Flexible Packaging Recycling in Ann Arbor
Business Plan

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in collaboration with Amcor

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Problem Statement

Amcor, a leader in developing and producing packaging for food, beverage, pharmaceutical and other industries, is committed to designing all of their packaging to be recyclable, reusable, or compostable by 2025. Currently, much of their flexible packaging portfolio is not considered recyclable in practice or at scale due to widespread lack of consistent materials recovery facilities (MRFs), especially in the US. Locally in Ann Arbor, conversations with Recycle Ann Arbor confirmed that they receive large quantities of flexible packaging that cannot be processed with their current infrastructure.

Given this challenge, this project seeks to make a business case and identify a recommended collection approach for flexible packaging. If completed, Amcor and our team will build consensus among project partners and community stakeholders to transition the business plan to educational materials and potentially a pilot program.

Methods

The team first conducted stakeholder interviews to assess viable recycling options to expand flexible and film recycling in Ann Arbor. With this initial understanding, the team continued regular stakeholder engagement alongside market research analysis of collection programs and end market solutions for recycling films and flexibles. The team then objectively benchmarked all existing or potential collection options by considering cost of the collection method, customer participation, difficulty of implementation, and ease of transfer of collected materials. Focus was then narrowed to end market recycling programs within a 500-mile radius of Ann Arbor using the strategic planning framework SCORE. This allowed the team to bring in more subjective considerations to end market recycling options by considering strengths, weaknesses, opportunities, relationships, and efforts needed to use each end market.

Recommendation

The team's final recommendations were for both a short- and long-term solution to address increased recycling of flexible plastics and films in Ann Arbor. In the short term, an increased use and expansion of store drop-off programs should be explored because of pre-existing relationships with end markets. In the long term, we recommend investments to expand the curbside pickup program. While transitioning and working toward the long-term solution, continual review should take place regarding whether the Ann Arbor MRF can be upgraded. If it can, the team recommends these upgrades take place to ensure that curbside recycling of flexibles and films can happen efficiently and effectively. The desirable end state is a hybrid system in which store drop-offs continue to operate and function, but customers also could recycle in curbside carts which allows Recycle Ann Arbor and the City of Ann Arbor to handle all sorting and processing needs.

Project Description

Amcor Background

Amcor is a global leader in developing and producing responsible packaging solutions for food, beverage, pharmaceutical, medical, home and personal-care, and other products. Amcor works with leading companies around the world to protect their products and the people who rely on them, differentiate brands, and improve supply chains through a range of flexible and rigid packaging, specialty cartons, closures, and services. The company is focused on making packaging that is increasingly lighter weight, recyclable, and reusable, and made using an increasing amount of recycled content. In fiscal year 2022, 44,000 Amcor generated $15 billion in annual sales from operations that span 220 locations in 43 countries.[1]

Amcor's expertise in developing more responsible packaging across a range of materials, combined with the company's ambitious sustainability goals and global presence, makes it the partner of choice for market-leading brands and is a key opportunity that fuels its continued growth.[2]

Amcor's packaging plays a critical role in delivering essential food, beverage and healthcare products that improve the lives of millions of people around the world. Amcor firmly believes that packaging will continue to add value to modern life and is passionate about the opportunity to create a better, more circular future.[3]

[1] *See About*, Amcor, https://www.amcor.com/about (last visited Nov. 15, 2024).
[2] *See* AMCOR, 2024 PROXY STATEMENT TO SHAREHOLDERS (2024)
[3] *See* AMCOR, TOWARD A CIRCULAR SOCIETY (2024).

Overview of Dow Fellows Team

The team consists of five graduate students from a diverse range of academic studies across the University of Michigan, with biographies included below.

Kamryn Sannicks is a third-year Law student. Prior to law school Kamryn spent six years working on political campaigns and in public policy. Since 2016, she has served in the Nebraska Army National Guard, currently she is an Air Defense Artillery Officer and Company Commander. She is interested in pursuing a career in corporate law focused on emerging companies and emerging technology. In her free time enjoys teaching her dog new tricks and baking.

- *Interests in project: Policy making and initiative development.*

Karen Martins is a second-year MBA student with over seven years of experience in the technology sector at large multinational companies. Her expertise lies in innovative approaches to managing complex organizational changes. She is particularly interested in corporate strategy and in placing sustainability at the heart of strategic discussions. Karen is passionate about delivering the best solutions for both customers and employees and truly believes that people working together can drive meaningful change towards a sustainable future for the next generation. In her free time, Karen enjoys baking and biking in parks.

- *Interests in project: Sustainable solutions*

Katie Bailey is a first-year Masters in Energy Systems Engineering student. With 3 years of experience in the nuclear, solar, wind industries through internships and extra-curriculars, she is interested in a career in renewable energy, specifically nuclear. Katie is passionate about this project due to her personal interests, include recycling and sustainability education. In her free time, she loves cooking, running, and spending time outside.

- *Interests in project: Recycling infrastructure and sustainability education*

Mackenzie Mock is a third-year MBA/MS student in the Erb Institute for Global Sustainable Enterprise. Mackenzie has 5+ years of experience leading local-to-global marketing and communications strategies for major players in the fashion and environmental non-profit sector. She is interested in retail strategy to catalyze responsible social and environmental practices within the fashion industry and its global value chains. In her free time, she loves to garden, do yoga, and read about the history of textiles.

- *Interests in project: Sustainable solutions for film packaging in apparel shipping and packaging*

Shloki Jha is a second year Masters in Data Science student, with a background in civil engineering. She has been drawn towards sustainability since school, where she engaged in projects on recycling, water management, forest protection, and city development. Her civil engineering background deepened her technical expertise, and now she intends to build a career at the intersection of data science and sustainability. In her free time, she enjoys cooking, playing the piano and seeking new connections.

- *Interests in project: Process mapping of plastics recycling & sustainable improvements*

Project Partners

The below showcases our project partners consulted during this 10-month project scope. The stakeholder map in Figure 1 shows the various priority levels of stakeholders within our scope.

Dow Chemical Company (Dow): Jennifer Ronk, Senior Manager for Sustainability Policy and External Engagement, Packaging and Specialty Plastics. Jennifer Ronk leads Dow's efforts in sustainability policy and external engagement specifically for packaging and specialty plastics. Her role involves shaping the company's sustainability strategies, engaging with external stakeholders, and driving initiatives that address environmental challenges. As our project mentor, Jennifer provided invaluable guidance and support, leveraging her extensive experience in sustainability and policy, particularly in the plastics industry. Her expertise in this area has been instrumental in advancing the project and achieving its goals.

Circular Great Lakes: Mark Fisher, President and CEO at the Council of the Great Lakes Region. Mark Fisher leads the Council of the Great Lakes Region, focusing on sustainable development and regional collaboration. As an advocate for the circular economy, he drives initiatives for waste management and recycling in the Great Lakes area. Mark provided valuable insights into the regional landscape of flexible plastics recycling, helping our team better understand the specific challenges and opportunities in Ann Arbor.

Resource Recycling Systems (RRS): Jim Frey, Co-Founder & CEO, Resource Recycling Systems. Jim Frey leads Resource Recycling Systems, specializing in waste management and recycling solutions. He provided subject-matter expertise in developing effective recycling programs and advancing sustainable waste practices.

Delterra: Shannon Bouton, CEO. Shannon Bouton is the CEO of Delterra, an organization focused on scaling circular economy solutions and advancing sustainable waste management. Under Shannon’s leadership, Delterra works to implement innovative strategies for waste reduction and resource recovery, driving impactful environmental change. Shannon provided critical support to our project, sharing expertise and insights that helped shape our approach to flexible plastics recycling.

University of Michigan Office of Campus Sustainability (U-M OCS): Alison Richardson, Sustainability Program Manager, Office of Campus Sustainability. Alison aided our project by meeting with us to discuss how the University addresses sustainability issues on campus as well as discussed the pilot program for flexible plastic and film recycling.

