

SWARTHMORE COLLEGE

ZERO WASTE PLAN

June 2022

Swarthmore College Zero Waste Working Group

Patti Braun, Senior Buyer, Facilities
Anthony Coschignano, Assistant Vice President, Auxiliary Services
Alex Danovitch, Nothing Left to Waste, Consultant
Tyrone Dunston, Director, Environmental Services
Andy Feick, Associate Vice President, Sustainable Facilities Operation & Capital Planning
Adam Glas, Garden Supervisor, Grounds
Richard Green, Associate Director, Dining Services
Kyra Hall '22, Student, Green Advisor Student Coordinator
Clare Hyre, Associate Director of Sustainability, Office of Sustainability
Chris Kane, Director of Procurement, Purchasing Office
Oswaldo Morales Solorzano '21, Sustainability and Engaged Scholarship Fellow
Christopher Proctor, Manager of Administration, Environmental Services
Chantal Reyes '22, Student, Senior President's Sustainability Research Fellow
Cynthia Shi '23, Student, Green Advisor
Susan Smythe, ADA Program Coordinator and Senior Project Manager, Facilities

With additional contributions from
Terrence Xiao '20, Tyler White '22, and Elizabeth Drake, Office of Sustainability

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Executive Summary

The 2022 Zero Waste Plan is the culminating effort of many members of the Swarthmore College community, written by the members of the Zero Waste Working Group (ZWWG). It highlights the College's zero waste commitment, which is deeply tied to our pursuit of environmental and social justice. Additionally, it demonstrates the College's commitment to addressing the current climate crisis and the disproportionate impacts waste (and climate change) has on communities of color and low-income neighborhoods. The 2022 Zero Waste Plan (ZWP) sets out to do three things:

1. Review current zero waste operational systems and educational programming on campus and highlight zero waste achievements since 2017.
2. Acknowledge the zero waste framework set up by the [2017 ZWP](#) and provide an updated zero waste definition, guiding principles, and goals for Swarthmore College waste management moving forward.
3. Identify the key zero waste strategies necessary to achieve new zero waste goals by 2035.

Objective 1: Review current zero waste operational systems and educational programming on campus, highlight achievements since 2017

Planning for zero waste requires both a strong vision and bold actions. From 2014 to the present, the College has focused its waste efforts on building accountability and a strong foundation for zero waste systems on campus. From 2017 to 2022 there have been numerous updates to the campus waste operational systems and educational programming, and many accomplishments. The full list is detailed in the 2022 Zero Waste Plan, and includes investments in infrastructure and containers to ensure recycling and composting are accessible at all buildings on campus and can be safely collected by EVS staff; zero waste trainings at new student, faculty and staff orientations; transitions to contracts that provide more accountability and transparency; and innovative programs like Worthmore, reusable utensils and takeaway container pilots, and hosting the annual waste characterization study.

While there is still work to be done to meet our goals, the concerted efforts of the ZWWG have helped the College's diversion rate grow significantly since 2016. Currently, 41% of trash is diverted to recycling and composting, representing a 30% increase in diversion rates between 2016 and 2022.

Objective 2: Provide an updated definition of zero waste, develop guiding principles and goals

In 2022, as part of the process of developing the ZWP, the ZWWG adopted an official definition of zero waste, and defined goals, guiding principles, and key strategies for the College as it continues to work towards achieving zero waste.

The [Zero Waste Institutional Alliance](#) defines zero waste as: “the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or

human health¹.” This international, peer-reviewed definition was formally adopted by the ZWWG in 2022. We consider having a standard definition of zero waste a key part of the College’s plan, in order to help align our zero waste goals and guiding principles with the unique perspective of Swarthmore College as a leader in environmental stewardship and social justice.

Additionally, in 2022 the ZWWG adopted the following principles to guide decision-making processes around zero waste strategies and implementation. The guiding principles are to:

1. Consider employee safety and ergonomics in all decisions.
2. Work to maximize the positive environmental impact of efforts, including reduction, reuse, and diversion.
3. Engage the whole campus community to create inclusive strategies with ongoing education.
4. Align efforts with the carbon neutrality commitment.
5. Align efforts with the College’s long-standing commitment to social justice on campus and in the surrounding community.
6. Utilize a data-driven and life cycle analysis approach.

This plan also includes a revision of the campus’ zero waste goals. While the 2017 ZWP identified a goal of reaching an intermediate 80% diversion rate by 2022, our waste characterization study results have shown that the current campus diversion rate has leveled off at 41% over the last several years. The impacts of Covid-19 and the increase in single-use packaging due to takeout dining certainly affect campus waste streams; however, these were not the only reasons the College was unable to reach its intermediate diversion rates. In 2022, the ZWWG determined that additional time is needed to implement the strategies required to increase diversion rates. We also determined that, in addition to a diversion rate target, the College’s zero waste goals should include reduction, education, and engagement targets. The revised goals are shown in the table below.

Updated 2022 Zero Waste Goals			
	2022	2030	2035
1. Embed Zero Waste into Campus Culture			
Measure engagement and education successes			
2. Secondary Per Capital Reduction Goal			
Set Baseline Municipal Disposal Volumes (contingent on data availability, ETA 2023)			
Reduction from Baseline Per Capita MSW Disposal (including Trash, Recycling, Composting Streams)		15%	25%
3. Diversion Goal			
Previous Diversion Goal	80%	90%	

¹ <https://zwia.org/zero-waste-definition/>

Revised: MSW Diversion Goal (including Trash, Recycling, Composting Streams)		80%	90%
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The zero-waste commitment has been codified through the adoption of an internationally peer-reviewed definition of zero waste, the development and adoption of guiding principles in relation to zero waste planning and implementation, and updated zero waste goals, including engagement, reduction, and diversion. With these pieces in place, the ZWWG and the campus community can align around the development and implementation of strategies needed to meet measurable goals.

In order to achieve the revised zero waste goals, the Zero Waste Working Group recommends prioritizing the implementation of existing initiatives over the next one to three years. The initiatives include:

1. Updating zero waste goals, metrics, and definitions
2. Encouraging educational and behavioral changes by:
 - a. Increasing campus-wide education around the multifaceted reasons to engage in zero waste
 - b. Tying in broader topics of environmental justice, human health, and climate change to zero waste educational programming on our campus
 - c. Promoting more educational campaigns targeted towards reusables, such as the reusable takeaway container program and reusable utensil set giveaways
 - d. Continuing rescue programs like Worthmore Free Store and the campus move-in/move-out process
3. Making process change and infrastructure investments, such as:
 - a. Implementing campus-wide data tracking system across all three waste streams and with additional conditions including financial, carbon, and social impact
 - b. Continuing the transition to campus-wide reusable dining takeaway containers
 - c. Systemizing internal waste movement and collection systems, and creating an efficient sorting system
 - d. Consolidating or eliminating visits from waste-haulers to campus
 - e. Restructuring all solid waste agreements and contracts to incentivize zero waste
 - f. Assessing staffing capacity and resource needs to provide operational and educational zero waste and support.

Objective 3: Identify the key zero waste strategies necessary to achieve zero waste by 2035.

Listed below are the short-term, mid-term, and long-term prioritized strategies identified by the ZWWG. In addition to listing the strategies, the diversion impact and estimated greenhouse gas (GHG) impact is also included, to show how linked implementing the strategies are to the College's reaching its zero waste goals. In essence, by moving forward with these specific strategies we will be able to achieve our zero goal within our proposed timeline.

Specific Strategies	Short Term	Mid Term	Long Term	Estimated Diversion Impact	Estimated GHG Impact (MTCO ₂ e)
BASELINE (current)				40.7%	-456.2
Education to increase participation		X	X	8.27%	-120.5
Education to reduce and reuse	X	X	X	3.95%	-173.7
Education to increase diversion to recycling and composting	X	X	X	9.6%	-175.4
Implement increased data tracking and reporting	X			NA	NA
Invest in reusable infrastructure and systems		X	X	7.2%	-204.8
Diversion infrastructure and systems		X	X	3.03%	-35.48
Assess staffing capacity and resource needs throughout the implementation of the ZWP	X			4.8%	-87.70
Institutionalize Zero Waste through definitions/goals	X			NA	NA
Implement Policies to Promote Reduction and Diversion		X		13.20%	-623.5
Actively participate in regional conversions and work around zero waste and env. justice			X	NA	NA
TOTAL DIVERSION	50%	77%	90.8%		
ANNUAL GHG REDUCTION (Measured in Metric Ton CO₂ equivalents- MTCO₂E)	-660.3	-1,580.5	-1,877.3		

Success in achieving the zero waste goals set for 2030 and 2035 is dependent on the investment and engagement in the work listed above. While the short-term goals are clear, this is a living document, and work will be done to ensure continued engagement to address new opportunities and challenges that may arise throughout implementation.

Through this document, the ZWWG has laid out the goals for zero waste on Swarthmore's campus moving forward. It also provides an overview of the current zero waste systems on campus (both indoor and outdoor), highlighting updated data from the most recent waste characterization studies, and outlining the zero waste educational program and policies implemented across campus. Finally, it provides a prioritized list of opportunities to improve zero waste systems moving forward.

The ZWWG will provide periodic updates around zero waste work on campus, and benchmarks to engage the entire campus community. We recommend that an updated ZWP is written every five years and shared

with the campus community, both for feedback and to establish the necessary buy-in required to implement the suggested zero waste strategies. While the ZWWG plays an essential role in the management and oversight of programs, it will take investment from the entire campus community to reach these ambitious but important goals.

Section 1: Background

A. Land Acknowledgement

Swarthmore College sits on the traditional lands of the Lenape (name meaning *original people*), who were also called Lenni-Lenape and Delaware people. At this time, the Land Acknowledgement Task Force and the Swarthmore College administration are working on an official Swarthmore College Land Acknowledgement, which is forthcoming. The contents of the official Land Acknowledgement will be included in this document as soon as it has been made official and public.

B. 2017 Zero Waste Plan

Swarthmore's first [Zero Waste Plan](#) was written by the Zero Waste Working Group (ZWWG) in 2017, and was the first-ever summary of the College's waste management practices and changes that had occurred since 2015. It was also an early attempt to articulate a comprehensive vision for ongoing and future improvements. The 2017 plan was written during the 2016-2017 academic year, and many of its goals are based on findings from the 2016 Waste Characterization study. Its purpose was to guide the College to reach its Zero Waste commitments, which at that time consisted of reaching an 80% diversion rate by the year 2022, and then moving towards a 90% diversion by 2030. Diversion is a consistent theme throughout the 2017 Zero Waste Plan, and Swarthmore's waste diversion rate is defined as the percentage of our waste stream that is diverted from incineration - how much we throw away that is recycled or composted instead of thrown into the trash. The 2017 Plan was designed to achieve two long-term objectives:

- Create a zero-waste campus - one in which no trash is sent from campus to the incinerator or landfill (in other words, a close to 100% diversion rate). This includes reducing Swarthmore's environmental impact on the community and creating a long-term process for continuous improvement of Swarthmore's waste management.
- Educate the Swarthmore community on ways to minimize their waste footprint via their on and off-campus actions and engender an awareness of their actions and impacts on the environment.

Additionally, the 2017 Zero Waste Plan provided a series of recommendations for the college to implement moving forward. The recommendations include:

- Hiring a Zero Waste Manager
- Expanding compostables collection
- Building an on-site In-Vessel composting system
- Focusing on up-stream waste management
- Expanding exterior waste collection systems

While the College has yet to achieve its 80% diversion rate by 2022, much has been done to standardize waste systems across campus and across operations. Likewise, an educational program around zero waste has been a key objective of the Zero Waste Working Group, and something that continues to need attention. The 2017 key recommendations identified by the ZWWG have either been implemented, are in progress, or extensive research has concluded that the recommendation is not viable at this time.

Since the publication of the 2017 Plan, much work has been done to formalize the Zero Waste Working Group, to better define zero waste, and imbue an understanding of and commitment to environmental justice into the College's zero waste efforts. In sum, the Zero Waste Working Group sees this 2022 document as a more comprehensive and more forward-thinking engagement plan.

[Appendix B: Where We Started: 2017 Zero Waste Plan & Earlier Work](#)

Section 2. Updated Zero Waste Framing

A. Swarthmore College's Zero Waste Commitment

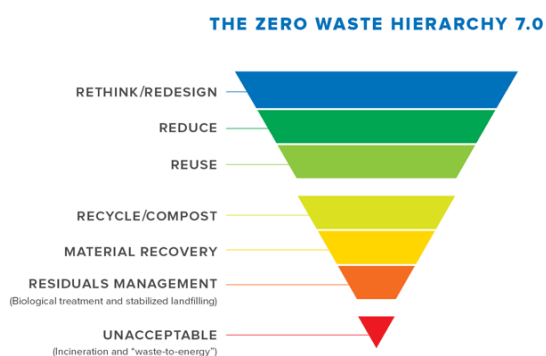
Swarthmore College's zero waste commitment is deeply tied to the College's pursuit of environmental and social justice, as well as a commitment to addressing the current climate crisis through a just transition that reflects the currently disproportionate impacts waste (and climate change) has on communities of color and low-income neighborhoods. As described below, zero waste strategies are among the fastest and most cost-effective approaches to both reducing greenhouse gas emissions and mitigating the direct harms of waste.²

When done right, zero waste can be a powerful tool that goes well beyond diversion to address climate change and social justice. Historically, wasting has disproportionately impacted communities of color and low-income communities, and in Delaware County, all waste is delivered to the country's largest incinerator, located just 6 miles from the college campus in a predominantly Black community. And while carbon reductions are often focused on transportation and energy use, when you look at it through a systems-based approach, 42% of Greenhouse Gas (GHG) emissions in the US come from the products and food we consume³. Zero Waste can address the entire system of consumption; from what resources are extracted to make products, to how far products are shipped, to how products and packaging are designed for durability and reuse, and finally, to how products are ultimately disposed of.

