

**UVM's Roadmap to Zero Waste:
Effective Strategies for Enhancing Zero Waste Management Goals at the
University of Vermont**

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Abstract

This senior thesis seeks to provide effective strategies for enhancing Zero Waste management goals at the University of Vermont by incorporating the needs of campus stakeholders. As the global garbage problem increases, posing detrimental environmental, economic, and social challenges to the planet, the Zero Waste movement advocates for a whole system approach to human resource and consumption cycles that prevents waste at its source and encourages best disposal practices. Universities, towns, and cities around the world have created Zero Waste goals in an effort to move towards more sustainable, resilient, and environmentally efficient communities. In a case study of the University of Vermont, I evaluated 16 different campus departments and their waste streams to identify opportunities to move the University towards Zero Waste and encourage its collaborative growth across departments. Although the University is a recognized leader in sustainability initiatives, it lacks a set of coherent guidelines for effective long-term waste reduction. This thesis outlines a set of waste mitigation recommendations and strategies for each campus department to incorporate into their management policies. It takes into consideration the specific needs of the departments while recognizing that many of them deal with similar waste mitigation challenges. Several political, educational, structural, and infrastructural changes are advised to mitigate waste on campus. These changes will facilitate the practical application of the recommendations over time across various University of Vermont departments.

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Reflection

After four years as an Environmental Studies major at the University of Vermont, I have developed a passion for the Zero Waste movement. My first year at UVM, I realized that I had the ability to make a direct impact on the health of the planet by limiting the amount of trash I produce. I learned that I could make a difference in my own life and even in my community just by adopting several simple habits. So, I decided to commit myself to the Zero Waste Challenge. In theory, this transition would be easy, but in practice going zero waste proved harder than I

thought. I began to notice the immense amount of single use items our culture consumes on a daily basis and the lack of understanding around the life cycle of a product. After a year or so of living waste free, I realized that institutional level change might have a longer lasting impact on the systems that will guide us to a more sustainable future.

Eager to create lasting change in my immediate community, I set out to help UVM Recycling and Zero Waste and the Office of Sustainability write UVM's Zero Waste Plan under the generous 2019 summer research scholarship I received from the Environmental Studies department. The purpose of my research was to provide effective strategies for enhancing Zero Waste management goals at the University of Vermont by incorporating the needs of campus stakeholders. I conducted in person interviews with staff from 16 different campus departments to understand each division's internal operations, to discern a connection between each division's mission and its waste streams, and to determine the best approach for incorporating the mission into the Zero Waste plan.

The experience of sitting down with different departments across campus proved incredibly valuable not only for my report, but also in developing a solid understanding of the connection between departments. I enjoyed my conversations with department heads about the inner workings of the University as well as their faculty perspective on the school's current waste management system. I realized that the University of Vermont is a complex organism filled with multiple moving parts, systems, and intricate programs that help it run smoothly. Creating a successful Zero Waste program; therefore, requires communication and teamwork across all aspects of campus.

My work with the Office of Sustainability and UVM Recycling and Zero Waste on my thesis to create the Zero Waste Plan has paid off. In collaboration with the Post Landfill Action

Network, an outside Zero Waste consulting firm, we created an official working document that will be used to implement some of the findings and recommendations from my research. In fact, the Office of Sustainability has organized a Zero Waste Action Group (ZWAG) to bring together departments across campus to begin working on the most critical areas of the report. As the chair of the ZWAG team, I have been organizing committee meetings as well as in person conversations with key stakeholders in the project. In my last semester at UVM, I am excited to finalize my work for my Honors Thesis and help the University reduce its environmental footprint. Molly Hetzel, a current first-year, shadowed my work this semester in anticipation of continuing in my place once I graduate. The success of this project requires a sustained effort among students, staff, and faculty for years to come, and I hope that UVM will continue to lead the charge on mitigating waste.

General Introduction

Increasing worldwide concern over global climate change poses new challenges to addressing population growth and development while preserving the integrity of fragile ecosystems. A recognized leader in campus sustainability related initiatives, The University of Vermont (UVM) actively confronts these challenges through courses offered at the school (e.g. environmental studies, ecological economics, sustainable MBA program etc.), and through ongoing engagement with sustainability research (Pollock, Horn, Costanza, & Sayre, 2009). The Princeton Review ranks the University of Vermont as the third 'greenest' school in the nation, for its environmental efforts to adopt sustainable policies, prepare students for future conservation focused careers, and nourish an eco-conscious campus culture (Krier, 2018). In 2017, the University of Vermont received its second Gold rating from STARS, the Sustainability Tracking, Assessment and Rating System for higher education (ASHEE, 2017). The University's

score of 70.87 places it among the top 12 percent of all rated institutions (Thompson, 2017). The score reflects judgement of academic, engagement, operations, and planning and administration excellence. UVM's emphasis on sustainability has led to the implementation of a campus wide recycling program, composting in residence and dining halls, a LEED Certified Building Program, a student facilitated Eco-Reps program, a commitment to renewable energy use, considerable reductions in greenhouse gas emissions, and a variety of other environmentally mindful campus initiatives (Thompson, 2017). Support for the continuation of these programs will ensure their future success (Thompson, 2017). However, there is a vital element missing from UVM's current sustainability plans: a set of 'Zero Waste' guidelines.

Americans make up 5 percent of the world's population, yet we produce more trash than anyone else on the planet (Humes, 2012), generating 4.4 pounds of trash per person per day (Nathanson, 2019). UVM has not yet sufficiently addressed this issue of trash generation in its sustainability related practices. UVM Recycling pinpoints deficits in current sustainability plans that lead to stagnation of waste efforts, specifically the lack of up-stream waste prevention, challenges to consumption, and education and outreach (Berman, 2018). Even though several solid waste efforts were successful in years past (e.g. Ecoware program, plastic water bottle ban, residential composting), they have never been condensed into a comprehensive set of guidelines. This leads to conflicting initiatives and a lack of cohesion between waste reduction ideals and actual waste mitigation practices (Berman, 2018).

Several campuses across the country are already creating 'Zero Waste Roadmaps' to address these problems (ASHEE, 2017). UVM's environmentally conscious faculty and student body should continue to model best sustainable practices through developing and implementing their own set of waste management guidelines. These would not only involve waste-sorting

practices such as composting, but also include 'upstream' systemic change to shift campus culture toward an actively trash conscious population.

This proactive approach is meant to transform how the University thinks about waste. It seeks to challenge the paradigm of waste from useless materials into valuable resources. Zero Waste is described as a vision, a goal, or a guide to promote positive behavioral and structural change around the culture of discarded materials (Connett, 2013). It incorporates an all systems approach to waste management, acting as a solution to monitoring the broader system in which waste is generated (Leonard, 2010). The Zero Waste approach aims to reduce overall consumption of goods, capture material goods for reuse, compost all applicable organic matter, and recycle goods and materials at the end of their useful lifespan (Connett, 2013). Using Zero Waste concepts and principles involves rethinking the way resources and materials flow through the University, taking a systems approach, and moving from a linear model to a circular one. By working to shift campus infrastructure, policies, and practices, the Zero Waste Plan will offer a set of concepts, knowledge and stewardship to the UVM community.

In order to develop a complete plan, it is essential to incorporate feedback from sixteen different campus departments to gain a holistic perspective of the current waste management system. From custodial services, to student life, to academic departments, this thesis shows how different campus entities can work together. It will enhance Zero Waste goals at the University of Vermont by tailoring Zero Waste strategies to specific campus divisions. Through a series of semi-structured interviews, the objective of this thesis is to collect information from a variety of campus operations, identify committed stakeholders, and determine their specific needs in relation to creating a Zero Waste Campus.

Background

As UVM's interest in sustainable campus development has ground, there has been a concerted effort to continue to increase diversion rates while, at the same time, decreasing the total amount of waste generated. Specifically, this effort is spearheaded by the Office of Sustainability and UVM Waste and Recycling Program Supervisor, Corey Berman. In 2017, Corey introduced a rough outline of a framework to direct future sustainable materials management decisions through a "Zero Waste" lens. The current draft Zero Waste Plan emphasizes UVM's commitment to diverting 90 percent of all materials from the landfill by 2025. The current planning framework has not yet considered input from internal operations on meeting specific departmental needs. It lacks directed feedback from different campus operations on how to best incorporate the Zero Waste Plan into their mission and future objectives. The purpose of this thesis is to provide effective strategies for enhancing Zero Waste management goals at the University of Vermont by incorporating the needs of campus stakeholders. It will identify committed campus stakeholders and their specific needs in relation to creating a Zero Waste campus through semi-structured qualitative interviews with representatives from 16 different campus departments: Environmental Health and Safety, Purchasing Services, Custodial Services, Dining, Facilities Design and Construction, two academic departments, the Print and Mail Center, the Fleming Museum, the Office of Transportation, the Bookstore, the Athletics department, the Library, the Campus Children's school, the College of Medicine, the Physical Plant, and the Grounds Department.

The purpose of the interviews is to understand the different motivations and backgrounds of the stakeholders that are involved or may be connected in any way to future Zero Waste developments at UVM. The aim is to understand how Zero Waste can be incorporated into

specific facets of campus life and how to best support campus waste management strategies.

Each interview will decipher the divisions' internal operations, discern a connection between the divisions' mission and their waste streams, and determine the best approach to incorporating the mission into the Zero Waste plan.

Literature Review

Introduction

The Zero Waste movement began attracting public attention in the 1990s as a reaction to the alarming spike in consumer related garbage production (Leonard, 2010). While waste management is one of the oldest forms of human civilization pursuits (Letcher & Vallero, 2011), published literature specifically addressing Zero Waste initiatives did not become prominent until the 1990s (Connett, 2013). Key authors and organizations responsible for publishing literature in this area include Zaman (2015), Annie Leonard (2010), Humes (2012), Paul Connett (2013), Biocycle (2010), the Post Landfill Action Network (2019), and the Zero Waste International Alliance (2017). These authors addressed the environmental, economic, and social inequalities associated with trash and landfills. They described the role waste plays in the larger context of the economy, termed the linear consumption economy. Several case studies of universities, cities, and countries that have implemented Zero Waste plans introduce essential information regarding the structure and effectiveness of different waste mitigation programs (Cuneen, 2010; Cutter-Mackenzie, 2010; Ebrahimi & North, 2017; Gallini, 2016; Kwasny, Leblanc, Yan, & McCartney, 2016; Walker & Xanthos, 2018). Trends presented in the literature depict individual, community, government, organization, business, political, and education oriented solutions to addressing waste along different stages of the linear consumption economy. This literature review covers the definition of Zero Waste, the history of the Zero Waste

movement, Zero Waste in the context of the materials economy, several Zero Waste case studies, campus waste concerns, and campus Zero Waste initiatives. It lays out relevant trash statistics as they relate to the consumption economy, trash reduction programs, and campus Zero Waste efforts. Lastly, it provides a comprehensive overview of the University of Vermont's waste management history and current waste management systems (Berman, 2019).

A. Zero Waste Overview

Zero Waste Concept

The concept of Zero Waste is relatively new, a guiding principle for interdisciplinary waste management approaches. The definition of the term itself varies throughout the literature. One overarching theme in the literature depicts Zero Waste as a preventive approach to waste management throughout all points in the supply chain (Leonard, 2010). The Zero Waste International Alliance (ZWIA) 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 health” (Anthony, 2018). This definition comprises more than a sole focus on waste. Rather, it encompasses a whole system approach to human resource and consumption cycles that prevents waste at its source (Dinshaw, Fortin, Gleason, Glick, & Olivos, 2019). This widely cited definition challenges waste mitigation practices at the production, consumption, and disposal levels of the supply chain, emphasizing resource recovery and prevention as an environmental benefit.

The responsible production part of Zero Waste incorporates a product design philosophy that eliminates waste at the source and at all points down the supply chain (Snow, 2006).

Sunpreet Singh, a pioneer in low waste design principles, created Zero Waste manufacturing

(ZWM) guidelines that encourage manufacturing systems to produce parts that can be easily reused and achieve consistent function with a reliable service life across multiple use cycles (Singh, Ramakrishna, & Gupta, 2017). This might include products that can be tossed on the ground to decompose and become food for plants and animals and nutrients for soil; or redesigning products to give the materials another useful life (McDonough & Braungart, 2010). For example, designing a car for disassembly, so that the steel, plastic, and other technical nutrients can once again be available to industry (McDonough & Braungart, 2010). It moves away from the traditional economic philosophy of planned obsolescence, the purposeful design of products with a limited useful life (Bartl, 2014) to promote the creation of durable materials with reusable parts. This allows for extended producer responsibility, or guidelines that hold producers responsible for the end of life management of their products, ensuring better product design on the front end and waste mitigation at the back end (Leonard, 2010). For example, soap companies may be required to engineer their products to contain biological nutrients that would wash down the drain, pass through a lake or river and support the balance of the ecosystem (McDonough & Braungart, 2010).

