UCLA Sustainability Action Research

Reusable Container Study

Final Report 2024

Evaluation of the Environmental, Financial, and Logistical Feasibility of a Reusable Container Program at UCLA To-go Dining Halls

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Abstract

In recent years, a concerted push toward sustainability has led to the proliferation of reusable container programs across college campuses, setting a precedent for UCLA to follow. Past Sustainability Action Research teams and the Kerckhoff Coffee House reusable mug program have laid the groundwork for reusables at UCLA. Our team expanded on these research efforts, specifically mapping and analyzing the logistics and costs of a reusable container program for UCLA's to-go dining halls.

Two key questions guided our research. Firstly, what are the financial and environmental implications of a reusable container program in UCLA dining halls? Secondly, what recommendations and logistics should a reusable container system at UCLA adopt? These questions take into account UCLA's value of sustainability while considering the feasibility of the program for UCLA's dining staff, dining managers, and students with a residential meal plan.

To address these questions, we conducted interviews with experts both at UCLA and beyond. We initiated a student survey to gain feedback on reusables and gauge how student habits may affect the success of a pilot program. We further completed a utility data analysis to calculate a final cost/benefit analysis, which serves as the key point of our final deliverable. Through the survey, we discovered that a majority of students living in Residential Buildings would be in favor of a reusable program and identified three primary concerns. Our cost-benefit analysis yielded savings of $130,000 per academic year and a significant reduction in solid waste. We ultimately recommend that UCLA Dining proceed with a reusable pilot program at the to-go dining hall, Rendezvous, as an advancement towards a full-fledged reusable program for all residential takeout locations.

Introduction

The Reusable Container Study, as part of Sustainability Action Research (SAR), aims to conceptualize and quantify the impacts of a reusable container program among UCLA takeout locations on the Hill, the residential portion of campus home to over 14,000 undergraduates live. Currently, UCLA dining's primary takeout container is made of compostable bagasse, which is the fibrous plant material leftover from sugarcane production (Harnoto, 2013). We hope to understand if replacing these bagasse containers with reusable containers is financially feasible and environmentally beneficial in regard to energy, water, and waste. While the actual implementation of reusable containers in takeout locations is not in the scope of our project, our team aimed to provide recommendations for UCLA Housing for a future pilot program.

Various colleges, from UC San Diego to Vanderbilt, have set the precedent for reusable container programs. For instance, Vanderbilt launched its reusable container system called Fill it Forward in August 2022. The system utilizes an app and QR code system to rent takeout containers (Rosenbaum, 2022). However, the majority of these colleges serve a smaller student body than UCLA, reducing the complexity of their reusable programs. The few larger universities with reusable programs, such as University of Pennsylvania, only operate reusables in their sit-in dining halls. At UCLA, Kerckhoff Coffee House piloted a reusable to-go mug system with Reuzzi, a mobile app that uses a check-out-and-return system to track containers, in hopes of promoting more sustainable practices (Manuel, 2023). Due to the success of Reuzzi, UCLA plans to continue partnering with the service for the reusable program among to-go dining halls on The Hill. Additionally, a past SAR team, the 2021 Plastic Policy Implementation group, conducted research regarding reusables, investigating polypropylene reusables as alternatives to disposables. They held informational interviews with staff and other universities, conducted a reusable cutlery pilot program, and completed a limited financial analysis.

Our research was guided by our two primary research questions. What are the financial and environmental implications of a reusable container program in UCLA dining halls? What recommendations and logistics should a reusable container system at UCLA adopt? To address these questions, we focused on four core areas of study: dishwasher water & energy consumption, disposable container waste reduction, student opinions, and expert insights. The final report to UCLA Dining includes all of our findings with respect to these pillars, informing future efforts to implement a reusable container program.

Methodology

Financial and Environmental Data Analysis Methods

After researching reusable container programs employed at other colleges, our team noted that these colleges were significantly smaller and implemented reusables mostly at sit-in dining halls. Due to the differences between these programs and the expected UCLA system, our team decided to directly calculate energy consumption, water use, waste, and costs from primary utility and purchasing data from UCLA's dining halls. Since Rendezvous would be the most likely location for the pilot according the UCLA Assistant Dining Directors (see interview section), we decided to concentrate our data analysis efforts on this location alone to provide the most accurate cost-benefit analysis possible.

To inform our cost-benefit analysis of a reusable container program, we calculated the potential savings of halting disposable container purchases. The first step was to identify current disposable container usage rates at Rendezvous. To do this, we analyzed raw data sheets on Rendezvous mobile order transactions and derived averages for takeout container use per day for the three primary containers offered by Rendezvous: the 8x8x3 in. clamshells for burrito bowls, the 9x6x3 in. clamshells for tacos, and the 32-oz bowl for Asian Freestyle. Supplemented by Rendezvous takeout purchasing data, our team then used the unit price for each container type to derive the total monthly costs of disposable containers.

Second, we provided a holistic overview of all impacts to water and energy consumption from a reusable container program. We looked into both the increase in water and energy usage due to container washing in UCLA's commercial dishwashers and the avoided environmental costs from the bagasse container's lifecycle. For the container washing, we consulted the model specifications for the dining hall dishwashers, analyzed dining utility bills to determine water and electricity rates, and visited the De Neve dishwasher room to measure the number of dishes washed per minute in real-time.

For the disposable bagasse containers, we consulted scientific papers on their life-cycle impacts to estimate electricity use associated with their production.

To round off our cost-benefit analysis, we examined the avoided waste generation under a reusable system due to the reduction in disposable containers. We estimated the reduction in solid waste in pounds by weighing each container and multiplying these values by the daily container use rates calculated earlier.

Athens, UCLA's choice waste hauler, charges for waste collection by volume and the number of pickups, so our goal was to estimate the number of three cubic-yard bins filled per day by Rendezvous containers. To collect experimental data, we conducted a waste audit at Rendezvous. We partnered with Rendezvous dining staff to block certain trash bins and funnel students to the bins used for the waste audit. Students disposed of each takeout container type in separate bins, and staff compacted the waste to model the real-life scenario. When the bins reached saturation, we counted the number of containers. After finding the ratio of each container to the its occupied volume, we scaled to account for the number of containers used per day to calculate the number of three-cubic-yard bins filled daily. With the knowledge of bin pickup costs from waste hauler invoices, we derived an estimate for waste reduction savings.

Student Survey

Our team conducted a student survey in Weeks 1 through 6 of the Spring Quarter to gather student-sourced data on the perceived impacts of a reusables program and current student habits. The survey was conducted via Google Forms and targeted UCLA students on The Hill. Our team obtained $150 Bruincard deposit funding through The Green Initiative Fund (TGIF). The prize money incentivized students to complete the survey. To align with EDI principles, manage bias with the survey, and to reach a diverse and representative section of the student body, we only posted the survey QR code in accessible locations throughout all the residence halls and in front of dining halls on The Hill. This ensured that all students had an equal opportunity to respond tohe survey, and there were no bias in regard to who was allowed to participate.

Additionally, we crafted the questions to minimize response bias by avoiding leading questions or extraneous information to avoid swaying student opinion. For instance, we asked students to rate their degree of interest in a reusable program, but avoided directly mentioning the environmental benefits in the question. However, we did provide contextual information in the background, such as where the containers would be washed and the checkouts system, in order for students to comprehend how the program would actually operate. This approach also helped reduce bias, as some students may misinterpret the program and report different answers. For instance, students may have assumed they would be responsible for washing the containers, potentially leading to lower interest.

The priorities of our survey questions were threefold. First, we intended to gather data on how often students choose takeout options and disposal habits. Second, we assessed students' opinions on a reusable container program and the collection system. Lastly, we obtained relevant, open-ended feedback on recommendations and concerns regarding a reusable program. This last component was critical in upholding equity, diversity, and inclusion by centering the voice of the student body — those who will be using the containers daily. Students come from a variety of economic backgrounds and hold differing perspectives. Open-ended feedback enables students to elaborate on a more meaningful level how a reusable container would positively or negatively impact their wellbeing compared to a one-dimensional multiple choice answer.

Challenges

The magnitude of our project scope was the first challenge we encountered during our study. There are six takeout dining halls located at UCLA, all of which serve a variety of items in specialized containers. This large scope created a high level of complexity to our data analysis. During our interview with the dining directors, we learned that, due to the staffing shortage, they were considering a pilot program to test out the feasibility of a reusable container program at Rendezvous. Subsequently, we narrowed our scope to just Rendezvous, allowing us to concentrate on more specific data sets and container types.

Our team faced difficulties with calculating water usage for washing reusable containers. The first water usage data we received was aggregated by building, and we could not devise a method to separate dining hall water use from residential use. So, our team decided to estimate the additional water usage by looking at the dishwasher model (STPCW-ER) information and manually calculating how much water would be needed to wash the containers based on the average number of takeout orders Rendezvous receives daily. We did so by calculating the dishwasher capacity and how much water is required to run the dishwasher.

