Food Wrapper Condiment packet or container Plastic Grocery Bag Sandwich or snack bags Plastic Utensils

	Straws Foam to-go container or clamshell Plastic to-go container or clamshell Compostable plastic container or clamshell Other Food-Related Plastic
Plastic Fragments	Film Fragments Foam Fragments Hard Plastic Fragments Rubber/ tire fragments Other Fragments
PPE	Disinfectant Wipes Disposable Gloves Face Masks Other PPE
Tobacco Products	Cigarette Packaging Cigarettes Tobacco Sachets or packets E-cigarettes and vaping Plastic cigar/cigarillo tips Lighters Cannabis-related waste Other Tobacco Product

Figure A1. Litter density by transect in the high, mid, and low population areas.

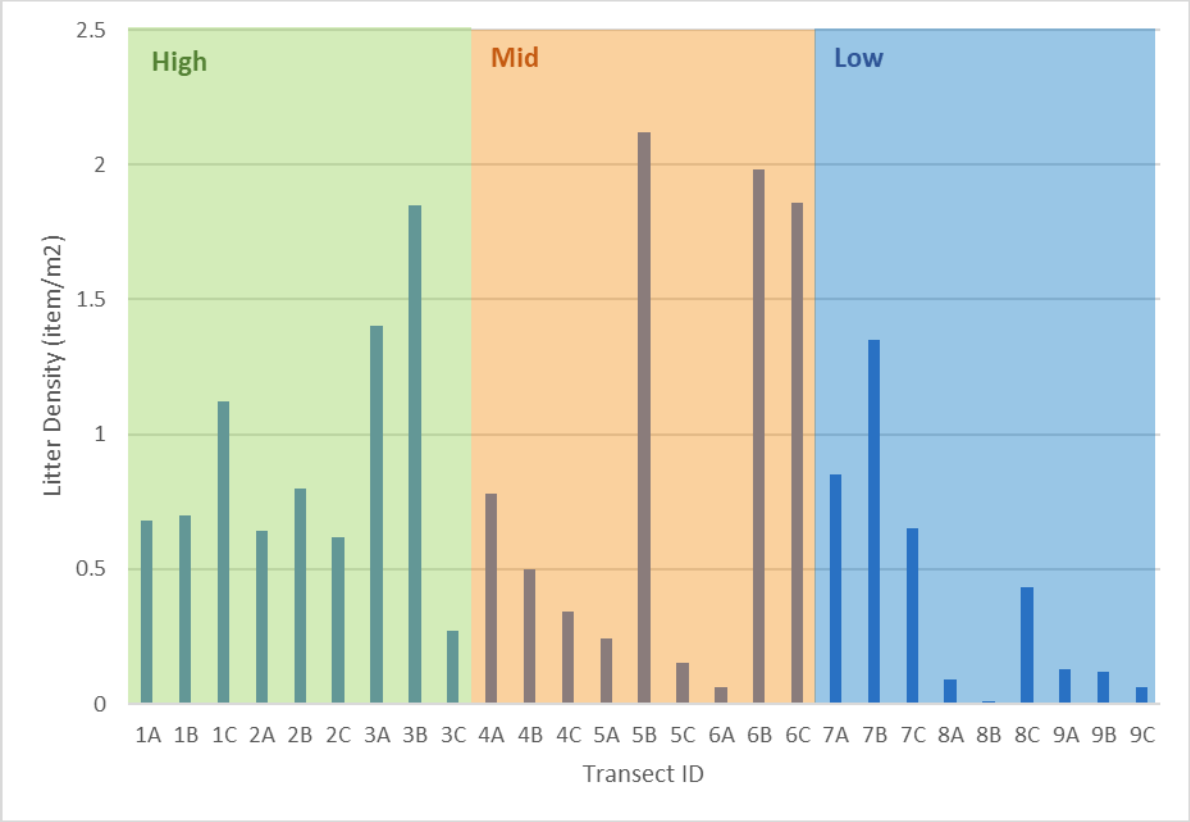


Figure A2: Minnesota Pollution Control Agency SCORE Overview Statewide for 2022.