Others describe Zero Waste as a guide to promote positive behavioral consumer change around the culture of discarded materials (Connett, 2013). It encourages consumers to rethink purchasing choices to reduce their environmental impact through a lifestyle shift. The literature cites the five R's: refusing unnecessary items, reducing the need for these items, reusing existing items, recycling what cannot be reused, and rot or sending the rest to compost (Johnson, 2015). This powerful concept enables consumers to challenge old ways of thinking and inspires new attitudes and behavior (Snow, 2006).

The last trend in the literature portrays the downstream end of waste management. At the recovery level, composting, upcycling, and clean recycling efforts are used to practice the principles of Zero Waste (Bridgens et al., 2018). These practices transform the idea of products as waste into the notion that they are simply misplaced valuable resources (Leonard, 2010). At this level, the concept of Zero Waste encompasses the entire supply chain to create a more circular economic system of waste management.

The majority of waste comes through the absence of good design in the products themselves. To truly revolutionize the production of waste, it's crucial for production companies to pioneer the redesign of packaging through recycling initiatives (Singh, Ramakrishna, & Gupta, 2017). Zero Waste institutions have leverage here to put pressure on circular cradle to cradle design (Leonard, 2010). This can be accomplished through a set of new business models that rely on product lifecycle data to prevent waste generation as well as infrastructure for product lifecycle data to prevent waste generation (Esmailian et al., 2018).

Ultimately, the literature suggests that Zero Waste incorporates an all systems approach to waste management, acting as a solution to monitoring the broader system in which waste is generated. It includes upstream waste prevention, downstream waste reuse, and engagement with community, policy, and economic markets to address the accumulation of trash in the environment (Connett, 2013; Leonard, 2010; Stave, 2008; Zaman, 2015).

History of the Zero Waste Movement

The concept of Zero Waste first appeared in Canberra, Australia in the 1990s, as a political response to citizen interest in minimizing the amount of waste sent to the landfill (Connett, 2013). When asked how much waste citizens felt should be going to the landfill, they said "None!" Politicians responded to this challenge, and by 1996 the Australian government passed

the 'No Waste by 2010' law. Meanwhile, at the other end of the world in Berkeley, California, a man named Daniel Knapp, was developing a recycling operation from recovered materials from the landfill (Connett, 2013). He divided up these materials into twelve categories efficiently to collect, process, or use the materials on-site. His business model aimed for 'total or 100 percent recycling' (Connett, 2013). The idea revolutionized the notion of waste as unusable discarded material into a valuable resource.

The waste free vision of the Australian government merged with Knapp's recovery operation at a crucial moment in Zero Waste history. Knapp's idea sparked interest from the Australian government, and they invited him to speak in Canberra and Melbourne (Connett, 2013). His phrase of 'total recycling' combined with Canberra's phrase 'No Waste by 2010' to create the slogan 'Zero Waste.' Knapp spread the term on the internet, emphasizing that the Australian government was endorsing Zero Waste. He found that the term 'Zero Waste' gained more attention than 'total recycling', and soon the concept went viral in the United States. Unfortunately, the vision was lost to new legislation in Australia before the 2010 goal, but the message exploded across the United States at a critical time for decision makers (Connett, 2013).

California as well as other states across the U.S. had already begun to embrace the 'Zero Waste' ideal in the 1990s. Policy makers, citizens, and grassroots organizations in California, alarmed by the increase in the number of landfills and incinerators, were primed to accept Knapp's 'Zero Waste' message (Connett, 2013). Knapp's enthusiasm along with his endorsement by the Australian government, inspired U.S. communities to create single-stream recycling curbside collection programs, develop community resource centers (such as RESource in Burlington), expand composting efforts, and address the need to fight overconsumption in a

throwaway society (Leonard, 2010). The term began to take hold in efforts to redesign different parts of the materials economy.

Materials Economy Drives Waste Production

Annie Leonard, author of the *Story of Stuff*, points to the American materials economy as inexplicably linked to overconsumption and waste production (Leonard, 2010). The materials economy combines extraction, production, distribution, consumption, and disposal in a linear model that wastes resources and strains ecosystems (Connett, 2013). Material flow is described as the entrance of only virgin material at the beginning of this value chain (Michelini, Moraes, Cunha, Costa, & Ometto, 2017). Zero Waste advocates argue that the linear materials economy, as the dominant material and energy flow model in America, encourages economic growth at the expense of extracting natural resources from the earth, creating products, selling them, and then sending those products to the landfill (Satyro, Sacomano, Contador, & Telles, 2018). Sometimes referred to as a cradle to grave model, this system extracts resources to make into products such as furniture, carpets, televisions, clothing, plastic packaging, etc., and eventually, these products are disposed into a 'grave' of some kind, usually a landfill or incinerator (McDonough & Braungart, 2010). Within this system, more than 90 percent of materials extracted to make durable goods in the United States become waste almost instantly (McDonough & Braungart, 2010).

Some companies will specifically engineer products to break or become unfashionable within a few years, months or even days, reducing the product lifetime and sending the item straight for the landfill (Satyro et al., 2018). This practice, known as "planned obsolescence" (Bridgens et

al., 2018), may drive innovation (Blonigen, Knittel, & Soderbery, 2017), but at the expense of depleting natural resources and polluting the environment (Echegaray, 2016). The more often these products break down, the more that Americans consume, and the higher the piles of garbage become. Therefore, this linear production model not only creates resource loss during production but also at the end-of-life waste (Michelini et al., 2017).

The concept of Zero Waste essentially reverses this model to address waste production at each stage of the materials economy, incorporating a holistic approach to waste management systems (Zaman, 2015). The idea has become incorporated into waste management policies around the world to address the growing demands for materials and evidence of environmental impacts of the disposable consumerist economy (Silva, Rosano, Stocker, & Gorissen, 2017).

B. Zero Waste Policy Initiatives around the World

Waste management practices around the world are shifting from the conventional landfill and recycling of municipal waste towards integrated waste policy (Silva et al., 2017). As urban populations expand, programs involving zero waste targets and 100% diversion from landfills are being created to save land space and lower costs. Waste policy intervention is fortified by circular economic programs and shifting production and consumption patterns (Andrews-Speed et al., 2012).

1. Europe

In Europe, some economists and policy makers are using these Zero Waste concepts by taking a more circular approach to product life cycle to minimize waste and conserve materials. The German Recycling and Waste Management Act of 1996, separates goods circulating in an economy into two separate categories: products and waste (Crampton, 2003). By separating these categories, it defines waste in a way that makes it inseparable

from the production process, and it essentially places responsibility on manufacturers to manage their waste from the beginning of the produce life cycle. Also known as the Polluter Pays Principle (Glazyrina, Glazyrin, & Vinnichenko, 2006) the expectation is that manufacturers will design low environmental impact packaging that encourages reuse (Crampton, 2003). The idea has spread to other countries throughout Europe, by influencing a company's behavior to reduce their amount of daily trash related production.

2. San Francisco, California

In 2002, the city of San Francisco adopted a goal of Zero Waste by 2020, hoping to divert a vast majority of solid material from the landfill (Lambrick, 2017). The literature outlines the city's trash removal initiatives, its government policies, and the successes and obstacles the city faces as it implements these goals. San Francisco took a crucial step towards diversion when it declared composting and recycling mandatory for all businesses (Silva et al., 2017). Shortly thereafter, the city passed the Universal Recycling Ordinance, which required every resident to keep their recyclables, compost, and trash in three separate bins. This law involved a three-cart collection program that extended to both private and commercial establishments; the first of its kind for a major U.S. city (Sullivan, 2011). The term 'Zero Waste' was applied to this 2020 target of 100% diversion from landfill. The San Francisco Board of Supervisors, aware that several other cities (Toronto, Seattle) had adopted similar goals, were motivated to move forward with the plan (Silva et al., 2017). Specific waste streams were targeted when they banned Styrofoam and single-use check out bags, and made trash disposal cost more than composting and recycling. The ordinances soon prompted the Department of Environment Services to educate the community on proper waste sorting methods by fining individuals or businesses who don't cooperate (Lambrick, 2017). The city's Zero Waste objectives are currently responsible for

diverting 78 percent of landfill bound material. By making waste sorting easy, efficient, and mandatory, the SF Environment, a government body responsible for environmental policy implementation, has been recognized as a leading example of a sustainable city (Silva et al., 2017).

3. Vermont: Act 148

The Vermont legislature passed Act 148 in 2012, to propel Vermont towards its diversion rate goals and address the issue of increasingly limited landfill space (Shamlan, 2014). Known as the Universal Recycling Law, this act supports the development of infrastructure and systems that enable Vermonters to prevent reusable resources from ending up in the landfill. These systems are designed with convenience, incentives, and mandates in mind to increase participation rates in composting and recycling programs (Shamlan, 2014). In partnership with Vermont solid waste districts, the city of Burlington implemented landfill bans that exclude mandatory recyclables and leaf and yard debris from dumps. By 2020, the city of Burlington will require that all food scraps from business and residents will be banned from the landfill, and instead donated, used as livestock feed, or sent to a composting facility (Tucker, 2007).

The act addresses waste reduction at different points along the waste-removal chain. Trash collectors are required to offer recycling and organic waste collection, as well as combine fees for recycling and trash for residential customers (DEC, 2018). Waste facilities are obliged to base the cost of disposal on the volume of waste in 'pay as you throw' fees for customers. Recycling bins must be placed next to trash bins in public spaces. In doing so, the act encourages participation rates through easier access to low-cost waste reduction programs and provides consistent hauling services to Vermont residents (DEC, 2018). In this sense, Burlington's Act 148 is driving changes at the University of Vermont. The influx of compost from residential areas

and the University could pose a challenge to the amount of limited space at the Green Mountain Compost facility (DEC, 2018).

C. Campus Waste Management

1. Universities and trash production

American universities produce large varieties of waste streams (Camp, 2010). From food scraps, to beer bottles, to plastic packaging, to landscape refuse, to construction waste, to lab equipment, university campuses generate as much trash as the cities in which they are located (Camp, 2010).

Several schools have published results from campus waste audits in an effort to track specific waste streams. The literature reveals high levels of waste production at different universities around the country. Western Kentucky University, home to 20,000 students, generates 1,500 tons of solid waste, annually (Ebrahimi & North, 2017). Contrast this to the estimated waste production at the University of Idaho which totals 1,500 tons for 11,000 students, *each day* (Camp, 2010). In the year 2017, waste collected only from residential halls at University of New Hampshire totaled 40 tons (McCord, 2018). This is a high proportion of trash production compared to schools that have adopted Zero Waste goals and divert considerable amounts of waste from the landfill (Cuneen, 2010). The amount of trash the schools must manage means more money and energy spent on collection services and transportation costs (Connett, 2013).

In addition to the amount of waste generated on a college campus, the findings from these waste audits uncover the amount of material that could have been recycled, composted, donated, or reused. In their analysis of campus residential waste streams, Baldwin and Dripps emphasize an understanding of the composition of waste streams across college campuses is an important first step to developing effective waste management strategies (Baldwin & Dripps, 2012). A

dumpster audit at Western Kentucky University revealed that nearly 34 percent of the contents of each dumpster comprised recyclable commodities (Ebrahimi & North, 2017). With an effective waste management plan, this recycling could have been diverted from the landfill and sent to a recycling facility. According to Tufts University, dumpster audits at the end of the school year reveal unopened cans, packaged food, furniture, books, old clothes, and shoes that could easily have been donated. At Furman University, in South Carolina, a three year waste audit revealed that 41% of residential waste could have been recycled under the university's current waste management program, and 63% could have been diverted from the landfill through recycling and composting (Baldwin & Dripps, 2012). These trends of misplaced materials appear across higher learning institutions creating significant budgetary and environmental problems (Camp, 2010).

Universities have responded to these issues by funding permanent positions ('Sustainability Coordinator'), and developing location specific 'Zero Waste Roadmaps' aimed at reducing the amount of trash generated and diverting waste from the landfill (Camp, 2010).

2. Campus zero waste initiatives

Many of these university 'roadmaps' outline a commitment to a specific diversion rate goal by a certain date. The plans lay out several different initiatives to achieve these goals. Some of the most common initiatives include all-inclusive recycling programs, increased composting infrastructure, environmentally preferable purchasing guidelines, resource conservation, and education and outreach tools for schools committed to building a Zero Waste culture. They lay out current waste management practices as well as the school's history of waste reduction initiatives. The plans address flaws in the current waste management system by creating a list of suggestions the school can take to mitigate trash at different levels of the supply chain.

a. The University of New Hampshire

In recent years, University of New Hampshire administrators and stakeholders have increased their focus on campus waste reduction. This shift in attention stems from the motivation to achieve a STARS Platinum rating through the Association for the Advancement of Sustainability in Higher Education (AASHE), as well as give UNH a competitive edge in campus sustainability initiatives (Powley, 2017). In a Sustainability Institute video module, University President Mark Huddleston stated, “Sustainability is a key factor in giving UNH a competitive edge on institutions across the nation as we prepare our students for meaningful careers”(Powley, 2017). In addition to the administration, students also emphasized the need and desire to focus more on achieving campus waste reduction. In a 2016 campus wide survey, numerous students suggested improvements in composting infrastructure and signage, food waste reduction efforts in the dining halls, stricter recycling policies, and e-waste recycling programs (Powley, 2017). These factors propelled the University’s Sustainability Institute to develop a comprehensive waste reduction plan.