Additionally, UCLA's staffing shortage posed a significant challenge, as they reported a deficit of almost 317 career staff and student positions from pre-pandemic levels. The dining facilities hope to increase their staffing numbers before they look to implement a reusable container program to focus their energy on opening more dining locations. This poses a challenge for our project, as the reusable program is placed further on the list of priorities. The staffing shortage is outside the scope of the project, so there are minimal ways for us to circumvent this challenge. We focused instead on mapping the logistics behind a reusable program to ease the rollout of a reusable program when UCLA overcomes the staffing problem.

Regarding logistical challenges, we faced issues with planning the waste audit and receiving funding from The Green Initiative Fund (TGIF). It was difficult to coordinate with dining to find an open time for the waste audit at Rendezvous, and while we initially had planned to conduct it in week 6, it was pushed until week 8. However, this change did not harm the effectiveness of the waste audit data. The principal repercussion was the delay in calculating expected waste hauler savings for our final cost-benefit analysis. In regard to survey funding, TGIF initially did not respond to our application, and we had to book an appointment to meet with the staff. When they responded that our funding was accepted, receiving the money took several more weeks. This was difficult because our survey flyers promised cash prizes for completing the survey, so we had to wait to post the flyers until we secured funding from TGIF. Nonetheless, we successfully posted the flyers with sufficient time to garner responses and analyze results.

Interview Results

Assistant Dining Directors Interview

Our interview with Charles Wilcots and Calvin Farr provided valuable contextual information regarding the project scope and logistics for a pilot program. The directors stated De Neve would be the most likely location for container washing due to the vehicle access point and the two commercial dishwashers present. They outlined that reusable containers would likely first be implemented solely at Rendezvous, narrowing our scope from all UCLA to-go dining locations. They estimated around 10,000 reusable containers would be required for a Rendezvous pilot. To increase durability, they specified plans to incorporate QR codes into the physical design of the containers and that each student could check out a maximum of five at a time. To test hygiene, UCLA Dining left food in reusable containers for several days and then ran them through the dishwashers. The containers came out clean after washing, mitigating concerns regarding containers returned after a long period of time. Before the interview, we held fears surrounding Equity, Diversity, and inclusion (EDI) due to the assumption that a reusable program would burden dining staff. However, the directors explained that any additional labor would be assigned to additional staff rather than increasing current staff workload. They also emphasized that the current dining staff shortage would have to be addressed first before a reusable program would be considered.

Reuzzi CEO Interview

During our interview with Dr. Schnitzer, Founder and CEO of Reuzzi, we obtained promising initial results regarding the program's effectiveness. Dr. Schnitzer shared that Reuzzi saved Stonehill College $70,000 in its inaugural year and anticipates a 300-400% return on investment overall. Additionally, we learned about the success of Reuzzi at Kerckhoff Coffee House over the past two years, with a high return rate of 99%, demonstrating the program's viability. Furthermore, Dr. Schnitzer emphasized that Reuzzi's model is scalable and adaptable to UCLA's needs despite its previous implementation in smaller locations. Notably, other colleges implementing Reuzzi have reported reduced workload associated with waste management, indicating the program's potential for streamlining operations and promoting sustainability

However, one concern was the durability of the containers, specifically the QR code. The QR code labels are purportedly guaranteed to withstand hundreds of washes and likely thousands. Due to the high volume of washing over its lifecycle, a design incorporating the label into the container could increase the container's lifespan. We also acquired the expected costs of the Reuzzi program. The service fee per container is $0.29 a year, with initial costs of $0.18 per tag for the QR code label and $0.20 to apply the QR code to the container. However, using student volunteers to apply the QR codes would overcome this latter fee. For 10,000 containers, the program would require $1,800 for the initial labels plus a $1,450 discounted service fee in the first year. For each following year, the service fee would be $2,900.

Boston University Dining Directors Interview

We interviewed Boston University's Sustainability Director Lexie Raczka and Dining Director John Webster about how their "Choose to Reuse" program cut packaging waste and costs. Their program operates across 15 takeout and dine-in locations on their campus, using seven different container shapes with strategically placed return bins emptied multiple times daily. During the pandemic, the program required a $4 sign-up fee, ultimately leading to low participation due to upfront costs. The program was later redesigned to collaborate with apps like Grubhub and Topanga to track containers. Students receive daily text reminders to return the containers within three days to avoid an $8 late fee. To incentivize reusable containers, Boston University placed a $2 charge on disposable containers. Interestingly, Boston University found that the return rate dipped by 6% when reusables were the only option at their late-night location, so they found that having both options was the most effective. As Mr. Webster stated, some students will always prefer disposables and refuse to return. Marketing efforts consisted of social media, digital signs, and stickers on disposables leading up to the program implementation, ensuring that students understood the program. In summary, the program has successfully completed around 215,000 orders, reduced disposables by 78%, and achieved a 95% return rate. Despite several concerns, the program encountered no major operational issues and required no additional staff, saving over $100,000 in the first year after costs were deducted. When asked about the best advice for UCLA, John Webster stated, "Make the path of least resistance the most sustainable option." The interview provided evidence of a university comparable to UCLA in size successfully implementing a reusable container program.

Data Analysis Results

Current Disposable Container Usage Rates & Costs

The Rendezvous Item Sales Summary spreadsheet (Appendix A) provides a breakdown of all Rendezvous orders placed in February 2024 by menu option. Grouping orders based on the container type yielded a February monthly total of 52,005 8x8x3 in. containers used for tacos, 5,660 9x6x3 in. containers used for burritos, and 29,022 32 oz. bowls used for Rendezvous East. Given the twenty-nine days in February (leap year) , we derived a daily average of 1,793 8x8x3 in. containers, 195 9x6x3 in. containers, and 1,001 East bowls. These daily usage rates served as a reference point in our later analyses. In summary, UCLA students toss away approximately 3,000 disposable bagasse containers from Rendezvous each day, consisting primarily of burrito bowl clamshells. This figure reveals the immense amount of single-use material produced by disposable to-go ware and the high potential for waste reduction through a reusable program.

The Usage by Location spreadsheet details disposable container purchasing in 2023 for Rendezvous (Appendix B). The total spending at Rendezvous in 2023 for the 8x8x3 containers, 9x6x3 containers, 32 oz bowls, and lids amounted to $268,771. Combining the daily averages from earlier with the unit price for each of the three containers, we found that the cost of single-use container use at Rendezvous equates to $921 a day or $27,614 a month.

Reusable Container Washing Impacts

Since reusable containers will be washed in the commercial dishwasher at De Neve, we estimated the expected change in water and energy consumption. Assuming the daily orders for Rendezvous wouldn't change significantly under a reusable program, the dishwasher would clean 3,000 containers daily. The dishwasher model at De Neve, Stero STPCW-ER, consumes 58 gallons of water and 56.25 kilowatts per hour (Appendix D). During our team's visit to De Neve, we clocked the time for a dish

to travel through the dishwasher at 3 minutes. Approximately 300 medium-sized plates were washed during this interval, five per row on the belt. However, given the larger size of the expected reusable clamshells and the necessity of washing them in their open configuration to clean the interior, we took a washing rate of 30 reusable containers per minute. At this rate, the dishwasher would wash all 3,000 containers in about 1 hour and 40 minutes. This increase in dishwasher operating time equates to an additional 97 gallons of water and 94 kilowatt-hours per day under a reusable program. For an entire academic year (three quarters), the additional water and energy consumption would be 23,000 gallons and 22,310 kilowatt-hours, respectively.

Although UCLA's energy consumption would increase under a reusable container program, a large percentage of the energy use would be offset by the avoided energy consumption from disposable container production. The processing and molding of sugarcane bagasse into clamshells require substantial energy inputs as well. Consequently, the environmental burdens associated with reusable containers are not as high as they might appear at face value. Based on the facility utility datasheet provided by our stakeholder, UCLA pays $0.14 per kilowatt-hour of electricity and $0.014 per gallon of water (Appendix C). Subsequently, the annual costs for additional utility use under a reusable program for one academic year would be $320 for water and $3,123 for electricity.

Reusable Container Replacement Costs

As students will inevitably break or lose containers, we estimated expected replacement costs based on the return rate for Boston University's program. Assuming a similar return rate of 95% for UCLA, roughly 500 out of the total 10,000 reusable container inventory would need to be replaced per year. According to the cost of Preserve2Go containers, total replacement costs would amount to $1,250 a year (Appendix G). Although this estimate cannot be fully guaranteed, the return rate across various Reuzzi college programs generally fall in a similar range.