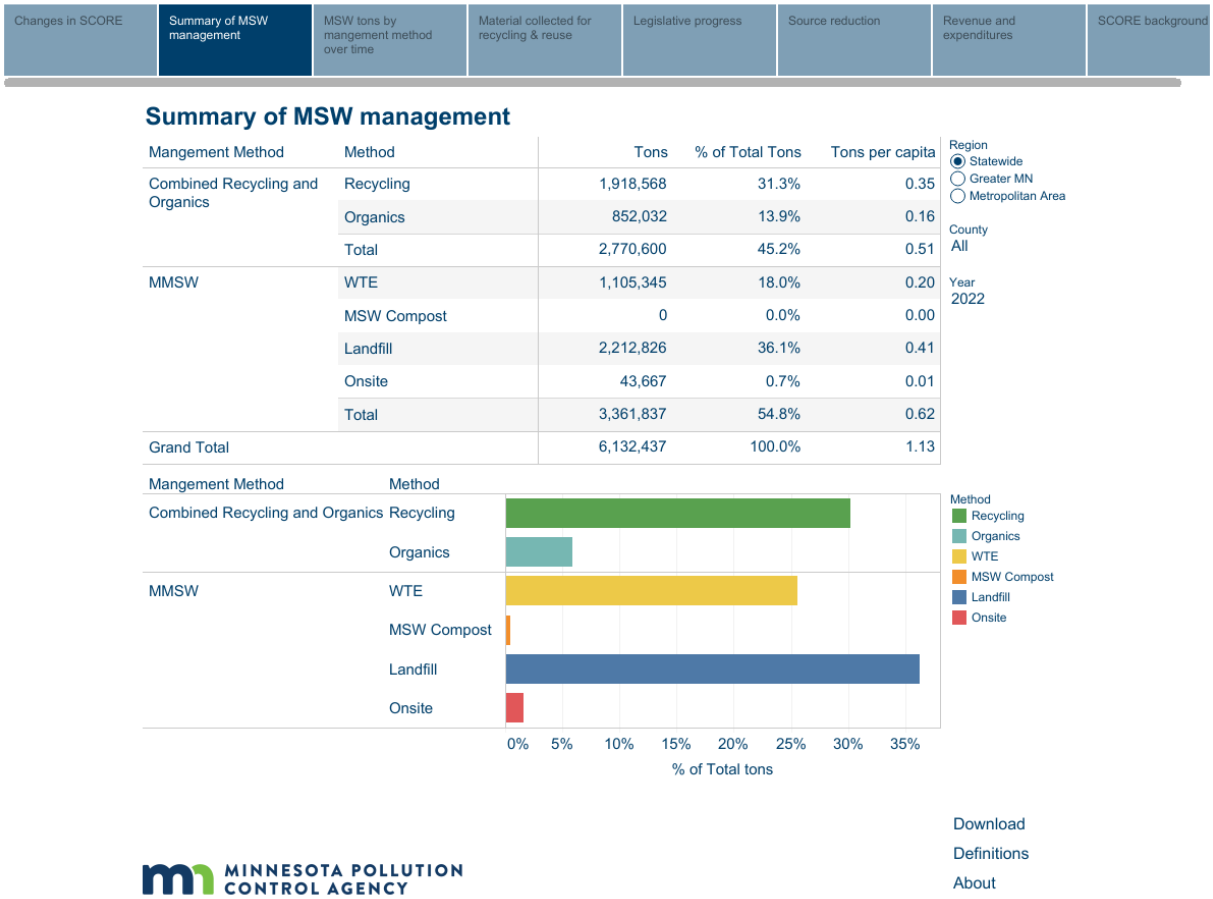


Figure A3: Minnesota Pollution Control Agency SCORE Overview for Hennepin County from 2014 to 2022.