Zero waste is a journey, not a destination. Given the complex life cycle of the items we discard, diversion

²[STOP TRASHING THE CLIMATE](#)

³[Opportunities to Reduce Greenhouse Gas Emissions through Mat](#)



alone is not a fully accurate measure of impact. Each material and product has unique impacts both upstream in extraction, manufacturing, and transportation and downstream where it is ultimately discarded. Even within recycling or composting streams, the way that material is handled and the final product it is made into can vary between vendors and can result in significantly different (and potentially harmful) impacts on the environment and communities.

The Zero Waste International Alliance (ZiWA) Zero Waste hierarchy, lists from highest to lowest, the best use of materials. Its goal is to provide additional guidance to those who wish to develop systems that move us closer to zero waste, and is a more in-depth guide than the standard 3Rs (Reduce, Reuse, Recycle). This distinction between diversion and zero waste is important to recognize in order to understand how diversion in itself is a target, not a goal. The international, peer-reviewed definition of zero waste is: “The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health⁴.”

Achieving zero waste is not synonymous with reaching a 100% diversion rate. The Zero Waste International Alliance (ZiWA) notes that “the since the mid-1990s, international and US organizations have used 90% or more diversion from incineration and landfill as the equivalent of Zero Waste. This is considered Zero Waste even if some materials - 10% or less, would still be wasted.” Using this framework, the first Zero Waste Plan in 2017 kickstarted the work of the College towards achieving an interim goal of an 80% diversion rate in 2022, and 90% in 2030. Swarthmore College and the Zero Waste Working Group (ZWWG) continue to use the guiding framework that reaching a 90% diversion rate is considered achieving zero waste, but also recognizes that achieving zero waste also goes far beyond reaching diversion rates.

Since the first zero-waste plan, the Zero Waste Working Group at Swarthmore College has been developing the critical foundations needed to successfully scale the campus’ zero waste programs. This work includes the development of education and zero waste training programs, sustainable purchasing policies, installation of campus-wide tri-bin waste systems, the purchase of trucks and compactors to manage waste internally and improved contracting with key recycling and composting vendors, and the development of financial strategies that incentivize zero waste initiatives. As a result, we’ve seen our diversion rate (based on weight for indoor trash, recycling, and composting containers) grow from 32% in 2016 (the first year a waste characterization study was conducted) to 41% in 2019, with a significant reduction in contamination. Since 2019 however, the diversion rate has remained level. With the planned completion of operational transitions by late 2022, now is the time for the adoption of a renewed Zero Waste Plan that will galvanize the campus community around the importance of zero waste to increase participation, prioritize actions that most efficiently move us closer to our goal, and establish values-based metrics to benchmark impact.

⁴ <https://zwia.org/zero-waste-definition/>

B. Impacts of Zero Waste

1. Environmental Justice and a Just Transition

Swarthmore College is located in Delaware County, Pennsylvania, home of the nation's largest incinerator run by Covanta. Controlled through a contract with the Delaware County Solid Waste Authority, all commercial and residential waste in the County is required to be delivered to the Covanta incinerator. Unfortunately, the incinerator is the [largest source of pollution](#) in Delaware County and one of the largest in eastern Pennsylvania. As 80% of the population within a mile of the incinerator is Black, and 98% of the waste is coming from outside of the community, there is serious environmental injustice that disproportionately impacts the predominantly Black community in Chester.

The importance of a zero waste strategy is amplified by the significant environmental justice impacts of both extraction and disposal investments in the region, and the need for a Just Transition. As defined by the International Labor Organization (a specialized agency of the United Nations) the term “Just Transition” means “greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities, and leaving no one behind.” Additionally, “a Just Transition involves maximizing the social and economic opportunities of climate action while minimizing and carefully managing any challenges – including through effective social dialogue among all groups impacted, and respect for fundamental labor principles and rights.” As an institution that contributes to the systems of disproportionate exposure to waste management pollution in Chester, the College should develop an actionable strategy that recognizes tangible ways that build and create new systems.

Zero waste reduces both the need for extraction of resources and the disposal of waste, an essential step to take in addressing these harmful practices prevalent in our community. In the case of Swarthmore College, the College’s Zero Waste efforts focus on reduction and diversion in order to reduce reliance on incineration and landfilling as methods of waste disposal, recognizing that such processes perpetuate environmental racism, as well as contribute to the global climate crisis.

[Appendix F: Social Justice](#)

2. Zero Waste and Carbon Reductions

a. Systems-Based Greenhouse Gas (GHG) Approach

According to the EPA, the products and food we consume equates to 42% of the total greenhouse gas emissions in the US when you include the upstream impacts of extraction, manufacturing, distribution, usage, and end of life accounts for⁵. To achieve these benefits, however, requires a drastic disruption of our current linear, “take -make- waste” model of consumption where we extract resources, make them into a product, and throw the product away at the end. Instead, the college must focus on reduction and reuse where possible, which eliminates the need for extraction, manufacturing, and transportation. For products that can’t be immediately reduced, discards should be recycled through a circular approach, which decreases the demand for extraction and saves energy in manufacturing. Because recycling on its

⁵ [Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices](#)

own will never completely eliminate the need for extraction, manufacturing, and transportation, recycling alone can not get the institution to zero waste. The upstream emission reductions associated with reuse and recycling make zero waste a vital strategy in reducing carbon emissions quickly and cost-effectively.

2. Highest and Best Use

After reduction, recycling and composting are an important bridge strategy that keeps waste out of the incinerator while we continue to develop systems that further reduce discards. Recycling has the largest carbon reduction impact when it is made into a product that can be recycled over and over again. Not every recycling facility sends recycling for the same use. For instance, many recyclers use glass as an alternative to daily cover in a landfill instead of making glass back into a bottle that can be recycled over and over again. Plastics are perhaps the most problematic material for circularity in that it is most often made into lower-grade products like carpet backing, drainage piping, or cheap promotional products that can't be recycled again. These factors should go into the decisions the college makes, both on what recycler to work with, and what types of products and packaging should be prioritized for purchase on campus, to ensure that recycling truly provides a quantifiable environmental impact as opposed to using the acceptance of recycling in a single stream as a justification for unsustainable consumption.

3. Methane

Methane is a particularly harmful greenhouse gas released when organic material anaerobically decomposes (without oxygen), like in a landfill. Over a 20-year time frame, methane is 72 times more potent than CO₂, a particularly salient point when considering the short window identified in the IPCC⁶ report to reduce our emissions before climate catastrophe. Composting all organic waste (food, non-recyclable paper, bioplastics) is critical to reducing methane emissions. Composting also has the advantage of further sequestering carbon and creating fertilizer that can displace petroleum products in food production. Like recycling, all compost processing is not equal and a deeper exploration of how the site composts and what the finished compost is used for will impact potential carbon reductions.

C. Zero Waste Definition, Guiding Principles, and Goals

As part of the process of writing the current Zero Waste Plan, 2022 the current Zero Waste Working Group adopted an official definition of zero waste, and defined goals, guiding principles, and key strategies for the College as it continues to work towards achieving zero waste.

An international, peer-reviewed definition of zero waste by the Zero Waste Institutional Alliance is: “the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health⁷.” This definition was formally adopted by the Zero Waste Working Group in 2022. We consider having a standard definition of zero waste a key part of this plan, as

⁶ <https://ilsr.org/wp-content/uploads/2008/06/keyfindingsandpolicies.pdf>

⁷ [Zero Waste Definition](#)

it will help to align our zero waste goals and guiding principles with the unique perspective of Swarthmore College as a leader in environmental stewardship and social justice.

Additionally, in 2022 Swarthmore's Zero Waste Working Group adopted the following principles to guide decision-making processes around zero waste strategies and implementation.

1. Consider employee safety and ergonomics in all decisions.
2. Work to maximize the positive environmental impact of efforts, including reduction, reuse, and diversion.
3. Engage the whole campus community to create inclusive strategies with ongoing education.
4. Align efforts with the carbon neutrality commitment.
5. Align efforts with the College's long-standing commitment to social justice on campus and in the surrounding community.
6. Utilize a data-driven and life cycle analysis approach.

This plan includes a revision of the campus' zero-waste goals. As described in the following sections, the current campus diversion rate has leveled off at 41% over the last several years. The impacts of covid and the increase in single use packaging due to to-go dining was certainly a factor. However, the ZWWG determined that additional time is needed to implement the strategies required to increase diversion rates and that the goal should also include reduction and education and engagement targets. The revised goals are shown below.

Updated 2022 Zero Waste Goals			
	2022	2030	2035
1. Embed Zero Waste into Campus Culture			
Measure engagement and education successes			
2. Secondary Per Capital Reduction Goal			
Set Baseline MSW Disposal Volumes (contingent on data availability, ETA 2023)			
Reduction from Baseline Per Capita MSW Disposal (including Trash, Recycling, Composting Streams)		15%	25%
3. Diversion Goal			
Previous Diversion Goal	80%	90%	
Revised: MSW Diversion Goal (including Trash, Recycling, Composting Streams)		80%	90%

The zero-waste commitment has been codified through the adoption of an internationally peer-reviewed definition of zero waste, the development, and adoption of guiding principles in relation to zero waste

planning and implementation, and the updated zero waste goals; including engagement, reduction, and diversion. This critical step allows the campus community and ZWWG to align around the development and implementation of strategies needed to meet measurable goals.

[Appendix D: Evaluation Criteria for End Markets \(Recycling and Compost\)](#)

Waste Prioritization Criteria

D. The Zero Waste Working Group

While led primarily by Environmental Services (EVS) and the Office of Sustainability, zero waste strategies on campus require cooperation across many departments and impact the entire campus community. To reflect the commitment needed for success, the Zero Waste Working Group (ZWWG) is a committee with members representing a broad swath of the campus community. It meets year-round, with rotating student membership and staff/community membership added as needed depending on current projects. Its formation has contained membership from students, staff, faculty, alumni, local residents, and a zero waste expert consultant. The Zero Waste Working Group is chaired by the Office of Sustainability's Associate Director, as well as the Assistant Vice President for Auxiliary Services, and reports to the Ecosphere Executive Committee, which is chaired by the Director of Sustainability.

The Zero Waste Working Group is driven by collaborative relationships between offices across the College. As of 2022, this includes representation from

- Auxiliary Services
- Communications
- Facilities & Capital Projects
- Environmental Services
- Grounds
- Office of Sustainability
- Purchasing
- Students

2021- 2022 members of the Zero Waste Working Group are:

- Patti Braun, Senior Buyer, Facilities
- Anthony Coschignano, Assistant Vice President, Auxiliary Services
- Alex Danovitch, Nothing Left to Waste, Consultant
- Tyrone Dunston, Director, Environmental Services
- Andy Feick, Associate Vice President, Sustainable Facilities Operation & Capital Planning
- Adam Glas, Garden Supervisor, Grounds
- Richard Green, Associate Director, Dining Services
- Kyra Hall '22, Student, Green Advisor Student Coordinator
- Clare Hyre, Associate Director of Sustainability, Office of Sustainability
- Chris Kane, Director of Procurement, Purchasing Office
- Oswaldo Morales Solorzano '21, Sustainability and Engaged Scholarship Fellow
- Christopher Proctor, Manager of Administration, Environmental Services

- Chantal Reyes '22, Student, Senior President's Sustainability Research Fellow
- Cynthia Shi '23, Student, Green Advisor
- Susan Smythe, ADA Program Coordinator, and Senior Project Manager, Facilities

[Appendix A: Zero Waste Working Group Members and History](#)

E. Zero Waste Achievements: 2017 - 2022

Planning for zero waste requires both a strong vision and bold actions. From 2014 to the present, the College has focused its waste efforts on building accountability and a strong foundation for zero waste systems on campus.

Accomplishments include:

- Distributing standardized recycling, compost, and trash tri-waste bin containers across campus.
- Standardizing signage across tri-bin waste containers at indoor locations across campus.
- Constructing two zero waste compacting stations for trash and recycling.
- Developing comprehensive educational programming for all first-years during orientation.
- Creating a year-round composting program with student employees to help sort contamination out of the stream.
- Constructing an all-weather, sheltered compost sorting facility.
- Strengthening contractual arrangements for increased consolidation of waste on campus.
- Investing in capital investments for collection infrastructure that supports the reduction of truck traffic, operational cost efficiency, and increased diversion, including a vehicle with a ParKan Easy Dump attachment, compactors, and carts.
- Launching an annual Waste Characterization Study.
- Supporting student and alumni-driven pilot programs and research around key zero waste challenges.
- Integrating annual distribution of reusable utensil kits to all first-year students during orientation.
- Launching a pilot program for reusable takeout containers through Sharples Dining Hall.
- Developing and maintaining campus free-store (Worthmore) that works in coordination with an annual move-out program and repurposed materials that would otherwise be disposed of in the trash.
- Creating college-wide policies and guidelines for purchasing, campus catering, and events to move towards more sustainable and zero-waste practices.
- Developing contractual requirements for Construction and Demolition (C&D) recycling.
- Building systems for reporting and tracking of key waste streams across campus (in progress).

While there is still work to be done to meet our goals, the concerted efforts of the ZWWG have helped the College's diversion rate grow significantly since 2016. Currently, 41% of trash is diverted to recycling and composting, representing a 30% increase in diversion rates between 2016 and 2022. This Plan attempts to share the development of current zero waste systems on campus since 2017, including both the primary and secondary waste streams that stem from both our indoor and outdoor waste operations on campus.

