

Chapter 1: Waste Management on Campus

1.1 Introduction

In order to reduce waste at Chapman University, recycling efforts must be improved and organic recycling services must be provided. Additionally, students, faculty, and staff must be properly educated on proper waste management practices. The constant production of new products and packaging means knowledge of recyclable and compostable materials has become a complex and confusing topic for many people. In a society that values convenience, the current “throwaway” lifestyle encourages a linear approach to the production and disposal of products, rather than a circular approach that regards waste as simply another resource (Moscone). College students, staff, and faculty often lead busy lives and value convenience; as they go about their day rushing between activities and classes, the purchase of single-use products is often the most convenient choice. The consequence of this convenience comes in the form of high quantities of waste. In an era where societies around the world are becoming more conscious of the issues surrounding waste, Chapman University can greatly improve its image by increasing the *diversion rate* -- the rate in which waste is *removed* from the landfill waste stream -- on main campus.

1.1.1 Compost Services/Organic Recycling

Providing composting services will be integral for the reduction of waste at Chapman University. This is a service that the University must provide in the near future due to recent state legislation. In 2014, Governor Brown passed AB 1826, which defines mandatory commercial organics recycling measures. According to the Bill, businesses that generate more than four cubic yards of organic waste per week must provide organic waste recycling services by January 1, 2017 (AB 1826, sect. 1). The Bill gives Chapman University an excellent opportunity to reduce landfill waste, increase campus *diversion rates*, and save money in the process.

The Environmental Protection Agency (EPA) has estimated that 20.5 percent of Municipal Solid Waste (MSW) generated in the United States comes from food waste, the majority of which can be diverted from landfill. Burying organic waste in landfills produces large amounts of methane, which is commonly flared on site. Flaring methane at landfills leads to unnecessary carbon dioxide production, much of which can be relatively easily avoided. Though there is no current estimate on the annual amount of solid waste Chapman University sends to landfill, this information provided by the EPA allows us to assume a significant portion of the landfill waste stream can be reduced by providing composting services. Waste audits introduced within this chapter will attempt to estimate the compost-related component of waste produced in Argyros Forum, a building at Chapman University that contains the majority of food options.

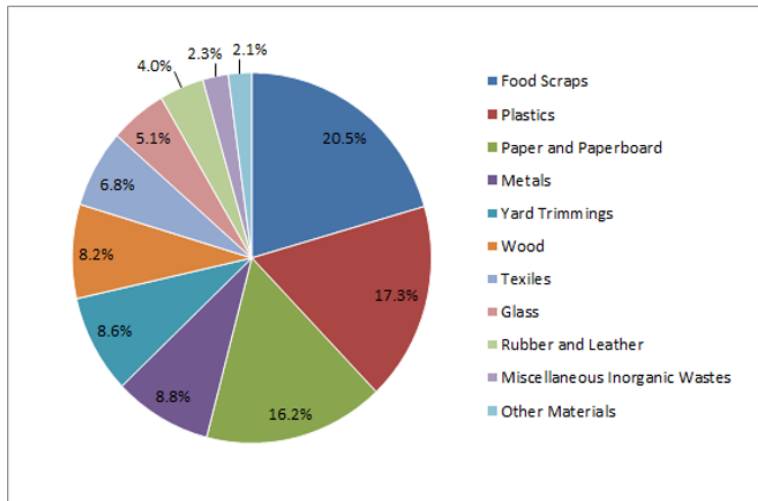


Figure 1.1. EPA estimates of Municipal Solid Waste Production by composition.



Figure 1.2. The EnviroPure waste disposal system located in Randall Dining Hall

Because Chapman has an *EnviroPure*® organic waste disposal system on campus—a machine that uses microorganisms to break down organic wastes – the University has the opportunity to internalize the entire organics recycling process. An internal composting process allows Chapman to increase the campus diversion rate without the inclusion of high-cost trash pickups.

1.1.2 Recycling Signage on Campus

A study conducted in 2006 at Massey University in New Zealand investigated on-campus attitudes toward a university recycling program and found trends in attitudes towards recycling across the campus. One of the most significant findings in its overall acceptance was the suggestion to increase recycling signage across the campus (Kelly et. al., 2006). A 1998 study focused on making effective instructional recycling signs, specifically using schema theory to increase comprehension. This approach resulted in both an increase in recycling rates as well as improved quality and cleanliness of the material recycled (Werner et al., 1998).

Schema Theory states that knowledge is stored in units, called schemata, which house categorical information. For example, people have a schema for ‘dog’, containing all a person has learned about dogs, both through gained knowledge and anecdotal or experiential information. Throughout life, a person is constantly developing schemata for everything they experience. “Schemata become theories about reality. These theories not only affect the way information is interpreted, thus affecting comprehension, but also continues to change as new information is received” (“Schema Theory”). This theory can be used to create effective signage to increase understanding of recycling on Chapman’s campus. The schema of recycling across the Chapman community can be enhanced and strengthened with educational signage and the use of positive messages to increase the understanding of why recycling is necessary and which items found prevalently on campus are recyclable.

1.1.3 Education

Although the introduction of more recycling bins on campus may help increase recycling rates, a study noted that any recycling or waste management system depends not only on technical factors and availability, but also the motivation of the users to participate in the process. Salhofer & Isaac stated that if these systems relied solely on installation, with no education or motivation for users, the system would likely fail (2002). By observing this, it can be understood that waste management education is essential in reducing waste, increasing diversion rates and encouraging environmentally friendly behavior.

Research has also shown that environmental behavior is a much more complex system than originally thought. In the past, environmental education and behavior were thought to have a linear relationship. However, recent studies have proven that although knowledge-based education is a key factor for environmental behavior, the relationship between the two is relatively weak. Other factors including, personality traits, empowerment, knowledge of action strategies and situational factors all influence an individual's behavior. (Hungerford and Volk, 1990). These factors will be studied in a comprehensive analysis of Chapman's past and current environmental education, programs and attitudes of the student population. This will help identify the most effective educational techniques to increase recycling and reduce waste.

1.1.4 Paper Use

While paper materials are an essential part of classrooms in higher education, as Chapman University continues to grow they must become more conscious about their paper usage and developing more green classrooms. According to the Green School Initiative, "Americans now use about 31.5 million tons of printing and writing paper each year, meaning 660 pounds per person, which requires 535 million trees (most from virgin tree fiber) and 12 billion gallons of oil for its manufacturing." AS a result of this impact, it is essential for institutions to start developing new goals to combat this growing contributor to the waste stream. Currently the EPA has noted that the decomposition of paper not only releases a large amount of methane, but 38 percent of all waste is from paper, and of that 38 percent, 50 percent of that waste comes from schools (Green Schools Initiatives, 2016). Campuses and corporations, such as Google, Microsoft, Yale University, Occidental University, across the United States have started implementing paperless initiatives to both enhance their companies and reduce their impact on the environment.

The reduction of paper waste also ties in directly with Chapman's sustainability statement to "foster a culture of sustainability in: Our facilities, our operations, and our classrooms" (Chapman University, 2014). By reducing paper waste in a classroom setting Chapman would have the ability to divert waste while fostering an appreciation for the importance to sustainability in higher education. In a study completed at the University of Michigan, students implemented a paperless policy in the Business and Finance department and found that moving towards a paperless campus overall enhanced communication and provided a unique learning experience. By implementing paperless policies within one department they were able to: save money, reduce waste, create an organized online system for all documents, increased time for staff to focus on other tasks, and increase communication

between students and faculty (Artley, Blankenship, et al. 2011). This study alone shows the success of and the practicality of moving towards a paperless campus.

1.2 History of On Campus Waste Management

1.2.1 Overview

In 2012, Chapman University released the statement that as an institution they “strive to foster a culture of sustainability among the facilities, operations, and classrooms of the University” (Chapman University Facilities Management, 2012). As stated in 1.4.1., in 2014 Chapman University released a Sustainability Policy. In the last four years, the University has made efforts to implement sustainable waste management practices on campus through multiple initiatives. Those initiatives include the placement of recycling bins in classrooms, offices, and main spaces so the opportunity to recycle is easily accessible. In 2011, when the Argyros Forum was renovated, double-sided waste bins were installed in the Student Union, making it more convenient for students to discard recyclables and landfill waste properly. In 2013 Chapman University piloted three sets of BigBelly trash cans on main campus in an attempt to decrease the frequency of waste collection per week. The BigBelly trash cans included the added bonus of continuously collecting data in the form of weight and frequency of collections. The receptacles (now 15 dual units distributed throughout campus) have been continuously collecting data since installment, providing three years of data collection on University waste.

1.2.2 Compost Services/Organic Recycling

Chapman currently composts *green waste* generated on campus, which includes grass clippings, leaf litter, and other landscaping related refuse. This green waste is taken to the Tierra Verde facility in Irvine. Composting initiatives had been attempted in the resident halls in the past; however, complications in the initiative lead to its discontinuation. In 2013, Chapman University explored the possibility of providing post-consumer compost bins on campus. This proposition was shelved due to excessive costs and large transportation distances. For this reason, these services have never been offered as an option on the main campus.

The EnviroPure system, located in Randall Dining Hall, was purchased in the spring of 2013. The system is able to digest large amounts of food waste (one Tonne) over the course of 24 hours, using bacteria to break down waste into a gray water effluent. Currently, this gray water effluent is not utilized.

1.2.3 Education and Behavior Change

Environmental education at Chapman University has been studied with a particular focus on sustainability education. It was noted in the 2013 audit that the use of the word sustainability was chosen because, “it is the only subject that can successfully marry environmental and earth sciences to sociology, business and economics.” The World

Commission on Environment and Development (Brundtland Commission) defined sustainable development as, "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (1987). In relation to the goal of reducing waste on campus, the term sustainability falls in line with these goals. Because of this, auditing waste management education of the Chapman community will include studying sustainability education.

The 2013 audit researched sustainability education as it pertains to: courses; major, minor and cluster offerings; faculty and student education; programing; and importance of sustainability education to students and faculty. The audit revealed that in 2013, only approximately 23 percent of students had learned about sustainability at Chapman. The survey also identified that 65.4 percent of the faculty believed that practicing and teaching sustainability in higher education was very important. Additionally, a total of 95.3 percent of staff agreed that sustainability in higher education was at least somewhat important. Although most of the faculty believe that sustainability is important, little is known about their knowledge of sustainability in the classroom. The 2015 audit found that many students and faculty were unaware of how easy sustainable behavior changes could be.