In 2017, the University outlined ‘A Zero Waste Planning Guide’ by evaluating key waste streams and providing suggestions for furthering zero waste goals. Stakeholder interviews and University research informed the focus of the report, as well as the framework of waste reduction strategies, including the suggestions to address composting, dining services, bins and signage, athletics, procurement, surplus property, and education and outreach (Powley, 2017). The plan calls for the redesign of the school’s current composting facility by constructing an anaerobic digester or an aerated static pile system. It suggests that UNH dining services implement a food recovery program, and that athletics staff should consider alternative waste collection systems

for food waste from tailgaters at sporting events. The report specifies the importance of developing a green procurement plan outlining standards and practices for more sustainable purchasing decisions and phase out the purchase of single-serve bottled water, Styrofoam, and single-use plastic bags. These recommendations are supported by the idea that an initial investment in the plan will result in long-term financial savings and reductions in campus waste generation (Powley, 2017).

b. Appalachian State University

Appalachian State University (ASU) aims for a 90% diversion rate from the landfill by 2022 (Maxwell, 2012). Similar to the University of New Hampshire, ASU developed a Waste Reduction Strategic Plan to work towards this vision of a zero waste campus. Using zero waste as a guiding principle, the approach strives to reduce overall consumption, return material goods for reuse, compost all organic matter, and recycle goods and materials at the end of their life span. These goals are important to the University because they have a direct impact on the health of the planet, challenge existing consumption behaviors and purchasing habits, and educate the campus community about responsible living for a sustainable future. The first initiative outlined in the document encourages the expansion of reuse and recycling efforts through increasing the amount of bin locations, forecasting procedures for the sale of marketable recyclables, and engaging Design and Construction in the implementation of a construction and demolition waste plan (Maxwell, 2012). The next initiative works to expand composting efforts through an increase in pre-consumer and post-consumer waste collection with Food Services. The third initiative focuses on the institution of an Environmentally Preferable Purchasing Program (EPP) that requires the university to purchase compostable products when the price and quality are comparable to disposal costs of other products such as Styrofoam. The last part of the plan

emphasizes campus engagement through education and outreach to offer students and staff campus sustainability resources (Maxwell, 2012).

D. UVM Waste Management System

1. History

Throughout the years, the ways in which the University of Vermont (UVM) has viewed and managed waste on campus has evolved, making a more comprehensive understanding of this history valuable in moving forward with new mitigation strategies. In the late 1980s, the Custodial Crew took the lead in creating an institution wide recycling initiative with the help of a student run club (Vermont Students Towards Environmental Protection)(Berman, 2019). The group closed the trash chutes in residence halls and started a recycling collection program in the dorms. By 1996, a branch of the Custodial Crew called UVM Recycling began sending recyclable materials to Chittenden Solid Waste District's new Material Recovery Facility (MRF)(Berman, 2019). Shortly after, they started a program to collect food waste for composting in the dining halls, and sent the food scraps to the Intervale Compost Facility, which had just opened up operations in Burlington. Around the same time, UVM Recycling implemented a recycling and trash bin 'cluster' policy in all academic and administrative buildings to ensure that each waste receptacle had a recycling option (Berman, 2019). In 1999, the Recycling department began collecting old computers and batteries for recycling in an environmentally-secure manner, as awareness about the hazards of "e-waste" disposal started circulating campus (Berman, 2019). Next, the program expanded composting efforts to residence halls by providing students with special biodegradable bags, and Dining Services began to explore the idea of using compostable packaging for serving food. By 2004, UVM Recycling launched the first student outreach group called ECO-REPS to

promote recycling, conservation and environmental awareness among peers in residence halls (Berman, 2019).

2. Overview of Current Waste and Recycling Program

There is a lack of literature surrounding information about UVM's current waste management systems, except for several University case studies and reports from the UVM Recycling Program itself. The reports explain that the UVM Recycling and Solid Waste program oversees the daily collection of solid waste, food scraps, and recycling from all University buildings and facilities. They also run the surplus property program by collecting furniture and miscellaneous discards from the UVM campus and selling them back to the greater Burlington community (Berman, 2019).

a. Trash (Solid Waste)

UVM's trash is collected by Casella Waste Systems trucks, brought to a solid waste transfer station in Williston, and then packed into a large semi-trailer which goes to a landfill in Coventry, Vermont. The Coventry Landfill is the only landfill in the state of Vermont, located 70 miles from Burlington.

b. Recycling

UVM uses a Zero Sort recycling system that allows paper, glass, plastic, and metal to be put in the same single-stream bin (Berman, 2019). The materials are sent to the Materials Recovery Facility in Williston Vermont, sorted into specific categories, and then shipped to factories that will turn the discards into new products (CSWD, 2019). There are several materials that are excluded from the single-sort bins; these are recycled differently. Florescent light bulbs and batteries, collected in electronic waste bins around campus, go to Complete Recycling Solutions in Massachusetts where they are disassembled into mercury, glass, and aluminum. Good Point

Recycling in Middlebury, Vermont, disassembles UVM's old computers and recycles the metals, plastic casings, glass, and batteries from the monitors (GPR, 2019). A scrap metal yard in northern Vermont takes old metal chairs, pipes, and mufflers and separates the metals to send to steel mills and smelting plants (Berman, 2019). Lumber, scrap wood, and pallets are burned as biomass fuel to make electricity at the McNeil Generating Station (Thompson, 2017). UVM Recycling is in charge of making sure these materials get to the correct place.

c. Composting

In an average week, UVM diverts over 10 tons of pre- and post- consumer food waste through composting efforts. Food waste and compostable packaging are collected every day from dining halls and residence halls. Casella, a contracted hauler, picks up the organic waste from dining halls and sends it to Green Mountain Compost, a compost facility operated by the Chittenden Solid Waste District located in Williston, Vermont (CSWD, 2019). Work study students operate the collection of compost from residence halls (Berman, 2019).

3. Current Zero Waste Efforts

Currently, UVM Recycling is working towards creating less waste in the up-stream part of University activities (Berman, 2018). While UVM is not yet a Zero Waste campus, there have been a few key efforts in recent years to achieve these goals. University Dining Services eliminated the use of trays in dining halls to reduce post-consumer food leftovers, and launched the Ecoware program as an effort to reduce the use of take-out containers at retail locations around campus (Thompson, 2017). Procurement Services works with an office supply vendor to deliver supplies around campus using reusable corrugated plastic shipping boxes, and UVM Telecommunications Department publishes the Student and Staff Directory electronically rather than a hardbound book copy. During move out week, UVM Recycling has set up a program for

students to donate couches, rugs, carpets, appliances, refrigerators, microwaves, lamps, etc. to community organizations such as ReSource, Habitat for Humanity, and the Salvation Army (Berman, 2019). These are the only documented efforts by the University in the literature, but there may be more efforts that are not specifically cited or tracked.

Objectives

In 2017, Corey Berman, UVM Waste and Recycling Program Supervisor, introduced a rough outline of a framework to direct future sustainable materials management decisions through a “Zero Waste” lens. The current draft Zero Waste Plan emphasizes UVM’s commitment to diverting 90 percent of all materials from the landfill by 2025.

Currently, this plan entails adoption of the following four basic Zero Waste criteria:

1. **Infrastructure Development:** This includes the effective use of signage, social media, online resources, sort stations, reuse opportunities, and more sustainable purchasing patterns;
2. **Zero Waste Culture:** This includes reduced consumption, waste reduction, sustainable purchasing practices, material reuse, product repair, and waste diversion;
3. **Education and Outreach** for students, faculty, and staff that model waste prevention strategies;
4. **Waste Tracking Data:** This includes implementation of procedures that most accurately track the Zero Waste programs and results.

There are large gaps between these goals and actual strategies for putting them into every day, campus wide practice at the University of Vermont. As a recognized leader in campus sustainability, UVM has been pursuing various waste reduction initiatives for years (e.g. Ecoware program, plastic water bottle ban, residential composting). But like many campuses, UVM struggles to move toward integrated strategic, campus-wide zero-waste systems and

procedures. As enrollment and operations grow on campus, there is a concerted effort to continue to increase diversion rates while at the same time, decreasing the total waste generated. UVM needs help completing a comprehensive Zero Waste infrastructure plan that addresses these gaps. The current planning framework has not yet considered input from internal operations on meeting specific departmental needs. It lacks directed feedback from different campus operations on how to best incorporate the Zero Waste Plan into their mission and future objectives.

The purpose of this thesis is to provide effective strategies for enhancing Zero Waste management goals at the University of Vermont by incorporating the needs of campus stakeholders. Using a systems approach, it will take the current draft plan to the next level by incorporating input on different functions of a Zero Waste campus specific to the internal operations of different departments.

Post Landfill Action Network

As part of this goal, I reached out to PLAN, the Post Landfill Action Network, to learn more about the structure of their Zero Waste campus assessment toolkit. PLAN is a consulting company that works with Universities to come up with a holistic framework for measuring waste reduction on college and university campuses. I wanted to understand the process behind developing such a framework and get a sense of the types of questions they asked different schools to develop a set of waste mitigation recommendations. Their framework aims to build a zero waste assessment for schools that goes beyond diversion and compost to incorporate a holistic systems approach. PLAN found that campuses with goals of Zero Waste by 2020 diversion rates were not going to achieve their targets. They discovered three main challenges:

- 1) Diversion Metric - that these diversion metrics didn't accurately reflect a measurement of Zero Waste,

- 2) Standardization – research shows that in order to create effective behavior change, you need infrastructure in place to ensure that this behavior change lasts,
- 3) Management – the goals of Zero Waste must incorporate input and cooperation of different departments.

PLAN used these findings to develop a quantitative set of measurements that would give schools a baseline Zero Waste 'score' of how well they were doing in regards to specific categories.

The meeting with PLAN went so well in fact, that UVM Recycling & Zero Waste and the Office of Sustainability decided to hire PLAN to provide UVM with its own baseline score. Because my thesis lined up with PLAN's goals, I acted as an ambassador for PLAN in addition to conducting my own research for my thesis. My findings were used to help write PLAN's report as well as my own report.

Methods

I conducted my research through semi-structured interviews. A semi-structured interview is a verbal interchange where one-person, the interviewer, attempts to elicit information from another person by asking questions (Longhurst, 2003). They unfold in a conversational manner offering participants the chance to explore issues they feel are important. The questions are predetermined, but the conversation allows flexibility in the way issues are addressed by the respondent (Longhurst, 2003). This method was selected as the means for data collection in order to explore interviewee's opinions, gather complete information, clarify interesting and relevant issues, and allow for some freedom in the conversation topics. Studies show that opportunities for face to face contact with a researcher stimulates interest in the project and establishes a sense of rapport between respondents and researcher (Barriball & While, 1994).

I identified committed campus stakeholders and their specific needs in relation to creating a Zero Waste campus through semi-structured qualitative interviews with representatives from 16 different campus departments: Environmental Health and Safety, Purchasing Services, Custodial Services, Dining, Facilities Design and Construction, two academic departments, the Print and Mail Center, the Fleming Museum, the Office of Transportation, the Bookstore, the Athletics department, the Library, the Campus Children's school, the College of Medicine, the Physical Plant, and the Grounds Department. UVM Recycling & Zero Waste and PLAN gave me specific suggestions for which departments to contact based on the structure of the campus waste system.

The purpose of the interviews was to understand the divisions' internal operations, discern a connection between the divisions' mission and their waste streams, and determine the best approach to incorporating the mission into the Zero Waste plan. Because the purpose of this thesis focused on the improvement of operations at the University of Vermont, it has been exempt from IRB approval (Personal Communication, January 9, 2020). The research fell under the category of a quality improvement project that systematically collected data for administrative or reporting purposes, but isn't designed to contribute to, or advance generalizable knowledge. Instead, the thesis aims to develop or contribute knowledge relevant to the organization (UVM), thus exempting from the IRB process.

Interviewees were selected based on their position in the organization as well as their availability. They each had an understanding of their divisions' internal operations. During the summer of 2019, UVM Recycling & Zero Waste emailed the correspondents asking for their consent to be interviewed by a student, me, as part of the compilation of a Zero Waste Roadmap. I collected specific information regarding waste streams, and the challenges and benefits of reducing certain waste streams using the same set of uniform questions.

Before the set of interview questions, I sat down with each person to provide them with an explanation of Zero Waste and give them a summary of UVM's draft of the current Zero Waste Plan. Then I conducted the interview using this set of uniform questions:

Questions:

1. What is the mission of your department?
2. Describe the different waste streams your division creates. Explain the biggest type of waste in your department. For example: Cardboard, packaging, food waste, e-waste.
3. What would the challenges be of reducing the biggest waste stream for your department?
4. What would some of the benefits be?
5. What have you already done with regards to recycling/composting/zero waste efforts? What accomplishment are you most proud of? What could be improved?
6. Is your operation/team/department interested in working with the Office of Sustainability towards UVM's diversion rate goals?