Section 3: Primary Waste Streams

This document considers municipal solid waste (including trash, recycling, and compost) as the primary waste stream on campus. There are many additional streams that the campus tracks including; electronic waste, yard waste, hazardous waste, and construction waste. These other streams are considered “secondary waste streams” in this report and are described in Section 3.

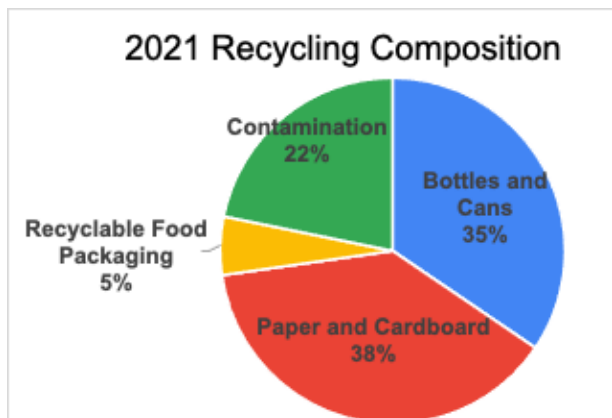
A. Recycling

What’s included:

Recyclables are collected in a “single-stream” and include paper, cardboard, glass, metal, and plastic containers. Details of items included are listed [here](#). In an effort to increase accountability of where products go after they leave campus, Swarthmore College has chosen not to include everything accepted by their recycling processor, instead of limiting materials in the program to items that meet the college’s goal in recycling. In general, this means that items sent to recycling are ultimately used as feedstock in manufacturing a new product and do not include waste to energy. The college is transitioning away from “wish-cycling” products on campus and will be updating signage across campus to reflect changes. Wish-cycling is a term that refers to putting something in the recycling bin and hoping it will be recycled, even though there is little evidence to support the assumption.

Composition:

Recycling is primarily composed of bottles and cans, cardboard, and mixed paper. The 2021 Waste Characterization Study composition shows that 22% of material in the recycling was not recyclable. This is known as the contamination rate in the recycling stream. The contamination included items that should have been placed in the trash or compost stream instead.



Where does it end up?

In 2019, Swarthmore went through an extensive process, including touring facilities and an RFP, to identify standards for recycling companies with whom we might contract. After an open bidding process, J. P. Mascaro & Sons was selected on the basis of cost, location, data transparency, worker safety (Material Recovery Facilities (MRFs) are one of the most dangerous workplaces in the US), and more. Mascaro has worked together to meet the College’s goals around transparency and the highest and best use of material collected, reflected in a contract that includes requirements to report on the composition of the stream and a list of end markets for the items recycled.

B. Composting

What's included:

Compostable items include food waste (including meat and oils), non-recyclable papers, compostable plant-based service ware, and other organic matter. The facility the material is currently self-hauled to, Kitchen Harvest, can accept most Biodegradable Products Institute (BPI) certified compostable service ware products, with the exception of Polylactic Acid (PLA) straws and utensils.

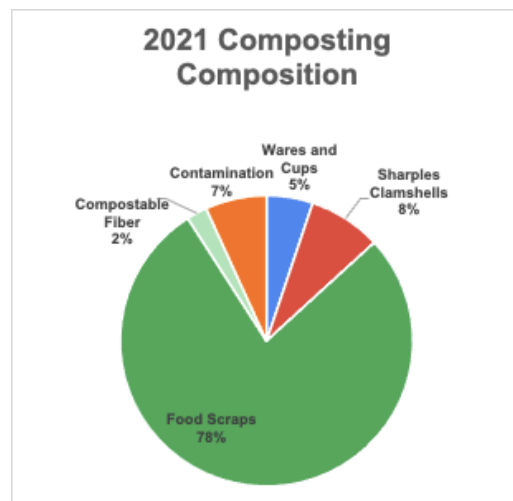
The facility is a small, community composting operation, which has little ability to handle contamination. To address this, the Office of Sustainability hires Green Advisors (student sustainability liaisons) and Compost Interns to sort through the post-consumer compost to remove any non-compostable materials, prior to delivery to the end market. Pre-consumer food waste is also collected from the Dining Hall, Sharples, but does not require sorting prior to hauling.

Composition:

The 2021 Waste Characterization Study shows that the organics stream is primarily made up of food waste and compostable fibers (paper towels and napkins). About 17% of the stream is currently made up of compostable food packaging (compostable clamshells, hot and cold compostable cups, and paper straws).

Where does it end up?

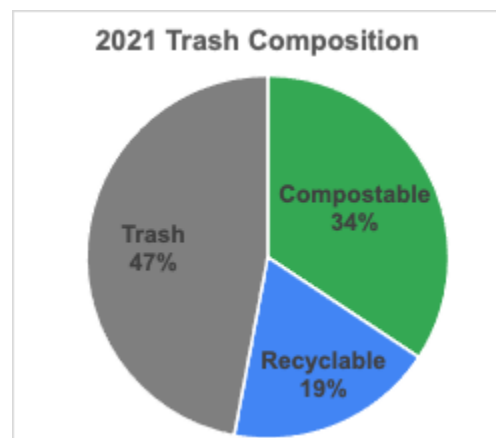
Campus compost is delivered locally to a community-scale composter, Kitchen Harvest, located at Linvilla Orchards in Media, PA (5 miles from Swarthmore). A new contract was executed in 2021. Kitchen Harvest uses composting practices with minimal fossil-fuel inputs (relying on high heat in large compost piles, called windrows, to decompose materials), and offers a healthy and safe work environment. The close location and mission alignment of Kitchen Harvest make them a great collaborative community partner. The Zero Waste Working Group has designated a small Compost Task Force to monitor the regional emerging composting market and onsite processing technology to explore additional opportunities to further the college's zero waste goals. A report produced in 2021 affirmed that the current vendor, Kitchen Harvest, is still the most viable option for the college.



C. Trash

What's in it:

There is a tremendous opportunity to reduce the amount of material currently going in the trash stream. Over half of the trash stream is recyclable or compostable in the current systems on campus. 34% of what is found in Swarthmore's waste streams are compostable items and 19% are recyclable items. The remainder of the waste is primarily non-recyclable plastics, food-contaminated recyclables, and bulky items that can be best addressed through purchasing or reusing systems. Of particular note during the time of the Covid-19 pandemic, the Waste Characterization Study showed that 27% of the waste found in trash was food packaging.



Where does it end up?

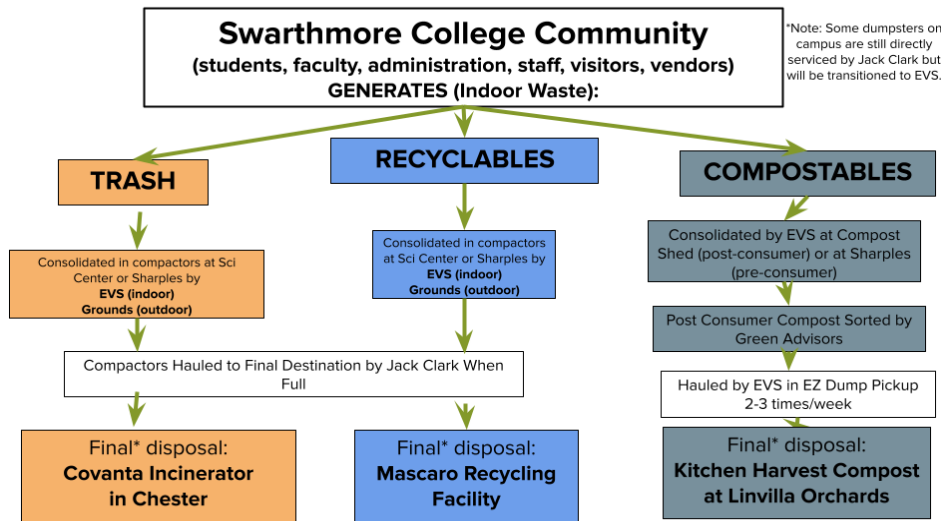
Swarthmore's trash is required to be burned at an incinerator in Chester, PA operated by Covanta (7 miles from Swarthmore) as part of an agreement between Swarthmore Borough and Delaware County Solid Waste Authority.

Data about the composition of our three waste streams is mainly collected through our annual Waste Characterization Study, but where it goes has been established through rigorous research and RFP process. To understand more about how indoor waste operations (managed by Environmental Services) and outdoor waste (managed by Grounds) review the section below.

[Waste Characterization Report](#)
[Appendix E: Regional Market Place and Policies](#)

Section 4: Current Flow of Primary Waste on Campus

A. Indoor Waste Streams



Based on the number of containers and frequency of collection on campus, over 95% of the waste on campus is collected indoors. As of Fall 2019, compost bins are located in every campus building as one part of the tri-bin, standardized ‘waste stations’ including trash, recycling and compost. The graphic above shows how the primary discard stream flows through campus. Each step is described in further detail below.

Each compost bin is lined with a green compostable bag, recycling uses a blue liner, and trash uses a clear liner. The bags are brought outside the building by EVS cleaning staff each morning. All bags of compost are placed in designated totes where they are picked up by EVS technicians and transported to the compost shed where Green Advisors hand-sort non-compostables out of the compost stream. This material is then transferred by EVS to Kitchen Harvest in Linvilla.

Trash and recycling currently leave campus via one of two methods. About 34% of the trash and a small amount of the recycling stream is collected by Jack Clark directly in small dumpsters located at specific locations across campus. The remainder is consolidated by EVS into compactors at centralized locations. Once the compactor is full, a contractor hauls this material directly to Covanta (for waste material) or J.P. Mascaro (for recycling material) for processing.

Swarthmore College is currently in the process of transitioning away from contract haulers collecting material from *dumpsters* on campus and towards a system where EVS staff will consolidate all streams from each building on campus to *compactors* for transfer by contract haulers to processing locations in compactor loads.

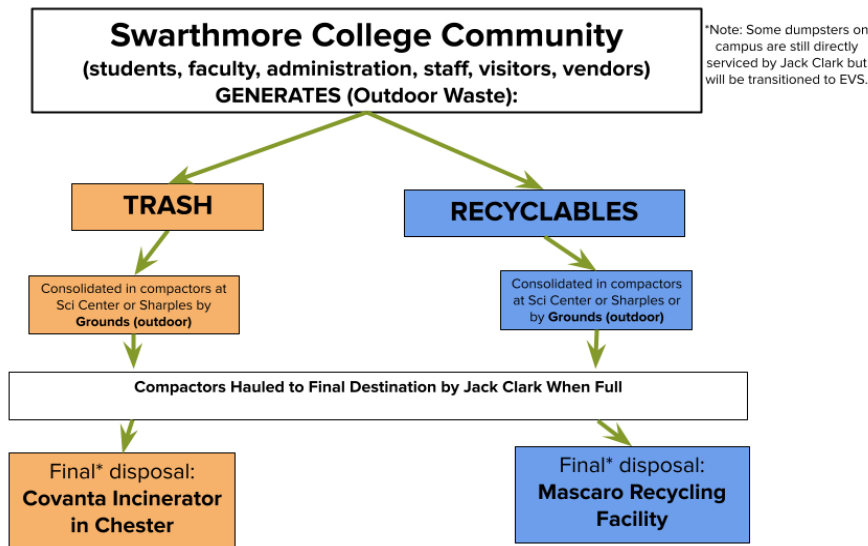
The goals of this transition are:

- Increased transparency: By contracting directly with an end market, the College can direct where the material goes based on their zero waste goals, increase reporting and feedback and ultimately, ensure that recycling and composting are not sent to an incinerator due to decisions made by hired contractors.
- Reduced Truck Emissions and Noise: The EVS crew's smaller pickup style truck or utility cart reduces truck traffic on campus as well as emissions from the daily rear-load dumpster service (whether dumpsters are full or not) to call-in service only when compactors are full.
- Improved efficiency: The new system of carts allows the material to be collected across campus less frequently and compacted for higher hauling density.
- Improved ergonomics and worker safety - the use of a semi-automated truck with a cart lifter, reducing the lifting of bags from the ground.
- Cost-Effective and full utilization of capital: As EVS had to invest in collection systems for buildings inaccessible to contract haulers, it makes sense for EVS to use that equipment to service all buildings, rather than pay for redundant services, which is a net cost saving.
- Cart System: The cart system eliminates the need for color-coded bags, eliminates issues of bag breaking and reduces the need for unsightly bags on the ground (collected in piles outside of buildings by EVS members cleaning the buildings) that attract rodents.
- Flexibility and Access: The truck does not require a CDL, allowing multiple staff to be trained as backups. It also allows the potential to direct haul streams to close locations if needed or desirable.
- More accurate waste hauling data: Daily rear load dumpster service does not provide measured data about waste volume or weight whereas compactor service provides measured weight tickets.

The flow of collection includes:

1. EVS cleaning staff inside buildings bring material to toters located outside of the building.
2. EVS Staff picks up individual streams utilizing a Parkan Easy Dump insert on the back of a pickup truck with a built-in toter lifter or a utility cart.
3. Material is brought to a compactor in a centralized location for periodic collection and transfer to the final processing location (recycling, trash, or compost).