This data reveals a large gap in sustainability education for students. It also shows that a large percentage of Chapman University staff may be open to learning more about sustainable practices and integrating those topics into their classrooms. According to Chapman's sustainability manager, Mackenzie Crigger, the Facilities Staff have participated in sustainability trainings in the past, but they were not implemented as a consistent part of the monthly trainings. Little is known about the faculty's knowledge on sustainability issues or if the University provides any guidance for faculty on sustainable classroom practices. Paired with this, the 2013 audit noted that little is known about the status of faculty education or Chapman training for the faculty and staff members.

1.2.4 Paper Usage

In 2000, Chapman University introduced the very first Learning Management System on campus, Blackboard. The installation of this eLearning tool has been vital in the enhancement of communication and the classroom experience on campus. With Blackboard, faculty members are now able to provide class material, feedback, assessments and more to all students online. Along with the implementation of this system, facilities, IS&T departments, and individual colleges, have made efforts to develop paper and printing policies. In 2006, the IS&T department created a print management system that distinguished which printers IS&T is responsible for, created policies for the maintenance of printers, and set the price that each student must pay for printing. The goal of this management system was to normalize printer usage across campus. Along with this, in 2013 the IS&T department switched all public printers to the double-sided printing default to reduce waste across campus, but still give students the option to print one-sided if needed. The most recent change to paper usage on campus was made in 2014, when the Chapman University Sustainability Policy was released and the commitment to only purchase paper with at least 30 percent recycled content was made.

1.2.5 Past Accomplishments

The Green Certification Program, developed in 2010 allows separate departments to audit sustainability practices in their individual offices. According to the Chapman University website eight audits of departments have been completed, with more underway. On these published reports, departments are scored on a variety of factors including waste, paper practices, energy usage, transportation, and other relevant areas that help gain an understanding of the current practices.

The waste section of the calculator tool studies:

- The percentage of disposable items that are recyclable
- The percentage of items that are disposed of properly
- If the department uses rechargeable batteries
- If there is educational signage that accompanies waste and recycling bins

Based on the score the department receives, tactics for improving sustainable waste management practices are recommended. Out of the eight departments whose reports are published online, there was a participation score of above 59 percent.

Although the Green Department Certification program does not include any sort of sustainability training for their faculty and staff, the participation of departments in this program shows that they are interested in becoming more sustainable and may be open to participating in trainings.

Along with programs like the Green Certification program, Chapman University has implemented tools, such as Blackboard to reduce paper waste and develop an effective method of communication outside of the classroom. The use of Blackboard has allowed faculty members to host discussions and provide students with the course materials. However, more improvements and trainings can be offered to faculty to continue decrease the amount of paper in their classrooms. Paired with this, the University's Sustainability Policy provides more consistency of environmental policies campus wide.

1.3 Current Status

1.3.1 Organic Waste

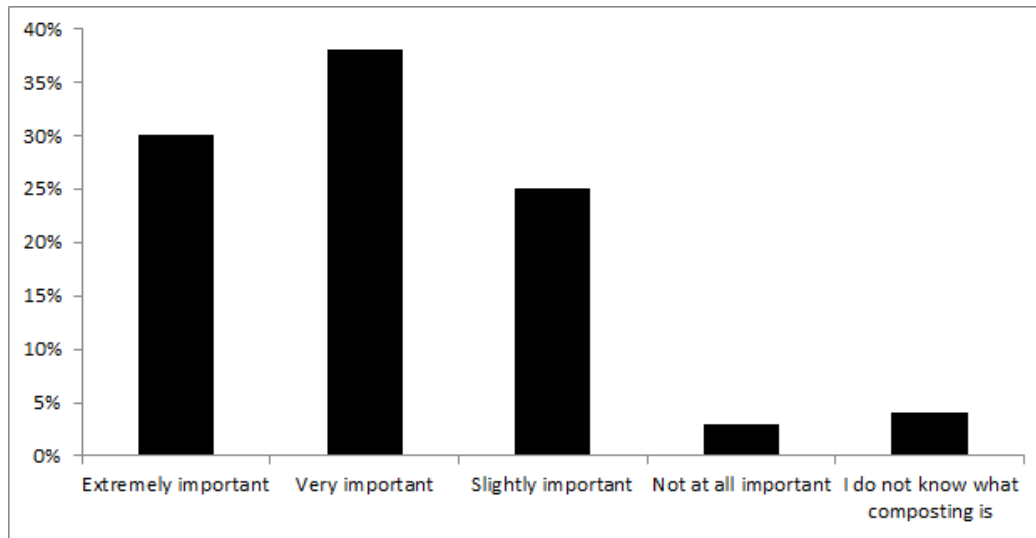


Figure 1.3 Individuals (n=485) were asked *How important is it for Chapman to provide composting services?*

Survey questions were sent out to the general student body in order to gauge the importance of composting services. Of 485 responses, 68 percent noted that compost services were either 'extremely' or 'very' important. The responses confirm positive interest in composting services on campus from the greater Chapman University student body.

In order to quantify the amount of organic waste produced on main campus, two waste audits were conducted throughout the semester. Argyros Forum (AF), a building on campus housing the majority of Chapman's eateries, was chosen for the audits due to its significant diversity in users. AF includes four popular campus restaurants on the first floor; classes, offices, and conference rooms constitute the majority of the second and third floors. Each waste audit gave insight into the amount of organic waste produced on campus. The audits divided wastes into 15 different categories based on their material composition, and waste from each floor was analyzed separately. Both audits collected data in terms of weight (lbs.) and analyzed 24 hours of waste production (for a total of 48 hours). For the sake of simplicity, this section of the chapter will combine the categories related to compost-related materials (compostable food containers, food waste, and soiled napkins) and will consolidate the remaining categories based on material composition.

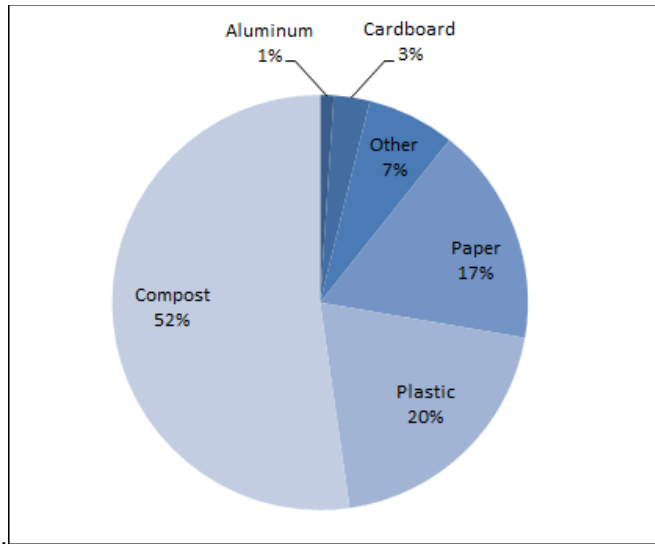


Figure 1.4 Total composition of all waste produced in Argyros Forum over 48 cumulative hours

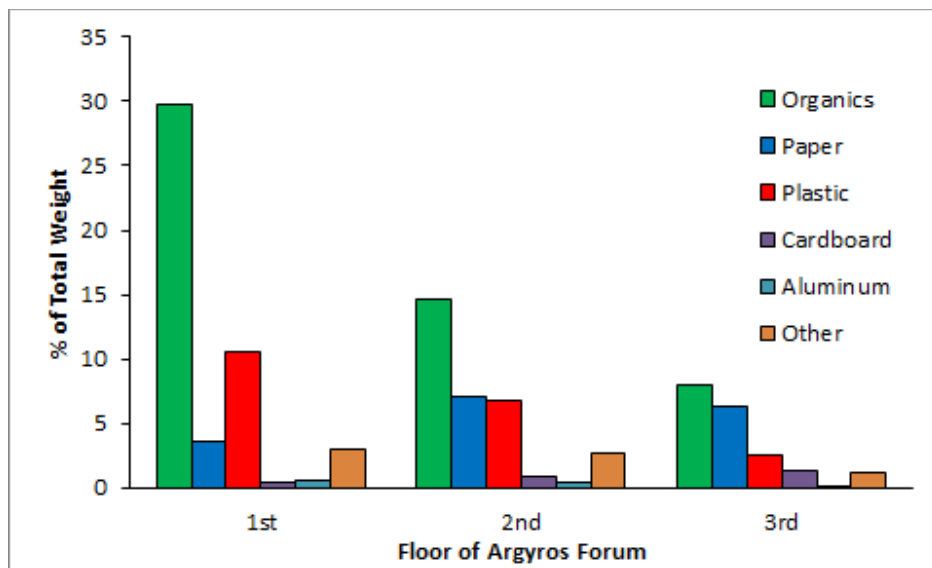


Figure 1.5. Total composition of all waste produced in Argyros Forum, separated by floor. Paper waste and plastic wastes categories are consolidated by composition. Though compost was a major constituent of wastes in every floor, it is by far the largest composition of 1st floor trash, where many popular food locations are present.

The initial waste audit of AF found 71.4 lbs. of the waste analyzed (in total, 140.7 lbs.) was categorized as organic wastes (52 percent by weight). Compostable material was the largest portion of waste on the first and second floors, and a major component of waste on the third floor. The second audit categorized 41.3 lbs. of a 92.5 lb. total (44.7 percent) as compostable material. When both audit periods were combined, compostable material made up the largest percentage of waste on all floors. The total weight across the two audits

suggested waste production on campus has high variability; the total waste analyzed in the first audit contained 48.2 lbs. more than the second audit.

Because waste audits were limited to 48 cumulative hours of analysis, estimates of organic waste production in AF were severely limited. Nevertheless, data from the waste audits suggests AF produces roughly 56 lbs. of compostable material within an average weekday, which constitutes 1,232 lbs. a month (22 weekdays). These figures are well within the physical limitations of the EnviroPure system in Randall Dining Commons, which can process one tonne of organic waste in a single day. Because AF contains the majority of eateries, the building is likely to produce the majority of the compostable wastes on main campus. Diverting post-consumer organic waste to the EnviroPure system will prepare the Chapman University for AB 1826, as well as produce a service that is generally accepted by the student body. The University could potentially save thousands of dollars in waste collection in the process, by reducing the amount of waste pickups by CR&R and the necessary number of dumpsters for the campus.