Meijer: Erik Petrovskis, Director of Environmental Compliance and Sustainability at Meijer. Erik Petrovskis oversees environmental compliance and sustainability efforts, focusing on integrating sustainable practices into Meijer's operations and supply chain. Erik supported our project by offering valuable insights into retail sustainability practices, which helped us better understand the role of flexible plastics recycling within larger supply chains.

Firststar Fiber (Recycling): Patrick Leahy, CEO. Patrick Leahy leads Firststar Fiber (Recycling), focusing on innovative solutions for sustainable packaging and recycling. Under his leadership, the company emphasizes advancing fiber-based technologies and promoting circular economy principles in packaging. Patrick shared insights on First Star Fiber’s Plastic Pre-Processing Facility and Hefty Renew Program, helping us explore complementary approaches to flexible plastics recycling.

Alterra: Kelly Ng-Feng, Business Development Advisor, Feedstock at Alterra. Kelly Ng-Feng focuses on sourcing and optimizing feedstock for recycling, advancing Alterra's efforts in improving flexible plastic recycling. Kelly provided key insights into pre-processing, feedstock preparation, and Alterra's role in flexible plastic recycling, helping us navigate challenges in Ann Arbor.

City of Ann Arbor (A2Zero): Sarah Mason and Jenny Petosky. Sarah and Jenny are key members of the City of Ann Arbor A2Zero team, leading efforts to achieve carbon neutrality in Ann Arbor. They work on implementing sustainability initiatives, community engagement, and policy development to support the city's climate goals. They provided valuable insights into local climate goals and guided our recommendations for improving flexible plastic recycling, particularly by emphasizing the importance of drop-off locations and the role of Recycle Ann Arbor in flexible plastic collection.

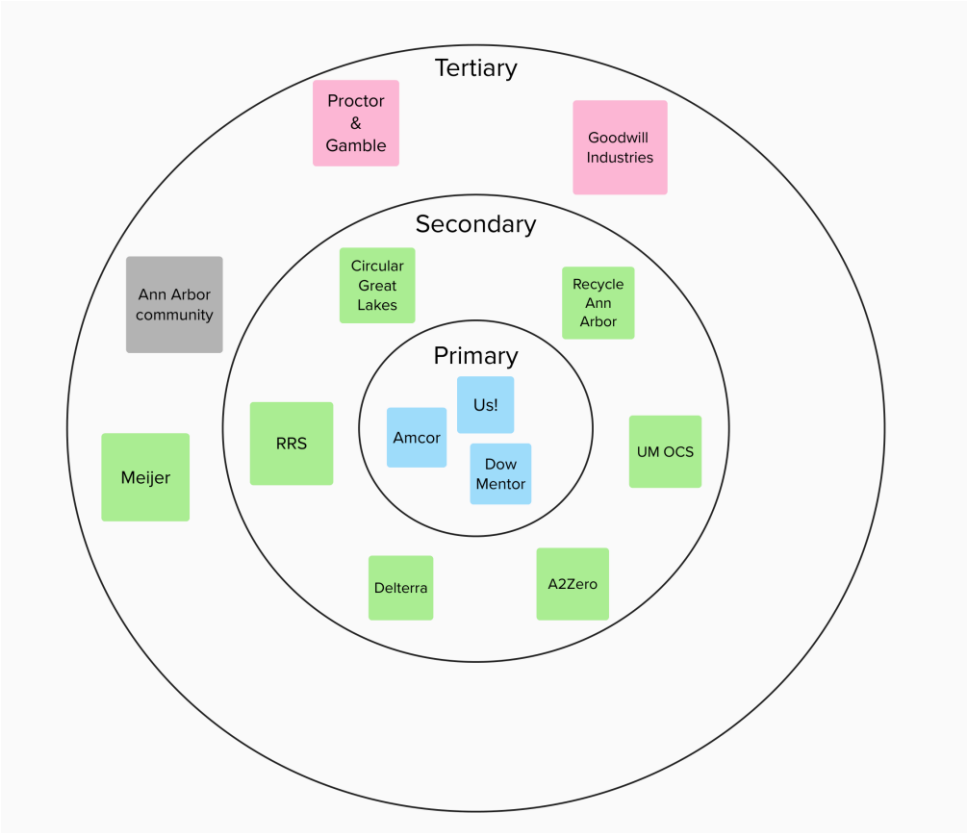

Figure 1: Stakeholder Mapping exercise. Green and blue indicate completed interviews and ongoing discussions. Pink indicates potential conversations, which we did not utilize in the end.

Deliverables

Our project consisted of three deliverables, the first two aided in the development of the third, the business case proposal.

1. Evaluate different collection options such as establishing a drop-off program for flexible packaging and opportunities for recycling the material once collected.
2. Build consensus among Amcor-identified partners and Dow Fellows-identified partners to inform the business plan and educational materials development. Key focal areas are understanding their roles in the process, pain points and strategies for addressing flexible packaging recycling at the moment.
3. Make a business case proposal for a recommended collection approach that quantifies the costs and impacts associated with the material flow of Ann Arbor's flexible packaging volume.

Market Research

Current State: Flexible Packaging Recycling

In Ann Arbor, the recycling system is primarily managed by the City of Ann Arbor, which follows a single-stream recycling approach. This means that residents can place all recyclable materials into one bin.[4] However, the presence of flexible plastics (used synonymously with film plastics for this report) in this stream complicates recycling efforts. MRFs are not equipped to process flexible plastics, leading to high contamination rates and increased costs for waste management.

According to the Michigan Department of Environment, Great Lakes, and Energy (EGLE), while the recycling rate for all materials in Michigan hovers around 15%, flexible packaging is often not included in this statistic due to its low processing rates.[5] The issue is further exacerbated by the variability in the quality and type of flexible packaging, which can include multi-layer materials that are difficult to separate and recycle. Moreover, current plastics, especially flexible packaging, are often not designed with recyclability in mind, creating a challenge for recycling systems and adding to the economic burden of waste management.

A significant challenge in the flexible packaging recycling landscape is the prevalent notion of "wish cycling," where consumers and stakeholders—including material recovery facilities (MRFs) and organizations—believe that items labeled as recyclable will automatically be processed correctly.[6] This mindset contributes to contamination in recycling streams, further complicating the recycling of flexible plastics.[7] The lack of a cohesive end-to-end recycling process exacerbates these issues, leading to confusion among consumers and inefficiencies in recycling operations. Without clear guidelines and efficient systems in place, a substantial amount of flexible packaging still ends up in landfills despite recycling solutions that currently exist.

As of writing this report, flexible plastics could be recycled in two manners: mechanical or chemical (advanced) recycling. Mechanical recycling involves shredding plastics into uniform sizes and re-granulating them into pellets. Chemical recycling methods, such as pyrolysis and depolymerization, convert plastics into valuable feedstocks or monomers. Advanced recycling encompasses these chemical techniques and other innovative approaches to recover materials from hard-to-recycle plastics, enabling broader applications for recycled outputs.[8]

Despite these challenges and existing solutions needing scale, there is a growing awareness among consumers in Ann Arbor regarding sustainability and the importance of recycling. The City of Ann Arbor's Solid Waste Resources Management Plan (2019-2023) outlines strategies to improve waste diversion and recycling practices, aligning with the city's long-term Zero Waste goals, building on previous efforts to increase total citywide diversion

[4] Recycle Ann Arbor, *Curbside Recycling for Single-family Residences*, RECYCLE ANN ARBOR, https://www.recycleannarbor.org/divisions/curbside-recycling/service-areas/single-family.
[5] Michigan Department of Environmental Quality, Recycling FAQs (on file with author).
[6] Jessica Helges and Kate O'Neill, *Ann Arbor's Single-Stream "Wishcycling" Problem Is An $80M Environmental Disaster*, THE ANN ARBOR INDEPENDENT (Jan. 18, 2022), https://a2independent.com/2022/01/18/ann-arbors-single-stream-wishcycling-problem-is-an-80m-environmental-disaster/.
[7] Tour of Ann Arbor MRF with Bryan Ukena, CEO, Recycle Ann Arbor (Sep. 29, 2024).
[8] Video Conference Interview with Kelly Ng-Feng, Business Development Advisor, Feedstock, Alterra (Aug. 19, 2024).

rates to 40%.[9] Community initiatives and educational programs have been launched to raise awareness about proper recycling practices and the environmental impact of plastic waste.[10]

Local businesses and organizations are addressing flexible packaging recycling in Ann Arbor through initiatives like store drop-off programs that allow consumers to return flexible plastics for proper recycling, enhancing rates and promoting responsible behavior. Additionally, the City of Ann Arbor provides residential curbside pickup to ease the collection of recyclables.[11]

The current state of flexible packaging recycling in Ann Arbor presents both challenges and opportunities. While the local recycling infrastructure struggles to accommodate flexible materials, growing consumer awareness and community initiatives provide a foundation for improvement. By leveraging local partnerships and investing in advanced recycling technologies, there is potential to enhance the recycling of flexible packaging in Ann Arbor, ultimately contributing to broader sustainability goals.