I analyzed the research qualitatively to provide an analysis of the mechanisms and structures of campus divisions. I chose a qualitative analysis, because the focus of the thesis lies on the understanding of the different motivations and backgrounds of the stakeholders that are involved or may be connected in any way to future ZW developments at UVM. The aim is not to prove that ZW is the right way to go. The aim is to understand how this can be done and how to best support campus waste management strategies.

I created guidelines for sustainable procurement based on the missions of different campus stakeholders. This was done through a general inductive approach. According to Thomas (2006, p. 239), "the purposes for using an inductive approach are to a) condense raw textual data

into a brief, summary format; b) establish clear links between the evaluation or research objectives and the summary findings derived from the raw data; and c) develop a framework of the underlying structure of experiences or processes that are evident in the raw data.” Studies indicate that the general inductive approach is less complicated than using other approaches to qualitative data analysis. It provides a simple straightforward set of procedures than can produce reliable and valid findings (Ezzy, 2013; Thomas, 2006).

Results

In the summer of 2019, I conducted in person interviews with staff from 16 different campus departments: Environmental Health and Safety, Purchasing Services, Custodial Services, Dining, Facilities Design and Construction, two academic departments, the Print and Mail Center, the Fleming Museum, the Office of Transportation, the Bookstore, the Athletics department, the Library, the Campus Children's school, the College of Medicine, the Physical Plant, and the Grounds Department.

I recorded each interview, took detailed notes for each interview question, and summarized the contents of the interview for its corresponding department. The interviews lasted thirty minutes to an hour depending on the amount of detail the interviewee shared about their department. Below are the summaries of each interview. I have outlined them in this way to organize the ideas of the interviewee, and present the information to the reader in a logical manner.

Environmental Health and Safety

I interviewed the Environmental Health and Safety Department (EH&S) on June 17, 2019. UVM's Environmental Health and Safety team ensures that hazardous and non-hazardous wastes are properly disposed of. Waste disposal is regulated by the U.S. Environmental

Protection Agency and Vermont Department of Environmental Conservation according to UVM's Environmental Management Plan. Waste management solutions include pollution prevention, toxics use reduction, reuse or redistribution of unwanted materials, treatment or recycling of materials, and disposal.

The biggest waste stream EH&S manages include flammable solvents from teaching and research facilities, specifically ethanol and methanol. These are co-mingled into 55 gallon drums, and sent to a facility in Michigan which reuses the mixture as fuel. UVM has a separate set of standards in regards to lab waste. Hazardous waste must be sealed, tagged and placed for special pick up by EH&S. This system seems to work well for both lab technicians and the EH&S department. Overall the system that EH&S oversees is efficient and effective at disposing of different forms of waste properly. They collect and manage tires, paints and solvents, chemical and radiological waste, waste oil from vehicles, pesticides, fertilizers, propane and propane tanks, paint and paint cans, and janitorial chemicals. According to the Post Landfill Action Network's checklist, UVM would score a 100% in regards to the Environmental Health and Safety category.

One part of the interview included the interviewee's concern about the disconnect between EH&S and the Office of Sustainability. He recently created a webpage and guidebook about proper lab and facility waste disposal that outlines how to fill out a waste tag, how to collect different hazardous materials, and where different materials go. According to the interviewee, this information is not well distributed throughout campus. The interviewee believes that because the Office of Sustainability and EH&S have very similar missions, they should combine forces. By doing so, they could train more UVM staff and students on proper waste management disposal practices for potentially hazardous materials.

Purchasing Services

On June 17th, 2019 I met with Purchasing Services to discuss the purchasing and procurement practices at the University of Vermont. Several gaps were identified in relation to the mitigation of upstream waste. First, there is a lack of environmentally preferable purchasing language in both purchasing policies and contracts with suppliers. Monitoring purchases proves a challenge because there are over 1,600 credit cards given out on campus, and over five hundred people who order different specific supplies. The most common items that people purchase include: copiers, vehicles, scientific equipment, computers, and commodities. However, the purchasing department may not see the invoice until after a purchase has been made. Additionally, the interviewee mentioned that many departments order products through Amazon which are shipped multiple times a day across campus with excessive amounts of packaging. In terms of reuse programs run by Purchasing Services, the University has a toner take back program, but there are not standardized collection bins throughout campus and not many people know about this program or how it works. Purchasing Services expressed interest in incorporating sustainability into the language of the contract suppliers must sign.

Custodial Services

On June 20, 2019, I interviewed Custodial Services to learn about the perspectives of the people who deal with actual waste collection and management at UVM. Custodial Services already does a fair amount in regard to sustainability related initiatives. For example, they have a contract with Foley for cleaning products, bathroom products, and paper products that outlines a

strong preference for eco-friendly products. Much of the cleaning products used are ozonated water. Additionally, they have eliminated disposable wipes for cleaning and replaced them with reusable wipes. Moreover, they have spent over a third of a million dollars on special entry matting which ultimately saves on custodial labor and cleaning product use in the interior of buildings.

The biggest waste streams that custodial staff handle include food and drink, cans and bottles, Styrofoam, and paper. With food and drink being the largest waste stream, the challenge is educating students and staff on how to properly dispose of food scraps. Custodial staff do not sort through the trash, recycling and compost bags, so if a bag is contaminated, they must send it to landfill.

Currently, custodial staff are not trained to minimize waste, and the department would like to work with the Office of Sustainability to implement more training specifically in the importance of waste mitigation, proper recycling and composting rules, and the significance of using the blue and green bag system. The interviewee says that many custodial staff do not think the blue or green bags are as durable as trash bags, so they don't like to use them. In actuality, this is not the case. In addition, he suggested that the Office of Sustainability or Eco-Reps could work on collecting data through waste audits to help figure out the parts of campus where high contamination issues exist and custodial slip ups need to be addressed.

Compost collection at the University is done by student interns and therefore is not emptied often enough, according to Custodial Services. The interviewee revealed that this practice creates a stink for the buildings and detracts from the overall mission of the Custodial department. The interviewee supports and encourages the idea of custodial services collecting building composting to the extent that compost would be better regulated on a daily basis. To do

so, he says buildings with composting would need a decent bag and a decent container in line with UVM's signage and standards.

UVM Recycling

On June 23, 2019, I interviewed UVM Recycling to learn more about the implementation of a campus wide composting system. UVM Recycling has developed a three tier system for implementing campus wide composting. Each tier involves different levels of composting on an industrial scale. The interviewee mentioned that UVM Recycling has been meaning to meet with Custodial Services for ages to develop a strategy for implementing tier two. He outlined a three tier composting system for the University as well as UVM's current budget for waste management.

Three Tier Composting System:

1. Tier 1:

This describes buildings where full service composting that already exists. Essentially any building with a dining hall.

2. Tier 2:

This describes any building near a centralized location with existing infrastructure. By aggregating 3 or 4 buildings, custodial staff could easily carry the physical compost bags over to the drop off areas in central locations. Some examples would include:

- Morrill Hall and Aiken, close to Davis Center
- University Heights, close to Harris Millis Dining
- CWP, close to Simpson Dining

3. Tier 3:

This tier would include the service of any outlier building. That is, a building that is not near compost dumping locations. This is challenging because most buildings already

have a dumpster, so they would need to route another truck entirely. They could add more composting dumpsters, but they are currently paying \$11,000 a month already to Casella for composting.

Cost of Recycling, Composting, and Municipal Solid Waste Tipping Fees:

The interviewee outlined the cost of materials handling and disposal. The cost of materials handling and disposal has greatly increased over the last year, specifically in the areas of recycling tipping fees and the collection/operational costs for organics diversion (composting). UVM Recycling emphasized that the recycling portion is mainly due to CSWD's challenge regarding poor market conditions both nationally and internationally. In essence "we are getting charged more because they can't unload (sell) the material the way they have in years past". Regarding organics, UVM is generating greater amounts of compostable materials and thus requiring increased services from Casella. Beyond that, normal route collection fees for trash and recycling and solid waste tipping fees have all gone up and "with the ever-increasing amount of material generated on campus these numbers continue to rise".

The interviewee mentioned that even though composting and recycling prices are rising, it is still better financially for the University to recycle and compost. He also emphasized that although the majority of the weight of compost includes food, more compostable materials are being added in bulk. An audit reveals a jump from 10 tons of compost a week to 16 tons a week, from 2018-2019, and the collection company has increased their charge rates because of this. Lastly, the interviewee stated that on a system wide level, composting material is not a closed loop system. It is better for the environment to push reusable over single use disposables, even if they are compostable.

Dining Services

On June 21, 2019, I interviewed UVM Dining to get a sense of how dining operates on a system wide level, what they are already doing to reduce waste, and what has the potential to be improved. UVM dining is a very complex operation on campus, managing four dining halls, seventeen different retail food operations, catering services, and concessions at athletic events. They already have multiple waste reduction programs in place to help reduce and eliminate waste in both the front (serving students) and back of house (kitchen) at their facilities. One such program is called Lean Path, which is a food waste measurement program implemented by Sodexo at Harris Millis, Northside, and Redstone dining halls. A scale connected to a computer tracks moldy food or the overproduction of food to ultimately help reduce food cost. They have a food insecurity working group to collect and donate pre-consumer food to local shelters around Burlington. UVM dining has also launched a campus wide Ecoware to-go program, gone trayless, has front and back of house composting at virtually all facilities, and works hard to limit excessive packaging.

Reducing single- use packaging is one challenge to reducing their landfill waste stream. The current To- Go program at UVM is mainly recyclable packaging. There is a team working with chefs on trying to switch the plastic containers to compostable ones; however, it is hard to find the technology to change some of these specific products. Dining is interested in learning more about how to provide students with bulk food items in places like the Marche, although health and safety could pose a risk to implementing such a program.

It is important to note that UVM dining is a service provider. This means that for the most part they will do what the customer (UVM) wants. If UVM asks for no straws, or more vegan options then dining will have to comply. In fact, many of the initiatives have come from

students in the past such as the water bottle ban, the real food challenge, etc. This is critical in regards to implementing future change in the Zero Waste field.

Facilities Design and Construction

On July 9th, 2019 I met with a representative from Facilities Design and Construction (FD&C) to understand the process behind upstream and downstream waste management in the Construction and Demolition department at the University of Vermont. A considerable amount of care and planning goes into sustainable design and construction at UVM.

There are currently 12 buildings on campus that are LEED certified, and all new buildings or renovations must be at a minimum LEED silver. The new on campus multipurpose center is trying for LEED gold. This certification in itself holds construction projects to a very high standard in terms of waste management. They must put different materials in specific dumpsters or send them to EH&S to make sure they are disposed of correctly. Some of these materials may include: dry wall, carpet, cardboard, concrete, asphalt, fuel, or hazardous waste. They have policy language that requires contractors to recycle or repurpose C&D waste. In fact, they recycle 95% of everything.

FD&C described the lengthy process that goes behind actually building a structure on campus. The construction team is given a specific project along with a budget. This project has been crafted by outside architects and engineers who create a conceptual design of how a building or a landscape should look. These projects are reviewed by custodial staff, the risk management team, and an architect before moving on to the next set of drawings. This practice ensures that all aspects of campus have input on a project. Next a contractor is hired, and special inspectors test soil density, structural welds, fire safety measures, etc. The process is time

consuming, but overall favorable in regards to staff communication and environmentally friendly design.

Some of the challenges that FD&C face to proper waste management include the difficulty of finding the right company to dispose of specific waste properly. For example, finding a company that will recycle drywall can be a hassle, and can be just another step added on to the construction worker task. Because some of these waste streams are managed by small contractors, there is no verification that they are disposing of the material correctly. Sometimes they will truck in specific materials over vast distances just to get a LEED point. FD&C is not sure that the benefits of having a new gym floor with FSC certified wood trucked in from far away is more sustainable than using wood from New England. Perhaps there is a way to provide preference to locally made materials.

Art Department

On June 12, 2019 I met with a lecturer in the Art and Art History department to learn about different types of waste produced from both students and staff in the classroom and discover how this waste is managed. The art department generates lots of different types of material rubbish. They produce a significant amount of paper waste which goes into the recycling bins, and there are currently no restrictions on purchasing recycled or unbleached paper. There are also large amounts of cardboard sent to landfill because of the paint or glue used in art projects that prevent the cardboard from going to recycling. The art department purchases sustainably harvested wood for sculpture classes, but using glue as part of the art process renders rejected work unrecyclable. These classes also tend to send a lot of pink insulation foam to the landfill.

There are some steps the art department has already taken in regard to reducing its environmental impact. They use non-toxic sprays and water soluble oil in printmaking, collect toxic waste containers for black India ink to prevent it from going into the water supply, and work with EN Health and Safety to monitor paint traps so that the pigment does not enter the water supply.

