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Reducing Styrofoam Waste in UCLA Laboratories

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UCLA Sustainability Action Research

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Abstract

As Styrofoam lab waste is pardoned from the UC-wide Foam Ban, there has been little incentive for laboratories to reduce or to manage their Styrofoam waste. Over the past two quarters, *Sustainability Action Research (SAR)*'s Green Labs team embarked on a mission to find ways of reducing the amount of Styrofoam waste generated by UCLA laboratories to guide UCLA to reach its Zero Waste goals *everywhere* on campus. To begin, the team sent a survey to over 70 currently active UCLA laboratories to gauge general purchasing behavior, current treatment of Styrofoam waste, as well as level of support towards Styrofoam reduction initiatives or programs. With this information, the team reached out to the most influential vendors (according to survey results), *Illumina* and *Thermofisher*, and interviewed their representatives. The last major component of the team's research was the informal life cycle analysis comparing the environmental impacts of Styrofoam and cardboard production. The results of the life cycle analysis indicated that cardboard has most "upfront" production costs (measured by carbon equivalent emissions and energy consumption) with a significantly cleaner end of life than Styrofoam. After two quarters of thorough research, interviews, and calculations, the Green Labs team finds cardboard coolers to be a suitable alternative for Styrofoam coolers, which aligns with the team's initial expectations. Moving forward, the team encourages laboratories to advocate their concerns to their vendors and suppliers about Styrofoam packaging to expedite the vendors' transition from the current Styrofoam packaging to cardboard alternatives.

Introduction

Styrofoam, also known as polystyrene, is ubiquitously found in single-use packaging, ranging from restaurant take-out containers to the packaging foams used for transporting fragile items. At UCLA, Styrofoam coolers are often used by laboratories as a convenient way to affordably ship fragile or temperature-sensitive lab materials. The unique properties of Styrofoam make it the ideal material for shipping laboratory materials. For instance, the low thermal conductivity of Styrofoam means that it can be used to ship extremely temperature-sensitive laboratory materials, such as DNA and chemicals, because it is such a poor conductor of heat and a great insulator (“Thermal Conductivity of Expanded Polystyrene,” 2016). Additionally, its shock-absorbing properties are beneficial in transporting fragile laboratory supplies such as glassware. Styrofoam also has a characteristically low density as air accounts for 95% of its composition. (“Say Goodbye to Styrofoam,” 2015). Styrofoam’s lightweightedness makes it advantageous for shipping, as it results in less additional costs in transportation and shipping. Production-wise, Styrofoam is a financially cheap material to manufacture in large quantities; as a result, it is often found to be a component in products designed for single-use ("Polystyrene"). All these properties together contribute to the appeal and versatility of Styrofoam as a packaging product for laboratories.

Despite its apparent benefits, Styrofoam poses certain hazards to all living creatures (“Impacts and Risks of Polystyrene,” 2019). Styrene, which is the building block of all Styrofoam, is known to pose risks to the central nervous system and normal hormone functions. According to the Environmental Protection Agency (EPA), exposure to styrene can “cause headaches, fatigue, dizziness, confusion, drowsiness, malaise, and difficulty in concentrating” as well as contribute to “thyroid problems, menstrual irregularities, and other hormone-related problems" ("Impacts and Risks of Polystyrene," 2019). The World Health Organization's International Agency for Research on Cancer has identified styrene as a possible human carcinogen, linked to breast and prostate cancers ("Impacts and Risks of Polystyrene," 2019). Styrene is found in measurable amounts in virtually all individuals in the United States ("Impacts and Risks of Polystyrene," 2019).

In addition to posing health risks, Styrofoam is harmful to the environment. The manufacturing process of Styrofoam produces enormous amounts of hazardous waste, including hydrochlorofluorocarbon compounds that react with nitrogen oxides to deplete atmospheric ozone and accelerate global warming ("FAQs: Styrofoam ™"). The endlife of Styrofoam is also hazardous as polystyrene is a non-biodegradable pollutant that does not break down for at least 500 years. Improper disposal can cause the brittle Styrofoam to break into small microplastics that are easily consumed by animals and leach harmful chemicals and toxicants into the atmosphere and waterways ("FAQs: Styrofoam ™"). Even in the "optimal" scenario where Styrofoam waste is handled carefully by both consumers and waste haulers, it is virtually never recycled. Recycling facilities are not capable of storing the immense amounts of Styrofoam waste and find it economically unfavorable to do so. This generates large volumes of Styrofoam waste abandoned in landfills. Despite Styrofoam being only 1% of all waste, it fills up 25-30% of landfill space around the world where it will not biodegrade for centuries (Lucas, 2014).