B. Outdoor Waste Streams



Outdoor waste on campus is managed by the Grounds department. Waste is collected by two, two-person crews via twice per week scheduled routes for a total of 20 labor hours/week. Additional collections come on demand if containers are full, often during nicer weather. Waste from the outdoor bins is collected in plastic liners that are swapped out at each container and washed before being replaced at the next route. During the pandemic, outdoor waste containers captured increased amounts of compostable to-go packaging, but overall the outdoor waste stream accounts for a small fraction of the waste collected on campus. Based on the number of containers and level of service at both indoor and outdoor locations, we estimate that 98% of waste is currently collected through the indoor system. Outdoor waste is collected by the Grounds Department and brought to the same consolidated compactor and/or dumpster locations that EVS uses to manage indoor waste.

Section 5: Financial Model For Indoor Waste Stream

The economics of waste are critical for ensuring a sustainable program through various market conditions and that financial, environmental, and social goals align. The operational transition described above creates a new financial model that incentivizes reduction and diversion through the following financial strategies. The current financial model (linked below), does not include the internal collection costs for outdoor containers incurred by the Grounds department. It does, however, include the cost of all vendors and subcontractors to transfer the material off-campus.

The system costs of waste on campus are broken down to:

- **Vendor Fees:** haulers that come on campus to haul the consolidated waste to trash or recycling destination and the associated tip fees or disposal costs

- EVS Labor: the fixed labor costs for EVS staff to operate the internal collection route and manage the transfer locations
- Capital and Operating Costs: The costs to purchase and operate the needed trucks, compactors, carts, and other equipment.
- Green Advisor Labor: Student workers play a critical part in sorting of post-consumer compost on campus prior to delivery to the compost site. This is due to the strict contamination limits of the compost processor.

System-wide costs are estimated at approximately \$328,695/year currently, with the opportunity to reduce that cost to \$235,694 through internalizing collection on campus and reducing vendor expenses. In addition, the model also provides important additional benefits:

1. Move to weight-based variable pricing. Fixed-priced contracts for all material on campus (the system the college is currently moving away from) are a monthly fee for managing all discards on campus. Variable costs contracts, that break out haul fees and charge per ton, provide cost savings as diversion increases or overall discards go down.
2. Decouple collection and processing of the material.
 - a. This takes the financial risk out of hauling, resulting in a fair price that doesn't have to hedge for market fluctuations in the value of recycling or fees for trash and compost.
 - b. By separating out the transportation cost and processing costs, the college is able to find the largest pool of potential vendors to bid on services. This increases competition and lowers costs, as there are only a few processing options, but many haulers available.
3. A revenue share formula for recycling provides the lowest long-term costs. Recycling fees are determined by the combination of two pieces. First, the cost to sort the materials into marketable grades, and second, the value that the material generates upon sale (or cost of disposal). Since the value of materials fluctuates with global markets, a revenue share formula that determines the price each month based on the value of materials ensures long-term fair pricing for both the vendor and the college.
4. Fully utilize capital. Since many buildings and locations on campus are not directly accessible to a dumpster (due to either trucking limitations or space for a dumpster), equipment was purchased for EVS to service those sites. Utilizing that equipment fully to service all buildings provides the greatest return on these investments.

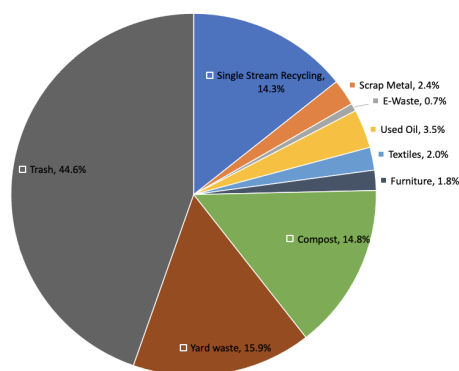
The Zero Waste Working Group develops a annual zero waste budget and submits it to the College through different departmental requests. The majority of request are made by the Environmental Services department and the Office of Sustainability. Other requests are made through Auxiliary Services or Facilities budgets. Any future funding needs must be brought forth and approved through the College's budgeting process.

Section 6: Secondary Streams

In addition to the trash, recycling, and compost streams described above, the college has several programs in place for other streams. These include:

- Yard Waste - Swarthmore College Grounds department manages and composts almost all plant material, except for those considered invasive or aggressive plants. Those plants are sent to the trash. For the majority of the year, the compostable materials are brought to bins behind the grandstands. Bins are separated based on materials, one side is for woody plant materials like branches or logs that could be turned into wood chips. These wood chips are then mixed together with leaf compost, and this is what is used for mulch across campus. The other bin is for all the plant material that cannot be chipped but can still be composted, such as perennials, weeds, turf, and additional leaves. Once the bins behind the grandstands are full, the chippable material gets chipped and the other compostable materials are taken to the nursery. These will be managed until they are usable on campus grounds. The Grounds department also collects leaves in the fall, and they utilize a [SCARAB](#) machine to break down the materials. The leaves are then combined with the collection efforts of Swarthmore Borough and Nether Providence Township and are available to all residents, for a fee.
- Electronic Waste, E-waste, is defined as discarded items that contain significant circuitry and/or batteries. The proper disposal of e-waste is critical due to the high recycling potential of its precious metals, and to mitigate the tremendous hazards of processing e-waste materials through incineration and landfilling. At Swarthmore College, e-waste and other hazardous waste, such as those produced in labs, are currently managed and collected by multiple departments, but overall tracked by the Environmental Health and Safety Officer. ITS, EVS, LPAC, and the Computer Science department all handle large amounts of e-waste. Eldridge Inc. remains the primary hauler utilized by the campus but other alternatives are being explored.
- Construction & Demolition Waste - Construction waste is not managed by the College, instead each contractor working with the college has its own waste plan which it submits to the College. The college's contracting requirements do list standards and metrics that each contractor is required to meet for tracking materials in both demolition and new construction. The contract details are listed [here](#) on pages 13-15. The amount of construction and demolition waste that is sorted and recycled in each project is submitted to the state by the college annually as part of a mandated report.
- Hazardous Waste & Special Recycling - Hazardous and special recycling materials are managed by the campus Environmental Health & Safety Officer. Eldridge Inc. currently picks up items every 180 days to ensure the College is compliant with removing this type of waste from campus.

Overall Campus Diversion Rate (not including construction and demolition)



- **Worthmore Free Store and Worthmore Move-Out** - Worthmore Free Store and Worthmore Move-Out are both well-known zero waste programs across campus and an integral part of Swarthmore's zero waste program. Like all students in transition, Swarthmore College students leave a lot of stuff behind when they move out of residence halls at the end of the academic year. In 2017, for example, Worthmore collected over 4,700 hangers, 100 lamps, 80 trash cans, and 60 fans. Other items that are collected in high numbers are binders, shower caddies, laundry hampers, books, and school supplies. The current Worthmore move-out process is primarily run by the Office of Sustainability, Environmental Services, the Office of Student Engagement, and students. Worthmore student workers collect donated items from numerous designated residential hall lounges across campus. By using lounges as a collection point, the issue of leaving EVS staff with the burden of transporting, sorting, and separating donations from trash is negated. Within student lounges, items are sorted into two groups. Items that are frequently needed by students will be brought to the Worthmore Free Store. Other items will be donated to charities through our off-campus hauler, [Green Drop](#). Additionally, donated items can be brought to the store throughout the academic year as well as during campus move-out.

The campus-wide diversion rate rises to 55% when including these secondary streams (not accounting for trash contamination in the recycling and composting streams). When including construction and demolition waste, the diversion rate goes higher but varies significantly from year to year depending on construction projects.

Section 7: Data & Metrics

Data tracking and evaluation metrics play a critical role in the successful implementation of zero waste strategies. To date, zero waste metrics have focused exclusively on diversion rate, the percent of material going to recycling and composting compared to incineration. This approach provided the best information at the time, given the extremely limited data available on how much of each waste stream leaves campus under the old system. Diversion rates were gathered through an annual waste characterization study where material from select buildings is sorted by staff and students on campus to provide a representative sample of diversion rate and composition year to year.

There are limits to using diversion rates as a goal since they don't measure net impacts on campus. For instance, increasing diversion rates do not necessarily mean that trash rates are decreasing. Increased consumption can easily outpace increased diversion resulting in more trash disposed of, even as diversion rates stay level or increase. In addition, reduction and reuse efforts can result in the displacement of items currently being recycled or composted (such as compostable to-go containers with reusable to-go containers), resulting in a decreased diversion rate even though the environmental impact is significantly higher with reuse efforts. An analogy could be measuring transportation impacts with a goal to reduce the number of car trips, but not measuring the length of the trip or the type of car driven.

There is a tremendous opportunity to increase the use of metrics that better quantify the intended impacts of zero waste (i.e. GHG reductions, toxicity, pollutants, costs, etc.) as the college moves to new systems of waste flow that provide more detailed data on the total annual weights of each waste stream (described in section 3 above). In this context, diversion rates are still important as a proxy for participation and to

provide analysis of potential future reductions. Total impacts, however, can be measured through a lifecycle approach that considers extraction, manufacturing, transportation, and disposal.

This plan recommends amending the current diversion rate goal timeline (80% by 2022 and 90% by 2023) and to consider the following additional metrics that help quantify the true climate and human health impacts of wasting:

- Life-cycle analysis that measures the greenhouse gas reductions in metric ton carbon equivalents for specific actions.
- Reduction of per capita waste disposal by benchmarking total trash volumes per capita. This allows for the quantification of not only diversion but also reduction, reuse, and changing consumption patterns.
- Economic goals that measure the financial savings of zero waste.
- Social measures that quantify impacts on the campus and neighboring communities.

Key uses of the data and metrics include

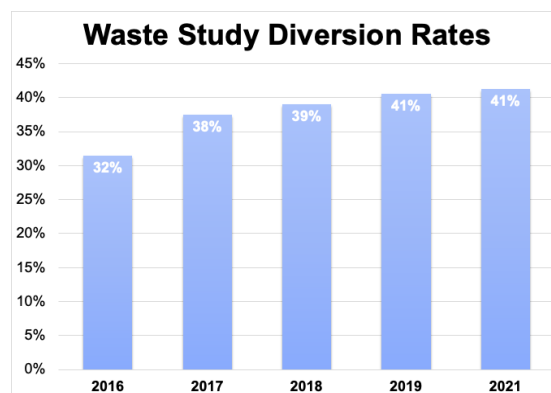
- Internal progress tracking: Data provides feedback on the effectiveness of implementation strategies and comparative analysis of investment options that result in the largest impact (rather than diversion alone).
- Pilot testing: Using pilot projects with well-established evaluation metrics is a cost-effective way to test strategies prior to campus-wide implementation.
- Budgeting: Projected amounts of materials leaving campus impact labor costs, transportation costs, and tip fees. These are important components for determining annual budgets.
- Reporting: Data is used to complete annual reporting needs. These reports allow the college to document their progress on zero waste to track internal progress and compare results to peer institutions. Currently, the College uses waste data for the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment and Rating System (STARS) report, Sightlines Greenhouse Gas (GHG) analysis, and the required annual recycling report for the Delaware County Solid Waste Authority (which reports to the Pennsylvania Department of Environmental Protection).

As a small institution, it can be challenging for Swarthmore College to have access to the necessary data required to inform waste processes and operations. There is limited information on the weights of the waste streams leaving campus. As EVS takes over more of the consolidation of the waste streams, the data will be much more accessible. The most detailed source of data is currently from the annual Waste Characterization Study, during which a week's worth of waste streams from 3-4 buildings is sorted into detailed categories. This provides an important benchmark for comparisons year to year, but it does not quantify the total volumes of waste leaving campus. There are several transitions that are taking place to increase the transparency and accuracy of this data, primarily the transition to centralizing and hauling all waste streams directly to recycling, compost, or incineration (described in section 3). However, the Waste Characterization Study is limited since it only reflects downstream impacts. Future use of Life Cycle Analysis (LCA) on materials moving through campus would provide us with a better understanding of our waste streams' full environmental impact. Additionally, creating systems that capture additional waste flows on campus will allow us to track the total waste stream per capita, and measure the impacts of reduction on campus.

Metrics Analysis

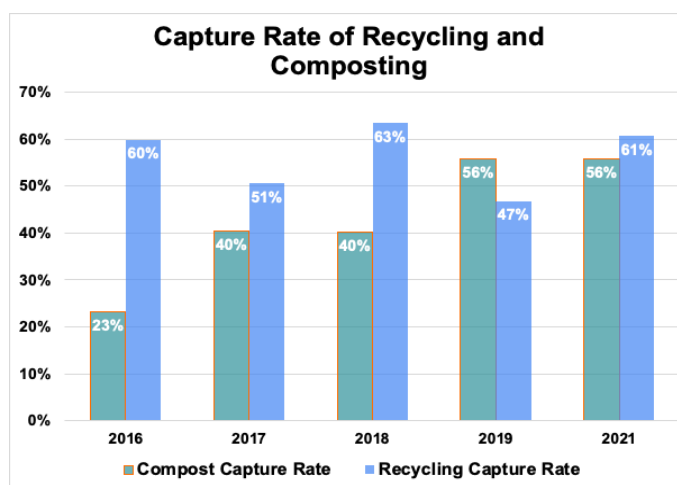
Using the data we do have available, some trends are clear relative to the primary waste stream (trash, recycling, and compost).