The Art Department is very interested in working with the Office of Sustainability towards UVM's diversion rate goals. The interviewee asked if I would present at the staff meeting about my project. "I would love to see your efforts support our department to more stridently pursue the goal of zero waste. I think we are very far from it and improvement is greatly needed and welcomed." The interviewee offered several insights of her own in this regard. She liked the idea of working with the Integrated Arts Academy to donate gently used art supplies, and setting up a formalized room on campus for free scraps. She would like to work across disciplines with ease and fluidity to collaborate with other departments such as CDAE and Rubenstein to engage students across the University and create a lasting impact on campus. She wants to inspire next semester's faculty team to implement recycling and waste mitigation in class projects, such as developing an art curriculum that prioritizes working with more natural materials. This could include restorative art projects, ecoventions, and tree planting sculpture projects.

Some important challenges of creating a more sustainable system include addressing waste mitigation without burdening the faculty. The interviewee is interested in incorporating some of these waste reduction efforts into her own classes but she is concerned that motivating both faculty and students to learn more about the importance of Zero Waste initiatives in the art department will prove difficult.

Chemistry Department

On July 11th, 2019, I met with a Chemistry Department Lab Technician from Discovery Hall to learn about how lab waste is handled through the Chemistry Department. There is a sense of efficiency, care, and establishment of an intricate waste management program in this department. The biggest waste streams in the chemistry department are brown paper towels, followed by gloves. The lab technician does a fair amount to make sure these waste streams are disposed of properly. For one, Discovery Hall has a three bin compost trash and recycling system. The compost/brown paper towel bins get sorted by student interns to be sure they are free of contamination before being sent on to the Green Mountain Compost Facility. They also manage a glove recycling program, with collection stations in each lab. In addition, the department has a chemical sharing, refill, and recycling program, as well as maintaining a shared equipment and resources website.

For the most part, the lab technician himself acts a sustainability steward and advocate for his department. He fixes old equipment himself that people bring directly to his office, as well as acting as a centralized purchasing middle man between labs and facilities. He is able to negotiate prices effectively, and because of this, all of the labs do their ordering through him. Perhaps this should become a more formalized system to ensure that a lab sustainability program would stay long after he retires.

The interviewee outlined a specific vision he hopes UVM adopts in the chemistry department. He wishes that UVM would give more funding for sustainability projects specifically to add more waste bins to classrooms, as well as purchase reusable paper towels. He would love to add a waste management section to the Discovery Hall part of campus tours.

Overall, I got the impression that the interviewee manages Discovery Hall well, although it is unclear how well other science buildings on campus do in regards to sustainability efforts. In this way, it is important to use this lab technician's effort as a model for other parts of campus.

UVM Print and Mail Center

On July 12, 2019, I interviewed the UVM Print and Mail Center to find out the ways in which the Print and Mail center facilitates and oversees the inflow and outflow of different materials. The main sources of waste from this department largely include paper and packaging from on campus deliveries. UVM delivers over 2,000 packages a day to students around campus, everything from food to bedsheets to clocks, delivered in the form of boxes or padded jiffy envelopes. Departments and faculty also order packages that are delivered on campus by FedEx or UPS. Eliminating some of these deliveries would reduce fossil fuel emissions from multiple truck delivery routes a day.

The department head seems to be passionate about what his department is already doing, and not too sure if there are many other ways to improve the system. The Print and Mail center uses about 70-80% recycled paper, reuses shipping pads and content envelopes, and keeps the extra waste from paper and posters to create little pads of notebook paper which they distribute around campus. His ultimate vision however, for the department is to purchase a new machine that is more environmentally friendly for creating posters. Currently, the posters have too much glue on them and they cannot be reused or recycled. A new machine would print directly onto a foam board without using any glue. This would cost about \$2,000.

The Print and Mail center is essentially a hub for in and out going materials, and they do not offer too many opportunities for certain materials to be recycled or reused.

Fleming Museum

On July 12th, 2019 I met with Fleming Museum staff to learn about art waste management as well as the effectiveness of UVM waste management programs at a location that caters to the public as well as people on campus. The biggest types of waste streams include: office waste, rack cards (used to promote attractions in the state such as those you might see in a tourist or information center), exhibition waste, craft supplies, and packaging shipments. The staff seemed informed about the issues of sustainability and well versed in the language of waste mitigation. It would be a challenge for the Museum to reduce the packing from art shipments, made up of cardboard and bubble wrap. In terms of advertising materials, they must get the word out about the Museum to attract tourists.

The museum is already taking strides to reduce their waste. For example, the museum used to print a newsletter for all faculty and staff on campus, and now they have an order on request system. In order to get a FSC certified paper copy, you have to specifically request it. This cuts down on an excess of paper waste. The museum also has a deaccessioning board committee responsible for donating or disposing of art. The complex process adheres to AAM (American Alliance of Museums) rules and guidelines for buying and disposing of this artwork.

Office of Transportation

On July 10, 2019, I interviewed the Office of Sustainable Transportation to learn about the daily operations and waste management streams of Transportation and Parking services. The Office shared a lot of information regarding the implementation of programs designed to reduce single use occupancy vehicles, and therefore reduce greenhouse gas emissions. I learned that the department offers education and outreach in regards to sustainable forms of transportation. They

are trying to raise parking prices to disincentivize single use cars, and they have developed an ebike lending program which includes a special cargo bike to replace a vehicle. When approving parking permits, they give preference to carpooling passengers as well as electric vehicles. They offer a wide variety of tips, incentives, and a mass of information on their [website](#) in regards to reducing tailpipe emissions. Importantly, the office is working to pass the new Green Fleet Procurement Policy to make sure the University adheres to a set of sustainable vehicle purchases.

In addition, the department does an effective job at managing general vehicle waste. They utilize a tire reuse program as well as a program for recycling old batteries. They reuse and resell abandoned bikes on campus, and they have developed a learn to bike program for custodial staff.

The biggest office waste streams include paper waste, plastic parking permits, and bike lights and bells that are individually wrapped in plastic.

UVM Bookstore

On July 16, 2019, I interviewed the UVM bookstore to get a sense of waste reduction purchasing policies, waste streams, consumer habits, and also to consider areas for improvement. The bookstore supplies the Catamount Store, Henderson's Cafe, Cat Pause Convenience store, as well as manages a textbook operation.

Bookstore

In terms of waste streams, the Catamount bookstore goes through 200-300 cardboard boxes a day, some of which are reused and the rest recycled. Clothing or gift items come in these cardboard packages with shipping noodles and air packs, which they try to reuse as much as possible. One of the most visible forms of excess waste includes plastic bags which they still give out to customers. These thicker bags fall outside of the guidelines for reducing single use

plastics in Vermont because they can pass the bags off as reusable. Even so, they have cut their bag usage in half by requiring staff to ask customers if they need a bag. Parents and prospective students require a certain standard when they buy a product at the bookstore, and some expect a bag. People buying books might come to expect a plastic bag to protect a textbook in the rain, and certain departments want bags for giving out supplies to staff. Eliminating them altogether did not seem like the best option in his mind.

The Catamount Bookstore does run a few Zero Waste and sustainability initiatives. They offer a recycling program for computers through the bookstore and techstore website for both students and staff. They offer a book and clothing donation program several times during the school year. All of the caps and gowns that the Bookstore sells are made out of recycled water bottles.

Some challenges to mitigating waste include the fact that there are over 300 vendors that provide over 130,000 unique items to the bookstore. Shipments of textbooks come in 3 times a year, clothing 3 times or 4 times a year, and school supplies 3 times a year. There is not always an option to reduce single use packaging with certain vendors. If in fact UVM required that vendors shy away from single use packaging, this could mean a loss in certain products or specific items.

Henderson's and Cat Pause

Henderson's produces a large amount of coffee grounds which all get sent to compost, as well as a substantial amount of disposable coffee cups. Many students drink coffee in a to-go cup and then sit down in the cafe. The interviewee suggested that staff in Henderson's could use the same training style as the Bookstore staff who ask customers if they need a bag. Instead it would

apply to a to-go cup. Henderson's could give reusable mugs first, and give people to-go cups second. However, he says, training staff takes time and energy.

Cat Pause offers plenty of packaged to go food. These items are supplied on a daily basis, to meet the demand of students and ensure freshness. It would be difficult to provide bulk food because they do not want to step on toes with Sedexo. Offering bulk shampoo, laundry detergent, and soap are possible, but the cost of supplying these items may be more than what they can sell them for. They do not know if there is a sustainable market for these products at UVM.

Athletics

On June 20, 2019, I interviewed the Athletic Department to learn about the waste streams produced by the Gutterson Field house, the feasibility of implementing a Zero Waste Stadium, and any current waste mitigation strategies that the athletics department practices.

The biggest waste stream in the operational side of Athletics comes from concessions during hockey and basketball games. The interviewee pointed out that proper waste management is only "as effective as the consumer" meaning, fans tend to put waste in the incorrect bins, leading to contamination. He is concerned that an increase in compost will mean purchasing and storing a compost dumpster, which he does not think there is space for. UVM Athletics also tends to give out a fair amount of disposable SWAG during games. Bambams and other disposable giveaways create unnecessary waste sent to landfill. Additionally, the interviewee mentioned that sports teams at UVM lack an equipment donation or reuse program.

Library

On August 1st, 2019, I interviewed a representative from the Howe Library to understand the types of waste streams produced by the internal operations of the library. Food waste from

the cafe is a large portion of library waste, as well as boxes or padded mailers from the interlibrary loan program.

Overall, the library complies with UVM's sustainability oriented practices. They donate or recycle all of their old books, take full advantage of UVM's surplus property program, and have a system where students can order books on demand, rather than supplying a bunch of books they only hope students will want. Because it is a shared community space, the library also has a whole set of multimedia resources to loan to students. This includes DVD players, cameras, a 3D printer, etc.

The Library implemented composting this fall. There is a three bin system for recycling, trash, and compost, similar to the bins in the Davis Center. Custodial services will be in charge of collecting compost. The interviewee is concerned that students will not use this system correctly and contamination levels will be too high for the compost program to work effectively. His vision around this idea involves creating an image package for students about the type of materials that are compostable, recyclable, and trash to show people proper sorting practices. He is interested in working with Ecoreps to conduct public waste audits in the front lobby of the library, as well as trying to reduce the amount of food containers brought in from dining halls outside the library.

Campus Children's School

On August 1st, 2019, I interviewed a representative from the Campus Children's School to learn about the internal waste management system and sustainability practices of the Childcare center as they relate to the rest of campus. I was surprised to learn that the school itself has a general guiding principle of both practicing sustainability and teaching it to their students. The nature oriented curriculum reflects the sentiment of a responsibility to the natural world and

teachers help to reinforce this ideal to the kids through certain programming. They teach about the importance of food and farming, and use an onsite garden to explain where food comes from. This is coupled with a robust composting program in each classroom. Sometimes, they will take the kids around campus to pick up trash and work with them to make 'please stop littering' signs. The teachers will sometimes create waste sorting activities by laying out the trash from different bins and asking the kids if the waste is sorted correctly.

The interviewee outlined a few waste streams that the school produces. The biggest is food waste from both students and staff created on a daily basis. Kids are not allowed to put leftovers back in their lunch boxes, so if they don't finish their mac n cheese, they must compost the rest. The compost is picked up by custodial staff. She mentioned that they order a lot of their paper products online in bulk from amazon as well as other supplies they need. The packing from this creates a fair amount of waste. The school really does not produce a lot of garbage because they do not give out a lot of plastic or consumables to kids. They have an entire room dedicated to reusing donated or recycled art supplies, donate any old toys or books to other childcare centers or Goodwill, and they do not use a lot of consumables or trash in their daily schedules.

College of Medicine

On August 9th, 2019 I met with an Operational Staff Member at UVM's Larner College of Medicine, to discuss the management of different waste streams in labs. The operational staff member oversees moves, changes, lab closures, and renovations, and had some important insights into how to close the materials management loop. She mentioned that some of the biggest waste streams include: paper, electronics, lab waste, and old equipment. In the labs themselves, most of the throwaway items include pipet tips, tissue culture flasks, consumables,

and gloves. The recycling bins are for cardboard and plastic pipet tip containers. Adding more recycling bins would prove challenging because of the space constraint in most labs. They are starting to use the same Kimberly Klark program that some academic labs use for glove recycling, but collection proves challenging due to physical space constraints. It is also hard to find a location to put the gloves for pickup.

During lab closures and cleanouts, a large proportion of old equipment (freezers, refrigerators, microscopes, etc.) goes to the landfill. This is because the operational staff cannot necessarily redistribute the supplies to all of campus or advertise the free items effectively, and there is not a standardized process for donating old equipment. The interviewee wants to improve this system by developing an online webpage that would be used to advertise old lab equipment to faculty. This online platform would provide information about used equipment for faculty to collect items themselves, and allow faculty to apply for a work order to move equipment or ask for a cart to bring an item to specific locations in the building.