Bagasse Container Lifecycle Energy Consumption

According to a life cycle assessment performed by researchers at UC Berkeley, the production phase of 1 kg of bagasse clamshells consumed 9.859 megajoules of

energy (Chiu, 2020). The total weight of the Rendezvous bagasse to-go containers disposed per academic year was approximately 27,500 kilograms. Subsequently, the disposable containers consumed on an annual basis at UCLA represent 271,100 megajoules or 75,300 kilowatt-hours of embodied energy use. A reusable container program would eliminate this energy consumption through avoided bagasse container use, demonstrating a substantial indirect environmental benefit of a reusable system

Expected Waste Hauler Savings

To identify the amount of waste that each disposable container would take up, the total volume of each bin filled with containers was divided by the number of containers present in it. This yielded the number of cubic inches that each disposable container took up. Our calculations found that a 32 oz Rende East bowl occupied 289 cubic inches, a 8x8x3 Container occupied 98.3 cubic inches, and a 9x6x3 Container occupied 117 cubic inches when in the trash. We multiplied these values by the daily usage of each container calculated above for Rendezvous. Our analysis revealed that disposable containers from Rendezvous are responsible for filling 3.24 three-cubic-yard bins per day, or 97.2 per month. As Athens charges UCLA a service fee of $16.44 for each three-cubic-yard bin pickup (Appendix F), we calculated the savings associated with the bin reduction to be approximately $1,600 a month (Appendix J).

Expected Solid Waste Reduction

With reusable containers in the UCLA takeout locations, there will be a significant reduction in total solid waste due to the reduction in disposable containers. By analyzing the daily usage rates, size, and weights of each type of takeout container, we calculated the expected solid waste reduction per academic year if the Reuzzi program is implemented. The most commonly used container is the 8x8x3 container, which weighs 41.2 grams. The 9x6x3 container and 32 oz bowl weigh 33.3 grams and 35.7 grams, respectively. Replacing the 8x8x3 container with a reusable container would reduce the net waste by 17.5 metric tons per academic year. Replacing the 9x6x3 container would reduce 1.5 metric tons per year. Finally, replacing the 32 oz bowls would reduce 8.5 metric tons annually. See Appendix E for detailed calculations. In summary, a reusable container program at Rendezvous can be expected to reduce to-go container waste by 27.5 metric tons or 60,630 pounds.

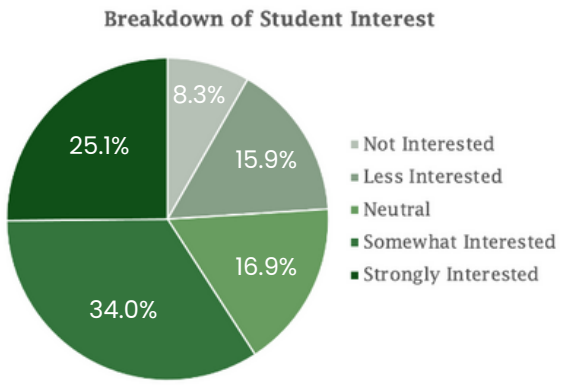
Staffing Costs

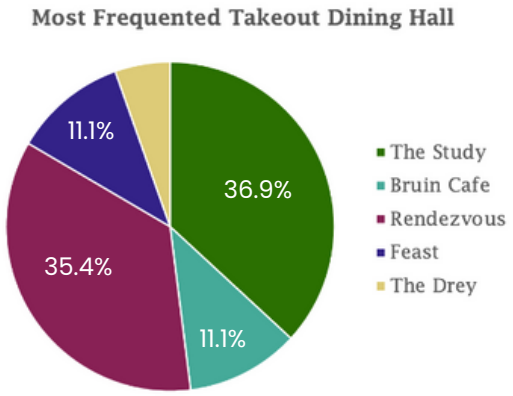
The implementation of a reusable container program may require additional staffing as a result of the proposed container return system as well as washing the extra containers. By analyzing four different container pickup and washing scenarios, we could conclude that the minimum staffing costs for implementing reusable containers may be $34,272, with an upper bounds of $94,248 per academic year. Scenarios 1 and 3 analyze costs with 2 container collection bins, located at Rendezvous and De Neve Dining Hall, with Scenario 1 excluding the staffing cost for washing and Scenario 3 including this cost. Scenarios 2 and 4 estimate costs if UCLA implements six container collection bins, with Scenario 2 excluding washing costs and Scenario 4 including washing. It was difficult to estimate with great certainty whether or not the proposed container program would necessitate extra full-time staff. Likely, the reusable container program would require additional part-time hours, potentially from student dining staff. No matter the scenario that UCLA Dining may choose to implement, a reusable container program at Rendezvous would still yield savings— even considering the upper bound estimate of around $100,000 for staffing costs. (Appendix H).

Survey Results

Reusable Container Replacement Costs

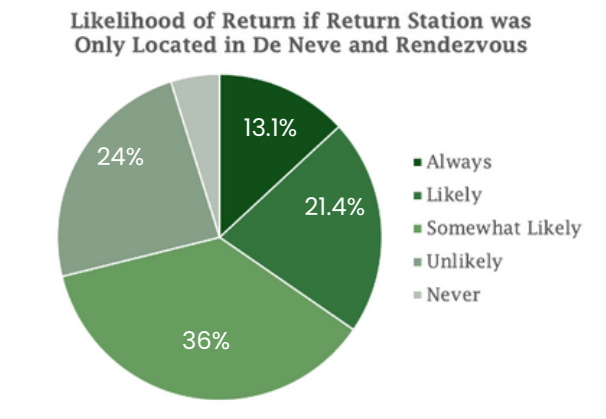
Our survey, which garnered 350 responses, yielded significant insights into student behaviors, pivotal for informing the viability of a reusable container pilot program. Among these respondents, a notable 58% expressed interest (Strong or Slight) in participating in such a program. This robust level of interest underscores a strong potential for student engagement and the adoption of sustainable practices. Delving deeper into dining habits, we discovered that students relied substantially on takeout options, with the highest reported frequency of weekly takeout visits reaching 10 at Rendezvous. Notably, The Study emerged as the most frequented dining hall, closely followed by Rendezvous. These findings reveal implications for the feasibility and success of a reusable container initiative. Frequent takeout orders signify a consistent demand for convenient dining options among students. Coupled with the demonstrated interest in sustainability, a fertile ground exists for implementing a pilot program. Such a program could cater to students' preferences for on-the-go dining and promote environmentally conscious behaviors.

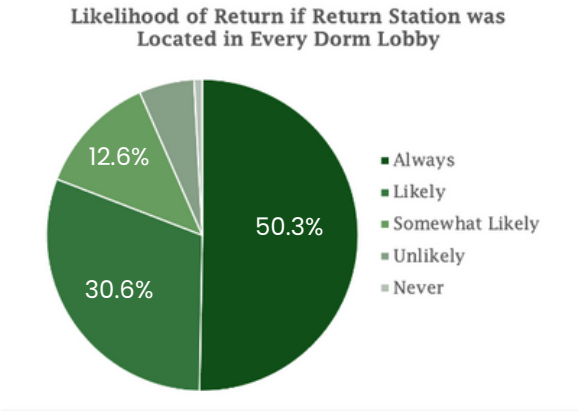




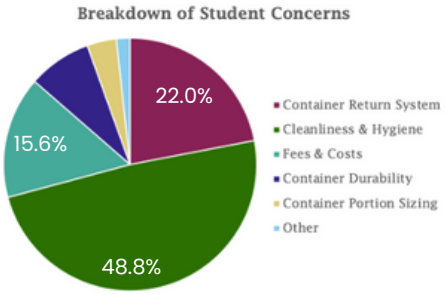
Our survey revealed a noteworthy 40% increase in students responding “always” to the likelihood of return when return stations were positioned within dormitories, compared to exclusively within dining halls. Initially, a mere 13% of respondents expressed commitment to always return containers when collection bins were only located at Rendezvous and De Neve. However, this figure substantially escalated to 50% when the prospect of return stations in residential buildings was introduced.

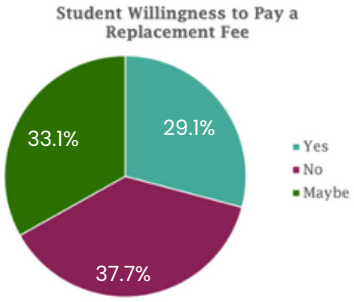
Moreover, a striking 80% of respondents disclosed disposing of their to-go meals in their dormitories. These findings carry profound implications for the future trajectory of the pilot program. The substantial increase in container return willingness when stations are located in dormitories suggests that proximity and convenience strongly influence student behaviors. The program could capitalize on students' existing routines and environments by strategically siting return stations within residential buildings, fostering seamless integration of sustainable practices into daily life.