[9] Solid Waste Resources Management Plan: 2019-2023 (Page 8)
[10] Recycle Ann Arbor, *Boost Reuse: A Recycle Ann Arbor Program*, RECYCLE ANN ARBOR, https://www.recycleannarbor.org/boost-reuse.
[11] Recycle Ann Arbor, *Curbside Recycling for Single-family Residences*, RECYCLE ANN ARBOR, https://www.recycleannarbor.org/divisions/curbside-recycling/service-areas/single-family.

Demographic Focus

Mapping flexible recycling in Ann Arbor thus necessitates the participation and engagement of Ann Arbor's residents. A city of 123,851 as of the 2020 census, Ann Arbor is the fifth most populous city in the state of Michigan.[12] The University of Michigan represents nearly half of this population, with a total of 51,823 undergraduate and graduate students on its Ann Arbor campus as of Fall 2023.[13] These varying demographics greatly affect the levels of engagement for recycling flexibles throughout the year, given that the design of a recycling solution needs to cater to both sizable permanent and transient populations. To date, Ann Arbor's recycling programs have targeted year-round residents, University populations (student and staff), and businesses (commercial and small-scale), each of which has varying degrees of opportunities and pain points. These three target markets are explored in more depth below.

The City of Ann Arbor's trash, recycling, and compost program oversees city-wide efforts for commercial recycling (recycling for households and businesses are facilitated by Recycle Ann Arbor[14]).[15] The City additionally facilitates consumer education materials on what to recycle (and how), recycling cart drop-off operations support, and consulting with local business' recycling programs.[16] The City of Ann Arbor is deeply committed to fostering a sustainable community, with support from its A2Zero strategy towards net zero carbon by 2030 adopted in June 2020.[17] The strategy includes efforts to increase commercial recycling rates to 30% by 2028 (explored later in the commercial business demographics section). The team has calculated Ann Arbor's city-wide 2023 recycling rate to be 2.35 tons per person per year.[18]

The City's Solid Waste Resources Management Plan (SWRMP): 2019 – 2023 takes a future-looking view in recommending strategies for its solid waste management approaches. Within the report, a demographic study of 400 residents indicated that Ann Arbor residents stand out for their progressive views on recycling and environmental responsibility as well as their (self-reported) propensity for donation of household items. Regarding education, 60% of respondents felt that they did not need more information on the city's recycling programs. Regarding satisfaction, 60% of respondents were "very" satisfied, with 33% citing that they were only "slightly" satisfied. However, a majority of respondents reported limiting their recycling to some degree, due to not having enough information on what is recyclable and not having a big enough cart size.[19]

The team recognizes the nuances present in the City of Ann Arbor's SWRMP reporting and reflects that since its collection in 2019, the presence of macro factors such as the pandemic has greatly shifted consumer behavior. While not known until the City's next Solid

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[12] Samuel Dodge, *Ann Arbor surpasses Lansing for fifth-most populous Michigan city*, MLive (Aug. 18, 2021, 7:30 AM), https://www.mlive.com/news/ann-arbor/2021/08/ann-arbor-surpasses-lansing-for-fifth-most-populous-michigan-city.html.

[13] The Regents of the University of Michigan, *Facts & Figures*, University of Michigan, https://umich.edu/facts-figures/.

[14] *See supra* Project Partners.

[15] *About*, A2GOV, https://www.a2gov.org/departments/trash-recycling/Pages/About.aspx (last visited Sep. 3, 2024).

[16] Recycling, A2GOV, https://www.a2gov.org/departments/trash-recycling/Pages/Recycling.aspx (last visited Sep. 3, 2024).

[17] Carbon Neutrality Home, A2gov, https://www.a2gov.org/departments/sustainability/Carbon-Neutrality/Pages/default.aspx#:~:text=Ann%20Arbor%27s%20A%202%20ZERO%20plan:%20innovation,%20sustainability (last visited Sep. 3, 2024).

[18] This rate is an estimate due to limitations in recycling rate availability. The calculation is estimated using date from the US Census Bureau regarding Ann Arbor's population in 2023 divided by the Ann Arbor MRF processing rate (in tons/year) supported by NextCycle Michigan. United States Census Bureau, https://www.census.gov/quickfacts/fact/table/annarborcitymichigan/PST045223#PST045223 (last visited Nov. 6, 2024); *Material Recovery Facility (MRF) Network*, NextCycle, https://nextcyclemichigan.com/mrfs-base-map (last visited Nov. 6, 2024).

[19] APTIM ENVIRONMENTAL & INFRASTRUCTURE, LLC, SOLID WASTE RESOURCES MANAGEMENT PLAN: 2019-2023, (2019) (on file with author).

Waste Resource Management Plan, the team assumes these data have fluctuated various degrees of magnitude to 2023.

University of Michigan students, who are on campus for roughly eight months out of the year (August to April), engage with recycling infrastructure and programs through the U-M Office of Campus Sustainability (U-M OCS).[20] The U-M OCS serves as a focal point for sustainable campus operations and collaborates with academic and research units, auxiliaries, and student groups to further efforts toward reaching campus-wide Sustainability Goals.[21] Its programs span the gamut of waste reduction, energy management, and workplace initiative opportunities.[22] Its specific Recycling program within its waste reduction strategy was a specific focus of this research.

U-M OCS Recycling program provides detailed information on what students can throw away, such as its "Where to Throw" presentation, and details on where to find and how to use campus waste bins.[23] In the fiscal years covering 2020–23, U-M OCS undertook research to analyze the diversion rate (percentage of waste that was diverted from landfill by recycling or composting). In FY2023, there was an average diversion rate of 46.9%, representing a 1% year-over-year growth from the previous fiscal year.[24] An important note is that the buildings included in the study include a range of dormitories, administrative centers, labs, libraries, and other affiliated operations, making a nuanced view at demographics hard to pinpoint. Generally, however, the FY2023 diversion rate and its growth are healthy indicators of student, staff, and faculty engagement with recycling initiatives.