Though the EnviroPure system can easily reduce Chapman's total waste sent to landfill, other methods of compost production can prove to have lucrative benefits for the university. Vermiculture is a common method of compost production which uses worms to break down organic waste. Vermiculture requires a 1:1 ratio of *paper waste* to food waste, which can be easily supplemented by bathroom paper towels. One pound of worm compost commonly costs around \$6.00, but can be found selling upwards of \$13.00. According to Cornell's composting program estimates, 1,000 worms can consume 1 pound of food a day, and produce 3.5 pounds of castings within a month (0.116 pounds of castings per pound of food). Using the rough estimate of 1,232 lbs. of food waste produced every month in AF (matched with the equivalent of 1,232 lbs. of paper waste), vermiculture efforts could produce \$20,697.60 in revenue every year, while drastically reducing the costs of waste collections required for campus. A vermiculture center could also work as a tax incentive for Chapman, as well as a way to increase community outreach.

1.3.2 Cost Analysis of Waste Stream Internalization

Chapman University currently uses CR&R as the main contractor for dumpster collections on campus. CR&R charges the University not by weight of collected waste, but by the number of bins collected on a given day. Bin collections are done by monthly patterns; however, collecting waste in this manner allows for Chapman to be charged for the collection of bins that are not completely full. The cost burden of this inefficiency is placed directly on the University. Currently, Chapman is tied to the contract between CR&R and the City of Orange, which is due to expire January 31, 2018.

At the University of California, Irvine (UCI), campus sustainability leaders found dramatic cost savings in waste management by internalizing their waste transportation process. Currently, UCI owns waste collection trucks and self-hauls campus generated waste to Waste Management™ (WM) transfer stations. Though UCI is a much larger campus than Chapman, Chapman may benefit from internalizing the waste transportation process. To see if internalization is an economically viable option, the University will need to take many fees into

consideration, including waste transportation (including a truck, truck driver, etc.), dumpster purchases, and drop-off locations.

A waste truck can be purchased new, purchased used, or leased. Each option has different benefits. Leasing a truck will include reduced costs of repairs and insurance expenses. Purchasing a new truck may have a large initial investment, but the purchase can last more than 20 years. The purchase of a used truck will be significantly lower than a new vehicle, but will last a shorter time. This cost-benefit analysis will assume a new truck will last 20 years, where a used truck will last 15 years. UCI sustainability management has recommended the purchase of a Peterbilt Chassis with Amrep box; the analysis will be done using this model. These trucks can be fitted with separated waste compartments so that recycling and landfill wastes can be transported in the same trip.

Internalizing trash collections will require Chapman University to purchase its own waste bins. Currently, Chapman leases bins from CR&R. The University leases three 2-yard bins, forty-one 3-yd bins, and twelve 4-yard bins. Each option will also require hiring a garbage truck driver, who will make roughly \$45,000 a year, plus benefits.

For Chapman to internalize the waste management process, waste will need to be taken to a waste collection facility. Fortunately, a waste transfer station is located 2.3 miles north of main campus, run by Waste Management™ Environmental Services. Circumnavigating all campus locations and returning to Facilities is roughly 12.5 miles. Assuming the University makes five trips to the transfer station a week all year, the price is roughly \$1,787 (using fuel efficiency estimates of 5 miles per gallon at a price of \$2.75 a gallon, the average cost of gas in California in 2015). The minimum fee (drop-offs under 1 ton) is \$85, or \$25,350 a year.

These management options will be compared with the current waste plan of the university. Waste pickups by CR&R have remained relatively linear since Chapman University switched providers in 2011. Thus, the university's current plan was estimated linearly, at \$100,704.85 a year. This estimate is likely conservative, as the university will need more waste collection with the current plan to increase the student body to 11,000 by 2020.

	Buying New	Buying Used	Leasing
Truck Cost	\$155,000 / 20 years	\$60,000 / 15 years	\$868.04 a month
Gas	\$1,787.50 / year	\$1,787.50 / year	\$1,787.50 / year
Dumpster Purchase	\$25,350	\$25,350	\$25,350
Driver	\$45,000 / year	\$45,000 / year	\$45,000 / year
Transfer Station Fee	\$22,100 / year	\$22,100 / year	\$22,100 / year
Initial Investment (end of year 1)	\$258,099.50	\$163,099.50	\$88,165.98
Average per year (after initial investment)	\$61,734.15	\$61,734.15	\$72,150.63
Return on Investment (ROI)	3.3 years	2.1 years	1.3 years

Table 1.1. Cost breakdown by category.

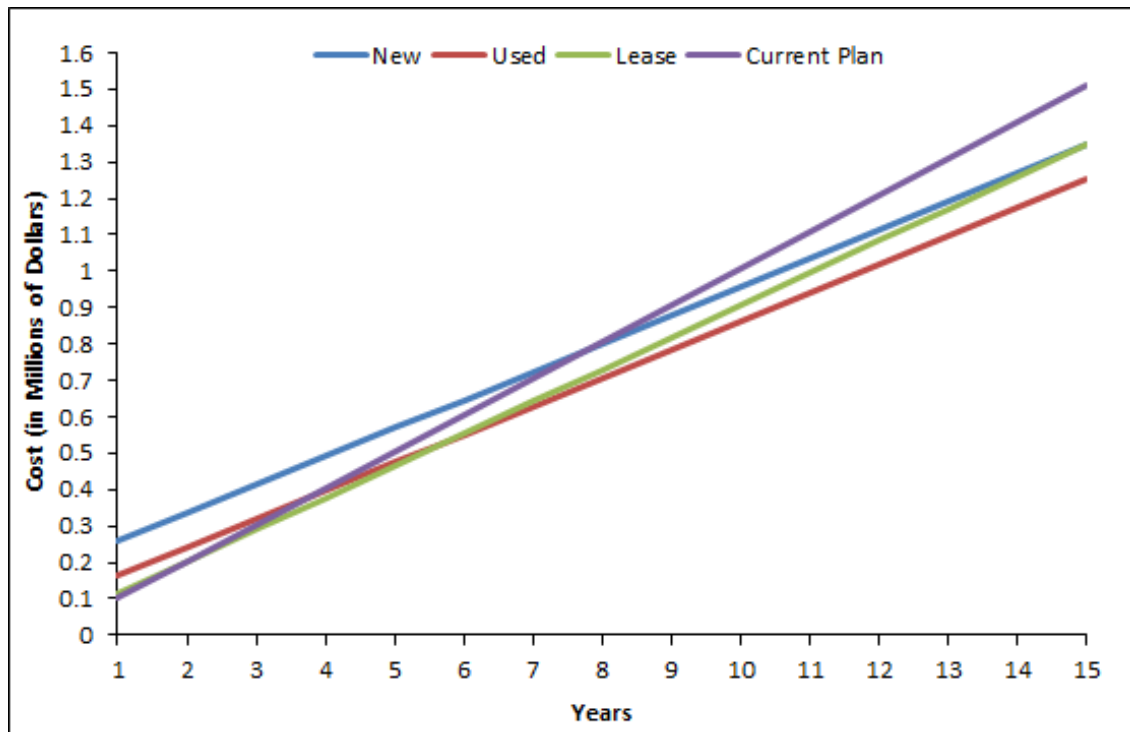


Figure 1.6. Various waste collection options (buying waste trucks new, used, or leasing) compared to the University's current waste collection plan.

These estimates show each option being significantly cheaper than the current plan, with savings higher than \$250,000 per option over a 15-year time period. The initial investment of each option will be paid for within five years' time. By these estimates, leasing or purchasing a used truck will pay for the initial investment within two years. With initial investments of \$258,099.50 for a new truck, \$163,099.50 for used, and \$113,515.98 for a lease, the return on investment (ROI) are 3.3 years, 2.1 years, and 1.2 years, respectively. Of the four options, buying a used truck is the most economically viable option. This option has the lowest initial investment and a low annual cost thereafter.

Enevo Technologies

In 2013, Chapman invested in BigBelly trash receptacles for the purpose of reducing the frequency of trash pickups on campus. The bins work by alerting facilities when a collection is needed. In this manner, bin collections do not happen on a schedule, but instead when a collection is necessary. Enevo sensors will produce the same function on a larger scale. These sensors are placed in dumpsters around campus, and alert facilities and staff when a dumpster is in need of service. The sensors have the ability to greatly decrease the number of trash pickups necessary on a monthly basis. The sensors also compute the most efficient routes to

pick-up sites, and collect data in a similar manner to the BigBelly containers. Companies that use Enevo services typically report a 20-40 percent reduction in collection costs. If Chapman University were to internalize the waste management process, the inclusion of Enevo Technologies would further increase efficiency.

1.3.3 Recycling Signage on Campus

Of the participants of the 2016 Environmental Audit Survey, 36 percent of respondents indicated they are very confident properly sorting landfill and recyclable items, and 49 percent responded they are somewhat confident doing so. Additionally, 97 percent of participants responded that signs with pictures of what items should be disposed of in each bin would make it easier to decide where waste belongs. Stickers on bins and signs above bins were the most popular choices when asked what form of education would be most beneficial regarding improving recycling rates, with 73 percent and 65 percent of participants choosing those solutions, respectively.

A primary trash audit was conducted on March 30, 2016 in order to discover how much recyclable material is disposed of in the garbage bins and which types of materials are the most misunderstood regarding their recyclable potential. Trash and recycling from Argyros Forum from the previous day had been collected and separated by each floor of the building. Both the trash and recycling from each floor was sorted into fifteen categories of material. The total for each category was then weighed, and the weights of each, in pounds, were recorded. Figure 1.7 displays the percentage of waste that was sorted improperly on each floor.