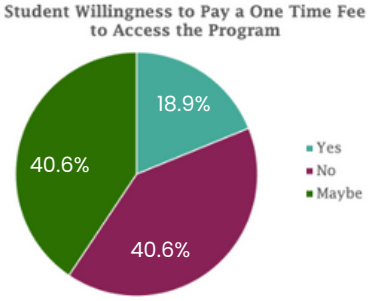




Lastly, our survey provided valuable insights into student concerns regarding the logistical aspects of the proposed program. Notably, 40.6% of respondents expressed aversion to paying a nominal one-time fee for program access, while 40.6% expressed uncertainty. Only 18.8% stated their willingness to pay an access fee. Similarly, when considering replacement fees for lost or damaged containers, 37.7% of respondents were opposed, 29.2% in favor, and 33.1% uncertain. These findings underscore the importance of addressing financial considerations and potential opposition in the program's implementation strategy. The hesitancy towards fees highlights the need for transparent communication regarding the program's cost structure and its perceived value proposition for students. The survey also revealed a clear hierarchy of student concerns regarding the proposed program. Foremost, cleanliness and hygiene were paramount, highlighting the need for stringent sanitation protocols and marketing to obtain student trust. Following closely, return location emerged as a critical topic for convenience and accessibility, while concerns about fees and costs ranked third. Addressing these priorities with targeted strategies and transparent communication will be essential for program success and widespread participation.







Student Survey Comment Analysis

The survey also provided a section where students could provide written feedback and comments regarding a reusable container program. Their responses fell in four categories: hygiene, cost, convenience, and enthusiasm. In total, there were 12 comments regarding hygiene, 16 about cost, 14 about convenience, and 12 about enthusiasm. We highlighted a few quotes in this section, but more quotes can be found on the document linked in Appendix I.

Many students were vocal about cost, stating they would not want additional fees tied to the program. One student said, "I probably wouldn't pay to participate in using reusable containers, but I would 100% do it if it were free and the containers were clean." Another student stated, "I'm just a bit concerned with the whole fee to participate and fee not to participate. It feels like additional costs left and right, and as a low-income student, dorm living and meal plans are already overpriced." Students overall expressed that the most equitable and inclusive model for a reusable system would be free of costs.

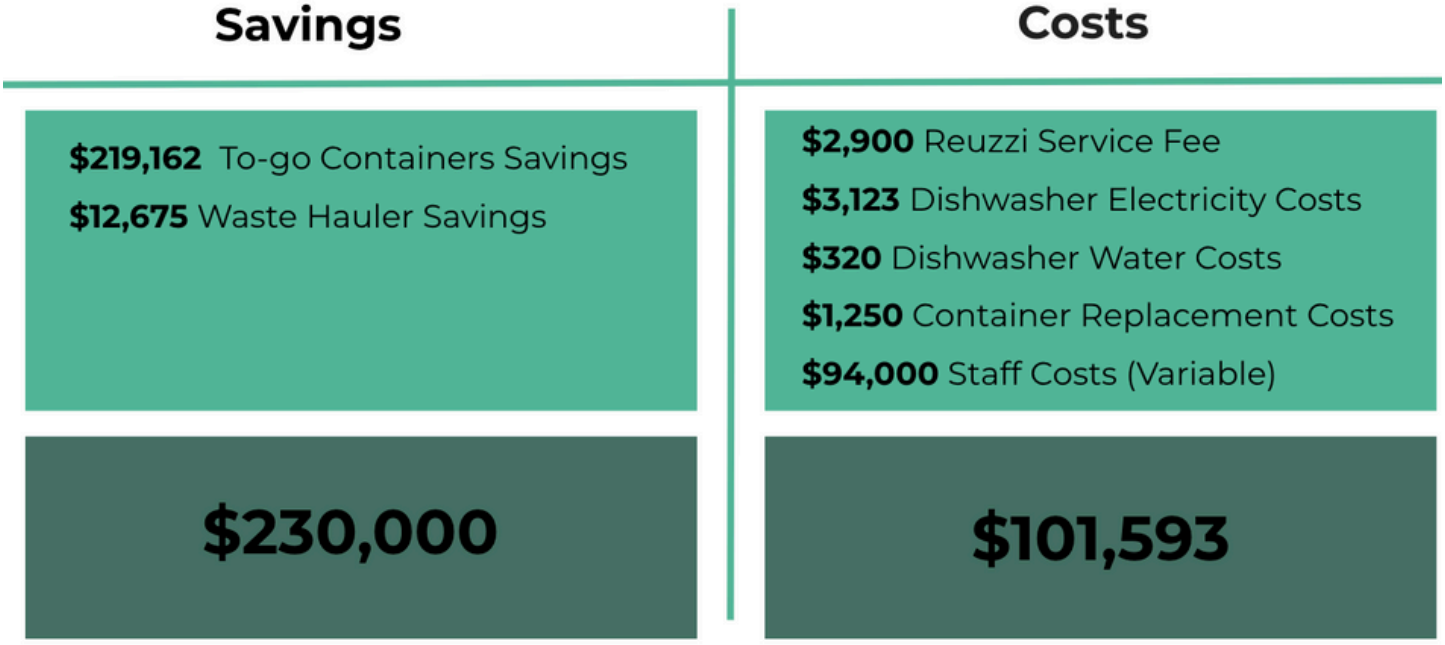
Additionally, students expressed concern that the reusable containers would hinder the ease of takeout. One student explained, "I believe the main reason students use takeout dining halls is because it is quick and convenient. Reusable containers defeat the purpose of the takeout dining halls." Another student brought attention to students with physical disabilities who may have difficulty handling and returning reusable containers.

Furthermore, students voiced worries about the hygiene of the reusable containers, such as cross-contamination for students with allergies and overall cleanliness.

One student said, "Coming from someone who takes cleanliness and hygiene very seriously, if we were to start using reusable containers, I would be less likely to order takeout or use the dining halls at all." Another student echoed this sentiment but also proposed a potential workaround: "I think this is a cool idea, but I do worry about the hygiene of it all. Maybe posting a how-it-would-work video would make more people incentivized to start." These responses highlight the apprehension toward container cleanliness and potential ways to mitigate them.

While many students were uncertain about a reusable program, many were excited about the potential environmental benefits and supported the implementation. One student exclaimed, "I think this is a great idea. Sustainability is so important given the state of the world right now, and I think this could not only be a great way to cut down on waste but also inspire other schools to do the same." The number of comments expressing vocal support for a reusable program suggests a good portion of the student body would readily adapt to reusables.

Cost-Benefit Analysis



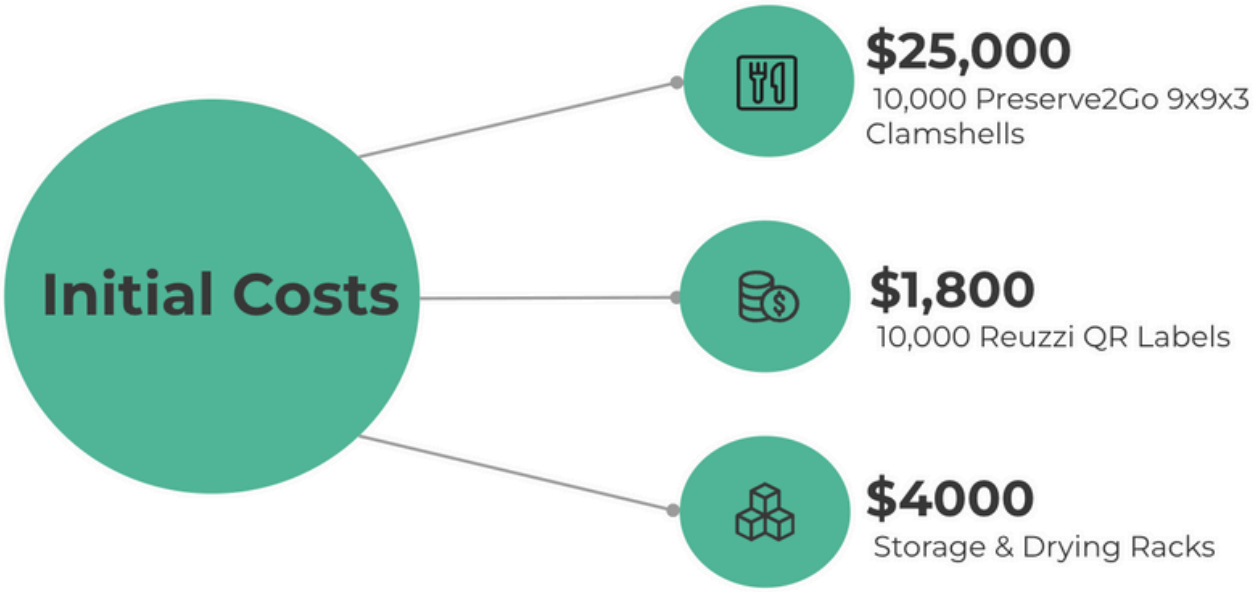
Calculations for 1 Academic Year (3 Quarters)