Given the apparent disadvantages of Styrofoam, UCLA initiated a Foam Ban on January 1st, 2020. Designed to meet the UC's Zero Waste Goal, the Foam Ban prohibits the "sale, procurement and distribution of packaging foam" on a systemwide scale with the exception of laboratory or medical products ("UC Packaging Foam Ban Takes Effect," 2020). Despite the special exemption laboratories are given from the packaging foam ban, the non-negligible quantities of Styrofoam waste produced by labs, as well as the the countless harms of Styrofoam on humans and the environment, motivated the Green Labs team to find effective and cost-efficient ways to reduce Styrofoam lab waste.

Amidst COVID-19 restrictions, the team worked remotely with the goal of reducing Styrofoam waste in UCLA laboratories. The research was divided into 3 phases: (1) data collection by means of surveys sent to laboratories, (2) communication with lab supply vendors, and an (3) informal life-cycle analysis (LCA). In the end, we held an Open House on Zoom to discuss our findings with UCLA researchers, students, lab managers, and anyone who were interested. A special emphasis was placed on Styrofoam coolers, which contribute to a significant fraction of Styrofoam usage in laboratories and are used in shipping. This paper presents the team's methodology, findings, and recommendations to laboratories and vendors.

Methodology

Surveys to Labs

As part of our methodology, we distributed an online survey to about 70 UCLA laboratories to fill out surveys with the focus of gaining a better understanding of Styrofoam use at UCLA. In our survey, we asked questions concerning the frequency of Styrofoam use in labs, how Styrofoam is used in labs (and for what purpose), how often Styrofoam is recycled or reused, and the lab's overall willingness to invest in other alternative options. Our survey questions were reviewed by the SAR advisors Cully Nordby and Carl Maida to improve the wording and professionalism. We also invited a lab member from the Terasaki Life Science building to read through and fill out the survey in order to test the clarity. With the feedback, we finalized our survey questions (see Appendix A) and sent the surveys to lab contacts we obtained from Kikei Wong, the UCLA Zero Waste Coordinator. In order to ensure survey responses and to provide incentive for labs to respond to our survey, we created a raffle for filling out the survey. After applying to the TGIF fund and receiving $100 for our research, we decided to give away three $20 Amazon gift cards during the first round of surveys that we sent out. We sent a follow-up email to contacts that did not respond during the first round, adding two more $20 Amazon gift cards to the raffle.

Interviews

In addition to the surveys, a critical step in our methodology was to interview campus faculty, vendors, and lab personnel in order to get a better understanding as to how Styrofoam is currently being handled by UCLA labs and their vendors. Interviews were conducted via Zoom with a list of general questions (see Appendix B) prepared for each interviewee.

We conducted our first interview with Claire Tsai, UCLA's Strategic Sourcing

Commodity Manager for Science, because she was very knowledgeable of UCLA's current programs regarding Styrofoam waste and had many connections with UCLA vendors. Through this interview, we hoped to learn about UCLA's efforts to reduce Styrofoam in the labs, specifically the take-back programs and the freezer programs.

Claire played an instrumental role in connecting our group with Scott Churchman, the Bioscience Account Manager for UCLA and UCSB from Thermo Fisher Scientific Life Science Solutions, and Sara Hashimi, the Executive Territory Account Manager from Illumina, for our vendor interviews. This was notable because from our initial survey responses, Thermo Fisher and Illumina were listed as vendors for more than 80% of the labs. Our main goals for these interviews were to discuss their current practices and initiatives for Styrofoam alternatives and to request data about these practices and UCLA's purchases for recent years.

Informal Life Cycle Assessment (LCA)

Life cycle assessment (LCA) is defined as a way to assess and gather data about the environmental impacts during the stages of the life cycle of a product, service or process. It is an excellent way to gather quantitative data that weighs the impact of products such as cardboard coolers or Styrofoam coolers. Our team thought a LCA would be a way to synthesize some of our research into numbers and data that is easy to read. However, creating a formal LCA is an arduous and time consuming process, and could take a couple of months to complete. As a result, we decided to create an informal LCA that could just explore the surface-level impacts of producing cardboard coolers vs. Styrofoam. An informal LCA means that we will focus on only two data aspects that a formal LCA would normally possess (energy and greenhouse gases during a product's life cycle). The two main aspects we focused on were the energy use and production of greenhouse gases during the lifespan of the two products.

Initially, we had hoped that we would be able to gather procurement information from vendors regarding how much cardboard and styrofoam is being shipped to UCLA laboratories. Unfortunately, after interviewing both Illumina and ThermoFisher representatives, the vendors did not provide us with any additional information. This created a large shift in how we approached the life cycle analysis, because rather than running an assessment specifically tailored to UCLA labs, we had to generalize our methods. In order to generalize, we attempted to extrapolate our survey results to create a rough estimate of how much foam and cardboard UCLA might use. However, this method ended up being too generalized, so instead we decided to create our analysis based on one million dollars worth of both styrofoam and cardboard production.