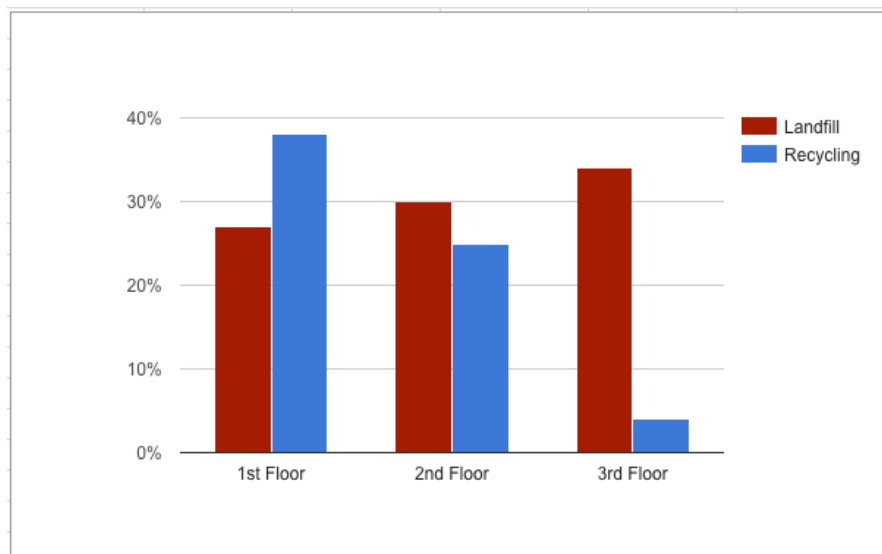


Figure 1.7. Breakdown of the amount of waste improperly disposed of in the primary AF audit; percentage of landfill waste that was recyclable and percentage of waste in recycling that was not recyclable.

Preliminary educational signs were installed on the bins in Argyros Forum on March 31, 2016. Throughout the building, 14 recycling and 19 landfill signs were taped to the side of the bins in classrooms and offices. Some rooms were locked, and therefore signs were not posted on every waste bin found in the building. There were five rooms without a recycling bin out of the 16 rooms where signs were installed. A second audit was conducted on April 20, 2016 to see whether or not there had been any marked improvement in recycling rates. The same methodology was used for the second audit as in the primary audit. Figure 1.8 displays the amount of improperly sorted waste by floor from the second audit.

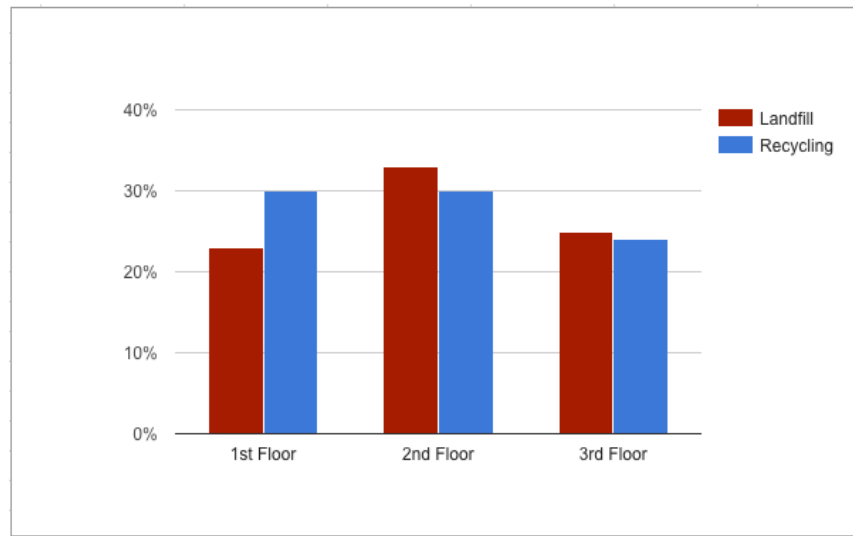


Figure 1.8. Breakdown of the amount of waste improperly disposed of in the second AF audit; percentage of landfill waste that was recyclable and percentage of waste in recycling that was not recyclable.

It has been estimated there are roughly 750 rooms on main campus, including classrooms, offices, and study areas. To have 1,000 signs printed at Kinkos and laminated by Staples would cost roughly \$230.00. Assuming one landfill and one recycling bin per room, it would cost Chapman only \$345.00 to put an educational sign on each bin on main campus.

The Ideation Lab has been asked to work on comprehensive educational signs to assist in these efforts. Chapman's Ideation Lab is a resource on campus; the staff and students can help with the visual presentation of ideas to facilitate effective communication. Once signs are created and produced, their installation can occur over the summer, when the facilities staff has a list of tasks to accomplish between school years. In addition to installing the signs, this would also be an ideal time to ensure all the rooms have two waste bins, one for landfill and one for recycling. It is estimated that 30-40 percent of rooms on main campus are lacking a recycling bin. This means approximately 260 recycling bins may need to be purchased, which would cost just over \$1,000 at \$3.89 a bin.

1.3.4 Education and Behavior Change

According to Boston University, the average college student produces 640 pounds of solid waste each year, including 500 disposable cups and 320 pounds of paper (2013). The goal

of this audit is to identify ways to reduce waste on campus through a combination of education, action, empowerment and accessibility. This reduction in waste could potentially lead to economic savings by reducing trash pickups, and reducing purchases of paper and other disposables. Additionally, as mentioned in the 2013 audit, the school could potentially sell recyclable items for profit giving increasing recycling rates an additional economic incentive.

Colleges and universities across the United States are taking steps to implement sustainable waste management practices and create a community of environmental stewards. For example, The Post-Landfill Action Network has created a network of over 35 schools with zero waste and waste reduction programs in place, including University of the Pacific, which is listed as one of Chapman's peer institutions. In order to maintain a competitive edge over similar universities, Chapman should promote sustainability education and sustainable practices. These schools can provide valuable insight into how to reduce waste on campus and show that zero waste can be an obtainable goal for Chapman. Schools such as Harvard include sustainability during orientation, in the official welcome packets and distribute thousands of reusable water bottles and other materials, as well as, host educational events across the campus during orientation. (Hammar, 2014).

A preliminary waste audit was conducted in Argyros Forum, a building on main campus that acts as the central hub for students, teachers and staff. The first floor of the building includes the student union and four eateries. The second floor is largely classrooms and some offices, the third floor is offices. During the first audit it was found that approximately 28 percent of materials in the trash was misplaced recyclable material. Additionally, 20 percent of items found in the recycling bin were either compostable or landfill waste. The most commonly misplaced items included: plastic and compostable food containers, plastic cups, food waste and paper food bags. This data shows the need for sustainable waste management education at Chapman.

After the first audit, educational signage was placed at every bin and composting bins were introduced to the first floor of Argyros Forum. A month later, a second audit was conducted. The results of the second audit show that the amount of recyclable material in the trash remained almost exactly the same and that the amount of landfill waste in the recycling increased. These findings are consistent with research on environmental education that shows no direct relationship between knowledge and behavior change, highlighting that information based education is not enough to stimulate environmental behavior.

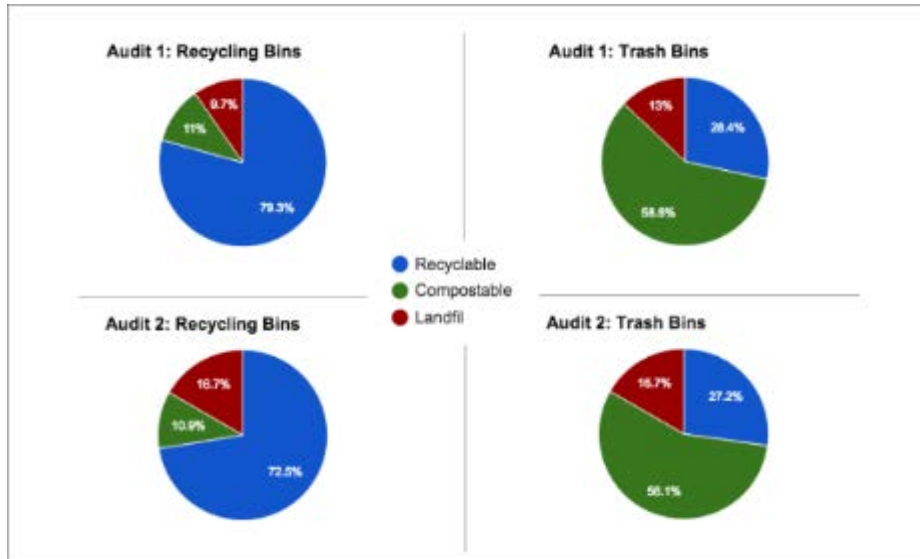


Figure 1.9. Percentage by weight of items disposed in recycling and waste bins during 1st and 2nd waste audits in Argiros Forum, before and after educational signage was introduced.

A 2011 study showed that Americans are becoming more aware of environmental issues. However, as this awareness grows, many feel they are unable to make a significant impact on the planet (GfK, 2011). Additionally, although increasing knowledge of environmental issues is a key aspect in inducing environmentally friendly behavior, it has been found that many other factors affect whether a person will act in an environmentally conscious manner. Hungerford and Volk and suggest that the traditional linear environmental education has been unsuccessful in inducing sustainable behavior. They state there are a variety of factors that influence a person's behavior that must also be considered in the educational process. For example, it is also important to foster a sense of empowerment and ownership of environmental issues. (1990).

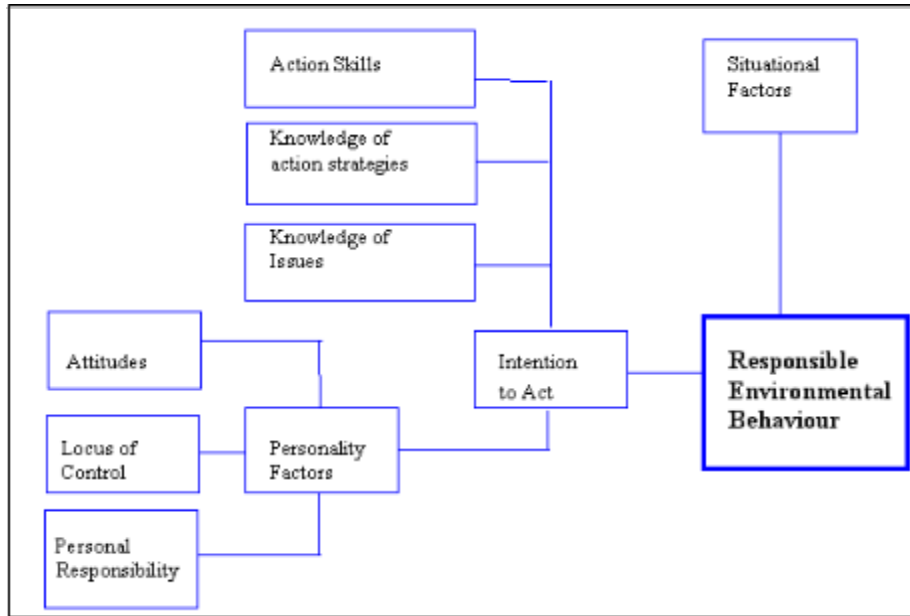


Figure 1.10. Hines model of behavior change, demonstrates multiple factors that influence an individual's behavior (Hines et al., 1986)

In the past most sustainability campaigns have been information-intensive and ignored psychological and sociological knowledge, as well as communication tactics (McKenzie-Mhor, 2000). Effective behavior change campaigns will identify the desired behavior, the barriers to that behavior and then use strategies to overcome those barriers. For this study, the desired responsible environmental behavior was proper recycling and decreased waste consumption. Using Hines model, each factor that affects responsible environmental behavior was studied at Chapman with the goal of recommending strategies that target each factor so they lead to environmental behavior.