Operational Cost-Benefit Analysis

The reported financial metrics above depict a Rendezvous pilot program's operational costs and savings per academic year. We defined an academic year as three quarters or 34 weeks. We found net savings of around $130,000 per academic year for a reusable program at Rendezvous. The bulk of the savings arose from reduced disposable clamshell purchases, approximately $219,162 per academic year. The reduction in bin pickups due to fewer disposable clamshells would save UCLA around $12,675 annually as well. Costs included $2,900 for the Reuzzi service fee, $3,120 for the additional dishwasher energy use, $320 for the additional dishwasher water use, $1,250 in replacement costs for broken/lost containers, and roughly $94,000 in staffing. Due to the uncertainty with the number of return stations, staffing costs were highly variable and difficult to estimate. This figure represented our high-end for additional staffing costs based on the scenario with multiple return stations around The Hill. A program with return stations only at De Neve and Rendezvous would entail fewer total staff and hours worked, resulting in significantly

lower staffing costs. Although we attempted to calculate all expected costs and savings, some elements remained missing. For instance, there were no calculations on the cost of electricity to operate the transport vehicles for container collection. In addition, unforeseen costs or savings may not have been accounted for in our cost-benefit analysis.

Initial Cost Analysis



The graphic above illustrates the upfront costs for a Rendezvous reusable container program. The cost of purchasing 10,000 Preserve2Go 9x9x3 Clamshells with the bulk discount was $25,000 (Appendix G). The initial cost of the Reuzzi QR code labels for the containers was $1,800, assuming student volunteers help with the labels' application. A rough estimate of $4000 was found for purchasing four drying racks and four storage racks from a certain supplier, though this cost could be drastically different depending on the supplier UCLA chooses. Overall, we calculated initial costs of approximately $30,800. Other initial costs may exist that are not represented in our cost-benefit analysis, such as the cost of specialized collection bins.

Ecological Cost-Benefit Analysis

Benefits	Costs
27.5 Metric Tons Bagasse Container Waste Reduction	**23,000** Gallons Dishwasher Water Use
75,300 kwH Avoided Bagasse Container Lifecycle Energy Use	**22,310** kwH Dishwasher Energy Use

Calculations for 1 Academic Year (3 Quarters)

The chart above shows the expected environmental costs and benefits of a Rendezvous pilot program. However, this ecological cost-benefit analysis was not all-inclusive. Missing factors included energy use during reusable container manufacturing and transport vehicle energy consumption. Unforeseen environmental costs and benefits may also occur during the implementation of a reusable program. Although the dishwashers would consume an additional 22,310 kilowatt hours to wash the reusable containers per year, energy savings amount to roughly 75,300 kilowatt hours due to the reduction in disposable to-go containers, which consumed energy during production, transport, and end-of-life. Subsequently, we expect a reusable container program to save around 53,000 kilowatt hours of electricity. Water consumption would increase due to the additional dishwasher operating hours, but the energy and waste reduction resulting from a reusable container program offer compelling environmental benefits.

Recommendations

Overview

The implementation of a reusable container pilot program would entail preparation, advertisement, and adjustment. There are several initial purchases and decisions that UCLA Dining must make, such as choosing the type of container and types of storage and drying racks. Management also has to effectively advertise their new reusable container program through signage and announcements in order to assimilate returning students into this new system and simultaneously introduce incoming students. Lastly, there will always be unforeseen challenges when a new system is introduced, and while this section seeks to address any anticipated complications, UCLA is a school with both a unique student population and dining hall system. As such, additional adjustments during the program's implementation is inevitable.

Reusable Containers

UCLA is currently considering two container brands. The Preserve2Go containers are 9x9x3 inch containers with three compartments, which mimic the primary disposable containers distributed at Rendezvous. The second container from G.E.T has dimensions of 9x6x2 inches but only has one compartment. Due to the similar shape of the Preserve2Go container to the Rendezvous clamshells and lower cost, this cost analysis will focus on the former. All of Preserve's containers are made with 50% recycled plastic and are designed to last over 1000 uses. As an added bonus, when these containers do inevitably wear out, UCLA will be able to dispose of them sustainably by either returning them to the company itself or sending them to a recycling center. Preserve offers customization for all of its containers, providing custom branding and labeling that specify the containers as reusable. This labelling proves necessary to indicate to students that these containers must be returned, contributing to a higher return rate for UCLA Dining. Once UCLA selects a specific container, UCLA Dining may partner with Reuzzi to track each container in circulation. Within the Reuzzi app, UCLA Dining management could limit how many containers a

student could check out at a time. This company will provide unique QR codes for every container that will identify when a container was checked out and who checked it out. While it is checked out, the student will be sent reminders to return the container by the Reuzzi app itself, with no extra effort from staff needed. Once a reusable container is returned and arrives at De Neve's dishwashers, staff will check the container back in using its QR code before washing. After washing and drying, the container will be returned to Rendezvous and the process restarted.

Washing, Drying, and Storage

As stated by the dining directors, UCLA expects to wash all reusable containers inside De Neve's dining hall. One of the main concerns management expressed was about where and how these containers would dry. Rendezvous gets around 3,000 orders daily, meaning each meal period (lunch and dinner) gets around 1,500 orders daily. We found that additional drying racks would be necessary as the currently used racks could not accommodate the unique size of the containers. One potential drying rack we identified ideal for the 9x9x3 Preserve2Go containers was the "Cambro Dome Drying Rack." These racks contain five shelves with ten slots per shelf, and each slot could comfortably fit two containers, meaning each rack could dry roughly 100 containers at a time. Due to limited space in the De Neve dishroom, it is unlikely more than four drying racks could be inserted.

Figure: Available spaces in De Neve

Subsequently, we recommend staggering the collection and container washing throughout the day to avoid washing the containers all at once. With four of these, 400 containers could dry simultaneously and with each cart costing $779.00 each, UCLA Dining would have to spend $3,116.00 total. The containers can be rotated out every hour, with the dry

clamshells moved to the storage carts for transfer to Rendezvous. For the storage and transport carts, our team recommends a collapsible cart to such as the "Wire Dump Bin - 200 lb Capacity" sold by ULINE. This cart's dimensions are 36" x 36" x 34", meaning they could fit roughly eight columns of 9" x 9" x 2.5" reusable containers if they are stacked on top of each other in their open configuration. Based on the height and the approximate vertical space a container would occupy when neatly stacked and fitted within other containers, about 64 containers could be stacked in each column.

Figure: Stacked P2GO containers

With eight columns, 504 containers could be stored in each cart. With four storage carts, 2,016 reusable containers could be stored and transferred to their next location at any given time. Once the containers arrive at Rendezvous, they can be removed and placed on shelves where disposable containers are currently stored. Each storage cart costs $235, so the total cost would be $940 for storage. Any extra clean containers could be stored in places in Rendezvous that were previously used to store disposable containers.

Return Locations

In the case of return stations, we envisioned two possible scenarios. In the first scenario, collection bins would be stationed only at Rendezvous and De Neve to reduce labor requirements, so container collection and drop-off would occur only between these two locations. In the second scenario, return stations would be located in five central locations: Hedrick Hall, Rieber Hall, Olympic Hall, Sproul Hall, and De Neve's lobby as indicated in the figure down below.

This placement ensures students will have an accessible and convenient location to return their containers while also minimizing staffing and logistical complexity. The company GET offers the "EcoDrop Bin" with clear signage designating it as return bin for reusable containers, preventing students from confusing the drop-off bins with trash cans.

UCLA Dining would also probably benefit from making their own custom signs to display on these collection bins that indicate what the bin is for and any additional instructions for students, such as emptying their containers of any leftover food before returning.