It is important to note that there is currently a timeline for how long a faculty member is allowed to hold onto a piece of equipment, and there are risks and liabilities for donating equipment outside of UVM as well as specific policies against reselling products. Some equipment also becomes obsolete because of the operating system. These factors could limit the amount of old equipment advertised on a webpage.

In addition to old lab equipment, lots of clean glassware (test tubes) ends up in the landfill during cleanouts due to a lack of a lab glassware recycling program. There is not a glassware collection or donation system set up. The interviewee is interested in finding such a program to mitigate clean glassware waste.

Physical Plant

On August 19th, 2019, I met with an operational staff member at the Physical Plant, to learn about the waste streams that operational staff handle on a daily basis and the disposal processes of that waste. The Physical Plant Department (PPD) performs critical and vital maintenance and upkeep of all buildings, mechanical, and utilities systems and infrastructure and grounds of the University campus. The department maintains over 6 million square feet of facilities ranging from teaching areas, research laboratories, athletic facilities, offices, residential halls, dining halls and libraries. The operational staff respond to specific service requests from buildings and departments around campus who need to replace old equipment or fix broken infrastructure. The types of waste streams that they deal with include: old circuit boards, ceiling tiles, filters, oils, chemicals, underground piping, belts, light bulbs, scrap metal, and any other kinds of equipment related to a building.

The Physical Plant participates in numerous waste reduction efforts encompassing an auction for selling cars and vehicles, utilizing the UVM surplus barn, and communicating with FD & C during the design process to make sure feedback is incorporated into the construction plans. The operations staff also implements sustainable ideas from students such as the installation of water bottle refill stations around campus.

The interviewee thinks that getting to zero waste is a noble idea but difficult to accomplish at a university or industry level. He is worried that the specific item replacements are not frequent enough for recycling companies to take them at a price that would work for the University. There is no policy or procedure in regards to how often certain items should get replaced or proper disposal methods of some equipment. He says that unless there is such a policy along with a staff training, his department will continue to function as usual.

Grounds Department

On August 19th, 2019 I met with a representative from the Grounds Department, to learn about the oversight of landscaping waste streams and the incorporation of certain sustainability standards into practice. The Grounds Department is a sub-section of the Physical Plant. The grounds department is in charge of campus landscaping, spring clean-up, edging, mulching, tree and shrub care, and snow removal. They maintain over 450 acres of grounds, care for 2,500 trees and maintain over 15 miles of sidewalks.

In terms of the types of landscape waste produced, the department is conscious about the proper disposal practices for these materials. Landscape debris such as old mulch, sod, dirt, stones, and wood are sent to the compost facility, and the waste that does not fit into the compost facility requirements (gravel, dirt, mixed waste with trash that has not been sifted or separated) is sent to the landfill. They try to compost as much landscape material as they can. Leaf litter is put in a designated dumpster and hauled to the composting facility. This is a huge part of fall cleanup and for the most part staff sort this leaf litter correctly. In the winter, road salt is applied to hard surfaces all over campus. They mix a magnesium chloride liquid with the salt to enhance the effects of salt and reduce the amount of salt used on campus. That being said, they still use a substantial amount of salt. UVM used to use sand but the quantity of sand along with the dust that escaped into the air and waterways after snowmelt caused problems.

This department is already working closely with the Office of Sustainability on implementing certain environmental practices. The Grounds Department requires its team to mulch around plants to reduce weeding and maintain moisture levels, put grass clippings back into campus lawns, and limit turf watering to a few specific areas. In collaboration with the Office of Sustainability, they follow the IPM (Integrated Pest Management) management plan to

adhere to certain chemical and pesticide standards, as well as plant certain species that are not known to attract pests (therefore using less chemicals). As much as possible, they use homemade organic topsoil from a pile of sifted debris to mulch around new plants.

The Grounds Department is trying to meet a certain expectation for aesthetics on campus. In this way, a low water planting technique such as Xeriscaping may directly oppose this goal. In addition, it is challenging to get landscape to grow around the pavement and concrete dotting much of campus. Underground utilities mean the grounds department must use more water, chemicals, pruning, etc. to support healthy plant life. In an ideal world, the interviewee says, "more communication with UVM's construction team around pre-planning and landscape design would be a great way to improve plant life". LEED practices do not require designing a building with the proper amount of topsoil in a spot where a tree should be planted. However, he is aware that the reality of money and cost makes this intricate planning process difficult.

Discussion with Recommendations:

Overview

The interviews proved valuable sources of information for determining specific areas to target in relation to mitigating waste on both a departmental and interdepartmental level. In regards to sustainability, the data reveal that the category of waste is a critical area for the University to focus on in order to reduce its environmental footprint. Many departments lack the infrastructure, knowledge, or resources to effectively manage their multiple waste streams. Some departments, such as UVM dining, Custodial Services, and Environmental Health and Safety, are already doing an excellent job in effectively implementing low waste strategies. Other departments, such as Athletics, Art, and Purchasing, have little or no guidelines around waste mitigation and diversion strategies.

Given the information collected from interviews around waste-reduction and diversion potential, the following recommendation section will outline suggestions to improve UVM's diversion rate and offer strategies specific to each department as well as strategies to guide the University towards a Zero Waste goal. I will address regulation improvements, infrastructural change, educational tools, policy instruments, and opportunities to work across departments.

The suggestions printed in "bold" were deemed the most relevant by the Office of Sustainability. The recommendations are not numbered in any particular order. Some suggestions are in collaboration with ideas from PLAN (Post Landfill Action Network), UVM Recycling & Zero Waste, and the Office of Sustainability.

Important terms

1. Surplus Property and Hard to Recycle Materials -
 - a. Materials UVM has direct control over - namely, items that the campus purchases, manages, uses, and maintains ownership over, and is ultimately fully responsible for the method in which they are discarded.
 - b. Examples include: electronics, furniture, office supplies, lab equipment, vehicles, chemicals, and facilities

General Trends and Campus Wide Recommendations

One of the most impactful recommendations from this report includes changing specific purchasing and procurement policies to reflect environmentally friendly purchasing goals. This will not only influence the Purchasing Department itself, but ideally it will trickle down to the individual departments by nature of the purchases bought on a department by department basis. Guidelines with clear language around sustainability and waste mitigation will help departments reduce waste before it even gets to campus in the first place.

In addition, my interviews revealed a lack of collaboration between departments with similar goals, programs, and missions. A few departments, such as Environmental Health and Safety, the Grounds Department, and the College of Medicine actually expressed frustration about feeling disconnected from other specific departments. They emphasized that in order to accomplish some of these Zero Waste goals they must prioritize working more closely with other departments. Therefore, I highlight improving departmental coordination, as one of my campus wide recommendations.

Another common recommendation included throughout the report involves implementing a more robust compost system in department buildings across campus. Some departments seem to have a compost bin, while most are lacking a bin altogether. I believe that in order to reduce the overall amount of waste sent to the landfill, the University must prioritize the facilitation of proper compost infrastructure. According to PLAN, it is virtually impossible for humans to change their habits if the infrastructure does not exist in the first place (PLAN, 2015). In this case, the University should fuel more resources towards the development of this program.

One valuable finding from the interview questions exposed a lack of circularity of hard goods and staff utilization of campus programs. To promote the reuse culture of Zero Waste, it is crucial to set up these resource sharing programs across campus.

Lastly, to ensure that the recommendations are implemented over a period of time, setting up a Zero Waste Task force dedicated to accomplishing specified goals will be an important part of the success of this Zero Waste Roadmap. Perhaps having the task force involved with creating a Zero Waste Education plan will keep enthusiasm going among staff students and faculty for years to come.

1. Create a Zero Waste Task Force or committee to review this report
 - a. Define a strategic vision to address system wide solutions
 - b. Create a strategic plan with a timeline to achieve measurable progress towards a zero waste campus
2. Expand campus capacity to manage surplus property and hard-to-recycle materials
 - a. Establish and publicize drop-off locations and sharing shelves for surplus property and hard- to – recycle materials on campus
 - b. Establish a campus thrift store, free store, office supply space and/or other physical space for reuse and sharing among students and staff
 - c. Ensure greater circularity (sharing) of hard goods and staff utilization of campus programs.
 - i. Enforce existing surplus policy. People tend to use the surplus barn for disposal, but don't always check it for new furniture.
 - ii. Increase use of Recycling listserv, and Catskill listserv
 - iii. Create more resource sharing spaces or online platforms for departments.
There is currently a lack of sharing spaces and programs.
3. Revise UVM's Purchasing and Procurement Policies
 - a. Work with the purchasing team to develop a campus wide Environmentally Preferable Purchasing Policy for contracts going out for bid.
 - b. Work towards the elimination of all single-use disposable plastics
 - c. Consider banning single-use plastics in the Environmental Purchasing Policy (EPP)

- d. See Purchasing Services section for more detailed information
4. Develop a tier 3 centralized campus composting system. (Start with tier 2)
 - a. See UVM Recycling Section for more detailed information
5. Create a Zero Waste Education Plan
 - a. Institutionalization of this information. Reach staff, students, and faculty.
 - b. Increase Ecoware awareness across campus. Send information to all students that this program is free, simple and easy to set up.
 - c. Develop a waste sorting education component to incorporate into SU (Sustainability) classes.
6. Improve Departmental Coordination
 - a. Work to ensure departments understand sustainability initiatives and are equipped with the tools necessary to make any changes.
 - b. Connect people in different departments working towards similar waste mitigation goals.
7. Encourage departments to work together on specific zero waste initiatives
 - a. Use the recommendations from interviews with department heads to implement smaller goals within the broader scope of the Zero Waste plan.
 - b. Goals should be tailored to the needs and collaborative effort of individual department stakeholders. See these goals below.

Purchasing Services:

There are a few key takeaways from my interview with Purchasing Services that are incorporated into my recommendations. First, the department lacks an Environmentally Preferable Purchasing (EPP) Policy that would limit waste from the source. Several other schools

around the country have successfully adopted such policies, such as Duke University, to give preference to environmentally friendly products whose quality, function, and cost are equal or superior to more traditional products (Duke, 2019). The University of Vermont has the opportunity to expand their procurement guidelines and recognize their impact as a major purchaser of goods and services through the implementation of the purchasing guidelines outlined below. Additionally, the interviewee mentioned that many departments order products through Amazon which are shipped multiple times a day across campus with excessive amounts of packaging. If a department had more time to prepare in advance, they could come together to consolidate an order which would reduce packaging and unnecessary shipments. The instant ordering culture Amazon creates makes this increasingly difficult. Lastly, the interviewee pointed out that the University has a toner take back program, but there are not standardized collection bins throughout campus and not many people know about this program or how it works. In this sense, it is critical to standardize the toner collection process across campus with bins, signage, and information for staff. The interviewee herself seemed passionate about the concept of sustainability within the financial sector of the University, and she expressed interested in holding weekly meetings with the Office of Sustainability to help incorporate these recommendations into the Purchasing Services goals.

1. Draft a campus-wide EPP (Environmentally Preferable Purchasing) policy that includes:
 - a. Preference for bulk products or limits on single-use/excessive packaging.
 - b. Preference for packaging made from compostable material or post-consumer recycled content.
 - c. Preference for products that are accompanied by a repair or take-back (industrial recycling) program.

- d. Preference for post-consumer recycled, agricultural residue, and/or FSC certified content.
 - e. Preference for local products.
 - f. A restriction/guideline on disposable swag, in favor of products that are durable, reusable, etc.
 - g. A restriction/guideline on single use items.
2. Purchasing and Procurement
- a. Require a list of items for each PUR card holder to be sent BEFORE the actual purchase is made.
 - i. If failure to meet some of the purchasing standards AFTER the fact, then the buyer must refund UVM out of their own pocket.
 - b. Include waste mitigation and environmentally preferable language in contracts going out for bid. Ideally there would be different standards for different product types.
 - i. Create a scoring system to determine who will be selected. Ask contract suppliers to outline their waste disposal program.
 - c. Expand upon electronics procurement policies to keep current electronics in use over purchasing new by prioritizing repairable products, full service warranties, and partnerships with electronics manufacturers for these services.
3. Limit amount of shipments per day that a department can make to reduce packaging and truck deliveries.
- 4. Standardized toner collection process across campus with bins, signage, and information for staff.**

Custodial Services

In regards to sustainability, I found that custodial services prioritizes waste mitigation more so than any other department. They have already changed a wide variety of their policies to reflect high environmental standards. In this sense, they are already open to the idea of waste mitigation and deal with it first-hand every day. On the other hand, they seem short staffed and pressed for time, which implies that some of these suggestions may fall as a financial burden for the department. One of my biggest takeaways from this interview centered around the interviewee's thoughts on compost collection. The interviewee supports and encourages the idea of custodial services collecting building composting to the extent that compost would be better regulated on a daily basis. I believe that this would improve the efficiency of the current composting system and allow for expansion of the program. Diverting more food waste to the compost would also reduce the amount of waste sent to the landfill.