Attitudes:

In the 2016 Survey, 82 percent of respondents strongly agreed that it is important to reduce waste generated on campus by staff, faculty and students. Additionally, 94 percent of respondents agreed that proper recycling in order to reduce the amount of waste sent to the landfills is important to them; zero percent disagreed. This shows that the majority of respondents have pro-environmental attitudes in regards to sustainable waste management practices. However, these respondents only represent a small percentage of the students, staff and faculty that make up the Chapman community.

It has been shown that public relations and marketing are important tools in successful recycling and waste reduction campaigns. However, successful strategies and tactics often vary across different populations. The three target audiences of students, faculty and staff have been identified and require specific targeted messaging. There is no current sustainability campaign that aims to create a culture that supports environmental behavior on campus.

Locus of Control & Personal Responsibility:

Whether an individual feels morally obligated to act environmentally and that they can make a difference, can be greatly influenced by civic ecology education. Research has shown that stewardship events such as community cleanups events can help individuals make important connections about their impact on the local environment and feel empowered about their ability to making a positive difference in the community (Tidball & Kransy, 2010). This type of education largely comes from direct experiences with the local environment, rather than in a classroom.

An analysis was conducted on programming offered through Civic Engagement, University Program Board, and Residence Life to assess the availability additional environmental education programs that could be “empowering” and influence locus of control, personal responsibility, attitudes, action skills and knowledge of actions strategies. In 2015 no environmental nonprofits or stewardship activities were offered during the Chapman Day of Service and Greek day of service. There was one creek cleanup in 2014, and no data is available for events prior to 2014.

The most consistent stewardship program available is ROOTS Native Habitat Restoration, which has been held once a month during full semesters since 2006. Other events included the sustainability banquet in 2014 and 2015, planting and gardening activities and educational films. Most environmental education themed events were held in coordination with Earth Week, which began in 2014. Year-long programs include the Community Cleanup Program and Watershed Action Heroes. Additionally, Chapman’s volunteer portal, OrgSync, does list local environmental nonprofit volunteer opportunities. Lastly, clubs such as Mission Environment and Alternative Spring Break Trips also offer additional environmental education.

After reviewing post event surveys from Civic Engagement programs, participants often reported, positive outlooks including: “increased awareness of natural habitats,” “the impact that one person can make when they set their mind to something,” “a feeling of accomplishment this trash doesn’t go into the ocean.” This analysis showed that Chapman does offer some civic ecology programming, however, the frequency of these programs could be increased to reach a greater number of the student body. Additionally, no university programs currently exist for faculty or staff, including involvement in stewardship activities.

Knowledge of Issues:

Knowledge of pollution problems and other environmental issues can be a powerful influencer for environmental behavior. At Chapman, environmental education that focuses on knowledge of issues is largely confined to classroom activities. By comparing survey results from 2013 to 2016 the percentage of respondents who had learned about sustainability in their classes rose from 23 to 31 percent.

As shown in Figure 1.11, over the last nine years, there has been an overall increase in courses regarding to the natural environment and sustainability. However, in the last three years the number of sustainability themed courses has remained constant. Of the ten available sustainability courses, all of them are upper division courses that often require pre-requisites. A course search was also conducted for the term ‘waste’. In the last three years,

there have only been three courses offered every year that pertain to waste. It is important to note that the number of courses presented does not include the number of sections that could have been taught. One course may have been taught two or three times a semester.

Freshman Foundation Courses (FFC) are proposed each semester by individual professors. They are required to promote specific skill development for incoming students, but there is no requirement for their theme. In the last five years, the number of FFC courses that related to sustainability or the environment has been variable, however there has been at least one course offered for the last five years.

After the introduction of the Environmental Science and Policy Major in 2009, enrollment in the major has increased from 10 to 66 students (*Figure 1.12*). The data also shows a decrease in students in the Environmental Science Minor, but an increase in the Environmental Studies minor. During the 2015/2016 academic year there were 105 students enrolled in environmental majors or minors.

Without considering individual sections, in 2015/16 there were 56 environmental and sustainability themed courses at Chapman. The average class size at Chapman is 25 students, thus, those 56 courses offered environmental education for approximately 1,400 students. This is approximately 22 percent of the total student population.

To date there is no lower division general education sustainability course offered. The ENV 101 course fulfills the GE science requirement, but is limited to most of the student population as it is reserved for ENV majors. A GE sustainability course that is not required for ENV majors and aimed towards educating the remaining student population, could help increase knowledge of environmental issues. The Award for Curriculum Innovation in Sustainability Education Award exists to assist teachers in accomplishing sustainability goals such as courses. Vice Chancellor of Undergraduate Education Nina Lenoir, stated that a proposed sustainability course could fulfill both the science requirement and the Global Citizen Cluster's citizenship, community, or service requirement. Funding from the award could make the addition of a sustainability course feasible.

An additional source for the Chapman community to learn about environmental issues includes the sustainability newsletter. This newsletter is only sent out to those who subscribe to it at the sustainability webpage. The reach of this information could be greatly increased if it was advertised to the general population.

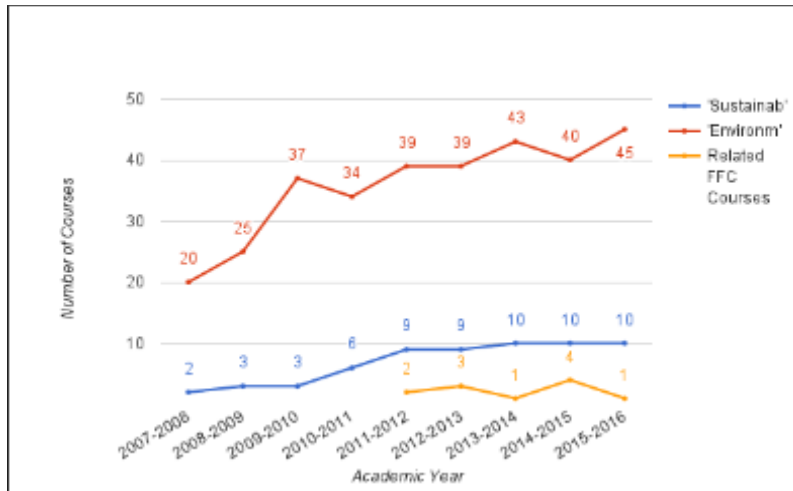


Figure 1.11. Number of courses offered during academic year, note: does not individual sections of classes, one class may be offered more than once a semester or year

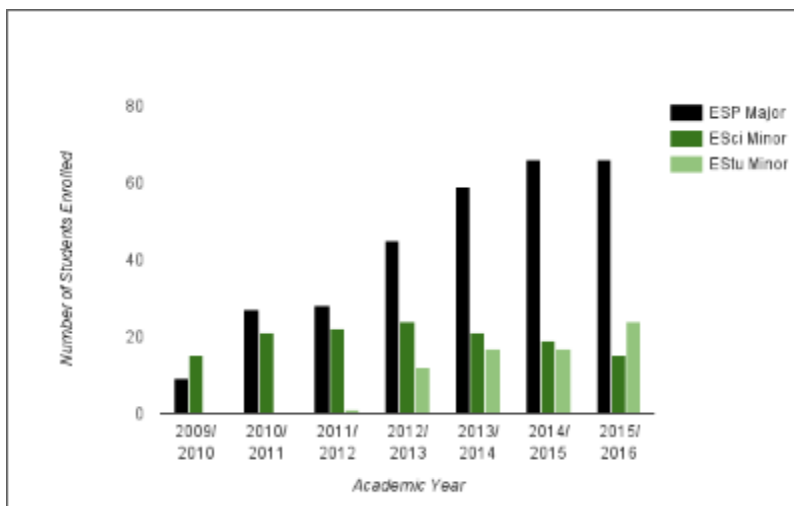


Figure 1.12. Student enrollment during the spring semester or corresponding catalog years in each of the environmental program options; Environmental Science and Policy Major (ESP), Environmental Science Minor (ESci), and Environmental Studies minor (EStu).

Knowledge of Action Strategies:

The 2016 Survey asked respondents how confident they are at properly sorting waste and recycling items. The majority of respondents answered that they were either very confident or somewhat confident (*Figure 1.13.*). Almost half of the respondents answered they were somewhat confident, this shows that many respondents still have some uncertainty about what can and cannot be recycled. Additionally, in the survey, respondents were shown pictures of common waste and recyclable items such as cups, food containers and bags. They were asked to identify if the item belonged in the waste or recycling. It was found that 46 percent of

respondents did not know an Einstein’s paper bag could be recycled, 65 percent were unaware that plastic silverware could not be recycled and 72 percent were unaware a Qdoba bottom belonged in the landfill. This further identifies the need for proper education on recycling.

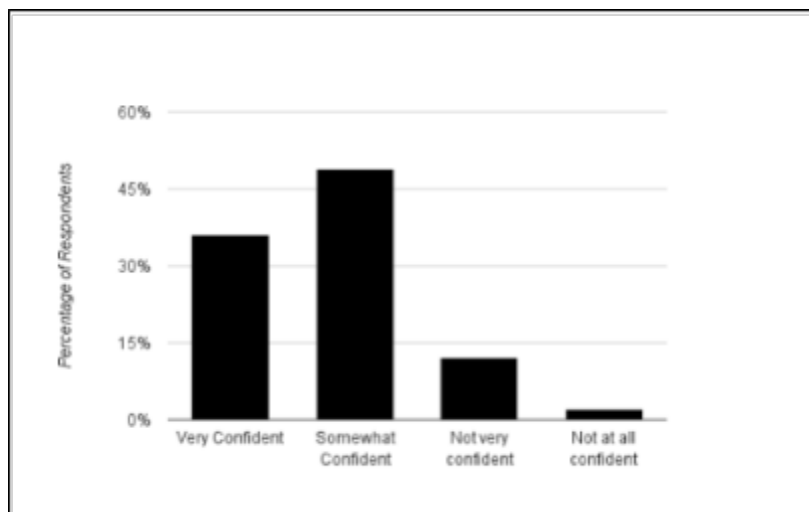


Figure 1.13. Responses to survey question “How confident are you in your ability to properly sort waste into trash or recycling bins?”