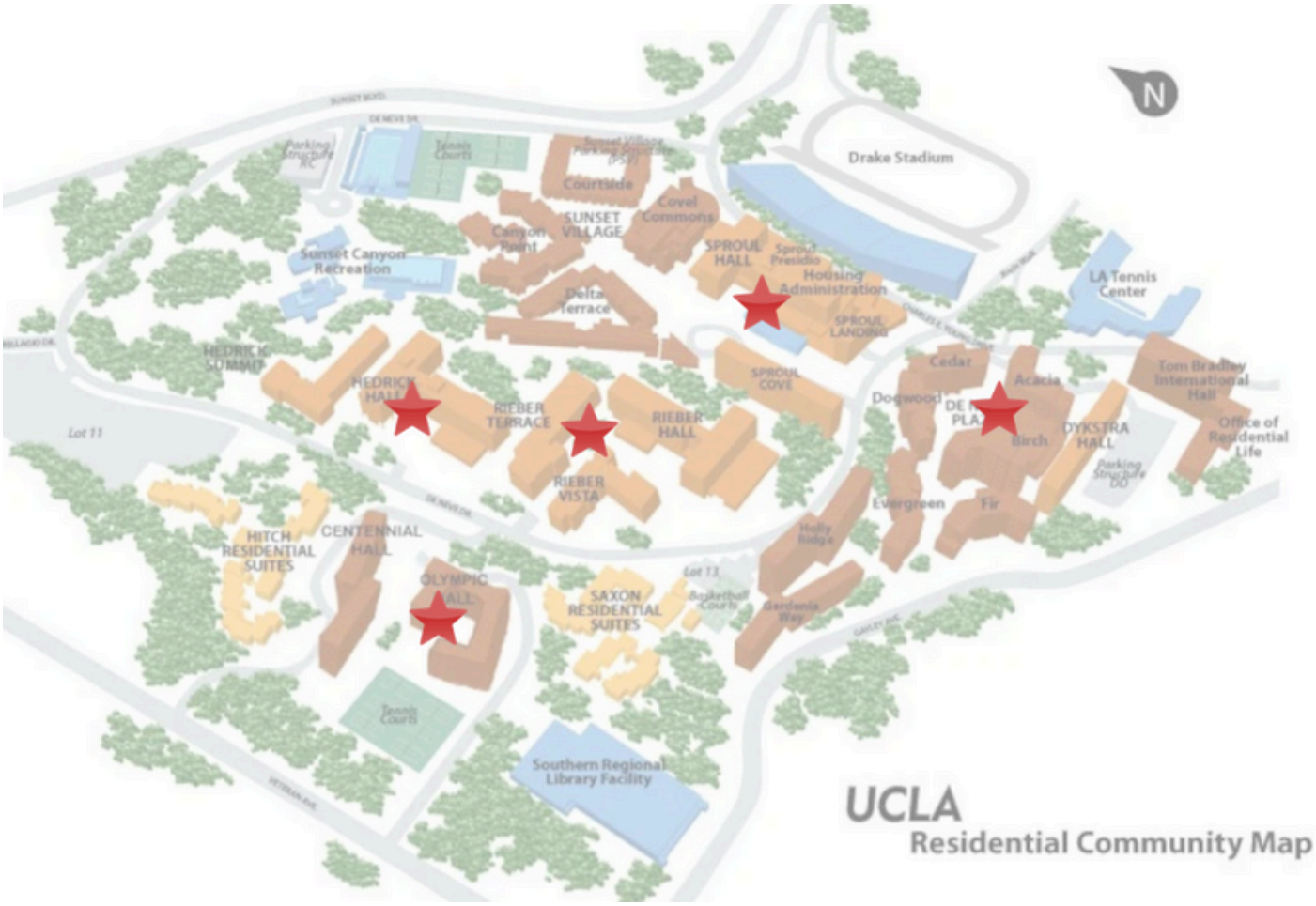


Figure: Map of Possible Container Return Stations

Marketing

To increase the likelihood of success, UCLA Dining must promote the program as much as possible beforehand. Taking inspiration from Boston University's reusable container program rollout, UCLA Dining should send multiple emails to students detailing the changes that would occur with Rendezvous's order system before the plan is enacted. This should include a step-by-step guide detailing the return system and highlights the program's simplicity. Signs throughout Rendezvous marketing the reusable container program's environmental benefits and outlining the system in a catchy slogan such as "Relish, Return, Reuse" would incentivize students to view this change positively.

As the pilot program progresses, advertisements highlighting the decreased waste generated could be displayed periodically throughout Rendezvous and reusable container return stations to motivate students to participate.

Survey Recommendations

From the student comment section, we learned that based on the high volume of comments centered around hygiene, UCLA would need to ensure proper washing protocols are in place to prevent leftover food contamination. We also considered that the 16% of students who expressed no interest in the program might refuse to participate in the reusable program due to distrust. Consequently, UCLA may want to consider providing disposables as an option for those who are strongly against reusables. Furthermore, based on the number of comments indicating an aversion to cost and the importance of inclusivity, we recommend that UCLA Dining not charge any fees for the program to prevent adding economic burdens on students. This approach would also make reusables the path of least resistance.Overall, the survey gave valuable insight into the voice of the student body and taking their feedback into account would ensure that the program is as inclusive and beneficial as possible.

Implementation

Before the program initiates, we recommend extra training for current staff members regarding checking out, collecting, and washing these reusable containers. Although the schools we interviewed stated they did not hire any extra staff for their reusable programs, as time previously spent unboxing disposable containers and emptying trash was sufficiently allocated to collecting and cleaning reusable containers, additional employees may be required for UCLA. Over time, the UCLA Dining management should track return rates. Although management and students expressed that they did not want additional fees attached to a reusable container program, a charge for broken or unreturned containers might have to be implemented if return rates are low. Alternatively, students could be prevented from ordering from Rendezvous until they return a container if they have exceeded the permitted maximum checkouts. Logistical changes will occur as UCLA Dining sees what works and what doesn't for its reusable container program. Still, with proper preparation and a willingness to adapt, a reusable container program has the potential to be very successful.

Discussion

Deliverables

As specific deliverables, our team created an abbreviated version of this report with clear financial and environmental costs that will be given to UCLA Housing and Dining administration for their review. This abbreviated report will allow dining to make informed decisions in implementing this program and provide clarity in future conversations surrounding a reusable program. While the entire report contains more background, methodological, and reasoning information, the abbreviated report will serve as a clear costs/benefits analysis that is easily digestible and contains only the most important information for dining administration.

This report itself is also a deliverable. It will help the dining administration and future SAR teams working to continue this project. Future teams could use the report to inform their research and use information in the report to help dining build the infrastructure for implementing a reusable pilot program, as we advise on the most efficient methods of where to place the return systems and how to best fit containers in the washing areas. The report can also aid researchers from other universities or institutions looking into implementing a reusable program, as it outlines various research and analysis methods.

UCLA Sustainability Significance

Our team's interviews and research of other university reusable programs provided a comprehensive background for the project. Specifically, learning of Boston University's success demonstrated UCLA's capacity to implement a similar program. Many universities across the United States have implemented widely successful reusable container programs that have yielded substantial environmental and financial savings. Schools with reusable initiatives like the University of Southern California, Boston University, University of Pennsylvania, Dartmouth, and Vanderbilt, demonstrate the room for UCLA to step up as a beacon of sustainability and avoid falling behind other universities.

The Paris 2024 Olympics also took a progressive step in advancing sustainability by banning all single-use foodware in the Olympic Village, opting for reusables. In 2028, the spotlight will be on UCLA as the university hosts the Olympic Village, and expectations to meet or exceed the bar for sustainability set by Paris will be monumental. With athletes living on The Hill and eating from to-go locations across the globe, UCLA should carry the torch by similarly eliminating single-use food ware through a reusable container program. As the Olympics are only four years away, UCLA Dining should strongly consider the implementation of a reusable container program.

While the research on other programs provides valuable context and ideas, the student survey, waste audit, data analysis, and dining hall tour provide insight into the implications of reusables at UCLA. Notably, we found the possibility of enormous savings for UCLA dining at $130,000 per academic year, as colossal spending on disposable containers is significantly greater long term than a relatively one-time purchase for reusable containers, which would provide UCLA with additional funding to improve its dining infrastructure. Additionally, eliminating disposable containers would significantly improve UCLA's environmental footprint, stopping the waste of hundreds of thousands of disposable containers. While there are projected increases in internal energy and water consumption, the beneficial impact of to-go container waste reduction outweighs these costs. Additionally, we recommend taking the water usage numbers with caution due to the uncertainty surrounding the actual washing rate of the containers and other variable factors. A reusable container program would move UCLA towards a more sustainable campus.

Future Research

Our report provides a comprehensive review of the expected financial and environmental impacts of a reusable container program, specifically for Rendezvous. Future efforts are needed to finalize concrete plans for this rollout. If the dining administration interprets the results of this report as positive, they may choose to implement a pilot reusable container program. The pilot program would likely occur at Rendezvous before the entire hill could adopt a reusable program. Promotional and educational material should be disseminated to students prior to a pilot program to ensure a smooth transition. Future SAR teams could potentially help create this material. Additionally, it would be helpful for future SAR teams to track and manage the reusable container program, looking into the

pilot's container return rates, student opinions, and reactions, staff impact, the effectiveness of drop-off locations, logistics, dishwashing management, and costs to determine the efficacy of the pilot program. Our report's data analysis focused primarily on Rendezvous, so similar research into more take-out locations would help expand the program. As a pilot program is reviewed, SAR teams could expand the program beyond Rendezvous to all the to-go dining locations on the hill at UCLA and Epicuria at Ackerman.