- 1. Incorporate training for all custodial staff in the importance of waste mitigation, proper recycling and composting rules, and the significance of using the blue and green bag system, as well as informing staff about the durability of compostable bags.**
2. To prevent contamination levels across campus: incorporate a training video for all students and staff about compostable and recyclable campus materials - a requirement for SU required classes at UVM and all staff to watch each semester. There is a [video](#) that the EcoReps created that could be used.
3. Work with the Office of Sustainability or Eco-Reps to collect data through waste audits to help figure out the parts of campus where high contamination issues exist and custodial slip ups need to be addressed.

- 4. Include compost collection in custodial services contract. Install compost bins in more buildings in line with UVM's signage and standards.**

UVM Recycling & Zero Waste

Part of the problem in implementing Zero Waste initiatives across campus reflected in my interview with UVM Recycling is a lack of communication between Custodial Services and UVM Recycling. The interviewee has developed a robust composting plan that outlines exactly how to improve composting efforts across the University, but has not been able to articulate this plan to Custodial Services. For this reason, I believe that setting up a meeting to talk about Tier 2 composting is the most important step to move forward in this process. In addition to this, funding seems to be an important part of the collection process to ensure the continuation of an expansive composting system. Lastly, the interviewee mentioned the value in requiring all staff to check the campus surplus property program first when looking for furniture or equipment. As the manager of the Wheelock barn, he sees first-hand the amount of furniture that could continue to be circulated throughout the University.

- 1. Require all staff to check campus surplus property program first when looking for furniture or equipment**
2. Set up a meeting between UVM Recycling and Custodial Services to develop a strategy for implementing a tier 2 composting system.
3. Tier 2:
 - a. This describes any building near a centralized location with existing infrastructure. By aggregating 3 or 4 buildings, custodial staff could easily carry the physical compost bags over to the drop off areas in central locations. Some examples would include:

- Morrill Hall and Aiken, close to Davis Center
- University Heights, close to Harris Millis Dining
- CWP, close to Simpson Dining

Athletics

UVM Athletics does not wholly adhere to the sustainability practices that govern the rest of the University. I believe that they could use some guidance and oversight in the area of sustainability as it affects both sporting events, concessions, and overall sports team management. Several schools around the country have already begun to address this issue of waste production during sporting events through the creation of Zero Waste Stadiums. I believe that UVM has the ability to achieve a ZW Stadium through proper bin placement, signage, education, and the implementation of a waste warrior staff training program. UVM Dining must also become more involved in standardizing their packaging to meet compostable certifications. The person I interviewed is concerned that an increase in compost will mean purchasing and storing a compost dumpster, which he doesn't think there is space for. Perhaps he can work with Corey and UVM Recycling to figure out the best solution to this problem. I believe that the marketing team could come up with different strategies for fan involvement and engagement at events that reduce their ecological footprint.

I also found out that sports teams lack an equipment donation or reuse program. As an athlete myself, I am well aware of the cost and need for sports equipment, and I am surprised that such a program does not yet exist. I would recommend partnering with the Burlington Public School system to implement an equipment donation program. Along these same lines of reuse, a clothing/uniform leasing program for students would not only reduce production waste, but also save teams significant amounts of money.

1. Provide **compost bins** for the entire Gutterson complex during the year (not just at sporting event games). Work with Corey to figure out the best place to store a compost dumpster.
2. **Equipment Donation Program**
 - a. Implement a program to donate/recycle old balls, hockey equipment, old sporting equipment from athletes. Perhaps partner with the Burlington Public School system.
3. **Limit disposable SWAG use**
 - a. **Games:** Create restrictions and specific guidelines around purchasing bambams and other disposable SWAG at games. Encourage durable, longer lasting prizes, or experience type prizes/giveaways such as coupons to a local restaurant, cinema, business, trampoline park, etc.
 - b. **Coaches:** Create restrictions and specific guidelines around items coaches can purchase for athletes as it relates to sustainability. Ex) Encourage coaches to buy a team jacket that first year students can purchase when they join the team.

Changing up the team jacket every year can create unnecessary waste and energy from production. Or create a system to lease uniforms, jackets, team equipment, so the gear remains within the team, once the athlete is finished using it.
4. Create a **Zero Waste Stadium** modeled from other school's ZW Stadiums: During games...
 - a. Clearly marked waste stations with compost, trash, and recycling bins

- b. Serve all Sodexo related food products (even popcorn) in BPI and ASTM certified compostable packaging. Or eventually create a dishwashing station for customers to drop off reusable dishware. This would prevent the issue of consuming disposable products in the first place.
- c. Offer a bring your own discount for mugs, EcoWare, etc.
- d. Provide clear educational materials around the stadium as to the Mission of ZW and why it is important to the health of the planet.
- e. Train staff through the Eco Reps program to be ambassadors for proper waste sorting warriors. Perhaps they stand in front of bins during every game.

5. Concessions

- a. Provide back of house composting
- b. Require that all packaged food meet UVM's compostable EcoProducts dining standards
- c. Provide beverages via bulk dispensers
- d. Provide sauces, condiments, creamers, sugar, salt and pepper in bulk without packaging

Dining Services

After living Zero Waste for a year as a student at UVM, working as a Waste Warrior with EcoReps, participating in Weigh the Waste programs, and interviewing UVM Dining, one of the bigger scale issues that jumps out at me about waste from dining is the incongruity of a standardized compostable product system. The dining halls themselves are doing an excellent job of limiting waste. Other retail places on campus sell so many different packaged food items that it becomes difficult for students to figure out how to tell the difference between compostable and

recyclable items and sort their waste properly. If there was one thing dining could work on, it might be to standardize these products across the system and require all vendors to use the same products. Below are a set of recommendations to help standardize this system.

1. Require and put into writing campus purchasing policies and waste management systems in the contract between Sodexo and UVM.
2. Implement a program to recycle plastic gloves. Perhaps work with the same group that recycles the gloves in the labs. Consider using compostable gloves.
3. Begin to phase out all unnecessarily wrapped single-serve items (napkins, oyster crackers, individually wrapped fresh baked goods, mints, toothpicks, etc) specifically in retail locations.
4. Require students to use EcoWare tags for to-go items at retail locations. If it becomes the norm, people will start carrying around their EcoWare tag all of the time.
5. Offer snacks in bulk bins at Marche, Marketplace etc. Students can use EcoWare.
6. Provide sauces, condiments, creamers, sugars, salt, pepper, butter, peanut butter and jellies in bulk or in compostable to-go packaging.
7. Set up composting at Athletics concession stands. Require/standardize compostable products sold there.
8. Standardize dishware compostable and recyclable products across the system and require all vendors to use the same products.
9. Source products that can be more easily determined as compostable or recyclable

Art Department

The Art Department seems disconnected from the rest of the University in regards to sustainability initiatives. Because of the nature of creating artwork, they are able to purchase and use materials that other departments might not be able to purchase. Some of these supplies include non-recycled paper and toxic chemical paints. Giving the art department the freedom to purchase what they please seem unfair in regards to an effective sustainability plan. All departments must comply with a certain set of standards for the Zero Waste plan to be most effective. An important takeaway from the interview involved the interviewee's desire to create a sharing space for art supplies that would allow students across campus to share resources more effectively. She even offered the idea of donating supplies to people who could benefit from art materials to the greater Burlington community. This would allow old paint and art materials to be put to use in a circular system that promotes the Zero Waste philosophy.

1. Create a free space for scraps. Formalize the room in Williams to include more than just sketchbooks, canvases, and stretchers. Advertise these supplies to students across campus.
2. Work with local schools/community centers to donate gently used supplies. Perhaps the Integrated Arts Academy would be receptive to such a program.
3. Develop an art curriculum that prioritizes working with natural (biodegradable) materials. This could include restorative art projects, ecoventions, and tree planting sculpture projects. Collaborate with other departments such as CDAE and Rubenstein to engage students across disciplines and create a lasting impact on campus.

4. Develop a policy to require Art Department staff to purchase 100% recycled and unbleached paper. The campus already adheres to this policy, but the art department is able to get around this rule.
- 5. Present ideas to the Art Department to plant the seed of faculty thinking about ways to reduce and eliminate their own waste.**
6. Figure out a way to reduce the amount of projects sent to the landfill. Use biodegradable pastes? Tie the curriculum into challenging students to figure out how to do this themselves: How can students eliminate the need for tape/glue/paint and still create a masterpiece?

Bookstore

During my interview with the UVM Bookstore, I got a sense of waste reduction purchasing policies, waste streams, consumer habits, and areas for improvement. The interviewee was receptive to my questions, and I noticed an environmental consciousness reflected in his business decisions and personal life, although it is important to note that the nature of running a consumer based operation on campus proves difficult in terms of sustainability. Included in my recommendations are some simple switches that the Bookstore could make in both their retail and café locations to make a difference in their environmental footprint; such as eliminating plastic bags, training staff on reusable mugs, and working with vendors to eliminate packing peanuts. Cat Pause is one of the only places on campus where students can buy packaged food To-Go. Because they are run by the bookstore, and not UVM dining, Cat Pause sells a lot of single use plastic. I would recommend that the shop manager work with vendors to offer more bulk food and hygiene products to sell to students. Even though the interviewee was skeptical from a purely cost-benefit analysis, I personally believe that students will be receptive to buying

in bulk and perhaps sharing the purchase with other students. The winners of the Eco-Reps sponsored ideathon last year received funding to implement bulk food in Cat Pause.

1. **Shipping peanuts and air packs:** Include wording for an environmentally preferable purchasing policy in contracts with vendors to eliminate single use packaging, shipping peanuts, and air packs.
2. **Eliminate Plastic Bags:** switch to paper, offer a discount for bringing your own bag, put a 15c fee on using a bag.
3. **To go mugs at Henderson's: Offer reusable mugs first, and give people to-go cups second. Provide training for staff in this regard.**
4. **Cat Pause:** Offering more bulk food and more bulk hygiene products (laundry detergent, shampoo, conditioner bar)

Library

During my interview with the Library, I was surprised to learn that the biggest type of waste stream they deal with is actually food waste from students carrying food in from the new CCRH dining hall. They have implemented a brand new composting system for this reason, and I am curious to know the functionality of the system since my last interview for the library. My recommendations center around promoting the new composting program and keeping the bins free from contamination. In addition, a large part of what makes the library an effective promoter of Zero Waste ideas is its large collection of books, media, and other shared items to loan to students. Some of these resources are not publicized very well to the student body and I encourage the library to promote all of the incredible free media resources and tools they offer. The Fletcher Free library in downtown Burlington does an excellent job of sending out

newsletters and information about these types of items, and perhaps UVM could model its own library marketing campaign off of the Fletcher Free Library.

1. Promote composting for students in the library. Create an image package for students about the type of materials that are compostable, recyclable, and trash. Work with Ecoreps to conduct public waste audits in the front lobby of the library.
2. Reduce the amount of food containers brought in from dining halls outside the library. Promote through signage and stricter staff monitoring. Front desk people could help implement. Encourage/enforce students to eat only in cafe area.
3. Promote the free media resources for students. An embodiment of upstream Zero Waste efforts.

- a. **Increase offerings in library to include tools (screw drivers, rakes, baking supplies, etc.) and other non-traditional items like FFL does:**

<https://www.fletcherfree.org/LONTCollection>

4. Host yearly book swaps.
5. Implement a policy that prefers electronic readings over paper.
6. Default double sided and BW printing. Use black ink when colored ink not necessary.
7. Collect unwanted paper for use as scrap or making into notepads, similar to the Davis Center.

Campus Children's School

I was surprised to learn that the Campus Children's school itself has a general guiding principle of both practicing sustainability and teaching it to their students. In fact, the school's robust waste program already works in line with the Zero Waste principles. The only recommendation I have is the implementation of a trash free lunch program that works with

parents to reduce the amount of packaging that kids produce in their lunches. Although the younger age of the kids (8 weeks to 6 years) proves a challenge, because this program would rely entirely on the support of the parents who are packing lunches.

1. Create a Trash Free Lunch Program

- a. Pick one consistent day a week, like Trash Free Tuesday, or Waste Free Wednesday to promote to parents.
- b. Send out emails to parents reminding them of the weekly challenge with guidelines on how to pack a trash free lunch.
- c. Weigh the trash that day with all of the students, and send a score to all parents to let them know how much trash was produced.

College of Medicine

The interviewee shared some important insights into how to close the materials management loop within the College of Medicine. She mentioned her frustration with the amount of equipment that goes unused by labs, as well as her desire to create a materials sharing platform across departments. Some of my recommendations stem from this sentiment. A large majority of my recommendations come directly from Harvard's Green Lab certification program which offers a robust and comprehensive checklist to certify that a lab is up to 'sustainability standards'. UVM does have a significant amount of requirements around hazardous waste disposal, but I learned from my interview that labs themselves could use more guidance around purchasing, materials, and general sustainable practices during an experiment or procedure.

1. Create a **Lab Reuse Room** to offer unused equipment to faculty and promote the reduction of surplus equipment, supplies, and cost.