Data from the Green Department Certification program, which audits specific departments and provides recommendations for becoming more sustainable, shows that many departments at Chapman do not meet the standards of sustainable waste management practices (*Table 1.2.*). Many lost points for waste being improperly disposed of and not recycling. A notable finding was that five out of the eight departments received a score of zero for “Info about what can/can’t be recycled posted above each recycling/trash bin.” Departments were recommended to post signage above recycling and waste bins, but is unclear what other recommendations were given to these departments to improve their scores.

The combined survey data, results from the waste audits and Green Department Certification program, shows a need for sustainable waste management practice education on campus. There is no current sustainability training for faculty, staff and students. However, the 2016 Survey found that 90 percent of respondents would be interested in learning more about how to reduce waste in their everyday life.

Through discussions with department heads and deans, it has been found that there is no consistent sustainability training or resources for faculty. Each department hosts bi-annual faculty trainings to discuss classroom standards and other topics, some of these have included sustainable practices such as recycling, but not consistently across campus. Additionally, there is a campus-wide retreat in August for faculty. This retreat is not mandatory, but usually has high participation. New faculty at Chapman participate in an orientation and are given the Faculty Resources Guide. However, there is no mention of sustainable practices in the Faculty Resource Guide or orientation. When faculty were asked if they would be interested in participating in a sustainability training, only 8 percent of faculty respondents answered they would not be willing to participate. The most interest was shown towards a sustainability training that is 30 minutes long (*Figure 1.14*).

Department	Waste Score (out of 11 points)
Financial Aid	5
Career Development Center	6
Admissions	8
Facilities	3
Fish Interfaith Center	3
Housing and Residence Life	0
Research and Programs Administration	0
Student Engagement	8

Table 1.2. Department waste scores from Green Department Certification Calculator Tools from 2013.

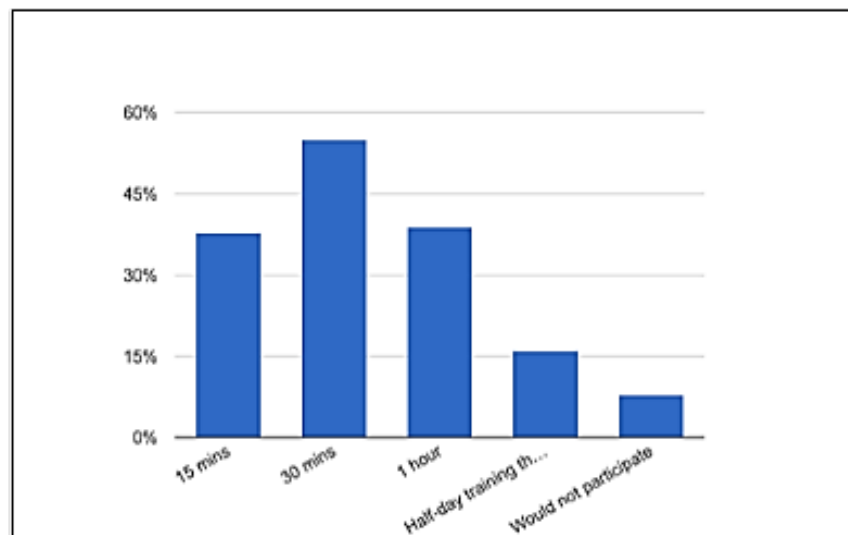


Figure 1.14. Percentage of respondents answering, “Would you participate in a sustainability training that is...”

Although many students have already developed attitudes and habits before entering Chapman, college is the first time many students are living on their own, making their own purchasing decisions and their behavioral choices are not strictly regulated by their parents or guardians. Many habits that students create during their time in college will continue into their adult lives. Chapman has a unique opportunity to influence these behaviors towards responsible environmental behavior. Interactive sustainability trainings could greatly impact student behaviors. Additionally, professors can greatly influence students during their time at Chapman. The implementation of sustainable practices in the classrooms and offices, could help make positive impressions on students, supporting environmental behavior and help

visualize action strategies. There is no sustainability training for students to help them make environmental choices as students, including where and how to dispose of waste items or reduce waste by using reusable items. Additionally, as mentioned in section 1.3.3, consistent educational signage accompanying every recycling and landfill bin on campus would increase user knowledge of action strategies.

Situational Factors:

Situational factors are more difficult to influence because of the variability from individual to individual. However, Chapman can take certain steps to maximize those situational factors that will result in pro-environmental behavior, and minimize non-environmental behavior. For example, accessibility of recycling bins, ease of use and availability of reusable items can all assist in recycling and waste reduction campaigns. In the 2016 Survey, respondents were asked to identify the greatest barrier to sustainable behavior such as recycling, *Figure 1.15* shows that many find convenience and financial cost the largest barrier.

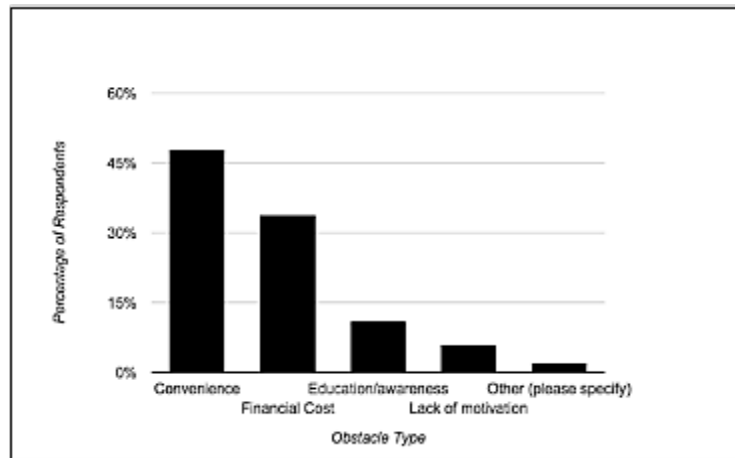


Figure 1.15. How confident are you in your ability to properly sort waste into trash or recycling bins?

In the 2016 Survey, respondents were asked a free response question, “how would you improve recycling on Chapman’s campus?” The most frequent answer was adding educational signage to the bins, however, many discussed the difficulties with the requirement that recycled items be clean and dry before they are disposed of. This highlights that many respondents may not be recycling these items because they are dirty and don’t want to have to wash them. Although it is desired that items be clean and dry, items with small amounts of food residue can still be recycled. Chapman could potentially increase recycling rates by decreasing the associated inconvenience of washing and drying items, or educating students that the items can still be recycled even with some remaining residue.

Additionally, it is recommended that all recycling bins be placed on the right side when placed beside a recycling bin. Another frequent comment, was that the openings of various recycling bins on campus are too small for items such as food containers, pizza boxes or other

recyclable items that are not bottles or cans. The openings to recycling bins should be big enough to accommodate all sizes of recycling bins and should be placed strategically so they are easily accessible at any point on campus. Measures should be taken to reduce any inconvenience associated with recycling.

Action Skills:

Action skills can be positively influenced largely through practice of sustainable behaviors. As individuals become familiar with proper recycling and waste reduction choices, such as choosing not to use a straw, lid or choosing reusable containers, they will become habitual. Since there is no consistent education or policy for students, staff and faculty to adhere to, behaviors are often inconsistent.

1.3.5 Additional Economic Benefit

By increasing its diversion rate and improving recycling rates figures, Chapman could reduce its waste load to landfills and benefit financially from reimbursement for recyclable materials. From the preliminary waste audit, during one day of trash and recycling at Argyros Forum, approximately 76 plastic bottles and 25 aluminum cans were collected. If we assume that during the five days of classes in the 30 weeks of full semesters approximately 100 recyclable items such as bottles and cans are disposed of in Argyros Forum, a total of 11,400 bottles and 5,250 cans would be disposed of in one building. These bottles and cans are valued at \$2.00 per 100 bottle/can so Chapman could profit \$333 during the academic year in Argyros Forum. This may not seem like a lot, however, Chapman currently owns 51 buildings, including the resident halls. Although the disposal rate and traffic through these buildings varies greatly, Chapman could potentially profit over \$16,000 during the 30 weeks fall and spring semester. This calculation shows the financial potential of increased diversion rates. Other materials including cardboard, paper, aluminum and glass bottles are also eligible for reimbursement.

1.3.6 Paper Usage

Results from the 2016 waste audits of Argyros Forum show that during the preliminary audit 43 percent of the recycled waste was paper, which was the largest portion of waste. This data alone shows that developing a paper reduction policy on campus has a large potential to improve Chapman's diversion rate. When looking more in depth at the paper waste habits on each floor of Argyros Forum the audit revealed that in areas where there is more foot traffic from staff and faculty, the amount of paper waste increases. The average between two audits shows that there was 2.6 lbs of paper waste on the first floor, but the third floor had 6.72 lbs of waste (*Figure 1.16*). In total, between the second and third floor, which have classrooms, faculty offices, a computer lounge, and the school newspaper, an estimated 1,200 sheets of

paper were disposed of during one day (based on the assumption that 100 sheets is equivalent to 1lb). Most of the paper waste consisted of lined paper, assignments, meeting memos, and documents from the offices located on the third floor. While the use of some paper is essential in the classroom, a campus wide education about online tools can be utilize to reduce the unnecessary paper waste.

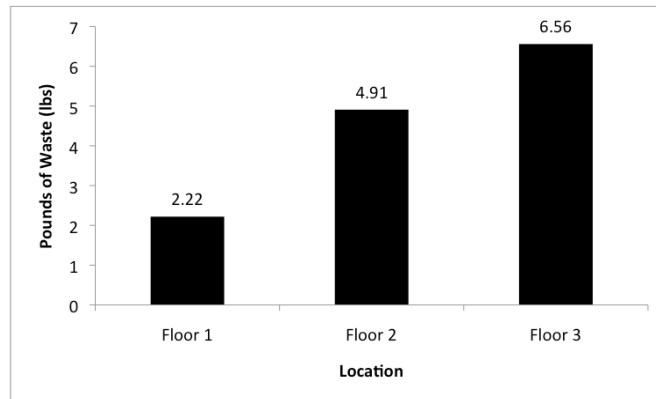


Figure 1.16. Average paper waste per floor in lbs. This is an average between the first and second waste audit conducted in Argyros Forum in Spring 2016.