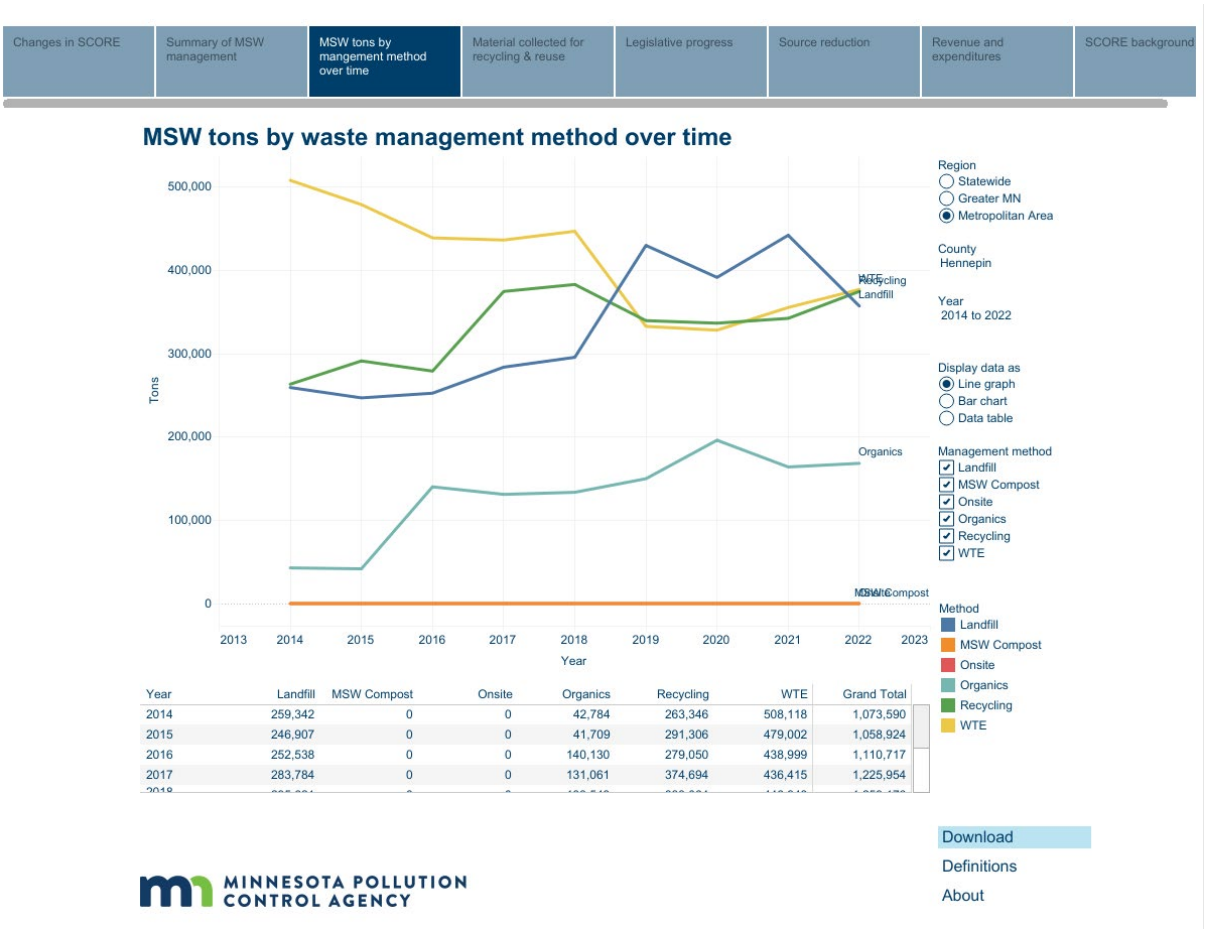


Table A2: Full table of manufacturers of top convenience products

Manufacturer	Manufacturing City	Manufacturing State	Manufacturing Country
7-Eleven Inc.	Irving, TX	Texas	USA
All Market Inc	Brazil		Brazil
Alter Eco	Switzerland		Switzerland
Angies Artisan's Treats, LLC	Osseo, MN	Minnesota	USA
Arizona Beverages USA, Llc	Woodbury, NY	New York	USA
Atkinson Candy Company	Lufkin, TX	Texas	USA