In the summer of 2024, U-M OCS undertook a flexible plastics recycling pilot program to support the University's goal of 40% solid waste reduction by 2025. The program was targeted at on-campus staff with partnerships from facilities, kitchen staff, custodians, dock staff, and other groups. As of July 2024, 10 gaylords (i.e. bulk-size corrugated boxes) of flexible plastic were collected and were sent to Recycle Ann Arbor, who worked with NexTrex to recycle the material.[25]

As of 2017 reporting from the Ann Arbor Chamber of Commerce, the city had 18,200 businesses ranging in industries such as health and medicine, food and dining, business services, contractors, shopping, and more.[26] Commercial and smaller-scale businesses made up this data, with different entities servicing both: the City of Ann Arbor collects commercial recycling dumpsters, while Recycle Ann Arbor (the city's MRF, detailed in Partner Overview), collects recycling carts from businesses.[27] Updated information from the City of Ann Arbor notes

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[20] *See supra* Project Partners.
[21] University of Michigan Office of Campus Sustainability, *About Us*, UNIV. OF MICH., https://ocs.umich.edu/about/about-us/.
[22] University of Michigan Office of Campus Sustainability, *Programs*, UNIV. OF MICH., https://ocs.umich.edu/programs/.
[23] University of Michigan Office of Campus Sustainability, *Waste Bins*, UNIV. OF MICH., https://ocs.umich.edu/programs/waste-reduction/waste-bins/ (last visited June 16, 2024); University of Michigan Office of Campus Sustainability, *Where to Throw*, University of Michigan, https://ocs.umich.edu/resources/where-to-throw/ (last visited June 16, 2024).
[24] Univ. of Mich. Off. of Campus Sustainability, *Building Recycling Rates*, UNIV. OF MICH., https://www.campus-sustainability.org/ocs/recycling/buildings/rates (last visited June 16, 2024).
[25] Email from Jennifer Richardson, Sustainability Program Manager, University of Michigan Office of Campus Sustainability (Jul. 22, 2024) (on file with author).
[26] CHAMBER OF COMMERCE, https://www.chamberofcommerce.com/business-directory/michigan/ann-arbor/#:~:text=Ann%20Arbor%20is%20considered%20a%20Large%20City%20with,which%20was%20less%20than%202017%20which%20had%20247 (last visited October 1, 2024).
[27] *Solid Waste Administration*, Ann Arbor Observer, https://annarborobserver.com/guide/solid-waste-administration/ (last visited Sep. 7, 2024).

that businesses can place recycling in any available recycling container; they are not assigned to individual businesses.[28]

Commercial and business film recycling primarily results from pallet film packaging (for large-scale entities owning their own fleet trucks), stretch wrap in inventory storage, and polyethylene bags in retail stores.[29] Recycling recovery rates of film plastics for businesses and commercial entities face similar data quality challenges to residential film plastics recycling. However, a 2017 study by Closed Loop Partners and RSE USA published one of the few known estimations for the recovery rates of polyethylene film: they found a residential recovery rate of 4% and commercial recovery rate of 13%.[30] With the higher recycling recovery rate seen in commercial entities, this target market represents a sizable opportunity area.

Ann Arbor residents, U-M students and staff members, and businesses play a crucial role in the future of film recycling success in the city. While varying degrees of data quality exist–from generalized recycling diversion rates in the case of U-M and potentially outdated, U.S.-wide film recycling rates for residential and commercial entities–there is opportunity for engagement of these three target markets in focused film plastics recycling efforts.

[28] *Downtown and Commercial Solid Waste Initiatives*, A2gov, https://www.a2gov.org/departments/trash-recycling/Pages/Downtown-and-Commercial-Solid-Waste-Initiatives.aspx (last visited Sep. 7, 2024).
[29] RSE USA, THE CLOSED LOOP FOUNDATION: FILM RECYCLING INVESTMENT REPORT, 5, (2020) (on file with author).
[30] The Recycling Partnership, *Addressing the Challenge of Film and Flexible Packaging Data*, 15 (Feb. 2021), https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2021/04/FF_Whitepaper_final.pdf.

Legal & Regulatory Framework

The federal government passed the Resource Conservation and Recovery Act (RCRA) in 1976.[31] Subtitle D is focused on recovery of nonhazardous solid waste and creates a state-driven model to ensure compliance with the law and related regulations. The RCRA sets the minimum required standards and states are free to enact more stringent policies. The RCRA also has funds available for states to implement solid waste management plans.[32]

The state of Michigan and city of Ann Arbor have recycling-initiative friendly laws, regulations, and/or municipal ordinances. Through grant programs, the state empowers municipalities, tribal governments, non-profit organizations, and the private sector to develop and implement new recycling initiatives.

The state of Michigan has two means of funding new recycling programs. These initiatives are overseen by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The Clean Michigan Fund provides funding for capital costs of recycling and composting programs undertaken by municipalities, nonprofit private entities, or private entities.[33] Additionally, the Recycling Operational Grant Program provides temporary operating subsidies to assist municipalities, nonprofit private entities, and private entities in recapturing the difference between the cost of collection, processing, and transportation and the revenues generated from the sale of recovered materials.[34]

EGLE also oversees NextCycle Michigan. NextCycle connects "entrepreneurs, companies, organizations, and communities to technical support, financial resources, and capacity building for recycling, recovery, and reuse initiatives."[35] They have 122 partners, 73 ongoing projects, have committed $327,000 in award sponsorships, and have $97 million in planned or started investments. EGLE's sponsoring partners include Carton Council, Closed Loop Partners, Dow, Foodservice Packaging Institute, Ice Mountain, Petoskey Plastics, and Washtenaw County Water Resources Commissioner.[36] The organization conducted a gap analysis in 2023 to determine where opportunities exist, and which solutions can produce tangible results.[37]

EGLE has a web page dedicated to Recycling Grants and Recycling Projects. Recently, EGLE has shown interest in projects targeting the collection of recyclable materials. For example, a recent request for proposal put out by the state in February 2024 and closed in May 2024 was for recycling infrastructure projects. Eligibility for this project was specified as non-profit organizations, tribal governments, school districts, universities/colleges, local health departments, regional planning agencies, cities, villages, townships, charter townships, counties, municipal solid waste authorities, and resource recovery authorities. Eligible projects included "transition from recycling bins to carts, public space recycling containers, creations, or enhancement of public drop-off recycling, new or improved recycling processing infrastructure, school recycling projects, collection vehicles, and multi-family recycling projects."[38]

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[31] R*esource Conservation and Recovery Act (RCRA) Overview*, EPA, https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-overview; *Resource Conservation and Recovery Act (RCRA) History* , EPA, https://www.epa.gov/rcra/history-resource-conservation-and-recovery-act-rcra.
[32] *EPA Grants,* EPA ,https://www.epa.gov/grants.
[33] MICH. COMP. LAWS § 324.19111 (1995).
[34] MICH. COMP. LAWS § 324.19113 (1995).
[35] NEXTCYCLE MICHIGAN, https://nextcyclemichigan.com/ (last visited Oct. 22, 2024).
[36] *Partners*, NEXTCYCLE MICHIGAN, https://nextcyclemichigan.com/partners.
[37] *Michigan Gap Analysis*, NEXTCYCLE MICHIGAN, https://nextcyclemichigan.com/michigan-gap-analysis.
[38] Michigan EGLE, *EGLE Recycling Infrastructure Grant: Request For Proposals*, (May 2023), https://www.michigan.gov/egle/-

A potential area for new legislation in Michigan would be to implement extended user responsibility laws for producers of flexible plastics. Laws regarding producer responsibility for packaging materials have been enacted in four states: California, Colorado, Maine, and Oregon.[39] Maryland enacted legislation in 2023 to conduct a needs assessment for extended producer responsibility (EPR) for packaging but has yet to implement a full system.[40] The programs in each state vary widely, however, most cover some form of packaging and type of plastic consumer goods, such as silverware.

Chapter 26 of the Ann Arbor Municipal creates and regulates solid waste management in the city.[41] The city broadly defines recyclables as "all containers, paper, cardboard, and other materials specifically designated as recyclable by the solid waste regulations."[42] Solid waste can be deposited in dumpsters or curb carts or taken to recognized drop-off locations.[43] Commercial locations file an annual plan and status report with the city "documenting the continued provision of recycling collection containers and collection services and occupant training and incentives required for separation of recyclable materials from refuse as required by this chapter, with timing, format and submittal procedures established by regulation."[44] These broad definitions are beneficial for future innovation and transition in sustainable recycling approaches going forward.

/media/Project/Websites/egle/Documents/Programs/MMD/Recycling/Grants/Recycling-Infastructure-Grant---FY-2024--RFP.pdf?rev=4fef614ba0794e32a6d201f13519607d&hash=B05E36328CA0A33EA09EA2C816B3F682.