One way to combat paper reduction on campus is to use the current Learning Management System (LMS) that is already in place. Currently 99 percent of institutions in the United States use an LMS to enhance the educational experience for both faculty and students. These web based tools have been noted to provide more custom learning experiences, develop more organized classrooms, reduce waste, are accessible to students of all learning types and increase communication and feedback outside of the traditional classroom (Dahlstrom, 2014). Data reveals that Chapman’s current LMS, Blackboard, is one of the top rated elearning systems and is proficient at creating an accessible learning space for students while reducing waste. Through Blackboard faculty members have access to the following tools:

- A tool for uploading readings, websites, YouTube links, etc.
- An assignment Dropbox and feedback mechanism
- A tool for online journals, wikis, blogs, and discussions
- A tool for online assessments/tests/quizzes, including a mobile version
- An integration with Turnitin (along with their grading mechanism)
- A grade book for giving immediate indication of assignment and overall grades

With all of these tools, faculty members are fully capable of offering a paperless course. Despite the environmental and educational benefits that Blackboard offers, only an estimated 60 percent of the Chapman University staff use Blackboard. Although Blackboard workshops are offered during new faculty orientation and throughout the semester, attendance has been low at the sessions. Through interviews it was discovered that one of the main reason for the lack of Blackboard use is because there are too many tools on Blackboard and faculty members do not have the time to learn how to use the system. However, with the reduction of paper and printing costs, the University may be able to provide other online resources for faculty members that are more geared towards their specific class, such as Moodle for math classes, and Adobe in art and graphic design classes. In a recent study conducted by Colgate University, colleges all over the world help provide information on the best technology to use in a paperless course (Pumilio, 2016). The results are as followed:

- Adobe professional: excellent for editing and commenting on various assignment types
- Evernote: easy to use mobile app, allows highlighting, annotating, and bookmarking
- Blackboard: good for organizing large classes, distributing materials, and checking for plagiarism
- Moodle: free, good online grading, easy to upload math problems, Turnitin integration
- Nearpad: excellent student/faculty interaction, faculty member can upload lessons

However, due to the lack of faculty responses in the 2016 environmental survey, little is known about their willingness to use online learning systems and printing habits. Out of the 82 staff and faculty members that answered the survey 68 percent said that they rarely or once a month print out papers for their students (*Figure 1.17*). Seventy-seven percent of faculty and staff answered they are at least very willing to use more online sources if more training is offered (*Figure 1.18*). This data shows that faculty members are conscious about their paper choices and could be willing to use other online resources, if the training becomes available. However, more faculty/staff members will have to answer this survey to confirm the trend.

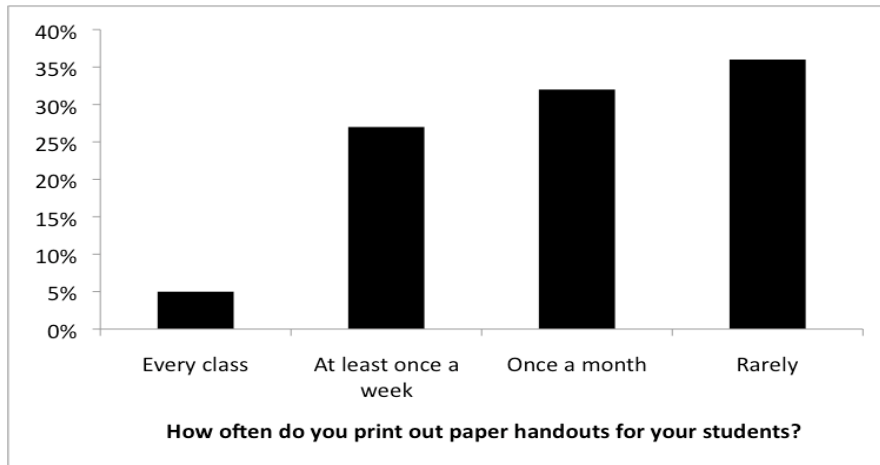


Figure 1.17. Survey data: How often do you print out paper handouts for your students?



Figure 1.18. Survey data: If provided with more online sources and training to reduce paper use, how willing are you to use it?

Along with the implementation and use of the Learning Management System, individual studies of different departments at Chapman were conducted in order to gain insight and target areas for paper reduction. Although there is no campus-wide communication and initiative to reduce paper, individual colleges have set policies to create greener classrooms. For example, within Schmid College, staff and faculty members are limited to 20,000 sheets of copy paper per month. Individual use of the copy machines is tracked using unique pin-code access and faculty members get notified when they exceed their paper limit. Within the Argyros School of Business faculty members are strongly encouraged to use Blackboard and scanning tools are available to all faculty members so that they can keep all class material on their computers. For each college, the facilities department provides 2-4 cases of paper per month. Any additional paper must be bought by the colleges themselves. Although there are some

initiatives within each college, there is very little communication and consistency of these practices campus wide.

Case Study: Library Printing and Current Financial Impact

With information provided by IS&T and Facilities, a case study was conducted to discover trends in printing patterns on the public library computers and insight was gained on the financial impacts of current paper use. In 2013, all public use computers switched to printing double-sided as the default. Although it is unclear what the job and sheet numbers were before this change, data shows that there is an overall decrease in both printer jobs and number of sheet printed since 2013 (*Table 1.3*). This decrease from the 716,909 sheets in 2013 to 540,875 sheets in 2015 depicts positive trends occurring in classrooms, assuming that the majority of printing jobs in the library are was class material. Although more research needs to be done, this trend could mean that more professors are requiring students to turn in or read material from online systems, and it also shows that the implementation of double-sided printing has significantly decreased the amount of sheets needed. Despite the reduction in paper within the library, interviewees found that amount of paper purchased for this year is relatively the same as the years past. Currently, between facilities and IS&T a total of \$30,101.34 has been spent on paper for fall 2015-spring 2016 (through April). The paper purchased by both of these departments has been used for all the public print papers, a set amount goes to each college per month. By developing a system to reduce paper usage, and offering more paperless courses, the University would be able to reallocate some of the funds to provide services to faculty members that would make hosting paperless course more feasible.

One of the services that University could provide is etextbooks for students enrolled in the paperless course. The services provided by Chegg, an educational technology company which provides ebook subscriptions to both students and classes, can be purchased. The ebooks provided by this company are geared towards enhancing the educational experience. Unlike paperback textbooks, ebooks allow students to tag sections in a chapter, highlight, make notes, get links to problem solving help, online tutoring and more. While University subscriptions to ebooks vary in price depending on the book, this type of service would benefit a student’s academic experience.

	2013-2014	2014-2015	2015-2016
Jobs	197,138	203,146	168,273
Sheets	716,909	677,472	540,875

Table 1.3. Library public printer usage by year. (Aug 1st-Aug 1st)

1.4 Concluding Assessment

1.4.1 Areas where Chapman is doing well

In the last seven years, Chapman has increased courses relating to sustainability and the natural environment. The University has also provided free student programs to help inspire environmental behavior. The introduction of the Green Certification Program in 2009 is a crucial step to providing personalized insights and recommendations for different programs. Additionally, an increase in the number of recycling bins on campus has improved accessibility to sustainable behavior. Lastly, the introduction of water refill stations also encourages the reduction of waste by encouraging reusable water bottles.

Over the past years, Chapman has also increased their Blackboard training for faculty members. Although the training is not mandatory for faculty members it is clear that Blackboard is sufficient enough to provide a wide range of services for faculty and students. Along with this the implementation of double-sided printing has shown a decrease in the amount of sheets that get printed on the public printers.

Chapman currently composts all green waste on campus. This decision is a move in the right direction for the campus, though efforts could be greatly expanded. Chapman can easily make up for the extra costs of providing composting services by improving inefficiencies on monthly trash collections.

1.4.2 Areas in which to improve

- Although overall number of courses has increased, there is no general education sustainability course, designed to educate students that are not ENV majors or minors.
- There is limited environmental education of the Chapman community. There needs to be easily accessible and engaging educational opportunities for the campus as a whole about recycling and how to reduce waste.
- There is no standard for sustainability training for faculty or staff, sustainable practices are not covered in faculty retreats, meetings, orientations or the Faculty Resources Guide.
- There is no sustainability training or resources available for students. There is no element of on-campus sustainable practices during orientation.
- There is no system for ensuring whether there are recycling bins in classrooms and offices. There is also a lack of educational signage accompanying recycling bins, resulting in improper disposal practices among students, faculty, and staff.
- There is no university-wide policy for sustainability in the classroom. While the individual colleges have set paper usage standards a campus wide standard can ensure the maximum paper reduction.
- No consistency in Blackboard trainings or stronger emphasis on implementing this e-learning system in the classroom.
- Creation of a more efficient model of campus trash collections.
- Creation of compost collection efforts to prepare for the 2017 AB 1826 deadline.

1.4.3 Existing gaps in knowledge

- There is a gap in knowledge within the student body of what can and cannot be recycled at Chapman.
- The amount of waste produced by the entire university is still unknown, because Chapman's waste stream is connected with city-wide collections.
- A detailed analysis on the savings provided by Enevo services must be carried out.
- Clearer estimates on campus-wide organic waste production must be evaluated.
- A detailed account of all sustainability-related education efforts campus-wide.

1.5 Recommendations

1.5.1 Easy

- Add educational signs at each recycling and waste bin with pictures of products frequently disposed at Chapman. Have the facilities staff install signs while completing their summer tasks.
- Develop a short guide to distribute to staff, students and faculty on waste management practices such as recycling, composting and reusing. These can also include recommended products to use instead of single-use products.
- Distribute online "sustainable waste management" guidebook via email to all students, staff and faculty
- Create a mandatory Blackboard training that Faculty members have to attend once a year to help them keep up to date on the resources Blackboard has available. This can be an in-person or online training that faculty members can complete any time during the academic year and they are awarded with a certificate of completion which will be turned in to their respective dean's office in order to hold them accountable.
- Increase the number of recycling bins on campus to ensure a recycling bin is paired with every landfill bin.
- Use Enevo technologies to reduce pick-up frequencies for on-campus trash.
- Add a section of sustainability resources and sustainable waste management practices to the Faculty Resources Guide.
- Increased marketing of Sustainability Newsletter.