Essentially, deciding to conduct the LCA based on 1 million dollars of output means that our research is not specific to UCLA labs. While it is not unique to UCLA, if laboratory vendors were to provide a dollar amount of foam or cardboard coolers that is sent to UCLA, students could extrapolate this information for the specific dollar amount. For the aforementioned reasons, we have decided to address our research as an *informal* life cycle assessment due to the generalizations and possibility of errors.

Results

Survey Results

We were able to get 21 responses from the70 labs we reached out to after two rounds of surveying (see Appendix C). According to the survey, 52.4% of UCLA labs receive lab supplies in one to five Styrofoam coolers once to several times a week and another 23.8% of labs receive Styrofoam coolers once every few weeks (Fig.1). Since the survey was conducted during the Covid-19 pandemic when lab activities and operation hours were limited, 57.1% of responses indicated that they have been purchasing significantly less compared to pre-pandemic operation. With more than 50% of labs receiving Styrofoam packages on a weekly basis even with a reduced purchasing quantity this year, it is safe to conclude that there is a high receiving rate for Styrofoam coolers in UCLA labs and it is both reasonable and necessary to find sustainable alternatives or form a reduction plan to cut down on Styrofoam use at UCLA.

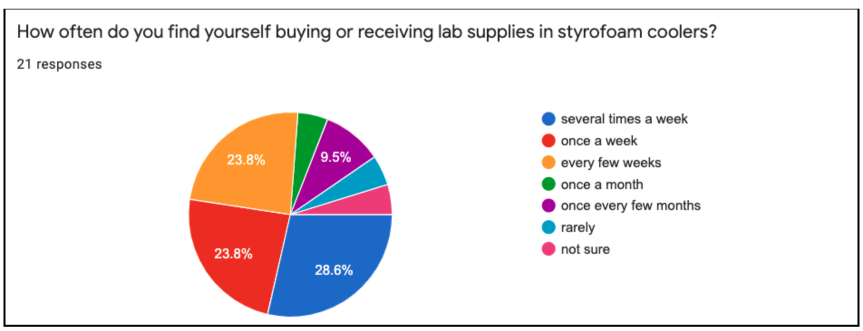


Fig1. Frequency of receiving Styrofoam packaging in UCLA labs

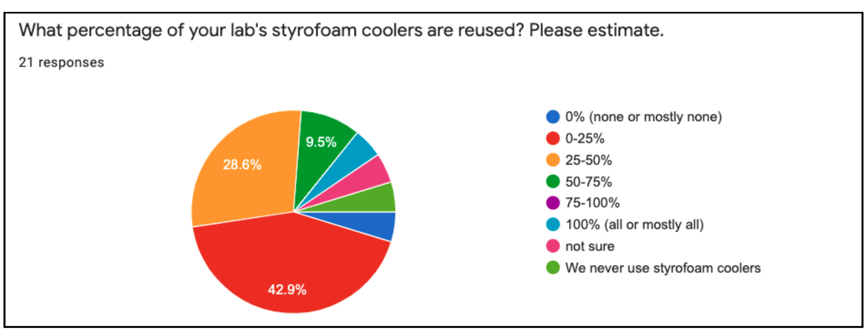


Fig2. Percentage of reusing Styrofoam coolers before disposing

The second section of the survey was about reusing and recycling. 71.4% of the labs who responded claimed to have put in efforts to reuse the Styrofoam coolers “sometimes”. However, the majority did not report a reuse rate over 75% (Fig.2). On a positive note, none of the labs reported a 0% reuse rate with their Styrofoam products. These numbers indicate that all the surveyed labs are conscious of Styrofoam waste and are willing to become more sustainable with their purchasing habits. Another notable statistic that reinforces the idea of sustainable consciousness within UCLA labs are the reported Styrofoam alternative options that some labs have considered. Of the 16 labs, three of them reported to have considered cardboard as an alternative to Styrofoam.

The last section of the survey was about Styrofoam alternatives. Many labs commented that they do not have the ability to choose alternatives for Styrofoam because they “do not get to specify the shipping material” when ordering. This is obviously a major point of contention for the overall scope of the UCLA Green Labs’ goal and the goals of SAR to become a 100% sustainable campus. Now that we are aware of the situation that labs do not have the alternative options to choose from, but would likely choose the alternative if offered, we recognize the importance of talking to vendors to negotiate better shipping options.