[39] *Extended Producer Responsibility*, NCSL (October 24, 2023), https://www.ncsl.org/environment-and-natural-resources/extended-producer-responsibility#packaging.

[40] *Id.*

[41] ANN ARBOR, MI., CODE Title II, ch. 26 (2023).

[42] ANN ARBOR, MI., CODE Title II, ch. 26, § 2.1(22) (2023).

[43] ANN ARBOR, MI., CODE Title II, ch. 26, § 2.1(26) (2023).

[44] ANN ARBOR, MI., CODE Title II, ch. 26, § 2.1(26) (2023).

Methods

Benchmarking Framework

To analyze prospective collection options, a combination of benchmarking and Pugh chart approaches were used as a means of quantifying qualitative attributes. The chosen criteria were the relative cost, customer participation, implementation, and transfer of collected materials. Each criterion was assigned a weight based on their relative importance, with implementation being the most important and cost being the least important. Cost is considered to be less relevant due to existing grants for recycling programs. Implementation is considered to be the most important as infrastructure remains a significant barrier to success for flexible packaging recycling. If process developers can grow and improve already implemented recycling programs, they may see more success. The collection methods and criteria were selected based on guidance from stakeholders and research.

Using Pugh chart methods, the system was assessed qualitatively and rated for each criterion on a -, 0, or + scale. If a criterion servs as a positive attribute of the system, it receives a +. If a criterion acted partially is as a neutral aspect of the system, it received a 0. If a criterion served as a negative attribute of the system, it received a -. Cost was rated on a scale of inexpensive to expensive, so the inexpensive options received a + and expensive pens received a -. The latter three criteria (customer participation, implementation, and transfer of collected materials) were judged based on an “ease” scale, where if a criterion is considered easy, such as low customer participation necessary, it received a +, and vice versa for collection methods that require a lot of customer participation. The results can be found in Table 1 in the Analysis section.[45]

[45] *Infra* Product Collection.

Strategic Planning: SCORE Framework

Through research and stakeholder interviews, the team identified the need to compare potential flexible packaging end market solutions. Assessment was then completed to identify a strategic planning process as the best means for providing readers with a quick summary of all solutions considered This decision also provides readers an easily digestible way to geographically consider local, statewide, and national solutions in the context of Ann Arbor, Michigan, and across the United States.

In total, the team reviewed eight potential strategic planning processes. Initially, the team considered the use of a SWOT analysis.[46] However, conversation among team members highlighted that the SWOT analysis did not adequately capture the goals of this project and was negatively focused in two out of four categories for consideration, specifically the categories focused on weaknesses and threats.

Considering the broadest array of inputs for our project, the team decided to utilize a SCORE analysis. The SCORE framework considers strengths, challenges, opportunities, relationships, and efforts.[47] Of strategic planning processes customarily used across industries today, the SCORE analysis was found to be more comprehensive and brought in a wider ability to analyze numerous stakeholder perspectives. This was key to the team as stakeholders across a wide array of arenas were integral to this project. Additionally, SCORE was found to be positively focused, which future-focused our recommendations with optimism in next steps. Finally, SCORE was found to be a people-first analysis that highlighted both the internal and external components of a large-scale project, such as the collection and recycling of flexible plastics.

In SCORE, each factor brought its own consideration. Strengths considered what an organization is currently succeeding at in the targeted area to help the project get off the ground or continue. Challenges was another internally focused metric used to determine where an organization can improve or needs to identify additional resources and capabilities for the targeted solution. Opportunities analyzed the options available to the organization and identified where risks can be taken. Relationships identified the necessary stakeholders that can work alongside the organization in achieving the desired outcome. Lastly, Efforts were what sketched out how the potential course of action can be pursued by the organization.[48]

The team selected six potential courses of action for the collection and follow-on recycling of flexible plastics. The analysis can be found in Appendix B of this report.[49]

[46] PESTLEanalysis Team, 5 Alternatives to SWOT Analysis Tackling its Weaknesses, PESTLE (Mar. 4, 2023), https://pestleanalysis.com/alternatives-to-swot-analysis/.
[47] Alyssa Zacharias, Alternatives to a SWOT analysis: Using SOAR, NOISE, and others, TEMPO STRATEGIC ROADMAPS, https://roadmunk.com/product-management-blog/alternatives-to-swot-analysis/; PESTLEanalysis Team, 5 Alternatives to SWOT Analysis Tackling its Weaknesses, PESTLE (Mar. 4, 2023), https://pestleanalysis.com/alternatives-to-swot-analysis/; FreshBooks, 3 Better Alternatives to SWOT Analysis for Business Planning, FRESHBOOKS (June 10, 2024), https://www.freshbooks.com/hub/other/alternatives-to-swot-analysis.
[48] PESTLEanalysis Team, 5 Alternatives to SWOT Analysis Tackling its Weaknesses, PESTLE (Mar. 4, 2023), https://pestleanalysis.com/alternatives-to-swot-analysis/.
[49] *Infra* Appendix, Flexible Packaging End Markets.

Analyses: Operations

Selected Approach Introduction: Short & Long Term

As discussed in the "Benchmarking Framework" section, store drop off and curbside pickup options already exist in Ann Arbor.[50] While these initiatives have played a role in supporting recycling efforts, there is significant potential to enhance them by expanding the range of materials collected and improving overall collection efficiency.[51] The team ultimately landed on a recommendation to build upon these existing programs to further enhance recycling efforts in the city.

According to the team's benchmark and SCORE analysis,[52] expanding the current store drop-off program presented a viable short-term solution for recycling flexible films. This approach can leverage the existing infrastructure and consumer familiarity in Ann Arbor, making it relatively easy to implement further improvements. Stores can enhance their collection programs and form new partnerships with end markets, providing more flexibility in recycling options. The widespread awareness of store drop-off locations such as Meijer [53], Kroger, Target, and Whole Foods among Ann Arbor residents is a significant advantage, potentially leading to even higher participation rates. Our recommendation is to expand the current program and increase community awareness to maximize its effectiveness.

For the long term, the team found that enhancing the existing curbside pickup system for flexible film recycling offered a more streamlined and potentially more effective solution. Ann Arbor already has a curbside pickup program in place, providing a strong foundation for improvement. By further integrating flexible film recycling into the municipal waste management system, convenience and ease can be prioritized for residents and potentially increase participation rates. Upgrading the current curbside pickup system to better handle flexible films will necessitate substantial infrastructure development, close collaboration between local government, waste management companies, and recycling facilities, as well as accommodating the associated hefty costs. While some investment may be necessary, the long-term benefits could include higher recycling rates, reduced contamination of other recyclables, and a more comprehensive approach to plastic waste management in Ann Arbor.

This analysis highlights key short- and long-term solutions for enhancing recycling infrastructure in Ann Arbor. The following sections provide a detailed examination of the steps involved in product collection, sorting and processing considerations, and flexible packaging end markets to support the implementation of these recommendations.

[50] *Supra* Benchmarking Framework.
[51] David Fair, *Issues of the Environment: Improving recycling rates and quality of recycling materials in Washtenaw County*, WEMU 89.1, https://www.wemu.org/show/issues-of-the-environment/2022-07-27/issues-of-the-environment-improving-recycling-rates-and-quality-of-recycling-materials-in-washtenaw-county (last visited Nov. 6, 2024).
[52] *Supra* Benchmarking Framework; *supra* SCORE Framework.
[53] Video Conference Interview with Erik Petrovskis, Director of Environmental Compliance and Sustainability at Meijer (July 24, 2024).

Product Collection

The results of the benchmarking analysis as discussed in the Benchmarking Framework section is seen in **Table 1** below.