August Storck KG	Berlin, Germany		Germany
BA Sports Nutriton LLC	New York, NY	New York	USA
Bai Brands, LLC	Plano, TX	Texas	USA
Barcel	Coppell, TX	Texas	USA
Barnana	Los Angeles, CA	California	USA
Beanfields Inc	Los Angeles, CA	California	USA
Blue Triton Brands Inc	New Tripoli, PA	Pennsylvania	USA
Bottling Group LLC	Witchita, KS	Kansas	USA
Boyer candy CO.	Altoona, PA	Pennsylvania	USA
Brooklyn Bottling	Milton, NC	North Carolina	USA
Buhl	Buhl, MN	Minnesota	USA
Circle K Stores. Inc	Tempe, AZ	Arizona	USA
Coco5	Pheonix, AZ	Arizona	USA
Connect You America	Vietnam		Vietnam
Core Nutrition LLC	Frisco, TX	Texas	USA
Danone	Paris, France		France
Davis Chocolate	Mishawaka, IN	Indiana	USA
DBM Packaging Inc	Chicago, IL	Illinois	USA
Dole Food Company Inc	Westlake Village, CA	California	USA
Donkey Brands LLC	Carol Stream, IL	Illinois	USA
Dot's Pretzels	Velva, ND	North Dakota	USA
Dr Pepper/Seven Up Inc	Plano, TX	Texas	USA
Earl's Foods	Savage, MN	Minnesota	USA
Enjoy Life Nature Brands, LLC	Chicago, IL	Illinois	USA
Essentia Water LLC	Bothell, WA	Washington	USA

Faygo Beverages, Inc.	Detroit, MI	Michigan	USA
Ferrara Candy Company	Chicago, IL	Illinois	USA
Ferrera Candy Company	Monterrey, MX		Mexico
Ferrero	Alba, Italy		Italy
Ferrero U.S.A., Inc.	Parsippany, NJ	New Jersey	USA
Fox Ledge Inc	Honesdale, PA	Pennsylvania	USA
Fresh Thyme Farmers Market	Downers Grove, IL	Illinois	USA
Frito-Lay, Inc.	Plano, TX	Texas	USA
Function Beverages	Yuba City, CA	California	USA
G.B. Ambrosoli	Ronoga, Italy		Italy
Gatorade	Chicago, IL	Illinois	USA
Glacéau	Atlanta, GA	Georgia	USA
Global Beverage Corp	Oradell, NJ	New Jersey	USA
Goetze Candy Co	Baltimore, MD	Maryland	USA
good2grow, LLC	Atlanta, GA	Georgia	USA
Harmless Harvest Inc.	Thailand		Thailand
Hershey Company	Canada		Canada
Hint, Inc	San Francisco, CA	California	USA
Honest Tea, Inc	Bethesda, MD	Maryland	USA
Inka Crops SA	Lima, Peru		Peru
Jackson's Food Co	Muskego, WI	Wisconsin	USA
Just Born Inc.	Bethlehem, PA	Pennsylvania	USA
Justin's LLC	Boulder, CO	Colorado	USA
Kettle Brand	Salem, OR, USA	Oregon	USA
Kolwaski's Markets	Saint-Elie-De-Caxton	Quebec	Canada