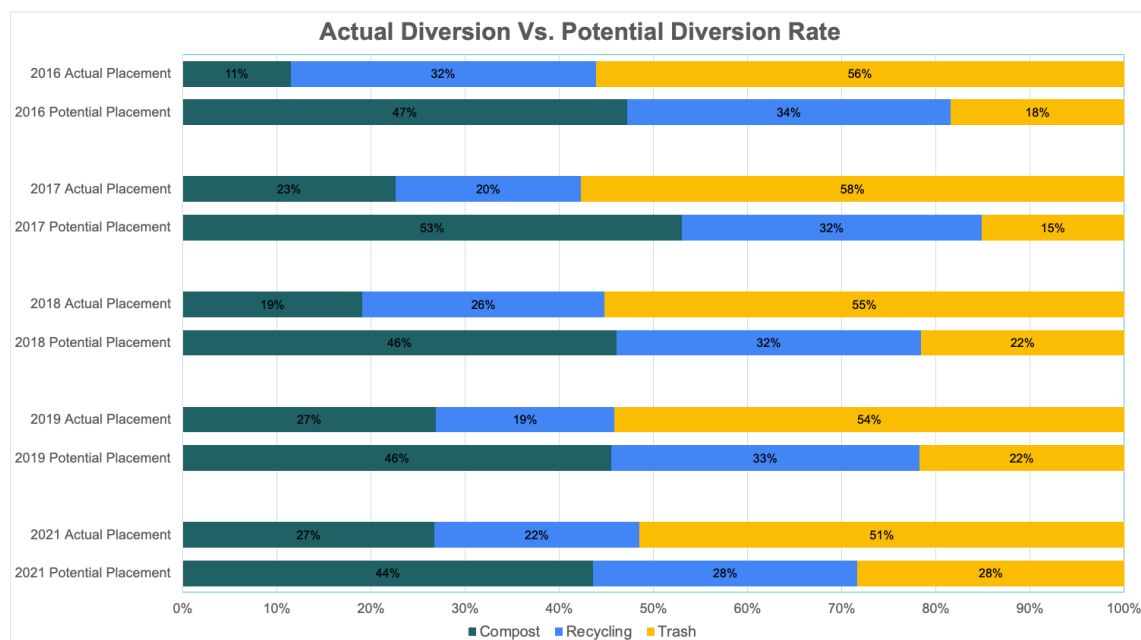
The “Waste Study Diversion Rates” chart shows how early growth in diversion rates have leveled off over the last few years at around 41%. This indicates that 41% of all waste discarded on campus is recycled or composted, with the remainder sent to incineration.



The “Capture Rate of Recycling and Composting” chart shows that only 56% of potentially compostable waste is composted on campus and only 61% of potentially recyclable waste is recycled. This shows that the college could almost double its diversion rate through the current collection infrastructure on campus. The key is motivating the campus community to participate by focusing education on “why” it’s important to participate rather than solely on “how” to participate.

The “Actual Diversion vs. Potential Diversion Rate” chart (below) shows that with composting and recycling alone, only 72% of the waste could be diverted in 2021. This number was consistently closer to 80% in previous years and may be indicative of the increase in single-use, non-recyclable packaging during the pandemic. As you can see in the “Reduction Potential from Single-Use Food Packaging” chart below, in 2022, over 20% of the waste stream was made up of single-use food products. This represented 28% of the trash stream after recycling and composting were removed. This may also be due to changes to what is and isn’t accepted by both our recycling and compost facilities, such as different types of plastics for recycling and industrial-grade compostable materials for our compost.





Reduction Potential from Single-Use Food Packaging				
	Compost	Recycle	Trash	Grand Total
bioplastics (cutlery and cups)	5.1%	2.7%	1.1%	2.5%
to-go dining clamshells (compostable)	8.1%	0.1%	2.0%	3.2%
recyclable food containers (thermoforms)	2.0%	5.4%	8.8%	6.3%
food package trash (plastic)	3.4%	3.1%	15.8%	9.7%
Total	18.5%	11.3%	27.7%	21.7%
Additional reduction potential from bag liners (plastic bags)				1.8%

In terms of meeting the 80% zero waste diversion goal, the data from the characterization studies can help inform what strategies should be prioritized. The fact that diversion rates have leveled off, while contamination rates have decreased, indicate that there is likely a segment of the population that does not participate in recycling or composting and/or only diverts certain items. While focusing on recycling and composting are important transitional tools toward zero-waste, new strategies to address consumption, purchasing, and participation will need to be implemented to reach the College's zero waste goals.

A focus on informing and inspiring behavior change is required for the campus to move forward with its diversion goals. This is indicated by the fact that some of the most basic recyclable or compostable items (bottles and cans, paper, food waste) are each diverted at roughly a 50% rate. Reduction of non-recyclable items to recyclable or compostable items is also a needed priority, as the use of non-recyclable or compostable items results in a large portion being improperly disposed of. For example, continuing to use

the compostable service ware that our community composter stopped accepting in 2020 resulted in 38% of those items being disposed of in the wrong stream.

Efforts to change behavior should include an emphasis on the positive benefits of reduction and reuse and the detrimental upstream impacts that trash creates downstream. Research conducted by the 2020 zero waste President's Sustainability Research Fellows (PSRFs) Chantal Reyes '22 and Tyler White '22, on changing behavior around zero waste suggested that providing a focus on the environmental justice impacts of consumption and disposal could be a powerful approach to increasing rates of accurate disposal of waste.

Along with efforts to increase the appropriate diversion of waste across campus and at events, efforts to reduce consumption as well as increase the reuse of items are critical. Approaches such as distributing reusable utensil kits at first-year orientation and offering reusable takeout containers at the Dining Hall, Sharples, provide alternatives to grab and go single-use options. Likewise, the campus free store (Worthmore) and the entire move-out process that is designed to capture lightly used items for reuse, provide the student body with free items for residential halls and classes.

Ultimately, increased campus-wide policies, both in terms of expectations for purchasing and discarding is a critical strategy when it comes to zero waste. Policies set standards, provide funding, and create mechanisms to incentivize participation. Policy, purchasing, and behavior change initiatives with a continued emphasis on zero waste education and infrastructure will move the campus towards its meaningful and impactful zero waste goals.

[Waste Characterization Report](#)

Section 8. Campus Engagement and Outreach



Since the completion of rolling out the tri-waste bin system in 2017, zero waste signage across campus has been a major component of Swarthmore's zero waste educational efforts and will continue to be an

important component of Swarthmore reaching its diversion and zero waste goals. Signage is included above all tri-waste bins throughout campus with clear color distinctions that match the colors of liners in the bins (green-compost, blue-recycling, and white-trash). In 2021, all tri-waste bin signage was updated to include changes to acceptable compostable items, and a bin inventory was performed. In 2021, the [buddy bins](#) system was also fully instated, reducing the amount of waste EVS collects from individual offices and allowing faculty and staff to individually consolidate their waste before placing them in the tri-bin systems for disposal. In the case that sorting questions arise, a complete [Waste Disposal Guide](#) can be found on the Office of Sustainability's website for reference.

The Zero Waste Working Group provides educational engagement with students on campus through the [Green Advisor](#) (GA) program. GA's lead zero waste training in residential halls and provide zero waste training at campus events, including Garnet & Alumni Weekend. GAs also works on a variety of zero waste initiatives through their partnership with Sustainability Advocates, who are staff and faculty who take a leadership role in the effort to create a sustainable campus. Green Advisors also promote zero waste on campus through social media, and through various residential peer leadership opportunities, like clothing swaps and composting events.

[President Sustainability Research Fellows](#) (PSRF) also provide significant leadership around zero waste on campus. PSRF projects include working on electronic waste management, zero waste signage, reusable takeout food container programs, and embedding equity and justice through zero waste initiatives on campus. Additionally, PSRFs also help organize the annual Waste Characterization Study, which helps the campus learn about the level of contamination in our current waste stream, determine its diversion rates and highlight areas for improvement.

Finally, the Zero Waste Working Group engages with faculty and staff through new staff orientation and visiting faculty departmental meetings.

Section 9: Campus Policies

Policies like the [Dining Campus Catering Policy](#) and the use of the [Green Events Guide](#) can lead to greater zero waste efforts with departmental activities and events. Swarthmore has a [Sustainable Purchasing policy](#) and works to continue to use the best practices in order to be a leader in sustainable purchasing. Additional policies will be discussed as part of the long-term strategies of the ZWWG, although policies were not identified as a strategy to be prioritized by the Zero Waste Working Group.

Section 10: Strategies to Achieve Zero Waste Goals

This Zero Waste Plan will prioritize reduction and move beyond a diversion focus, creating goals that are value-based. Prior to the implementation of the Zero Waste Plan, it is critical to have campus-wide alignment on the values and buy-in on the prioritization of implementation strategies. The Zero Waste Working Group has gathered the following potential strategies for implementation. The strategies are grouped into four broad categories and include estimated carbon impacts (shown in the impact analysis below). These strategies have been shared with members of the Zero Waste Working Group for initial

feedback and prioritization, and then shared with the border campus community for confirmation and by-in.

A. Behavior Change (Education and Outreach)

The waste characterization study shows the potential to significantly improve overall capture rates of all items in recycling and composting. Given the investments already made in clear signage and access to recycling and composting containers, education efforts must now focus on motivating the community to participate, inspiring the community on why zero waste matters. Education efforts will prioritize engagement around the urgency and need for zero waste with an emphasis on reduction.

Behavior Change (Education and Outreach)	
Strategy 1: Participation	Tie in broader issues of environmental justice, human health, and climate connection to waste*
	Increase participation in training
	Provide regular campus-wide communications and outreach about zero waste happenings
	Use Waste Characterization Studies (WCS) as a method of campus engagement
Strategy 2: Reduction and Reuse	Reduce paper use through double-sided copies and communal copy machines.
	Promote reusable containers pilot and reusable giveaways (focus on reusable utensils, takeaway containers, reusable bottles/cups, bags)*
	Continue the move in/move out process and the management of the campus free store (Worthmore)*
	Promote sharing of equipment across campus
Strategy 3: Diversion to Recycling and Composting	Provide special educational campaigns targeting bottles and cans
	Provide specific education campaign targeting target paper recycling
	Provide specific educational campaign targeting composting
	Provide specific education campaign on special recycle items/special collections

*Initiatives currently being developed or implemented by Zero Waste Working Group

B. Process Change/Infrastructure Investment

Investments in infrastructure and processes allow the college to address the systems that currently perpetuate waste. Zero Wastes systems will improve accountability through increased data tracking and allow the college to realize cost savings through reduction and diversion.

Process Change / Infrastructure Investments	
Strategy 4: Data Tracking and Reporting	Implement campus wide data tracking system (financial, carbon, human health, social justice)*
	Regularly publish key zero waste metrics
	Utilize a 3rd party zero waste certification program
Strategy 5: Reusable Infrastructure and Systems	Transition to offering reusable takeaway containers for the full campus at the Dining Hall, Sharples*
	Providing reusable dishes for campus events and departmental meetings
	Partnering on donation programs (food waste, textiles, moveout)*
	Partnering with departments to explore repair programs for bicycles, clothes, etc.
	Create a campus freecycle exchange program
	Expand water bottle refilling stations to all buildings on campus*
	Continue to improve and expand the Worthmore Free Store & the move-in/move-out process*
Strategy 6: Diversion Infrastructure & Systems	Develop internal waste movement, collection, and sorting efficiencies*
	Implement a special recycling initiative for plastic bags, styrofoam, etc.
	Restructure all solid waste agreements and contracts to incentivize zero waste*
	Consider outdoor bins placement and outdoor waste disposal systems*
Strategy 7: Staffing	Incentivize or reward Environmental Services (EVS) technicians who include zero waste in their outcomes
	Accessing EVS staff positions in order to handle campus waste consolidation*

*Initiatives currently being developed or implemented by Zero Waste Working Group

C. Policy Implementation

Policy can help align the campus community around the goals of zero waste and ensure the impact of waste is considered within relevant decision making structures.

Policy Implementation	
Strategy 8: Institutionalize Zero Waste At Swarthmore	Adopt an institutional definition of zero waste*
	Identify and adopt zero waste goals*
	Create a list of tangible, impact-based metrics for zero waste

	Implement a Life Cycle Analysis of products on campus to include upstream emissions
Strategy 9: Policies to Promote Reduction First, Than Diversion,	Develop purchasing policy standards (EPP)
	Include zero waste in vendor requirements (i.e. reusable packaging, take back programs, preference for local supply chains)
	Develop purchasing guidelines to minimize single-use plastics
	Create a zero-waste events policy*
	Identify methods and implement actions to eliminate packaging at athletic concessions and the College's campus store

*Initiatives currently being developed or implemented by Zero Waste Working Group

D. External Community Engagement and Role in the Just Transition

Decisions around products and food consumed on campus impact communities from extraction to disposal. Zero Waste is an opportunity to engage with broader communities on a multitude of issues including; environmental justice, climate change, human and ecosystem health, renewable energy, and worker equity.



External Community Engagement and Role in the Just Transition	
Strategy 10	Build regional zero waste infrastructure - Regional (Delaware County) Zero Waste Campus Collaboration*
	Engage in local and national conversations around shared zero waste values, goals, and efforts
	Engage with communities impacted by College's waste streams
	Work with the Swarthmore borough, county, and state on zero waste initiatives
	Build internal campus collaborations- engaging with other College initiatives that correlate with zero waste*

*Initiatives currently being developed or implemented by Zero Waste Working Group

E. Impact Summary of Zero Waste Strategies

Utilizing the Environmental Protection Agency (EPA) Waste Reduction Model (WARM) model and data from the waste characterization study, the following chart was created to show the potential diversion and greenhouse gas reduction projections associated with each strategy.

Relative cost and social impacts are estimated on a scale of 1-3.