Table 1. Benchmarking for collection methods

Criteria	Weight	Store Drop Off	Curbside Pick Up	Recycling Center Drop Off	MRF Revitalization	Subscription Services
Cost ($-$$$)	1	0	+	0	-	-
Customer participation	2	0	+	-	+	-
Implementation	3	0	-	0	-	0
Transfer of collected materials	2	0	+	0	+	+
Total		0	2	-2	0	-1

The highest rated collection method was curbside pickup and the lowest was recycling center drop off. However, when considering the context of Ann Arbor and timelines of installation, the team decided to suggest a short-term and a long-term solution for flexible packaging collection. Short-term is considered to be within the next five years and long-term is considered to be greater than five years.

In the long term, a curbside pickup program with supportive funding from local governments and grants had the best score of all collection methods, landing positively for its ease of customer participation (simply putting bins at the end of the driveway) and transfer of collected materials (flexibles inherently sorted from other recyclables upon pickup). However, this method poses high implementation costs and processes, making it less feasible in the immediate.

Revitalizing a MRF by upgrading sorting technologies is a good option for ease of sorting and customer participation but was found to have costs in the millions of dollars, as discussed in the proceeding “Sorting and Processing Considerations” and “Cost-Benefit Analysis” sections. It is assumed that funding these upgrades would take a significant amount of time, so it was determined to be a long-term option.

A short-term collection method was chosen as an immediate alternative to curbside pick-up. While recycling center drop-off had a low score in the framework seen in **Table 1**, in the context of Ann Arbor, it was found that residents are more willing to adopt flexible packaging recycling practices.[54] Additionally, a recycling drop-off center exists in Ann Arbor, making this option suitable for the area in the short term.

The store drop-off collection method served as the baseline for this analysis. There were many store drop off programs in existence, Meijer being one in the Ann Arbor area. Via store

[54] *Supra* note 18.

drop-off methods, the onus is on customers to bring in their own plastics when they visit the store, while the end market, sorting, and funding is already determined by the store, making it a viable short-term option.

For the selected short-term method of expanding drop-off programs at stores and recycling centers, flexible plastics and films will be collected by customers bringing their materials to the designated location. From here, the drop-off location has the option to develop their own system of sorting that the customers will interact with (e.g., keeping all types of plastics together or separating plastics based on their type). The product will be collected and sorted by the customers themselves at the drop-off location, then sent to the end market by the drop-off location.

For the selected long-term approach of a curbside recycling program, the materials are first collected on a household basis in bins at each residence that participates in curbside waste management. Then, the product is collected on a by-municipality basis by the recycling entity of the respective location, Recycle Ann Arbor in this case, at the recycling facility through consolidation of all recyclables collected. Recycle Ann Arbor will determine how the flexible packaging is sorted depending on the end markets being utilized. As stated, it may be more beneficial for recycling rates to shift responsibility of collection of plastics as specific as flexible packaging and films onto Recycle Ann Arbor or other recycling administrative entities as residents may be unwilling to do so themselves.

Sorting & Processing Considerations

Sorting Considerations:

The sorting stage of the flexible plastics recycling recovery process helps to concentrate the specific type of plastic arriving at a sorting location and maximize its volume. A higher volume that is accurately sorted at this stage yields higher results for recycling opportunities in the next stages of the process. While challenges exist, in an ideal state sorting can be done either at MRFs or flexibles can arrive pre-sorted through opportunities like the Hefty Renew program.[55]

Challenges present in the sorting process primarily result from inefficiencies found with the sorting infrastructure. Partner interviews and secondary research suggested that manual sorting brings high labor-intensive costs to this stage of the process, while machine sorting faces issues with films getting tangled in flat sorting machines.[56] While 3D sorting could bring potential efficiencies, high-cost barriers exist.[57] Sorting technologies are also one of the largest factors impacting total greenhouse gas (GHG) emissions within MRF operating processes.[58] Finally, the capacity by which MRFs can hold sorting capabilities is low: only about 40 of the over 200 MRFs in the Great Lake Region (about 20%) are able to sort films and flexibles.[59]

Partners indicated the bright spots that show promise for elevating the sorting stage. Pre-sorting, such as through the Hefty Renew program, can help cut down manual labor or machine time used for sorting flexibles when mixed with the regular recycling stream upon arrival at MRFs.[60] Advanced sorting technology that uses artificial intelligence (AI) also shows promise, with learnings to come from a leading MRF in Columbus putting this advancement to use.[61] Robotic sorting can also cut down on manual labor and enhance sorting efficiencies and has been invested in by Ann Arbor as of 2022.[62]

Processing Considerations:

The processing stage of flexible plastics and film recycling infrastructure is highly complex, encompassing both pre-processing and processing steps. Pre-processing involves cleaning the plastics to enhance their quality, removing contaminants through shredding and preparing them for more intensive recycling. This step addresses issues such as diverse contaminants, composite materials, and environmental concerns related to water use.

The processing stage further refines these cleaned materials using both mechanical and chemical recycling methods, covered previously in the Current State section.

Currently, a streamlined processing stage for flexible plastics does not exist within Ann Arbor's recycling infrastructure. Challenges arise from the high energy demands of advanced recycling methods and the need for significant capital investment to scale operations.

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[55] *See infra* Appendix A.
[56] Video Conference Interview with Jen Ronk, Sustainability & External Engagement, NAA Packaging & Specialty Plastics and Dow Mentor, Dow Inc. (April 5, 2024).
[57] Video Conference Interview with Patrick Leahy, CEO, First Star Recycling (Aug. 30, 2024).
[58] Pressley et al., *Analysis of material recovery facilities for use in life-cycle assessment*, Waste Management, Jan. 2015, at 2.
[59] Video Conference Interview with Mark Fisher, CEO, Circular Great Lakes (Jul. 12, 2024).
[60] Video Conference Interview with Jen Ronk, Sustainability & External Engagement, NAA Packaging & Specialty Plastics and Dow Mentor, Dow Inc. (Mar. 29, 2024).
[61] Video Conference Interview with Jen Ronk, Sustainability & External Engagement, NAA Packaging & Specialty Plastics and Dow Mentor, Dow Inc. (Mar. 29, 2024).
[62] *Ann Arbor's new 'samurai sorting robot' is a plastics recycling game-changer*, Department of Environment, Great Lakes, and Energy (Dec. 28, 2022), https://www.michigan.gov/egle/newsroom/mi-environment/2022/12/28/ann-arbors-new-samurai-sorting-robot-is-a-plastics-recycling-game-changer.

Additionally, processing flexible plastics can result in variable-quality outputs, making it harder to establish consistent markets for recycled products.[63] Ann Arbor's recycling infrastructure is further constrained by logistical barriers, such as transporting collected materials to advanced recycling facilities like Alterra, which require flexible plastics to be pre-processed into specific forms.[64] Moreover, the limited integration of advanced sorting and pre-processing technologies further exacerbates these challenges, impacting the overall effectiveness of recycling efforts.

To address the recycling challenges in Ann Arbor, several processing considerations are essential. Ensuring that incoming flexible plastics are free from contaminants and meet quality standards is crucial for optimizing recycling efficiency. Effective pre-processing is necessary to address issues with contaminants and mixed materials, as demonstrated by First Star Fiber's efforts to improve material recovery.[65]

Energy consumption is a crucial consideration in the processing stage. While chemical recycling methods can be more energy-intensive, they may produce higher-quality outputs compared to mechanical recycling.[66] Balancing energy requirements with the quality of recycled materials is vital for optimizing overall efficiency. Additionally, minimizing the environmental impact of recycling processes is essential. Integrating renewable energy sources[67], such as solar power, and adopting closed-loop systems[68] can help reduce negative environmental effects, supporting broader sustainability goals.

Establishing strong markets for recycling outputs, such as Alterra's synthetic crude oil, is crucial for the economic sustainability of recycling operations.[69] A reliable market ensures recycled materials have value. Solutions include improving pre-processing partnerships, increasing chemical recycling for hard-to-recycle plastics, and collaborating with local processors. These strategies aim to streamline and support Ann Arbor's sustainability goals, ultimately enhancing the effectiveness of recycling flexible plastics and benefiting the MRF.