Laboratorios PISA, S.A. De C.V.	Tlajomulco De Zuniga	Jalisco	Mexico
Langer Juice Company, Inc.	City of Industry, CA	California	USA
Lemon Perfect Company	Atlanta, GA, USA	Georgia	USA
LILY'S Sweets LLC	Boulder, CO	Colorado	USA
Lindt & Sprungli USA	Stratham, NH	New Hampshire	USA
Little Secrets, LLC	Boulder, CO	Colorado	USA
Lunds & Byerlys	Layfayette Township, WI	Wisconsin	USA
Mars Wrigley France	Haguenau Cedex, France		France
Mars Wrigley Confectionary US, LLC	Hackettstown, NJ	New Jersey	USA
Mondelez Global	Turkey		Turkey
Motts LLP	Plano, TX	Texas	USA
Naked Juice	Irvine, CA, USA	California	USA
Natural Waters of Viti Pte Ltd	Naqara, Fiji		Fiji
Nestle	York, United Kingdom		United Kingdom
Nestle USA, Inc.	Rossyln, Arlington, VA	Virginia	USA
Nestle Waters North America	Stamford, CT	Connecticut	USA
NuGo Nutrition	Oakmont, PA, USA	Pennsylvania	USA
Ocho Candy	Trinidad & Tobago		Trinidad and Tobago
OKF Corporation	Seoul, Korea		South Korea
Old Dutch Foods Inc.	St Paul, MN	Minnesota	USA
Old Vienna of St. Louis	Fenton, MO	Missouri	USA
Palmer Candy CO.	Sioux City, IA	Iowa	USA
Paqui	Austin, TX	Texas	USA
Pearson's	St Paul, MN	Minnesota	USA

Pepsi/Lipton Tea Partnership	Purchase, NY	New York	USA
PepsiCo Inc	Purchase, NY	New York	USA
Perfetti Vam Melle USA, Inc.	Erlanger, KY	Kentucky	USA
Perrier	Vergèze, France		France
Pirate Brands	Austin, TX	Texas	USA
Pop and Bottle Inc	San Francisco, CA	California	USA
Premium Waters Inc	Minneapolis, MN	Minnesota	USA
Pringles Manufacturing Co	Jackson, TN	Tennessee	USA
Quest Nutrition Llc	El Segundo, CA	California	USA
RAP SNACKS Inc	Miami, FL	Florida	USA
RawNature5 Corp	Los Angeles, CA	California	USA
REBBL	Emeryville, CA	California	USA
RTD Beverages LLC	Covington, LA	Louisiana	USA
Sanders Candy Llc	Clinton Township, MI	Michigan	USA
Seely Family Farm, Inc.	Clatskanie, OR	Oregon	USA
Siete Family Foods	Austin, TX	Texas	USA
SmartSweets Inc	Vancouver, BC, CN		Canada
Snapple Beverage Corp	Frisco, TX	Texas	USA
Snyder's-Lance, Inc.	Charlotte, NC	North Carolina	USA
SPI West Port Inc	Taiwan		Taiwan
Star Brands North America	White Plains, NY	New York	USA
Stewart Bros, Inc	Hood River, OR	Oregon	USA
Suja Life, LLC	Oceanside, CA	California	USA
Sundance Beverage Co	Warren, MI	Michigan	USA

Sunkist Growers Inc	Valencia, CA	California	USA
Sweetworks Confections	Cheektowoga, NY	New York	USA
Target Corporation	Minneapolis, MN	Minnesota	USA
TFCC, Inc.	Thailand		Thailand
The Coca Cola Company	Atlanta, GA	Georgia	USA
The Gatorade CO.	Chicago, IL	Illinois	USA
The Hain Celestial Group, Inc.	Lake Success, NY	New York	USA
The Hershey Company	Hershey, PA	Pennsylvania	USA
The Hershey Company	Monterrey, MX		Mexico
The Jelly Bean Factory	Dublin, Ireland		Ireland
Theo Chocolate	Seattle, WA	Washington	USA
Tootsie Roll Industries LLC	Chicago, IL	Illinois	USA
Topo Chico	Monterrey, MX		Mexico
Trader Joe's	Monrovia, CA	California	USA
Tropicana Manufacturing Company, Inc.	Bradenton, FL	Florida	USA
Uncle Matt's Organic, Inc.	Clermont, FL	Florida	USA
Utz	Hanover, PA	Pennsylvania	USA
Venture Food & Beverage LLC	Raleigh, NC	North Carolina	USA
Vermont Nut Free Chocolates	Colchester, VT	Vermont	USA
Vitner's Snacks	Freeport, IL	Illinois	USA
Waiakea Inc	Hilo, HI	Hawaii	USA
Walrus Snack Brands	Glecoe, IL	Illinois	USA
Way Better Snacks	Minneapolis, MN	Minnesota	USA