2. Develop an **online webpage** to advertise old lab equipment to faculty. This online platform would provide information about used equipment for faculty to collect items themselves, and allow faculty to apply for a work order to move equipment or ask for a cart to bring an item to specific locations in the building.
3. Implement a **clean glassware** recycling program. This program would include a proper collection system during lab closures and cleanouts and partner with a recycling company who could collect the physical material.
4. Incorporate some practices from Harvard's Green Lab Certification program:
 - a. Conserve Resources and Purchase Sustainably
 - i. Share freezer space and equipment with neighbors instead of buying your own.
 - ii. Reduce autoclaving needs by introducing a two-streamed process where only required items are autoclaved and other items are run through the dishwasher.
 - iii. Use a solvent recycler for your lab space or sharing one among neighboring labs.
 - iv. Make energy efficient purchasing choices and purchase Energy Star certified equipment.
 - v. Choose reusable over disposable products whenever possible.
 - vi. Use Green Lab Purchasing Tips when purchasing lab equipment and supplies.
 - vii. Use office paper and supplies made out of recycled content.

5. Incorporate Harvard's Top Ten Purchasing Tips for a Greener Lab (Harvard University, 2018)

a. Pipette tips

Use stackable tip boxes, or better yet refill your old boxes by purchasing your tips in bags. It makes a great pastime during lab meetings.

b. Tubes

Buy your conical tubes from recycled plastic. Get them in bags and refill the racks yourself.

c. Autoclavable glassware

Instead of disposable plastic products, buy autoclavable glassware whenever possible.

d. De-Icing kits

- i. Ask for a free freezer de-icing kit. Use a mallet and scraper to clear ice from the gaskets on the door of your ultra-low temperature freezer so it can run more efficiently. Email FAS or Longwood for one!

e. Alternative chemicals

Instead of using a chemical like Ethidium Bromide, find a safer, more environmentally-friendly alternative. Try the [MIT Green Chemical Alternatives Wizard](#).

f. Order your oligos dry

It's more stable and saves on shipping weight and materials, just make sure to centrifuge your oligos before opening them.

g. Use the right size plates

For example, don't store your DNA in deep block plates when you only have or need 150ul of the samples. You'll save on plastic and freezer space.

h. Reuse old boxes

Save a few boxes of different sizes with Styrofoam insulators. You never know when you'll need to ship something with dry ice. By having the right size box you can use the right amount of dry ice.

i. Get a mop!

Don't clean up your water and ice spills with paper towels or absorbent pads. This will come in handy when you defrost your -20 freezer as well.

j. Buy reusable/autoclavable reagent reservoirs

You will reduce your plastic waste and save money in the long run!

Physical Plant

I am a little lost as to how best assist this department. In the interview, I was not able to judge which waste streams the Physical Plant deals with that should be donated or recycled rather than sent to the landfill. The interviewee seemed defensive in his answers to my questions and confident in the fact that his department was already doing everything they could to help the environment. In this way, my recommendations are lacking in specifics.

1. Create a procedure in the physical plant staff contract that explains how to best dispose of certain products. Incorporate a staff training to go along with this procedure.

Grounds Department

I am impressed with the strong partnership the grounds department already has with the Office of Sustainability. They already work to compost any yard debris such as leaf litter and old mulch, and work hard to correctly to sort the material. The interviewee seemed proud of his staff and the efforts they have made to reduce UVM's environmental footprint around their disposal management practices and their integrated pest management plan. One highlight from the interview that I noted stemmed from the Grounds Department's frustration in being unable to connect with FD & C around pre-planning and landscape design to improve plant life. By working with the design team, Grounds hopes to offer insight into how to structure a building with the proper amount of topsoil where a tree should be planted. Perhaps doing so would give the plant the water and nutrients it would need to stay healthy. This would limit the amount of pesticides and water the grounds department would spend on maintaining such a plant.

- 1. Provide a compost bin to the Grounds Department office with custodial collection.**
2. Collaborate with FD&C on the design process of buildings to ensure that landscaping and healthy topsoil are incorporated into a blueprint.

Environmental Health and Safety

Out of all of the departments on Campus, Environmental Health and Safety scored a perfect score according to PLAN's Zero Waste assessment. They offer waste management solutions such as pollution prevention, toxics use reduction, reuse or redistribution of unwanted material, the treatment and recycling of materials, and disposal. In short, they are in charge of making sure dangerous chemicals from the University are disposed of correctly. While they do an excellent job at this, I believe that PLAN's assessment missed a few key elements of improvement from the interview. First, the interviewee expressed irritation at feeling

disconnected from the Office of Sustainability. He recently created a webpage and guidebook about proper lab and facility waste disposal that outlines how to fill out a waste tag, how to collect different hazardous materials, and where different materials go. According to the interviewee, this information is not well distributed throughout campus. The interviewee believes that because the Office of Sustainability and EH&S have very similar missions, they should combine forces. By doing so, they could train more UVM staff and students on proper waste management disposal practices for potentially hazardous materials. This disconnect is similar to the one expressed by the Grounds Department and perhaps an indicator that a crucial part of maintaining the success of this Zero Waste Roadmap is to encourage collaboration between departments.

1. Install a compost bin in the EH&S building specifically for staff.
2. Combine forces with the Office of Sustainability
 - a. Post Waste Disposal and Management Guide on the Office of Sustainability Webpage and promote through Ecoreps.
 - b. Create a more in depth training program for staff on proper waste management disposal practices for potentially hazardous materials.

Facilities Design and Construction

Facilities Design and Construction shared an impressive array of statistics regarding the building design process and its emphasis on sustainability. The nature of LEED certification itself mandates strict regulations around materials management and disposal practices. Therefore, my recommendations revolve less around construction design itself, and more around best practices within the buildings after construction.

1. Emphasize local materials and a subsequent reduction of fossil fuel emissions in the LEED certification process.
2. Preserve existing UVM natural areas such as Centennial Woods
3. Implement a compost bin in the office building.
4. Require all new buildings to have compost infrastructure.
5. Require staff to check off campus surplus property program before purchasing new equipment.
6. Require new carpet to be made of recyclable nylon in modular squares and arrange for recycling of eligible carpet that is being removed.

Chemistry Department

There is a sense of efficiency, care, and establishment of an intricate waste management program in this department. As I found out in the interview, this is mainly because of one specific person, the interviewee, who is personally dedicated to making sure waste within the Chemistry Department is handled properly. I am impressed by the dedication he shows to lab compost, a lab glove recycling initiative, and an equipment sharing program. For the most part, the interviewee himself acts a sustainability steward and advocate for his department. He fixes old equipment himself that people bring directly to his office, as well as acting as a centralized purchasing middle man between labs and facilities. He is able to negotiate prices effectively, and because of this, all of the labs do their ordering through him. I am worried that the interviewee's efforts will crumble if a new person fills his role. In this sense, I believe his programs should become formalized to ensure that a lab sustainability program would stay long after he

retires. My recommendations include several suggestions from the interviewee himself in how to improve his department in this regard.

1. Ensure that each academic lab on campus includes a **triple bin system** with both paper towel composting, and glove recycling.
2. Switch single use sharps containers to **reusable**.
3. Establish a formalized collection and equipment **repair** system.
4. Establish a written sustainability **purchasing** procedure for all lab purchases.
5. Require staff to utilize the Wheelock **surplus** barn for purchasing new furniture.
6. Allow a larger budget for sustainability efforts within science departments that helps labs purchase **reusable** paper towels.
7. Add a waste management section to the Discovery Hall part of campus **tours**.

Print and Mail

During my interview with the Print and Mail center, I learned that a surprising amount of packages are delivered to students and staff on campus each day. If a department had more time to prepare in advance, perhaps they could come together to consolidate an order in a group to reduce packaging and unnecessary shipments. The instant ordering culture Amazon creates makes this increasingly difficult. The interviewee also mentioned the amount of packing peanuts they go through on a daily basis. Bubblefast.com offers a sustainable alternative to packing peanuts as listed below. The other recommendations I list include programs to mitigate waste and encourage reuse throughout the Print and Mail center.

1. Require **Amazon** to deliver in compostable or recyclable packaging. Limit students/staff to a certain amount of deliveries per day. Whenever feasible, send all packages directly to the print and mail center instead of distributing them across campus.
2. Purchase a new machine that is more environmentally friendly for creating foam based, glue free **posters**.
3. Provide a **compost bin** for staff in the Waterman building on the basement level.
4. Implement a Styrofoam, bubble wrap, vinyl banner **reuse/recycling program**.
5. Sell a more sustainable alternative to **packing peanuts**. For example:
<https://www.bubblefast.com/store/pc/Packing-Peanuts-Air-Pillows-c128.htm>
6. Offer a program to unsubscribe students and staff from **junk mail**.

Fleming Museum

The interviewee shared some important insights about waste management at the Fleming Museum. For the most part, the staff follow strict guidelines in regards to proper art disposal practices. Therefore, many of my recommendations stem from general building and operational changes. Additionally, I noted a lack of connection between the Fleming Museum and the general on campus Art department. While the Museum had the same Environmental Health and Safety waste disposal standards as the Art Department, they did not have a connection with them in terms of art supply sharing. Perhaps implementing a collaborative art supply sharing room on campus would allow for greater circularity of art supplies across campus.

1. Require that the pieces come shipped without plastic. Using newspaper to protect a piece of artwork instead of plastic bubble wrap.
2. Install a compost bin and collection system.

3. Increase social media and online advertising presence while limiting the amount of Rack Cards and brochures that are printed.
4. Implement a collaborative art department and Fleming museum art supply sharing room on campus to allow students to use old supplies for their art projects.

Transportation and Parking Services

The person that I interviewed emphasized that the biggest office waste streams include paper waste, plastic parking permits, and bike lights and bells that are individually wrapped in plastic. I wonder if there is a way to give out biodegradable parking passes, or implement an electronic parking pass system to avoid this annual plastic parking pass challenge. Stanford is currently trying out a new electronic parking pass system that will replace physical parking pass permits with a [virtual system](#). Stanford affiliates purchase a pass online by entering their license plate number and the amount of time they wish the pass to be valid, and parking enforcement monitors can scan the license plates of cars parked in lots (Stanford, 2018). They claim that the electronic system is more efficient, allows greater flexibility for people with multiple vehicles, prevents lots permits, and provides automatic renewals. Perhaps UVM could adopt a similar model to Stanford to eliminate the need for thousands of permits to be printed and disposed of each year.

1. Implement a composting bin in the Transportation and Parking Services building.
2. Offer a biodegradable permit or look into eliminating any form of disposable materials.
3. Instead look into an [electronic registration system](#).
4. Purchase bike lights that are not wrapped in plastic.
5. Approve the new [green fleet procurement policy](#) for purchasing new vehicles on campus.
6. Implement 3 more electric charging stations on campus for electric vehicles.

Executive Summary

This thesis encompasses specific changes the University of Vermont could make to propel the University toward achieving a Zero Waste goal. In collaboration with the Office of Sustainability, UVM Recycling, and the Post Landfill Action Network, this thesis outlines a set of waste mitigation recommendations and strategies for each campus department to incorporate into their management policies.

Many departments lack the infrastructure, knowledge, or resources to effectively manage their multiple waste streams. Some departments, such as UVM dining, Custodial Services, and Environmental Health and Safety, are already doing an excellent job in effectively implementing low waste strategies. Other departments, such as Athletics, Art, and Purchasing, have little or no guidelines around waste mitigation and diversion strategies.

One of the most impactful recommendations from this report includes changing specific purchasing and procurement policies to reflect environmentally friendly purchasing goals. This will not only influence the Purchasing Department itself, but ideally it will trickle down to the individual departments by nature of the purchases bought on a department by department basis. Guidelines with clear language around sustainability and waste mitigation will help departments reduce waste before it even gets to campus in the first place.

The interviews revealed a lack of collaboration between departments with similar goals, programs, and missions. A few departments, such as Environmental Health and Safety, the Grounds Department, and the College of Medicine actually expressed frustration about feeling disconnected from other specific departments. They emphasized that in order to accomplish some of these Zero Waste goals they must prioritize working more closely with other

departments. Therefore, I highlight improving departmental coordination, as one of my campus wide recommendations.

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Appendices

A. *Timeline*

I worked both during the 2019 - 2020 academic school year and over the summer of 2019 on my thesis.

- **January 16- May 11, 2019:** Created ENVS and HCOL thesis proposals. Wrote literature review.
- **June 3 - August 23, 2019:** Identified, interviewed, and collected data from committed campus stakeholders; sought and received input on different functions of a Zero Waste campus specific to the internal operations of different departments.
 1. Worked closely with PLAN to accomplish this goal.
- **August 26 - December 11:** Analyzed, synthesized, and evaluated data.
- **January 16 – March 11:**
 1. Wrote up report, listed recommendations and suggestions for each department to take to reach diversion rate goals.
 2. Chaired the Zero Waste Action Group to begin to implement Zero Waste strategies at UVM.
- **March 12 – April 17, 2020:** Finalized thesis. Continued to follow up with departments on my recommendations.