Strategies	Impact Summary (Scale of 1-3)			Projected Diversion Rate (Including Reduction)	Projected Carbon Impact (MTCO ₂ e)
	Cost	Env.	Social		
Baseline				41%	-456
Behavior Change (Education and Outreach)					
Strategy 1: Increase Participation In Zero Waste	\$			8%	-120
Strategy 2: Promote Reduction and Reuse	\$\$			4%	-174
Strategy 3: Increase diversion	\$			10%	-175
TOTAL				22%	-470
Process Change / Infrastructure Investments					
Strategy 4: Tracking and Reporting	\$\$			NA	NA
Strategy 5: Reusable Infrastructure and Process	\$\$\$			7%	-204.8
Strategy 6: Diversion Process and Infrastructure	\$\$\$			3%	-35
Strategy 7: Assessment of Staffing	\$\$\$			5%	-88
TOTAL				15%	-123
Policy Implementation					
Strategy 8: Institutionalize Zero Waste	\$			NA	NA
Strategy 9: Policies to Prioritize Reduction	\$\$\$			13%	-623
TOTAL				13%	-623
External Community Engagement and Role in the Just Transition					
Strategy 10: Connect with broader community	\$			NA	NA
TOTAL				0%	0%
Net Total of All Strategies				91%	-1,877

Section 11: Prioritization & Next Steps

The Zero Waste Working Group recommends prioritizing the implementation of existing initiatives over the next 1-3 years:

- a. Update zero waste goals, metrics, and definition

- b. Education/Behavior Change:
 - i. Increase campus-wide education around the multifaceted reasons to engage in zero waste
 - ii. Tie in broader topics of environmental justice, human health, and climate connection to zero waste on our campus
 - iii. Promote more campaigns targeted towards reusables, such as the reusable takeaway container program and reusable utensil set giveaways
 - iv. Continue rescue programs like Worthmore Free Store and the campus move-in/move-out process
- c. Process Change/Infrastructure Investments:
 - i. Implement campus-wide data tracking system across all three waste streams and with additional conditions including financial, carbon, and social impact
 - ii. Continue the transition to campus-wide reusable dining takeaway containers
 - iii. Systemize internal waste movement, collection systems, and create an efficient sorting system
 - iv. Consolidate or eliminate visits from waste-haulers on campus
 - v. Restructure all solid waste agreements and contracts to incentivize zero waste
 - vi. Add additional Environmental Services staff to provide operational zero waste support, and increase staffing within other departments to provide educational support.

Listed below are the short-term, mid-term, and long-term prioritized strategies identified by the Zero Waste Working Group. In addition to listing the strategies, the diversion impact and estimated greenhouse gas (GHG) impact is also included to show how linked implementing the strategies are to the College's reaching its zero waste goals. In essence, by moving forward with these specific strategies we will be able to achieve our zero goal within our proposed timeline.

Specific Strategies	Short Term	Mid Term	Long Term	Estimated Diversion Impact	Estimated GHG Impact (MTCO ₂ e)
BASELINE (current)				40.7%	-456.2
Education to increase participation		X	X	8.27%	-120.5
Education to reduce and reuse	X	X	X	3.95%	-173.7
Education to increase diversion to recycling and composting	X	X	X	9.6%	-175.4
Implement increased data tracking and reporting	X			NA	NA
Invest in reusable infrastructure and systems		X	X	7.2%	-204.8
Diversion infrastructure and systems		X	X	3.03%	-35.48
Assess staffing capacity and resource needs throughout implementation of the ZWP	X			4.8%	-87.70

Institutionalize Zero Waste through definitions/goals	X			NA	NA
Implement Policies to Promote Reduction and Diversion		X		13.20%	-623.5
Actively participate in regional conversations and work around zero waste and env. justice			X	NA	NA
TOTAL DIVERSION	50%	77%	90.8%		
ANNUAL GHG REDUCTION (Measured in Metric Ton CO2 equivalents- MTCO2E)	-660.3	-1,580.5	-1,877.3		

Success in achieving the zero waste goals set for 2030 and 2035 is dependent on the investment and engagement work listed above. While the short-term goals are clear, this is a living document and work will be done to ensure continued engagement addresses new opportunities and challenges that may arise throughout implementation.

Through this document, the Zero Waste Working Group has laid out the goals for zero waste on Swarthmore's campus moving forward, provided an overview of the current zero waste systems on campus, and provided a prioritized list of opportunities to improve zero waste systems moving forward. The Zero Waste Working Group will provide periodic updates around zero waste work on campus, and benchmarks to engage the entire campus community. We recommend that an updated Zero Waste Plan is written every five years, and shared with the campus community for feedback and to build the necessary buy-in required to implement the suggested zero waste strategies. While the ZWWG plays an essential role in the management and oversight of programs, it will take investment from the entire campus community to reach these ambitious but important goals.

Appendices

Appendix A: Zero Waste Working Group Members and History

Zero Waste Working Group Members

The Zero Waste Working Group is a committee with members representing a broad swath of the campus community. It meets year-round, with rotating student membership and staff/community membership added as needed depending on current projects. Its formation contains membership from students, staff, faculty, alumni, local residents, and a Zero Waste expert consultant. The Zero Waste Working Group reports to the Ecosphere Executive Committee and is chaired by the Office of Sustainability's Program Manager and the Vice President for Auxiliary Services.

The Zero Waste Working Group currently includes representation from the following additional departments:

- Facilities & Capital Projects
- ADA Program
- Auxiliary Services
- Purchasing
- Environmental Services
- Office of Sustainability
- Communications

Zero Waste Stakeholders Waste Roles & Responsibilities

The College's Zero Waste commitments are the result of collaboration between a substantial number of departments and community partners. This list below tries to summarize all key stakeholders. The Zero Waste Working group reports to the Ecosphere Executive Committee, learn more about the committee structure [here](#). The Ecosphere Executive Committee is responsible for evaluating what policy and budget changes might be necessary to support the implementation of the changes in the waste management plan. Based on those evaluations, the Zero Waste Working Group can move forward on various components of managing zero waste.

Facilities

The Associate Vice President (AVP) for Sustainable Facilities Operations and Capital Planning provides strategic oversight to many of the areas of implementation of the Zero Waste Plan. Subsidiary departments of the Facilities Department report to the AVP.

Environmental Services

The Environmental Services (EVS) Department staff, under the leadership of the Director of Environmental Services, is at the heart of the College's Zero Waste commitments.

EVS responsibilities include:

- Removal of waste from buildings and management of all indoor waste movement on-campus
- Management of all contracts pertaining to the movement or removal of trash, recycling, and compostables
- Planning, in coordination with the Office of Sustainability, for replacement schedule for interior waste receptacles
- Purchase and placement of all interior trash and recycling receptacles on campus
- Maintenance of all trash and recyclables receptacles
- Collect and haul post consumer compost from back of house Sharples, and post-consumer compost after sorting by GA's to Kitchen Harvest
- Tracking of metrics relative to waste composition and flow with support from the Office of Sustainability
- Mentorship of President's Sustainability Research Fellow(s) and Green Advisors when assigned to work on waste reduction

EVS and the Office of Sustainability partner closely on planning, reporting metrics, and education and good communication has developed between the two partners. Many of the changes in waste movement incorporated into this plan came from recommendations offered by EVS techs as they observed areas for improvement during their daily routines.

As this plan is implemented, it will be the responsibility of the EVS staff and techs to understand and adopt the new or revised practices that the plan will require. They will also be counted on as an important part of on-going process improvement, providing feedback on the success or deficiencies of system changes.

Grounds & Horticulture

The Grounds Department is responsible for emptying all exterior trash and recycling receptacles and moving the contents to the appropriate collection site. In addition to managing the exterior trash & recycling receptacles they also manage outdoor organics, like leaves, trees, and other natural organic materials.

Office of Sustainability

Under the leadership of the Director of Sustainability, the role of the Office of Sustainability is to support the campus to design and implement sustainability best practices. That broad design includes, among many other categories, overseeing the development of best waste management practices campus-wide. President's Sustainability Research Fellows, Green Advisors, and Sustainability Advocates are all programs within the Office of Sustainability that help implement zero waste initiatives.

President's Sustainability Research Fellowship

The President's Sustainability Research Fellowship (PSRF) at Swarthmore College is designed so students learn by leading: by taking stewardship over vital sustainability challenges. The program matches motivated students with small teams of staff and faculty mentors to research, develop, and implement projects in a year-long course and associated internship. With faculty guidance, students

conduct wide-ranging research and write reports, proposals, and/or white papers relevant to their sustainability project. The fellowship is composed of both regular and senior PSRF fellows. PSRF fellows often sit on the zero waste working group and projects often pertain to various educational or operational zero waste initiatives.

Green Advisor

The Green Advisors (GAs) are residential peer leaders (RPLs) and student workers of the Office of Sustainability who work to encourage sustainable and socially-just lifestyles among all Swarthmore community members. The GAs work to reduce campus waste generation in close partnership with Environmental Services and support with managing the campus composting system, amongst other tasks. The GA program supports a multitude of approaches to environmental issues, and encourages dialog within and beyond the program to understand these differing perspectives, and engage across campus on zero waste efforts.

Sustainability Advocates

The Sustainability Advocates (SA) Program offers staff and faculty the opportunity to take a leadership role in the collective effort to create a healthy and sustainable campus community. Advocates are each partnered with a student Green Advisor for the academic year; together they work to implement sustainability projects within the Advocate's department. The Sustainability Advocates Program supports the College's commitment to achieve a range of sustainability targets, many which focus on reducing campus waste and supporting upstream wastestream management priorities.

Auxiliary Services

Dining Services

Sharples Dining Hall

Within the waste management plan, dining hall services provide support for best practice waste management in Sharples. Their responsibilities include accurate sorting and disposal of trash, recyclables and compostables, planning for enhancements to the current system, and promotion of food waste reduction practices. Dining Services runs the reusable takeout container that allows up to 110 students to utilize reusable takeout containers rather than compostable disposable containers throughout the academic year.

Dining Retail Services

The role of dining retail services with respect to the waste management plan is to provide support for best practice waste management in Essie Mae's and other retail food sites on campus (Kohlberg, Sci Center).

Catering Services

The role of catering services is to provide support for best practice waste management in all catering situations. Their responsibilities include providing appropriate dinnerware and utensils, and implementing and enforcing policies for both on-campus and off-campus catered events that promote best practice waste management. The new [campus catering policy](#) has a strong focus on sustainability and waste reduction.

Events Management

Events staff play a major role in supporting waste collection with indoor and outdoor events across campus. Events provide compost, recycling, and trash bins upon request at any event hosted by students, faculty, or staff. The [Green Events Guide](#) is one way the events team encourages zero waste practices at events across campus.

Campus & Community Store

The Campus and Community Store is run by the College, and the Inn at Swarthmore is contracted to outside managers. The Store's waste is disposed of as part of the Inn's contract (not directly by the College). Auxiliary Services management requires that the outside managers adhere to Swarthmore policies relative to waste management practices.

OneCard

The One Card program is managed in accordance with campus waste management best practices.

Communications

The Communications team supports zero waste efforts through developing and editing signage for the tri-bins waste stations across campus, as well as outdoor waste signage for various campus pilots. The Communications also reviews annual all-campus waste emails and ensures clear communication around zero waste updates and initiatives.

Purchasing

Sustainable purchasing is a key initiative at Swarthmore College. All purchases are made with environmental, social consciousness, as well as fiscal responsibility. The college is committed to being a leader in sustainable purchasing and a member of the Sustainable Leadership Purchasing Council (SLPC).

Office of Student Engagement

Although not primarily focused on sustainability or waste management, student Residential Advisors (RAs) and staff Residential Community Coordinators (RCCs) play a crucial role in maintaining the health, safety, and welfare of their communities. As such, they can be a backup resource for information on proper waste disposal practices. Office of Student Engagement also supports the campus' zero waste efforts by hosting a "Sustainability" session during new student Orientation, as well as supporting the distribution of reusable utensil kits to all new students.

Civic Engagement & Social Innovation

Lang Center for Civic Engagement, in partnership with the President's Sustainability Research Fellowship program and the Environmental Studies Department, offers a semester-long ChesterSemester course focusing on "the social, economic and political interactions of residents with the food system, waste management, and infrastructure needs of Chester City." This allows students first-hand access to residents who are most impacted by the environmental justice effects of incineration and waste disposal.

Environmental Studies Program

The Environmental Studies program is an interdisciplinary program and collaborates with other entities on campus, including the Zero Waste Working group. A number of Environmental Studies courses

intercept topics pertaining to zero waste, adding to the collective process of engaging in conversations around waste and social justice on campus.

Students

have a large impact on the success of the waste management plan. The ultimate success of the plan depends on significant improvement in the diversion rate. Since students comprise the largest proportion of the community, their actions to correctly dispose of waste will have a significant impact on the diversion rate. Their responsibility is to learn and incorporate good waste management practices into their personal lives. Students support zero waste efforts through taking academic courses that connect to zero waste, environmental justice, and the climate crisis. Additionally, they participate in clubs like Sync Up for Zero Waste, Sunrise. Office of Sustainability programs like Green Advisors train students to sort and maintain compost operations on campus, while President's Sustainability Research Fellows (PSRF) engage students in year-long zero waste projects. Students can also think about the necessity of having certain items and utilize the Worthmore Free Store to pick up non-essential items for their residential rooms and classes.

All Faculty, Administration, and Staff

The members of the community share a responsibility to their fellow community members to learn good waste management practices including waste separation. Faculty and staff can now participate in the buddy bin system and can implement good zero waste practices through utilizing the Green Events Guide, the Campus Catering Policy, and appropriately sorting and diverting their waste.