Whole Foods Market	Benton, TX	Texas	USA
Whole Grain Milling Co.	Welcome, MN	Minnesota	USA
Wrigley Company	Yorkville, IL	Illinois	USA
Zapp's Potato Chips	Hanover, PA	Pennsylvania	USA

Table A3: Full table of Parent Companies of top convenience products

Parent Company	Parent Company City	Parent Company State	Parent Company Country
7-Eleven, Inc.	Irving,TX	Texas	USA
Alimentation Couche-Tard	Laval, CN		Canada
All Markets Inc.	New York, NY	New York	USA
Alter Eco	San Fransisco, CA	California	USA
Amplify Snack Brands	Austin, TX, USA	Texas	USA
Andre Prost	Old Saybrook, CT	Connecticut	USA
Angie's Artisan Treats	Osseo, MN	Minnesota	USA
Atkinson Candy Company	Lufkin, TX	Texas	USA
Barnana	Santa Monica, CA	California	USA
Bimbo	Mexico City, MX		Mexico
Blue Triton Brands Inc	Stamford, CT	Connecticut	USA
Boyer candy CO.	Altoona, PA	Pennsylvania	USA
Brooklyn Bottling	Milton, NY	New York	USA
Buhl	Buhl, MN	Minnesota	USA
Cab Enterprises	Houston, TX	Texas	USA
Campbell Soup Company	Camden, NJ	New Jersey	USA
Chocolate Frey NA	Buffalo, NY	New York	USA

Coco5	Chicago, IL	Illinois	USA
Columbia Gorge Organic	Hood River, OR	Oregon	USA
Connect You America	Austin, TX	Texas	USA
CVS Pharmacy Inc	Woonsocket, RI	Rhode Island	USA
Danone	Paris, France		France
Dean Foods	Dallas, TX	Texas	USA
Disruptive Beverages, Inc	Yuba City, CA	California	USA
Donkey Brands LLC	Carol Stream, IL	Illinois	USA
Dot's Pretzels	Velva, ND	North Dakota	USA
Dr Pepper/Seven Up Inc	Frisco, TX	Texas	USA
Earl's Foods	Savage, MN	Minnesota	USA
Ferrero Group	Alba, Italy		Italy
Florida Fruit Juices	Chicago, IL	Illinois	USA
Fresh Thyme Farmers Market	Downers Grove, IL	Illinois	USA
Goetze Candy Co	Baltimore, MD	Maryland	USA
good2grow	Atlanta, GA	Georgia	USA
Harmless Harvest Inc.	Oakland, CA	California	USA
Hint, INC	San Fransisco, CA	California	USA
Inka	Lima, Peru		Peru
Innovative Flavors Llc	Orlando, FL	Florida	USA
Jackson's Food Co	Muskego, WI	Wisconsin	USA
Just Born Inc.	Bethlehem, PA	Pennsylvania	USA
Justin's LLC	Boulder, CO	Colorado	USA
Kar's Nuts	Madison Heights, MI	Michigan	USA

Kellogg's	Battle Creek, MI	Michigan	USA
Keurig Dr. Pepper	Frisco, TX	Texas	USA
Koia	Los Angeles, CA	California	USA
Kolwaski's Markets	Woodbury, MN	Minnesota	USA
Langer Juice Company	City of Industry, CA	California	USA
Lemon Perfect Company	Atlanta, GA	Georgia	USA
Lindt & Sprungli	Kilchberg, Switzerland		Switzerland
Little Secrets, LLC	Boulder, CO	Colorado	USA
Live Better Brands	Minneapolis, MN	Minnesota	USA
Lunds & Byerlys	Edina, MN	Minnesota	USA
Mars Inc.	McLean, VA	Virginia	USA
Mondelez International	Chicago, IL	Illinois	USA
National Beverage Company	Fort Lauderdale, FL	Florida	USA
Nestle	Vevey, Switzerland		Switzerland
NuGo Nutrition	Oakmont, PA	Pennsylvania	USA
Ocho Candy	Oakland, CA	California	USA
OKF America	Hackensack, NJ	New Jersey	USA
Old Dutch Foods Inc	Roseville, MN	Minnesota	USA
Old Vienna of St. Louis	Fenton, MO	Missouri	USA
Palmer Candy CO.	Sioux City, IA	Iowa	USA
PepsiCo	Purchase, NY	New York	USA
Perfetti Van Melle Benelux, B.V	Netherlands		Netherlands
Pop and Bottle Inc	San Francisco, CA	California	USA
PowerPlant Partners	Los Angeles, CA	California	USA