[63] Mona Arnold et al., *Challenges related to flexible plastics*, European Environmental Agency, Sep. 2022, at 5.
[64] Video Conference Interview with Kelly Ng-Feng, Business Development Advisor, Feedstock, Alterra (Aug. 19, 2024).
[65] Video Conference Interview with Patrick Leahy, CEO, First Star Recycling (Aug. 30, 2024).
[66] *See* Harish Jeswani et al., *Life cycle environmental impacts of chemical recycling via pyroliysis of mixed plastic waste in comparison with mechanical recycling and energy recovery*, Science of the Total Environment, Jan. 2021, at 3.
[67] Mitchell K. van der Hulst et al., *Greenhouse gas benefits from direct chemical recycling of mixed plastic waste*, Resources, Conservation & Recycling, 2022, at 9.
[68] *Advanced Recycling: The Future of Circular Plastic*, SEE, https://www.sealedair.com/resources/blog/closed-loop-advanced-recycling.
[69] Video Conference Interview with Kelly Ng-Feng, Business Development Advisor, Feedstock, Alterra (Aug. 19, 2024).

Flexible Packaging End Markets

The current and well-known limitation on recycling more flexible plastics and films is the lack of available end market solutions.[70] This problem exists because of the low overall value of the product stemming from the quality of materials collected and limited options to turn collected materials into a new product.[71]

To assess options for end markets near Ann Arbor, the team used a 500-mile radius[72] to be cognizant of logistical constraints as well as ensure the selected solution does not in turn create more pollution to produce a recycled product. From research, there were seven identified end market options for collectors to contract or their trash haulers to connect with. The one exception for this radius being an end market solution in Tennessee, 540 miles outside Ann Arbor, but the company is looking to expand their operations and advanced recycling methods to reduce environmental impacts despite being outside the radius.[73]

One option was not recommended over another as the selected end market depends on a number of factors such as cleanliness of plastics and film collected; amount collected; desire to receive the product the plastics are recycled into; location; and cost. While there is not one single recommended end market, there are three companies which do take or appear to take contaminated plastics and are well within 500 miles of Ann Arbor: East-Terra, Bright Mark, and Alterra. The ability to take contaminated feedstock reduces the cost of ensuring the products are free of contamination which in turn diverts increased waste and increases circularity. These entities also take a wide spectrum of plastics, which helps plastics collection entities by reducing the need to sort out which plastics and films can be sent to the selected end market.

What these end markets have in common is that they turn the collected materials into recycled products within their own operations. For the advanced recycling locations they are received by the end market, processed, and recycled into a new product all in one. They then leave the end market to re-enter the economy as a new product. This is different from mechanical recycling which does require the recycled product to be sent somewhere after it is broken down into plastic pellets to go back into the economy. This means the product can go back into the economy without having to travel to another location to turn into a usable product, limiting additional sources of environmental pollution. However, the team recognizes that for smaller entities with collection programs or entities dependent on the trash haulers to get flexibles and films to an end market, these choices may not be viable.

The SCORE Framework also helped to identify potential courses of action for each identified end market. The Efforts category highlights clear paths forward to establish partnerships with these entities as well as identify the minimum amount of feedstock collectors must have before sending their recyclable materials to the end market for processing and/or recycling.

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[70] Chris Musso et al., Beyond the bottle: Solutions for recycling challenging plastics, McKinsey & Company (Nov. 14, 2022), https://www.mckinsey.com/industries/chemicals/our-insights/beyond-the-bottle-solutions-for-recycling-challenging-plastics.

[71] *See* The Recycling Partnership, *Addressing the Challenge of Film and Flexible Packaging Data for The Recycling Partnership's Film and Flexibles Coalition*, 1-19 (Feb. 2021), https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2021/04/FF_Whitepaper_final.pdf.

[72] Video Conference Meeting with Amcor and Dow Mentor (July 31, 2024).

[73] Eastman, https://www.eastman.com/en (last visited Sep. 9, 2024).

Marketing & Communications

Growth & Adoption Strategy

The implementation of a flexible film recycling solution requires a strategic approach that addresses both short-term and long-term goals. Initially, the focus will be on leveraging existing store drop-off programs, which offer a quick and relatively easy-to-implement solution. This approach leverages consumer familiarity and the ability of stores to establish their own collection programs and partnerships with end markets.[74]

To begin, a comprehensive mapping of potential risks is essential. This includes identifying challenges such as consumer participation, data collection difficulties, and the decentralized nature of store-specific end market selection. Addressing these risks will involve developing robust communication strategies and establishing standardized reporting mechanisms across participating stores.

A critical component of the adoption strategy is increasing awareness and educating consumers on proper plastic separation. This will involve creating clear, consistent messaging across all participating stores and collaborating with local municipalities to ensure cohesive communication. Educational campaigns could include in-store displays, social media outreach, and community workshops to demonstrate the importance of flexible film recycling and the correct methods for separating these materials from other recyclables.

As the program grows, partnerships with end markets will play a crucial role. Potential partners like Novolex Bag-to-Bag Recycling, NexTrex, and East-Terra Plastics each offer unique strengths and challenges. For instance, Novolex's proximity to Ann Arbor is advantageous, but their focus on specific types of plastic bags may limit the range of materials they can process. NexTrex's national recognition and acceptance of various plastic sources make them an attractive option, but they may face capacity challenges as participation in store drop-off programs increases.[75]

Our proposed growth strategy will involve gradually expanding the types of flexible films collected and the number of stores participating. This expansion will require continuous evaluation of end market capacities and the development of new partnerships. As the program scales, a critical question remains as to whether advanced recycling will remain a viable option for sustainably recycling a variety of plastic types. We have identified a number of advanced recycling options within a 500-mile radius of Ann Arbor, which can help scale the project immediately.[76]

Transitioning to the long-term goal of curbside pickup will require significant infrastructure development and coordination with local waste management systems. This shift will involve working closely with material recovery facilities (MRFs) to upgrade their sorting technologies to effectively handle flexible films. The transition period will continue to see a hybrid model where store drop-offs coexist with pilot curbside pickup programs in select areas. We do not envision store drop-off programs ever ceasing to exist. Throughout this process, regular data collection and analysis will be crucial for measuring progress, identifying bottlenecks, and making informed decisions about program expansion. This data-driven

[74] *Supra* Benchmarking Framework; *supra* SCORE Framework.
[75] *Supra* Benchmarking Framework; *supra* SCORE Framework.
[76] *Supra* Benchmarking Framework; *supra* SCORE Framework.

approach will also help in demonstrating the program's success to stakeholders and securing additional support and resources for further growth.

By carefully navigating these steps and continuously adapting to the new inputs, this strategy can evolve from a store-based initiative to a comprehensive, community-wide solution that significantly reduces plastic waste and promotes a more circular economy.

Recommendations

We recommend a short- and long-term solution to address increased recycling of flexible plastics and films. In the short term, we recommend increased use and expansion of store drop-off programs because of these stores' pre-existing relationships with end markets. While exploring this transition, we recommend a long-term approach to review whether the Ann Arbor MRF can be upgraded. If it can, we recommend these upgrades to ensure that curbside recycling of flexibles and films can take place. The desirable end state is a hybrid system in which store drop-offs continue to operate and function but, customers also have the ability to recycle in curbside carts which allows Recycle Ann Arbor and the City of Ann Arbor to handle all sorting and processing needs.

In our conversations with MRF administrators, it was revealed that there is a deep disconnect between those who manufacture plastics and those who are able to process it as either recycling or, often, as waste. The innovations in the industry happen at a much faster rate than the MRFs can keep up with, in terms of equipment and processing knowledge, making it difficult for successful plastics recycling to occur. Thus, it is important to bridge the gap between these two key players in the design process to understand the entire lifecycle of the materials. By doing so, plastics can be designed to be more easily recycled or have a more profitable end market. We recognize that Amcor is deeply rooted in the plastics industry that serves as an important contributor to plastic packaging and can play an important role in this effort.