Given UCLA's large student body and dining hall usage, the school has the opportunity to make massive strides toward sustainable practices and waste reduction. Our project has outlined feasible next steps in reusable container implementation, demonstrating both a need and support for the project. Implementations would generate savings for UCLA and the environment and establish the school as a leader in sustainable practices.

Appendix

Appendix A: Rendezvous Item Sales Summary February 2024

Item Sales Summary

Date Range: 2/1/2024 to 2/29/2024

Category - Rendezvous

RZ Beverage	Quantity
Low-Fat Milk	6
Soy Milk	7
Coffee or Tea	15
Fountain Beverage	1,391
Orange Juice	11
Apple Juice	7
Chocolate Milk	11
No Beverage	19
RZ Boba	Quantity
Milk Tea Boba	738
Horchata Boba	241
Taro Milk Tea Boba	10
Green Milk Tea Boba	402
Thai Tea Boba	779
Vietnamese Coffee Boba	472
Assorted Aqua Frescas	401
RZ Burrito	Quantity
Chicken Burrito	340
Steak Burrito	402

Total February 9x9x3 Containers
52,005

Total Amount of 9x6x3 Containers (All Tacos)
5,660

Total February Rende East 32 oz Bowls
29,022

Average Per Day # of 8x8x3 Containers
1793

Average Per Day # of 9x6x3 Containers
195

Average Per Day # of East Bowls
1001

Daily Food + Boba Average
3094

Average Daily Food
2989

Appendix B: Dining Hall Purchasing Data 2023

Rendezvous

rice (IFS) 2023

DESCRIPTION	PACK	TOTAL	T UNIT PI	$TOTAL	1 Container ($)	Total Containers Costs
CONT BAGASSE PF 8X8X3 HNGD 1-CO	2/100	2738	$ 56.67	$ 148,105.70	$0.28	$ 268,771
CUTLERY FORK WOODEN WRAPPED	1/1000	467	$ 84.51	$ 39,466.17		
CONT BAGASSE PF 9X6X3 2-COMP HNGD WHT	2/125	436	$ 45.98	$ 18,638.78	$0.30	
NAPKIN DISPENSER 13X12 KRAFT 1-PLY O-FD	24/250	347	$ 43.24	$ 14,851.60		
BOWL BAGASSE FIBER 32OZ	500/CASE	237	$ 129.36	$ 29,141.52	$0.26	
CONT RND 32 OZ BLK W/LID	150/CASE	233	$ 49.36	$ 11,301.59		
BOWL PULP 32 OZ RND PFAS FREE	300/CASE	227	$ 89.81	$ 20,386.92		
LIDS FIBER FOR 24-32OZ BOWL	4/125	206	$ 49.80	$ 19,795.93	$0.10	
LID PLAST 24-48 OZ FLAT RND PET	300/CASE	141	$ 116.04	$ 16,364.02		
LID PULP 24-48 OZ FLAT RND PFAS FREE	300/CASE	71	$ 70.95	$ 5,037.45		

Appendix C: Dining Hall Water Bill October 2023

IDENTIFIER	JOB	METER	PERCENT	UTILCAT	MONTH	YEAR	BILUNITS	BILLDATE	RUNDATE	TOTBILL	Utility
2114	T5879	2114		4	10	23	147.87	Oct-23	11/1/2023	$1,539.13	WAT
2458	T5879	2458		4	10	23	104.06	Oct-23	11/1/2023	$1,083.13	WAT
T5880_2471	T5880	T5880_2471		2	10	23	26,414.50	Oct-23	11/1/2023	$3,671.62	ELE
T5880_2472	T5880	T5880_2472		2	10	23	155,902.40	Oct-23	11/1/2023	$21,670.43	ELE
T5881_G5-1598 0373	T5881	T5881_G5-1 5980373		3	10	23	5,037.55	Oct-23	11/1/2023	$4,414.69	GAS
T5955_2278	T5955	T5955_2278		2	10	23	27,936.75	Oct-23	11/1/2023	$3,883.21	ELE
T5955_2643	T5955	T5955_2643		2	10	23	18,906.25	Oct-23	11/1/2023	$2,627.97	ELE
T5956_2323	T5956	T5956_2323		4	10	23	196.14	Oct-23	11/1/2023	$2,041.59	WAT
T5956_2324	T5956	T5956_2324		4	10	23	100.19	Oct-23	11/1/2023	$1,042.84	WAT
							Water = HCF			(Dollars)	
							Electric = kwh				
Average Water Cost (1 HCF)	10.40866	0.013914403	$0.014 per gallon water					HCF = Hundred Cubic Feet = 748.05194805 gallons			
Average Electricity Cost (1 kwh)	0.139000	$0.14 per kwh			Dishwasher Electricity Cost (56.25 KW)	7.81875					
					Dishwasher Water Cost (58 gal)	0.8062					

Appendix D: De Neve Dishwasher Specifications

Model	Dishes per Hour	Conveyor Speed (FPM)	Maximum Water Consumption (GPH)	Pump Capacity (GPM)		
				Scrapper	Wash	Rinse
STPCW-ER 3 TANK*	13,689	2 to 9	58	225	330	330
STPCW-ER 4 TANK	20,832	2 to 14	102	225	330	330

*ENERGY STAR® Qualification on STPCW-ER electric heat, 3-tank only.

STERO STPCW-ER 3 TANK					
ELECTRIC HEAT WITH BOOSTER			ELECTRIC HEAT WITHOUT BOOSTER		
DM	2" NPT (F)	DRAIN, MACHINE WASTE: CONNECT TO EITHER END, LEAVE UNUSED PORTS PLUGGED	DM	2" NPT (F)	DRAIN, MACHINE WASTE: CONNECT TO EITHER END, LEAVE UNUSED PORTS PLUGGED
EM	ELEC. REQ. THREE FEEDERS REQUIRED	THREE (3) FEEDERS SIZED FOR: FEEDER NO. 1 1. SCRAPPER PUMP MOTOR – 2 HP 2. WASH PUMP MOTOR – 3 HP 3. RINSE PUMP MOTOR – 3 HP 4. 1/2 HP CONVEYOR MOTOR & CONT. CIRC. FEEDER NO. 2 1. WASH TANK HEAT – 25 KW FEEDER NO. 3 1. RINSE TANK HEAT – 25 KW	EM	ELEC. REQ. THREE FEEDERS REQUIRED	THREE (3) FEEDERS SIZED FOR: FEEDER NO. 1 1. SCRAPPER PUMP MOTOR – 2 HP 2. WASH PUMP MOTOR – 3 HP 3. RINSE PUMP MOTOR – 3 HP 4. 1/2 HP CONVEYOR MOTOR & CONT. CIRC. FEEDER NO. 2 1. WASH TANK HEAT – 25 KW FEEDER NO. 3 1. RINSE TANK HEAT – 25 KW
EB	ELEC. REQ	ONE FEEDER SIZED FOR: 1. BOOSTER HEATER _____ KW	WM	3/4" NPT (F)	WATER SUPPLY: 140°F. MIN. AT 20 PSI FLOW PRESSURE TANK FILL
WM	1" NPT (F)	WATER SUPPLY: 140°F. MIN. AT 20 PSI FLOW PRESSURE CONSUMPTION = 58 GAL./HR.	WH	3/4" NPT (F)	WATER SUPPLY: 180°F. MIN. AT 20 PSI FLOW PRESSURE CONSUMPTION = 58 GAL./HR.
WC	3/4" NPT (F)	WATER SUPPLY: COLD AS AVAILABLE	WC	3/4" NPT (F)	WATER SUPPLY: COLD AS AVAILABLE
VL	4 x 31-1/4 VENT I.D.	VENT, LOAD END: RECOM. MIN. DRAW = 300 CFM	VL	4 x 31-1/4 VENT I.D.	VENT, LOAD END: RECOM. MIN. DRAW = 300 CFM
VU	4 x 31-1/4 VENT I.D.	VENT, UNLOAD END: RECOM. MIN. DRAW = 700 CFM	VU	4 x 31-1/4 VENT I.D.	VENT, UNLOAD END: RECOM. MIN. DRAW = 700 CFM
HR	16-1/4 VENT I.D.	VENT, UNLOAD END: RECOM. MIN. DRAW = 700 CFM WHEN SPECIFIED-OPTIONAL-REPLACES VU	HR	16-1/4 VENT I.D.	VENT, UNLOAD END: RECOM. MIN. DRAW = 700 CFM WHEN SPECIFIED-OPTIONAL-REPLACES VU