Premium Waters Inc	Minneapolis, MN	Minnesota	USA
Quevos	Chicago, IL	Illinois	USA
Rap Snacks INC	Miami, FL	Florida	USA
REBBL	Emeryville, CA	California	USA
Seely Family Farm, Inc.	Clatskanie, OR	Oregon	USA
Siete Family Foods	Austin, TX	Texas	USA
Simply Good Foods Co	Denver, CO	Colorado	USA
S-L Snacks National	Charlotte, NC	North Carolina	USA
SmartSweets Inc	Vancouver, CA	California	USA
Spell Capital	Minneapolis, MN	Minnesota	USA
SPI West Port Inc	San Francisco, CA	California	USA
Star Brands North America	White Plains, NY	New York	USA
Storck USA L.P.	Chicago, IL	Illinois	USA
Suja Life, LLC	Oceanside, CA	California	USA
Suntory	Tokyo, Japan		Japan
The Coca Cola Company	Atlanta, GA	Georgia	USA
The Foreign Candy Company, Inc.	Hull, IA	Iowa	USA
The Hain Celestial Group, Inc.	Lake Success, NY	New York	USA
The Hershey Company	Hershey, PA	Pennsylvania	USA
The Wonderful Company	Los Angeles, CA	California	USA
Theo Chocolate	Seattle, WA	Washington	USA
TM & @2021 Target Brands, Inc.	Minneapolis, MN	Minnesota	USA
Tootsie Roll Industries LLC	Chicago, IL	Illinois	USA

Trader Joe's	Monrovia, CA	California	USA
Utz Quality Food LLC	Hanover, PA	Pennsylvania	USA
Vermont Nut Free Chocolates	Colchester, VT	Vermont	USA
Waiakea Inc	Hilo, HI	Hawaii	USA
Welch Foods	Concord, MA	Massachusetts	USA
Whole Foods Market	Austin, TX	Texas	USA
Whole Grain Milling Co.	Welcome, MN	Minnesota	USA
Wm B Reily & Company Inc	New Orleans, LA	Louisiana	USA
Yildiz Holding	Istanbul, Turkey		Turkey