Appendix B: Where We Started: The 2017 Zero Waste Plan & Earlier Work

The Zero Waste Working Group is already in the midst of implementing many projects to move the College toward its existing Zero Waste goals, which were articulated in an initial 2017 Zero Waste Plan. This earlier Plan was the result of project work done during the 2016-2017 academic year under the direction of Stu Hain, former Vice President for Facilities and Capital Projects, and Aurora Winslade, Director of Sustainability, and spearheaded by President's Sustainability Research Fellows (PSRFs) Adina Spertus Melhus '17 and Vanessa Meng '20. Detailed documentation of Adina and Vanessa's work can be found in their [May 2017 Final Report](#) and in the January 2017 [Development of Integrated Waste Management System Report](#) prepared by sustainability consultancy iSpring. The 2017 Zero Waste Plan was written soon after Adina and Vanessa's PSRF internship concluded, authored by iSpring and the newly created Waste Working Group.

Adina and Vanessa's PSRF work brought to light the complexity of the College's current waste management strategies, as well as some major inefficiencies. For example, they completed a substantial inventory of every campus waste bin (lovingly called the 'Binventory') – finding that the campus building contained around 40 different models of waste bins. Some recycling bins also presented misleading information; the College had switched from multi-stream recycling to single-stream in a year, but not all bins had been replaced so some still suggested the need for separation of paper materials from

plastic/glass.

Several other important factors were at play in the 2016-2017 academic year. First, the construction of a new residence hall, the PPR Apartments, forced a need to restructure waste pick-up routes because the College's current waste hauler, Jack Clark & Sons, could not fit their truck on the campus roads around the building. This led to an urgent but desired switch to more internal waste movement by Environmental Services (EVS), a system that continues to develop.

Second, plans were already in motion to vastly expand the College's compost capabilities from a few small bins in the residence halls and a handful of high-density community spaces to every hallway of all campus buildings. Students had begun campus composting independently in 2007 via the then-volunteer Green Advisors club, and managed the collected compost on-campus behind the Athletics Grandstands. Difficulty with general oversight, maintenance during breaks, and the challenges of on-site, in-vessel composting led in 2015 to the institutionalization of the Green Advisors program, creation of a second staff position in the Office of Sustainability (now the Sustainability Program Manager), and a contract with local commercial compost facility Kitchen Harvest. In the two years leading up to the 2017 Zero Waste Plan, the Program Manager and student Green Advisors significantly reorganized the existing compost system and began implementing a campus-wide expansion.

Third, PSRFs Adina and Vanessa conducted the College's first Zero Waste Characterization Study in September 2016, revealing that there was a high potential to improve rates of composting and recycling (as opposed to throwing waste in trash bins, which is later incinerated) by improving community members' sorting behaviors, by increasing the availability of compost bins, and by clarifying campus-wide messaging about our waste streams.

The 2017 Zero Waste Plan thus became a repository for the first-ever summary of the College's current waste management practices and the rapid changes that had been made since around 2015. It was also an early attempt to articulate a comprehensive vision for ongoing and future improvements. It is important to acknowledge that the 2017 Plan focused heavily on waste diversion because of the above-mentioned factors that led to a desire to tie together these various contemporary initiatives into one, overarching strategy. Since the publication of the 2017 Plan, much work has been done to better define Zero Waste, formalize the Zero Waste Working Group, and imbue an understanding of and commitment to environmental justice into our efforts. In sum, the Zero Waste Working Group sees this 2022 document as a more comprehensive and more forward-thinking engagement plan.

Appendix C: Indoor Zero Waste Stations & 2017 -2022 Timeline

Fundamental to Swarthmore's Zero Waste efforts is community engagement and participation in reduction and diversion efforts, a large part of which is sorting waste between recycling, compost, and trash. Prior to 2017, there were a wide variety of waste receptacles in use, and inconsistent representation of recycling, compost, and trash, across campus. This caused confusion amongst community members trying to identify the correct stream for waste disposal and resulted in a large portion of otherwise divertable waste being incinerated instead.

One of the first major Zero Waste efforts made was to replace existing waste receptacles with

standardized waste stations across campus. Standardized waste stations have designated receptacles for recycling, compost, and trash, as well as consistent coloration and signage. The design and planning process for the implementation of the waste stations involved an inventory of existing waste receptacles and their designated streams, the development of the color, placement, and signage standards of the waste stations, and then a multi-phase rollout of purchasing, assembling, and installing the waste stations. The timeline for the rollout of the waste stations was 2017 - 2020.

Between 2020 -2022 the ZWWG worked on completing the roll out of the waste stations, and monitoring and updating the signage connected to the tri-waste bins. Changes in what was able to be accepted through our composting provider led to a major shift in our compost and trash signage, and a major effort to install new signage in locations across campus. Additionally, inventory 2.0 led us to recognize the need to update bins within the residential halls, and the ZWWG will use the summer of 2022 to update and remove broken components of tri-bins and update signage. The project will start with first and second-year residential halls, and finish with upperclassmen dorms throughout the 2022 -2023 academic year.

Waste Bin Studies & Calculations

One of the first and most important components of the waste management plan is the installation of consistent bin designs with consistent signage to simplify correct waste disposal.

During stakeholder meetings in Fall 2016, the loudest and most common refrain was that it was difficult to correctly separate and dispose of waste because of confusing and incomplete signage, and myriad types of bins.

Over Spring Break 2017, three PSRF fellows conducted an inventory of the campus cataloging not only different types of existing bins but also their signage and location attributes entered into a spreadsheet using the Airtable application. .

The results of the Inventory provided data that confirmed the subjective responses that were recorded in the stakeholder meetings. Nearly forty different kinds of trash bins alone were identified on campus. It appeared as if many of the bins had been put out by individuals rather than by any coordinated program of the school. In addition, bins varied widely in color, size, and signage both within and between buildings.

Recycling bins were especially difficult because signage and colors were still in place from the period when the College collected paper separately from bottles and cans in a dual-stream system. The inventory also identified many built-in waste bin cabinets, particularly in the Science Center and Parrish, that make coordination with campus-wide standards challenging.

Based on the evidence from the binventory, six standards were created to inform the decision process for new bins:

1. Each bin either has a compostable segment or is equipped to have a compostable segment added.
2. Bins will have consistent colors based on the type of waste: trash – black; recycling – blue;

compostable – green.

3. Bins will have consistent labeling: Incinerator/Trash; Mixed Recycling; Compost.

4. Bins will have attached signage above and behind the bin that can be customized by Swarthmore and changed as conditions change.

5. Bins will be consistently positioned in the order (left to right): Compost, Mixed Recycling, Incinerator/Trash.

6. Bin liners will coordinate with the bin colors - compostable bins will have green liners; recyclable bins will have blue liners; trash bins will have clear liners.

BUILDING SELECTION CRITERIA SHEET										
Name:										
CRITERIA	EXPLANATION	BEARDSLEY/ TROTTER	BEP DESIGN	CLOTHIER	KOHLBERG	LANG CONCERT HALL	LANG PERF ARTS	MCCABE LIBRARY	PARRISH (FLRS 1&2)	SCI CTR/ELDRIDGE
TIME SENSITIVITY	2-low time sensitivity; 10-high sensitivity - urgency related to purchasing of bins for new space or other priority reasons									
VISIBILITY	1-low visibility; 5-high visibility - how broadly used is the building? Does it have high public usage?									
BIN SIGNAGE PLACEMENT AND EFFECTIVENESS	1-mostly correct messaging; 5-mostly incorrect messaging - Do most of the bins have correct signage? Is the signage placed where its easily visible?									
EVS EASE-OF-USE OF CURRENT BINS	1-mostly bin types that EVS likes; 5-mostly bin types that EVS dislikes - EVS dislikes the plastic liner bag clips. Are many of the bins of the type that EVS dislikes? Only a few?									
AGE/AESTHETICS OF CURRENT BINS	1 - most in good condition; 5 - most in poor condition - Are most of the bins in good condition? Are they presentable? How motley an assortment is it?									
QUANTITY OF WASTE	1 - relatively small waste production; 5 - relatively high waste production									
QUANTITY OF ORGANICS	1 - few organics; 5 - large quantity of organics									

Based on this standard, two bin styles were chosen - one for the bulk of campus, particularly dorms and academic buildings, and one for the more public areas of campus such as Parrish Hall's non-residential areas and the Lang Performing Arts Center.

A survey was circulated to the Waste Working Group to prioritize buildings for bin replacement.

Based on the survey results, the Waste Working Group adjusted some of its subjective priority decisions. Ultimately, the survey served as a basis for the more in-depth analysis undertaken by Melissa Tier, former Sustainability Program Manager of the Office of Sustainability, and Christopher "Chip" Proctor, Manager of Administration for Environmental Services.

Using the results of the bin inventory, the specific dimensions of the bin styles, building data, and their own experience and knowledge of waste management best practices and waste functions specific to campus locations, Melissa and Chip undertook a campus-wide analysis of the placement of new bins and the order in which they should be replaced. The results of this exhaustive analysis can be found in these [spreadsheets](#). For Phase 1 and Phase 1A bin placement, they identified the exact location, positioning within the space, type, and size of every new bin. These figures were used for RFQs from potential vendors.

To calculate the cost for the entire project, the number of bins needed for Phase 1 was multiplied by the anticipated cost of the bins. This number was then divided by the total square footage that this number of bins would serve to get a Phase 1 cost per square foot figure. This number was then used along with the

square footage figure for each of the buildings in Phases 2, 3, and 4 to estimate the cost of the total project. A summary of these calculations can be found [here](#).

Indoor Zero Waste Stations & Rollout Process

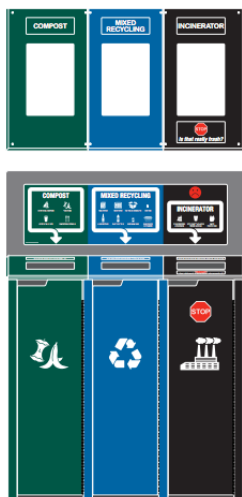
Fundamental to Swarthmore's Zero Waste efforts is community engagement and participation in reduction and diversion efforts, a large part of which is sorting waste between recycling, compost, and trash. Prior to 2017, there were a wide variety of waste receptacles in use, and inconsistent representation of recycling, compost, and trash, across campus. This caused confusion amongst community members trying to identify the correct stream for waste disposal and resulted in a large portion of otherwise divertable waste being incinerated instead.

One of the first major Zero Waste efforts made was to replace existing waste receptacles with standardized waste stations across campus. Standardized waste stations have designated receptacles for recycling, compost, and trash, as well as consistent coloration and signage. The design and planning process for the implementation of the waste stations involved an inventory of existing waste receptacles and their designated streams, the development of the color, placement, and signage standards of the waste stations, and then a multi-phase rollout of purchasing, assembling, and installing the waste stations. The timeline for the rollout of the waste stations was 2017 - 2020.

Two bin designs were chosen:



Busch Systems Waste Watcher Station This style will be used throughout campus in most locations, particularly dorms, classroom areas, office areas, and maintenance/ support areas.



Max-R Oxford Custom (and size variants) at a list price of \$2209 each for the “slim style” as shown. This style will be used in high visibility, public areas such as the non-residential portions of Parrish and large meeting rooms.



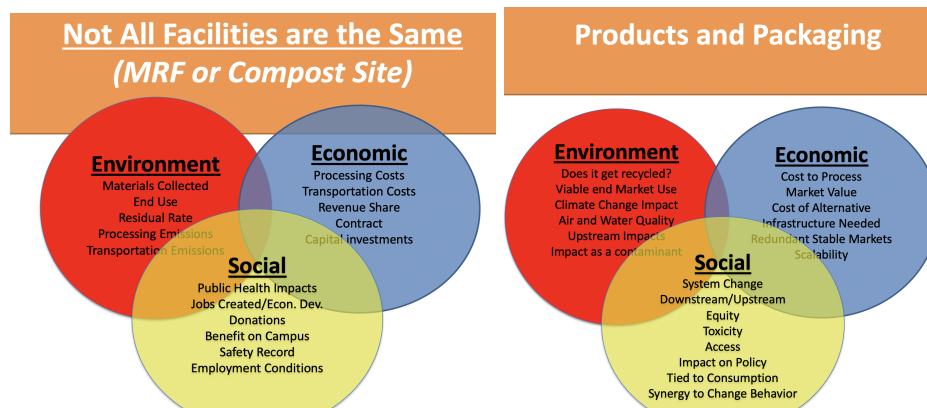
Buddy bins were rolled out between 2019 and 2020 to help faculty and staff consolidate waste within their offices, and then transfer that waste to the larger tri-waste bins. Buddy bins have been placed in nearly all offices across the campus.

Between 2020 and 2022 ZWWG monitored the tri-waste bins across academic buildings, offices, and residential halls. While bins in academic buildings and offices remained stable, bins within the residential halls have experienced some significant damage. During the summer of 2022, and into 2022-2023 the ZWWG will update signage across the halls, with the support of student interns hired by the Office of Sustainability.

Collection of waste from external (outside) recycling and trash bins is the responsibility of the Grounds and Horticulture Department is currently managed independently by EVS and the Office of Sustainability.

Appendix D: Evaluation Criteria for End Markets (Recycling and Compost)

An important component of Swarthmore College's zero waste plan is accountability and transparency. Typically, a college considers something "recycled" once it is placed in a recycling bin and collected by its contracted hauler (or delivered to a recycling facility). However, what happens to that material after it leaves campus can vary greatly between options within the marketplace. Understanding and evaluating these differences allows the college to align goals with impacts, measure success, communicate the rationale for decisions and prioritize actions.