Appendix E: Solid Waste Reduction Calculations

8x8x3 container:

- Weight: 41.2g
- Daily Usage Rate: 1793
- Waste reduced per day: 41.2g * 1793 = 73871.6g = 73.872kg
- Waste reduced per month: 73.872 * 30 = 2216.2kg
- Waste reduced per academic year (34 weeks): 73.872*7*34 = 17.5 metric tons

9x6x3 container:

- Weight: 33.3g
- Daily Usage Rate: 195
- Waste reduced per day: 33.3g * 195 = 6493.5g = 6.49kg
- Waste reduced per month: 6.4935 * 30 = 194.805kg
- Waste reduced per academic year (34 weeks) = 6.59*7*34 = 1.5 metric tons

Rende East 32 oz-Bowls

- Weight: 35.7g
- Daily Usage Rate: 1001
- Waste reduced per day: 35.7g * 1001 = 35735.7g = 35.75kg
- Waste reduced per month: 35.75 * 30 = 1072.5kg
- Waste reduced per academic year (34 weeks): 35.75*7 *34 = 8508.5kg = 8.5 metric tons

TOTAL SOLID WASTE REDUCTION: 27.5 metric tons

Appendix F: UCLA Housing Waste Hauler Invoice March 2024

ATHENS SERVICES
ON CAMPUS HOUSING RUBBISH BIN DETAIL REPORT
For the month beginning March 1, 2024

Item Number	Location Name	Group Name	Last Change Date	Bin Qty	Bin Size	Pick-ups / Week	Cost / Lift	Annual Cost	Monthly Cost
1	UCLA BRADLEY HALL HH & DS	UCLA ON CAMPUS HOUSING M	09/13/21	1	3YD	6	16.44	5,129.28	427.44
2	UCLA DENEVE DINING	UCLA ON CAMPUS HOUSING M	07/17/23	2	3YD	6	16.44	10,258.56	854.88
3	UCLA DYKSTRA/DENEVE HALL	UCLA ON CAMPUS HOUSING M	03/04/22	2	2YDC	6	23.02	14,364.48	1,197.04
4	UCLA DYKSTRA/DENEVE HALL	UCLA ON CAMPUS HOUSING M	03/04/22	4	2YDC	4	23.02	19,152.64	1,596.05
5	UCLA DYKSTRA/DENEVE HALL	UCLA ON CAMPUS HOUSING M	07/19/22	4	3YD	6	16.44	20,517.12	1,709.76
6	UCLA DYKSTRA/DENEVE HALL	UCLA ON CAMPUS HOUSING M	09/13/21	6	3YDC	1	27.75	8,658.00	721.50
7	UCLA DYKSTRA/DENEVE HALL	UCLA ON CAMPUS HOUSING M	09/13/21	6	3YDC	6	27.75	51,948.00	4,329.00
8	UCLA GARDENIA HALL	UCLA ON CAMPUS HOUSING M	09/13/21	1	3YDC	6	27.75	8,658.00	721.50
9	UCLA GUEST HOUSE HH	UCLA ON CAMPUS HOUSING M	01/03/24	1	3YD	2	16.44	1,709.76	142.48
10	UCLA HEDRICK DINING	UCLA ON CAMPUS HOUSING M	01/12/24	1	3YD	6	16.44	5,129.28	427.44
12	UCLA HEDRICK HALL HH (SUMMIT)	UCLA ON CAMPUS HOUSING M	11/01/22	2	3YD	6	16.44	10,258.56	854.88
13	UCLA HEDRICK HALL HH (SUMMIT)	UCLA ON CAMPUS HOUSING M	09/13/21	1	4YDC	6	27.75	8,658.00	721.50
14	UCLA HITCH SUITES HH	UCLA ON CAMPUS HOUSING M	09/13/21	1	3YD	3	16.44	2,564.64	213.72
15	UCLA HOLLY HALL	UCLA ON CAMPUS HOUSING M	09/13/21	2	3YDC	6	27.75	17,316.00	1,443.00
16	UCLA HOLLY HALL	UCLA ON CAMPUS HOUSING M	09/13/21	2	3YDC	1	27.75	2,886.00	240.50
17	UCLA RENDEZVOUS' CAFÉ (DINING)	UCLA ON CAMPUS HOUSING M	04/01/22	2	3YD	6	16.44	10,258.56	854.88

Appendix G: Preserve2Go 9x9x3 Container Costs

	Description	Item #	Color	Volume	Units/Case	Cases/Pallet	Case Price	Unit Price	# Cases to Order	Total
Preserve 2 Go™ 9x9x3 Reusable Containers										
Less than Pallet Quantities (1-19 cases)	Three (3) compartment	59117	Clear Green	9"x 9"x 3"	48	N/A	$ 206.40	$ 4.30		$ -
Pallet Quantities (1-3 pallets)	Three (3) compartment	59117	Clear Green	9"x 9"x 3"	48	20	$ 177.60	$ 3.70		$ -
Pallet Quantities (4+ pallets)	Three (3) compartment	59117	Clear Green	9"x 9"x 3"	48	20	$ 163.20	$ 3.40		$ -
Pallet Quantities (7+ pallets)	Three (3) compartment	59117	Clear Green	9"x 9"x 3"	48	20	$ 141.60	$ 2.95		$ -
Pallet Quantities (10+ pallets)	Three (3) compartment	59117	Clear Green	9"x 9"x 3"	48	20	$ 120.00	$ 2.50	**209**	**$ 25,080.00**

Appendix H: Staffing Cost Calculations

A	B
Staffing Needs Analysis	
Scenario 1: 2 collection bins, collection every 2 hours (excluding washing)	***Scenario 2: 6 collection bins, collection every 3 hours (excluding washing)***
2 staff per bin = 4 extra staff	2 staff per bin = 12 extra staff
8 collection periods total	6 collection periods total
30 min per collection periods = 2 hrs per staff	30 min collection periods = 1.5 hr per staff
hourly wage: $18/hr	hourly wage: $18/hr
$18/hr x 2 hrs = $36 per staff x 4 staff = $144 total per day	$18/hr x 1.5 hr = $27 per staff x 12 staff = $324 total per day
3 quarters = 238 days	3 quarters = 238 days
$144 per day x 238 days = **$34,272** per 3 quarters	$324 per day x 238 days = **$77,112** per 3 quarters
Scenario 3: 2 collection bins, collection every 2 hours including washing time	***Scenario 4: 6 collection bins, collection every 3 hours including washing time***
$144 per day + 2hr x $18/hr x 2 staff = $216 per day	$324 per day + 2hr x $18/hr x 2 staff = $396 per day
$216 per day x 238 days = **$51,408** per 3 quarter	$396 per day x 238 days = **$94,248** per 3 quarters
glassdoor UCLA dining wage estimate: $18/hr	

Appendix I: Survey Comments & Feedback

A four-page document with all student comments and feedback is linked here.

Appendix J: Waste Hauler Savings Calculations

Cost of 3YD Lift = $16.44, 3YD Bin =150,895 Cubic Inches

8x8x3 Container = 192 Cubic Inches, 9x6x3 Container = 162 Cubic Inches

- 8x8x3 Containers / 9x6x3 Containers = 192/162 = 1.19
- 36 8x8x3 Containers + 1.19 * (19 9x6x3 Containers)
- 58.8 8x8x3 Containers in trash

9x6x3 Containers / 8x8x3 Containers = 192/162 = .84

- (.84) 36 8x8x3 Containers + 1.19 * (19 9x6x3 Containers)
- 49.4 9x6x3 Containers in trash

32 oz bowl

- Dimensions of trash: 12*17*17 = 3,468 in^3
- Number of 32 oz Rende East bowls in trash: 25
- 1 32 oz Rende East bowl = 289 in^3

8x8x3 container

- Dimensions of trash: 20*17*17 = 5,780 in^3
- Number of 8x8x3 containers in trash: 58.8
- 1 8x8x3 Container = 98.3 in^3

9x6x3 container

- Dimensions of trash: 20*17*17 = 5,780 in^3
- Number of 9x6x3 containers in trash: 49.5
- 1 9x6x3 Container = 117 in^3

1,001 Rende East Bowls/day = 289,289 Cubic Inches

- 1.9 3YD Bin/day, $31.52/day, $945.54/month

1,793 8x8x3 Containers/1 day = 179,251 Cubic Inches

- 1.19 3YD Bin/day, $19.53/day, $585.9/month

195 9x6x3 Containers/1 day = 22,815 Cubic Inches

- .15 3YD Bin/day, $2.49/day, $74.57/month

3.24 3YD Bins per day, $53.26 Total lift cost per day, $1597.68 Total lift cost per month

TOTAL WASTE HAULER SAVINGS: $12,674.928 Total lift cost per academic year (3 quarters or 34 weeks)

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