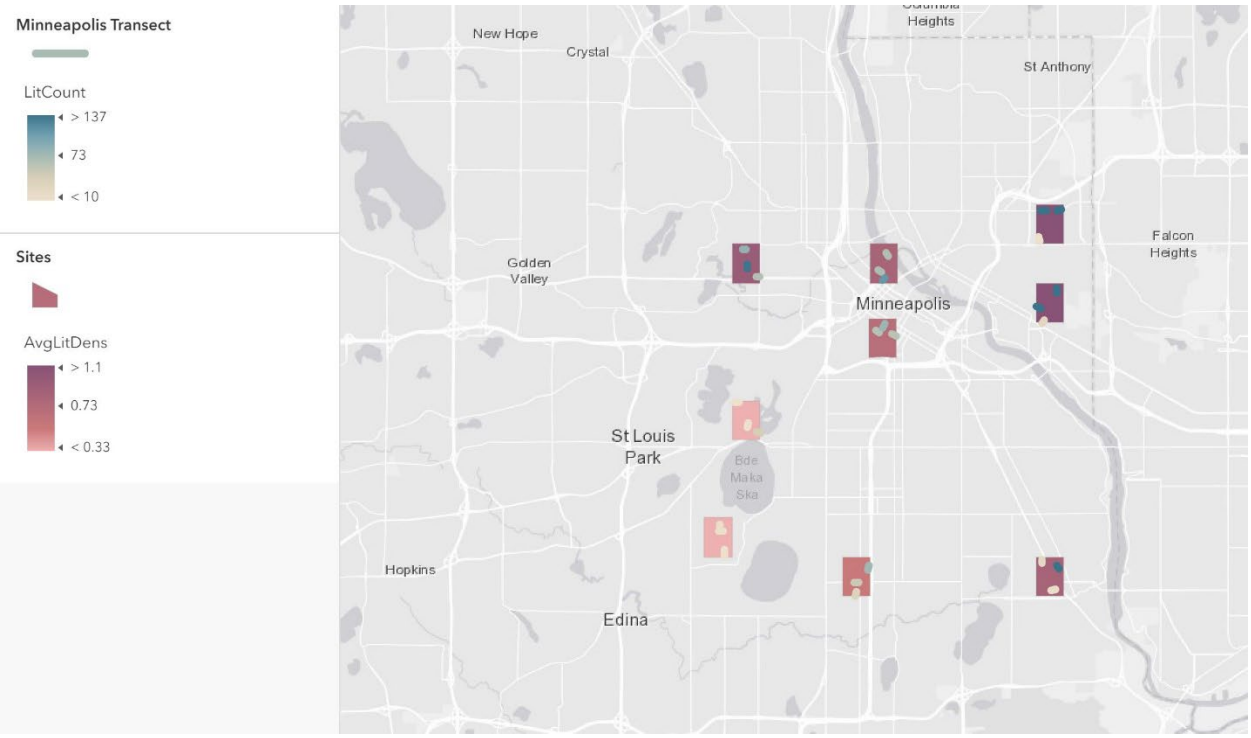
Table A4: Hennepin County Waste Flows 2015 (MPCA 2015)

Generating County	Transfer Station		MMSW Facility	
	Name	Tons	Name	Tons
Hennepin County	Brooklyn Park Recycling Center and Transfer Station	131,460	Covanta Hennepin Energy Resource Company L.P.	337,787
Hennepin County	BFI Fying Cloud transfer	85,742	Elk River Resource Processing Plant	133,016
Hennepin County	Waste Management - Maple Grove Transfer	65,480	Pine Bend Landfill	101,401
Hennepin County	Randy's Sanitation, Inc.	35,367	Burnsville Sanitary Landfill	100,973
Hennepin County	Malcolm Avenue Recycling & Transfer	29,521	Elk River Landfill	69,655
Hennepin County	Advanced Disposal	14,012	Spruce Ridge Resource Management, Inc.	6,735
Hennepin County	Walters Recycling & Refuse	9,125	Seven Mile Creek Landfill (Eau Claire, WI)	5,696
Hennepin County	RRT - NRG Empire Processing	5,476	Newport Resource Recovery Facility	4,418
Hennepin County	SKB Transfer Station/Blaine Environmental Campus	5,426		
Hennepin County	Dem-Con Recovery & Recycling, LLC	1,951		
Hennepin County	Waste Managment - Carver Transfer	1,055		
Hennepin County	LJP Recycling Transfer Station	914		
Hennepin County	TUBS, Inc. Transfer Station	272		
Hennepin County	Twin City Refuse Recycling and Transfer Station	269		
Hennepin County	Shamrock Recycling & Transfer LLC	186		
Hennepin County	Ray Anderson & Sons Companies, Inc	75		
Hennepin County	Lloyd's Construction Services, Inc. Transfer	56		
Hennepin County	J & J Recycling	52		
Hennepin County	Keith Krupenny & Son Disposal Service, Inc.	7		
Hennepin County	Veit St.Paul- Pierce Butler Transfer	2		
Hennepin County	Dan's Container Service	2		

Link A1: Map of Transfer Stations and Landfills that accept drop-offs from Hennepin County.

https://www.hennepin.us/green-disposal-guide/landfills-transfer-stations

Figure A4: Litter densities in transects and sites surveyed in Minneapolis.



An interactive web map version of this map is available at:

https://usg.maps.arcgis.com/home/webmap/viewer.html?webmap=cfcfff42628740dea88a1335aa585ed7