In the original scope of this project, there were stretch deliverables of developing consumer education materials to educate the public about flexible plastics recycling. Given the short-term collection approach of utilizing existing drop-off facilities and programs, further steps could include developing educational frameworks to encourage consumers to participate in flexible packaging recycling. For the long-term collection approach of upgrading MRF technology to handle flexible packaging and films, it may be advantageous to explore which specific technologies may be useful to implement in Ann Arbor given the end markets given in the SCORE framework.

These recommendations and next steps, combined with these report findings and continued partner collaboration, will help bring Ann Arbor closer to realizing a circular future for flexible plastics.

Appendixes

Appendix A: Hefty ReNew Program
Appendix B: SCORE Framework Analysis

Appendix A

The **Hefty ReNew™ Program**, originally launched as the Hefty® EnergyBag® Program, aims to address the challenge of recycling hard-to-process plastics. These materials, such as foam takeout containers, plastic cutlery, and certain food packaging, are often excluded from traditional curbside recycling streams due to their difficulty in processing. The program offers a straightforward solution by providing Hefty ReNew® orange bags, which participants use to collect these plastics.[77]

Once filled, these bags are placed alongside regular recyclables and sent to facilities that specialize in transforming the collected plastics into useful products such as plastic lumber, park benches, or even alternative fuels used in cement production. The Hefty ReNew™ Program helps divert millions of tons of plastics from landfills, promoting sustainable practices and advancing circular economy principles.

To participate, individuals purchase the Hefty ReNew® bags, fill them with accepted plastics, and place them in their regular curbside recycling bins or drop-off centers. The bags are designed to keep plastics separate, minimizing contamination with other recyclables and ensuring that the materials are properly processed into valuable resources.

[77] *Hefty ReNew* Program, HEFTY, https://www.hefty.com/products/hefty-renew (last visited Nov. 25, 2024).

Appendix B

SCORE Framework Analysis

End Market Solution	Location(s)	Strengths	Challenges	Opportunities	Relationships	Efforts
Alterra[78] Advanced Recycling	Akron, Ohio 190 miles from Ann Arbor	Proximity to Ann Arbor Plant is at commercial scale and uses a proprietary solution to breakdown plastics in an environmentally friendly way Can hold about 1 million pounds of plastics in their facility Multiple uses for oil that is created to be able to be used in various markets Accepts plastic types 2, 4, 5, 6, 7	Similar logistics challenges Does not accept plastic types 1 & 3 Assume more expensive due to potential costs for collector to arrange drop-off ($$)	Licenses their technology globally for others to use Partners with energy companies, governments, investors Companies can send feedstock inquiries directly to Alterra online	Some level of relationship with Dow Unclear number of overall customers in Great Lakes Region	Recommended course of action: Determine how much feedstock is required for Alterra to partner with entities Determine logistics requirements for getting feedstock to Alterra

[78] ALTERRA, https://alterraenergy.com/how-we-do-it/ (last visited Sep. 9, 2024).

Brightmark Circularity Centers[79] Advanced Recycling	Ashley, Indiana 123 miles from Ann Arbor	Proximity to Ann Arbor Diverts waste and reduces reliance on virgin plastics Takes all kinds of plastics Takes plastics from recycling programs, MRFs, and "other regional suppliers	Unclear at this time how to establish relationship to send collected materials to Brightmark Unclear who takes control of the logistics process to transfer collected materials Assume more expensive due to potential costs for collector to arrange drop-off ($$)	Partners with local community to expand circularity efforts Open to new partnerships and developing new solutions Depending on collection amount necessary for partnership with Brightmark, may allow for smaller entities to create or own collection point and transfer plastics to the Circularity Centers	Some level of relationship with Dow Unclear number of overall customers in Great Lakes Region	Recommended course of action: Determine how to partner with Brightmark Determine how much more collected plastics they have capacity to take on Determine if all Circularity Centers have the same capabilities
East-Terra Plastics[80] Mechanical Recycling	Yorktown, Indiana 217 miles from Ann Arbor	Proximity to Ann Arbor Location is 10 minutes from I-69 making drop off of collected plastics easy and efficient	Requires collection locations to develop a relationship with East-Terra and create a logistics plan to transfer collected	Can collect and process contaminated plastics Developing an online inventory control system that allows clients to	Has relationships with commercial and industrial businesses; hospitals/medical labs; municipalities and solid waste districts; manufacturers/retailers; educational facilities; and more	Recommended course of action: Determine how resource intensive it is to provide East-Terra with

[79] BRIGHTMARK, https://www.brightmark.com/circularity-centers (last visited Sep. 9, 2024).
[80] EAST-TERRA PLASTICS, https://www.east-terra.com/about.html (last visited Sep. 9, 2024).

		Processes plastics received from clients and turns it into feedstock for domestic companies Large facility for storage and production Has automated processing lines to separate, clean, decontaminate, and dry plastics in tons per hour	materials BUT East-Terra does some lifting in this planning	track their materials from start to finish Assume low cost due to ability to clean collected plastics and support from East-Terra for coordinating logistics ($)		collected materials

Eastman Chemical[81] Advanced Recycling	Kingsport, Tennessee 539 miles from Ann Arbor	Utilizes molecular recycling technology to turn collected plastics into original monomers Can recycle 110,000 metric tons annually “Materials can be recycled an infinite number of times instead of downcycling or sending them to landfill, incineration, or into the environment”	Achieved initial operating capability at scale in March 2024 Proximity to Ann Arbor Potentially higher cost due to distance from Ann Arbor, but similar costs for collection points near Eastman ($$$)	Has a community partnership program which entities collecting plastic could potentially utilize In the process of building more recycling facilities around the world	Unclear number of overall customers in Great Lakes Region	Recommended course of action: Determine if a molecular recycling option is preferred Determine how many entities Eastman can receive materials from at this point in time Determine the process for sending collected materials to Kingsport, TN

[81] EASTMAN, https://www.eastman.com/en (last visited Sep. 9, 2024).

NexTrex[82] Mechanical Recycling	Multiple Locations; contracts with multiple store drop-off programs	Proximity to Ann Arbor Widely known and used across the nation Accepts bails of plastics collected by numerous sources Has options for smaller entities or individuals	Only accepts two kinds of PE plastics - 2 & 4 Plastic must be free of all contaminants Requires healthy participation in store drop off programs which have established relationships Potentially high cost for "grassroots" recyclers ($$$)	Ability for more stores to implement store drop off programs For smaller entities, NexTrex offers a Grassroots Movement Project Assume low cost for grocery and retail stores ($)	Meijer is a big partner for NexTrex Has established relationships with grocery stores and retailers around the Great Lakes Region	Recommended course of action: Collect data on how much Amcor packaging is sent to NexTrex
Novolex Bag-to-Bag Recycling[83] Mechanical Recycling	Multiple Locations; closest to Ann Arbor are locations in Illinois and Indiana	Proximity to Ann Arbor Collects store drop off bags and turns them into reusable plastic bags for	Appears to only turn grocery store bags (in multiple varieties) into recycled bags	Opportunity for local grocery stores to use recycled plastic bags in lieu of virgin products Assume low cost for grocery and retail stores ($)	Unclear number of overall customers in Great Lakes Region	Recommended course of action: Potential to develop a new relationship to create a

[82] NEXTREX, https://nextrex.com/view/commercial, (last visited Sep. 9, 2024); NEXTREX, https://nextrex.com/view/grassroots, (last visited Sep. 9, 2024); NEXTREX, *participating film and bag recycling partners*, 1-2, https://nextrex.com/jsfapp/cdocs/20231201223810_9_jsfwd_493_q2_1.pdf.
[83] NOVOLEX, https://novolex.com/hilex-poly/#:~:text=Our%20facility%20processes%20plastic%20bags,the%20Novolex%20commitment%20to%20sustainability., last visited Sep. 9, 2024).

		purchase or resale to stores	Unclear whether contaminated plastics are accepted			redundant end market outlets