A recycling facility, known as a Material Recovery Facility (MRF), is where the material is sorted, densified to make transportation more efficient, and sold to an end market where the material is ideally used as a feedstock to make new products. Each MRF has many decisions to make ranging from how they treat their employees, how efficiently they process the material, and to who they ultimately sell the material. Similarly, a compost facility can process compost in various ways that result in varying quality of compost which can be sold for high impact and low impact uses. These decisions impact the cost to the college as well as the environmental and social impacts of the program. They can also impact the logistics of how the material is collected on campus, such as whether they accept bagged material or additional items that reduce contamination.

To inform better decision-making, Swarthmore College developed an evaluation matrix based on social, environmental, and financial criteria. The criteria can apply to compost facilities, recycling facilities and even connect to the products purchased on campus. The detailed evaluation matrix can be found at https://docs.google.com/spreadsheets/d/1pxI9IUU93oCkTB4z6sIIR0KS_ETRFNeWg454Ei8ABIY/edit?usp=sharing

Appendix E: Regional Market Place and Policies

Trash:

Swarthmore College resides in the Swarthmore Borough that resides in Delaware County. One of the

governing bodies of Delaware County is the Delaware County Council which is a group of officials that is elected every four years, staggered in two-year intervals. The council is currently made up of five individuals, who oversee the economic development, public transportation, waste disposal, human services, housing, land use, and culture as well as budgets and other governmental operations. The Delaware County Council oversees and works with the Delaware County Solid Waste Authority which is made up of eight members. The Delaware County Solid Waste Authority has been in charge of creating and agreeing to contracts with private waste management businesses such as the Covanta incinerator in Chester, PA also known as Delaware Valley Resource Recovery Facility. The Delaware County Solid Waste Authority signed a five-year contract with Covanta in June of 2017.

Compost:

Current commercial compost options for the College are extremely limited, however, it is likely a growing market. The limited marketplace is further exacerbated by the relatively large quantity of compostable service wares that the college currently has in their compost program as well as the fact that material is delivered in compostable bags. Many compost sites do not have the ability to process these. Work is being done to loosen the regulatory requirements to site and locate a compost site and the City of Philadelphia has recently invested in developing composting infrastructure as a priority for their work in zero waste.

In 2019 ZWWG toured the following compost facilities:

- Kitchen Harvest, located at Linvilla
- Mascaro runs A & M Compost in Manheim, PA.

The Mascaro Facility primarily composts low-value municipal sewage sludge through an indoor aerated static pile process. Given the lower value feedstock, if Swarthmore sent their high-quality food waste there, it is unlikely to be used for its highest and best use. They are also unable to commit to the ability to process compostable service wares.

Kitchen Harvest has been a great partner for the College, is located close to campus, is able to accept the current composition of Swarthmore's compost, produces high-quality finished products, and uses much of it to grow food.

The college also explored the option of on-site composting. While there is a desire to close the loop on food waste and use the material on campus, it has been determined that the college does not have enough quantity to justify the capital costs and is limited in staffing capacity to effectively operate the system. A full memo on the issues is available here:

In 2021 the Zero Waste Working Group revisited this topic and did a full review of compost options in the Delaware County region. Information on that research can be found here: [Zero Waste Working Group Compost Task Force Executive Summary](#)

Recycling

There are 3 regional Material Recovery Facilities (MRFs) that can potentially serve Swarthmore College.

- Total Recycle is operated by the Mascaro
- Republic
- Waste Management

The zero-waste working group toured all 3 MRFs in the region, evaluating them on social, economic, and environmental criteria. The full results can be found here:

https://docs.google.com/spreadsheets/d/1cs4vfbXtyjgM2s_YTAIbJ3tWmMTKZcTUoiSOuIpMtag/edit?usp=sharing

Key take-aways on recycling include:

- All 3 MRFs are successfully sorting single-stream recycling and sending the majority of material to end markets to be made into new products. Some are doing a better job with certain materials but recycling is certainly a viable option in the marketplace.
- Swarthmore College should be aware that just because an MRF accepts a material, it doesn't assure it is going to a circular use (one where it is displacing the need to extract new resources in manufacturing a new item and can be recycled again at its end of life). The main examples of this are glass, 3-7 plastics, aseptic and flexible packaging. See specific material recs below.
- Swarthmore College's single-stream material is currently clean enough not to be rejected by these facilities.
- To assure that recycling is really recycled, Swarthmore should separate as much recycling as possible on site (in roll-off or compactor) and contract directly with a processor to deliver to them.
- Mascaro is the only MRF to take bagged recyclables. This option is unique and could have significant operational benefits. In general, Mascaro is likely to have the least issue with contamination, but a greater transportation footprint.
- WMI is the only MRF sending glass to a beneficiary who processes glass for use to make new bottles. Mascaro uses glass as an alternative daily cover on their landfill, which results in very little environmental benefit. Swarthmore can explore separating glass and sending it directly to a beneficiary (such as www.aeroaggregates.com, www.paceglass.com, www.abcarecycling.com).
- Swarthmore should only include 1,2,5 bottles and containers in the program. It is likely all other plastic is disposed of (even though it is accepted at some MRFs). Mascaro does accept flexible packaging through its pilot program. However, there is no evidence that there is currently market demand for this material and it is likely to end up in non-circular uses at best and incineration at worst. The Mascaro program does result in the higher quality paper as it sorts this contaminant out, which also reduces the contamination issue of flexible packaging in Swarthmore College's single stream.
- Milk cartons, juice boxes, and tetra pack containers should only be included in the recycling if going with Mascaro or Republic as they are the only 2 MRFs that sort this material.
- While all MRFs recycle cardboard that is mixed in single-stream, there may be a financial advantage to keeping it separated depending on staffing and logistics. USRI, located in Philadelphia collects cardboard and mixed paper from institutions.

After an extensive RFP process, it was determined that Mascaro is currently the best fit for the College. The following chart summarizes the rationale.

Pros of Mascaro	Cons of Mascaro
Accept BAGGED material!	Distance to facility
Revenue share based on published indices and periodic composition studies.	Uncertainty around flexible packaging markets
Family owned, local business	Use of glass in landfills
Low facility-wide residual rate	Unclear what “transportation” charge is on processing
Market domestically	
Sort to higher grades	
No Temps	

Appendix F: Social Justice

Swarthmore’s Zero Waste commitment is deeply tied to the College’s pursuit of social and environmental justice. Through its pursuit, the college articulates a commitment to equal rights and opportunities for all. Similarly, environmental justice, as defined by the Environmental Protection Agency (EPA) “is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” The EPA states “ This goal will be achieved when everyone enjoys; the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.”

Social justice and environmental justice are intrinsically linked through the interconnectedness of daily human life and the well-being of the planet, and waste discards affect both.

Environmental Justice and Zero Waste in Pennsylvania and Beyond

The importance of a zero waste strategy is amplified by the significant climate and justice impacts of both extraction and disposal investments in the region.

Swarthmore College is located in Delaware County, home of the nation's largest incinerator run by Covanta. Controlled through a contract with the Delaware County Solid Waste Authority, all commercial and residential waste in the County is required to be delivered to the Covanta incinerator. Unfortunately, the incinerator contains the fewest emission controls, resulting in it being the [largest source of pollution](#) in Delaware County and one of the largest in eastern PA. As 80% of the population within a mile of the incinerator is black, and 98% of the waste is coming from outside of the community, there is a serious environmental justice that disproportionately impacts the predominantly black community in Chester.

In addition to the downstream impacts of disposal, Pennsylvania is also the home of significant fracking operations, processing facilities, and pipelines. These actions are extremely invasive and [toxic to the environment and impact public health](#), particularly in Southwest PA where fracking is most pervasive. The financial viability of fracking is now dependent on the [production of plastics](#), which uses Ethane from fracking as a fundamental building block. PA has the largest cracking plant in the country, which used to make Ethane from fracked gas in Pittsburgh.

Zero waste reduces both the need for extraction of resources and the disposal of waste, an essential step to take in addressing these harmful practices prevalent in our community.

In the case of Swarthmore College, the College's Zero Waste efforts focus on reduction and diversion in order to reduce reliance on incineration and landfilling as methods of waste disposal, recognizing that such processes perpetuate environmental racism, as well as negatively contribute to the global climate crisis.

Our Neighbors, Chester

As discussed, a significant portion of waste discards from Swarthmore College's campus are brought to the Covanta incinerator, located in the nearby city of Chester. As noted above, waste disposal comes with harmful externalities that are often pushed onto people and the environment; incinerators and landfills contribute to both poor air quality and greenhouse gas emissions. The Covanta incinerator is just one of several waste and hazardous material processing facilities that have been established in Chester and other municipalities along the Delaware River. These facilities have adverse health effects on local residents and contribute to poor living quality through pollutants and noise. The high concentration of such facilities in Chester, a primarily black, and relatively low-income community, is the epitome of both racial marginalization and NIMBYism (not-in-my-backyard politics), which are representative of the systemic disempowerment of the Chester community at large.

1. Waste Facilities in Chester include Covanta, Delcora (sewage incineration), Medical Waste Autoclave (medical waste incineration), and landfills. (Map from EnergyJustice.net)



2. The EPA lists multiple CERCLA and RCRA boundaries (federal waste legislation) and demonstrates the legacy of waste on Chester that forces the federal government to take action to remediate the land. This remediation continues into today. (Map from Superfund EPA site).



In order to fully understand the effects of waste on Chester, there are also multiple quantitative ways to understand the full picture. There are increased rates of cancer and other diseases as well as economic cost analyses of degradation on society. First, incinerators release lots of toxic pollutants such as greenhouse gasses, carcinogens, heavy metals, and particulate matter. Each of these pollutants has a different impact on the human body when inhaled, and when they are combined the effects are only exacerbated. For example, particulate matter is estimated to increase lung cancer by 7.8 times (7). Heavy metals bioaccumulate (when we inhale them some are never released from our body and stay there permanently), this bioaccumulation affects our immune system, the metals attach to chromosomes, disrupt hormone regulation, alter behavior, affect brain development and the thyroid gland (8-16). Two other studies found that cardiopulmonary mortality and lung cancer mortality were 37% higher in cities with high levels of particulate and sulfate in the air (18, 27). Jeremy Thompson and Honor Anthony write that “The populations living around an incinerator are being exposed to multiple chemical carcinogens, particulate matter, heavy metals, and in some cases radioactive particles, all known to increase lung cancer. Nitrogen dioxide has also been shown to synergistically increase lung cancer. When all these are combined, the effects are likely to be more potent, and in fact, an increase in the incidence of lung cancer has been reported around incinerators (BSEM Report, 125). Overall, incinerators through the release of toxic pollutants have major impacts on the human body.

These health impacts can also be measured in dollar values, such as one estimate finds that the overall damage of an incinerator that burns 400,000 tonnes per year would be about 48,000,000 euros in health damage (240). Another estimate is that 21-126 euros per tonne are placed onto society via health and environmental damage.

Swarthmore’s emphasis on Zero Waste and Chester is driven home by the fact that a large portion of Swarthmore’s custodial staff, an integral part of the College community, and especially our waste management system, are Chester residents. Through its Zero Waste initiative, Swarthmore hopes to act as a role model for peer institutions and communities across the region and motivate greater systemic change

and the reexamination of the modern waste industry and its negative impacts on people and the environment.

Pursuing a Just Transition

The purpose of this Zero Waste Plan is to identify and clearly articulate the College's path toward achieving Zero Waste with the ultimate goal of waste diversion away from incineration/landfill, eventually creating a closed-loop system where resources are resumed back into the system. Likewise, the purpose of the College's Zero Waste Plan is to provide a framework that is implementing environmentally sustainable and socially just waste management practices that cause no harm to people and the health of the environment, and instead maximize the positive impact on people and the planet. This plan will allow the College to create campus Zero Waste systems that can be utilized as a model throughout the county, and allow the College to be a leader in the field of zero waste. Planning for zero waste requires both a strong vision and bold actions. From 2017 to current, the College has focused its waste efforts on the intermediate goal of reaching 80% diversion by 2020, a well-researched and pragmatic goal that is still underway. This plan attempts to move the goals one step further. Through the strategy and recommendations of this plan, this plan will lead waste efforts beyond reaching our zero waste diversion goals to include greater zero waste efforts of waste reduction, upstream waste prevention, and appropriate waste discard management. This plan is designed to support the College's zero waste efforts between 2020 and 2025.

The nexus between waste management and social justice exists because of the dedicated work of communities of color, labor unions, and environmental justice groups alike, who recognized their disproportionate exposure in employment and geographical proximity to pollution caused by industrial practices. In the thralls of an unjust system that rationalized and justified the exposure of negative impacts of waste management from everyone on to one group of mostly Indigenous, Black, Latinx, and low-income communities, these groups organized collectively on behalf of their life.

Organizing transitioned from individuals risking their own individual livelihoods to forming collective organizations to adopt this fight to strategize new ways of relations between vulnerable communities, waste management, and the political economy that mediates those relations. Just Transition emerged as a new framework for relations. Crediting the foremost grassroots organizations, the Climate Justice Alliance defines just transition as: "a vision-led, unifying and place-based set of principles, processes, and practices that build economic and political power to shift from an extractive economy to a regenerative economy. This means approaching production and consumption cycles holistically and waste-free. The transition itself must be just and equitable; redressing past harms and creating new relationships of power for the future through reparations."

To understand just transition we must acknowledge and root this history. Just transition is a grassroots effort. As an institution that perpetuates the systems of disproportionate exposure to waste management pollution in Chester, the College must create an actionable assertive strategy that recognizes tangible ways that build and create new systems. It is incumbent on the College to devise clear transitions of the current mandate to send waste to the Covanta Incinerator and innovate necessary transformations within the system that generate healthy, remediating, and equitable relationships between the College and Chester.