1.5.2 Moderate

- Have Chapman faculty, students and staff volunteer at community cleanup events such as beach or creek cleanups. This could be an added teambuilding activity for trainings or could be added to the Chapman day of service. In order to engage faculty, the University should offer this time as paid leave.
- Recruit a team of "Green Panthers," students who are interested in helping educate the Chapman community about environmental issues and sustainable practices on campus.
- Have sustainability education booth or table at all major on campus events including homecoming, the Winter Fair, Spring Sizzle, etc.
- Create a pledge to reduce waste and aim to increase diversion rates for students, staff and faculty to sign.

- Implement a system to ensure recycling bins are in each classroom and office space. Once every two weeks could have a custodial staff person survey whether they are available when they are cleaning the buildings.
- Increase sustainability themed programming with Civic Engagement, UPB and residence life.
- Further develop the Green Department Certification program, and require each department to participate once every three years.
- Add sustainability training and education to Freshman Orientation. This includes a booth at the Student Services Fair, distributing reusable water bottles as the “Chapman Swag” and presenting them with information as they check into their dorms.
- Create general education sustainability education course.
- Create bins specifically for materials eligible for reimbursement including water bottles and aluminum cans, use company like Green Canvas Recycling to obtain profit from bottles and cans
- Create a three minute long sustainability education video for Chapman website as a resource for students, staff and faculty.
- Each College/Department is required to develop a reasonable faculty/staff paper limit per month and implement a pin-code tracking system (regulated by the Dean’s office). These paper limits will be presented to facilities so adjustments to paper orders can be made. If faculty/staff members require more paper than the set limit then they will be required to fill out a short paper request, turned into the dean’s assistant, explaining the need for the order.

1.5.3 Challenging

- Mandatory campus-wide training for staff and faculty about sustainable waste management practices during Staff Summit Week or monthly meetings. Short educational session on how to reduce waste in everyday life, how to dispose of waste and how waste impacts local ecosystems. They will also be exposed to the importance of having a sustainable classroom, and how this can be accomplished.
- Using research on effective messaging for differing target audiences (staff, faculty students, etc.) and implement targeted zero-waste campaigns across campus.
- Consider a campus-wide switch to Waste Management as the main waste services provider. Reduce costs of the switch by Chapman-owned waste trucks.
- Eliminate single use, non-recyclable products from being distributed on campus at restaurants. Instead, make the switch to compostable, recyclable and reusable products.
- Each College commits to providing one at least one paperless course each semester. The courses selected will be provided with tools (of their choosing) to make the course feasible. This opportunity will provide a unique and relevant learning experience for students, reduce classroom waste, and develop a more efficient course. End of the semester the faculty members and department will conducted an evaluation of each paperless course to ensure proper recommendations and improvements for the following semester. Along with providing all course material and assessments online,

the selected class will be provided with an ebook subscription of the course. The funds for these classes will come from the money saved by reducing the need to purchase paper, printers, and toner.

- Create work study position in charge of Green Department Certification program to audit all departments and facilitate Green Panthers program.

1.5.4 Future Areas of Research

After this audit is completed, research on the long-term effectiveness of signage on campus and sustainability trainings should be conducted. Future audits should conduct waste audits to compare how recycling, composting and waste levels have changed after these techniques were implemented. Future surveys should research whether student, staff and faculty knowledge of sustainable practices has changed and their attitudes towards participating in sustainable waste management practices. This includes developing a more in-depth study on how current faculty members utilize learning management systems (such as Blackboard) within their course. A waste audit of different buildings on campus would also help further assess levels of sustainability knowledge from building to building and departments. Also, continual monitoring of faculty knowledge and their classroom etiquette, as far as sustainability practices needs to be followed to ensure that the most efficient practices.

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1.8 Appendices

1.8.1 Extended Task List for Education and Behavior Change

Student Education (2016):

- Create and recruit ENV Majors or Minors, perhaps Mission Environment members, as Green Panthers, a group of students dedicated to educating the Chapman Community about sustainability initiatives. (June).

Freshman Orientation:

- Contact Jamie Guterrez to confirm that "CU Swag" will be reusable water bottles (June) and confirm of cleanup or ROOTS for Emerging Student Leaders retreat (end of May)
- Create short interactive presentation regarding Chapman's sustainability initiatives
 - Include topics such as: What can and cannot be recycled, where are the water bottle refill stations, Just Ask initiative at Randal Dining, where on campus can you use tupperware, turning off lights and unplugging appliances, common hazardous waste items and how to dispose of them, where you can donate gently used items.
- Train orientation 140 leaders during orientation leader training August 18-22

- Create materials including poster and handouts for a table at the Student Services Fair, educate students and parents about how to be a “green panther”
- During check into dorms, place table in Henley basement. When Resident Advisors hand out keys, give them free water bottle with info about water refill stations, using water from bathtubs and reducing plastic water bottle use.

During School Year:

- Utilize Green Panthers to table and man recycling, compost and waste bins at different events including Spring Sizzle, Homecoming Weekend, Winter Fair, etc. Can ensure proper disposal while also educate large amounts of people during a short time. Could have reusables for sale, etc.
- Recruit RA’s to continue education and encouragement sustainable dorm practices such as proper recycling, 5 minute showers, turning off lights, etc.
- Increase stewardship opportunities for students through UPB and Civic Engagement. Promote and encourage beach cleanups and community cleanup program. Add program that is beach cleanup and day at the beach (can coordinate with Orange County Coastkeeper)
- Advertise and publicize sustainability newsletter
- Send out electronic sustainability guide to all students, that includes signs to print for waste bins, tips and tricks etc. (Use same info from Orientation)
- Add Environmental non-profits and stewardship activities to Chapman Day of Service and Green Day of Service.
- Using funding from the Award for Curriculum Innovation in Sustainability Education Award: Develop GE Sustainability themed course that can fulfill both science and Global Study (Citizenship, Community, Service) requirements
- Add sustainability pledge to syllabuses
- Distribute pledge for students to sign saying they will aim to reduce the use of single use materials and recycle properly

Faculty Education (including additions to paper usage):

- Use Dodge to create short video to distribute to faculty regarding sustainability initiatives, how to reduce waste in the classrooms and offices.
- Contact Becky Campus from Human Resources to discuss adding sustainability to Wellness Program and identifying best practices for faculty training and engagement.
- Add “Sustainable Classrooms and Offices” section to Faculty Resources Guide.
- Use Sustainability Committee to determine goals and standards for waste reduction.
- Create pledge for Faculty to sign saying they will aim to reduce the use of single use materials and recycle properly.
- Identify faculty experts such as Mackenzie Crigger, Chris Kim to develop and present information to faculty.
- Host external expert speakers in sustainability to present at Chapman to draw faculty interest.

- Implement interactive in person sustainability trainings during either the faculty retreat in August or monthly meetings.
- Develop mandatory Blackboard training for all faculty members. In the Fall of 2016, faculty members should be required to participate in the badge system that is being put in place by the Blackboard administration team.
- Case studies of the current faculty members that offer paperless courses at Chapman need to be conducted. This will give the administration an idea of what practices are currently being used in order to make a paperless course successful.

2017 and Beyond:

- Add stewardship activity such as beach cleanup as activity option for freshman orientation
- Add service component to wilderness trek orientation groups
- Collaborate with Dani Smith to add sustainability to Healthy Panther presentations
- Utilize Public Relations, Communications and Human Resources departments to create Green Panthers campaign to promote sustainability and create sustainable culture on campus
- Encourage sustainability pledge to be included in syllabus'

1.8.2 Description of Programs

ROOTS:

- Habitat restoration in Upper Newport Bay, activities include planting and watering native species & weeding and removing invasive plant species

Community Cleanup Program:

- Weekly service projects for students in Greek life to cleanup Orange. Takes place Thursday-Sunday, 8-10 a.m. with 12 volunteers each day picking up trash in surrounding neighborhoods.

Poppin' Plants:

- Students decorate a recycled container and plant seeds to grow a plant for their room or house. In addition to planting seeds, information on the Green Initiative Fund, a grant available to students and faculty to receive funding for sustainability themed projects is presented.

Swap Not Shop:

- Clothing exchange, for each item brought you may choose another item that someone else brought

Orange County Watershed Ambassador Program:

- "The Watershed Ambassador Education program is collaboration between the OC Watersheds and Chapman University students. The goal of this program is to inform our community about our water supply and how we can take care of it. The program exists in a number of steps. There will be several training sessions to familiarize Chapman

students with the curriculum and presentations. During the sessions, students will learn what a watershed is and why it is important to those who live in Orange County. Finally, ambassadors will prepare presentations together on what they have learned for the community's elementary schools. This is a unique community service event in that it allows students to be creative in the way they educate, and have a positive impact on the way kids see our environment.”-OrgSync

Sustainability Banquet:

- “Join Civic Engagement Initiatives Thursday, April 23, at 7 pm to explore the environmental impacts of your dinner! The UN Food and Agriculture Organization released a paper in 2006 titled *Livestock’s Long Shadow*, that identified the supply chain for animal agriculture accounts for up to 18% of greenhouse gases. This is a larger contribution than the entire transportation sector, including cars, trains and planes. Animal Agriculture also consumes a lot of water up to 500 gallons of water for a pound of chicken and 1,800 gallons for a pound of beef. According to a recent New York Times Article “Meat Makes the Planet Thirsty,” switching to a vegetarian lifestyle can reduce your water imprint by 60%. Come to Argyros Forum Third Floor Patio and try a vegan or vegetarian meal, it’s on the house, so don’t worry if you don’t like it! We encourage you come with an open mind and a hungry stomach.”

Alternative Break:

- Chapman University’s Alternative Break Program seeks to provide students with an opportunity to work with community agencies, needs, and populations in a week-long service and immersion experience. Civic Engagement Initiatives offers several Alternative Break Trip options with varying levels of direct service, learning, reflection, and immersion. The Alternative Break Program is designed to connect Chapman students to shared experiences that foster personal growth, mutual awareness, and civic engagement. The Program is committed to being a drug and alcohol free program.

Greek Day of Service:

- A day of service for Chapman Greek Life, fraternities and sororities spend time volunteering and completing service projects in the local community.

Chapman Day of Service:

- A day of service for students to spend time volunteering and completing service projects in the local community.