Interviews Takeaways

In our interview with Claire Tsai, we were introduced to UCLA’s current take-back programs, which are programs where vendors take away the Styrofoam left by labs from previous purchases for potential reuse. Tsai recalled that Illumina was one vendor that provided this service, although she was unclear on the details of the program. The benefits of these programs are that there is less Styrofoam immediately diverted to landfills and that no third party is needed to transport the Styrofoam, reducing transportation emissions. The main drawback revolves around the cost inefficiency of transporting large volumes of light material. Tsai also spoke on UCLA's freezer programs, such as the distribution center located in Boelter Hall, which act similar to vending machines, only for laboratory supplies. Essentially, labs can access these supply centers with special vendor cards and purchase the materials they need. While these programs are popular due to convenience and reduced shipping costs (bulk shipping), not every vendor can build their own on campus due to the limited land space. Both of these programs are potential solutions to reduce Styrofoam use in labs, so we hope to relay information about these programs to all UCLA labs (Tsai).

In our first vendor interview with Scott Churchman from Thermo Fisher, we learned that Thermo Fisher already had several ambitious initiatives underway, such as the transition to cardboard coolers for their packaging, reduction of the amount of dry ice in coolers, and exploration for products that could be shipped in ambient temperatures. Churchman assured that theoretically, all of Thermo Fisher's products currently shipped in Styrofoam packaging could also be shipped in cardboard packaging, pointing to the fact that most orders are one-day shipments. The significance of the short delivery period is that it lessens the qualifications for potential alternatives, as materials possessing slightly inferior insulation properties to those of Styrofoam can now be considered as realistic alternatives for packaging laboratory supplies. Churchman also noted that every order to the labs had a $5 flat shipping rate, so the material of the packaging would be trivial when calculating shipping costs. We were also able to gain information about Thermo Fisher's supply center at UCLA. According to Churchman, labs could order any products to these supply centers, although they tend to offer regularly used lab materials and have difficulty with long term storage due to their limited capacity (Churchman).

Most importantly, we were able to request Churchman for data that we would be able to use for our future analysis on Styrofoam and its alternatives, including the number of Styrofoam and cardboard coolers that were ordered by UCLA labs over the past couple years and the number of labs that currently use Thermo Fisher's supply center. Other requested data that would be included in our analysis of alternatives were transportation costs of cardboard packaging and energy requirements of maintaining the supply center. Churchman also agreed to look more into their developing take-back programs for cardboard coolers; currently, the cardboard coolers are expected to be disposed of in the local wastestream for recycling (Churchman).

In our second vendor interview with Sara Hashimi from Illumina, we learned that Illumina shared similar sentiments with Thermo Fisher regarding Styrofoam alternatives. Hashimi reported that Illumina was also committed to finding more solutions for sustainable packaging, reinforcing the strategies of transitioning to recyclable packaging, searching for ambient shipping alternatives, and developing technologies to decrease the use of dry ice. In addition, Hashimi brought up two main challenges regarding Styrofoam use and UCLA labs. Firstly, Hashimi revealed that UCLA lab orders are often uncoordinated as labs tend to individually order supplies at different times. As a result, more Styrofoam packages are shipped to UCLA labs than needed, even if labs order the same supplies. Hashimi suggests that if UCLA labs can give better forecasts to the vendors and strategically plan and participate in bulk orders for commonly used supplies, the amount of Styrofoam packaging shipped to UCLA can be decreased. Secondly, Hashimi expressed that while there is interest for supply centers, Illumina does not have a supply center at UCLA because of the limitations of land space.

As in the Thermo Fisher interview, we requested Hashimi for data about UCLA lab orders from Illumina. Most of the requested data were about the amount or ratio of Styrofoam containers delivered to UCLA labs over the past couple of years. Hashimi did not immediately have access to this information, but she was open to asking other personnel in search of those statistics.

Informal Life Cycle Assessment

In order to establish a more thorough assessment of the actual impact of the cardboard and Styrofoam containers, our team decided to conduct a life cycle assessment of the different shipping options. The goal of the Life Cycle Assessment was to determine whether cardboard or Styrofoam is a more sustainable material for lab coolers in terms of its early life impacts. Our analysis specifically investigated the carbon equivalent emissions and energy consumption of the cardboard and Styrofoam packaging. As we did not receive data specific to UCLA labs from the vendors, we resorted to an informal life cycle analysis.

The assessment that we conducted features data from the primary and secondary stages of production and followed the Director of Leadership in Sustainability Certificate Program and Associate Professor Deepak Rajagopal's Life Cycle Assessment class and the "simple rule" which explains that the quantity of input needed at any step is equal to the input needed per unit output times the quantity of output at that step (Rajagopal). See Appendix D for the LCA diagrams that we created and the values for the emissions and energy consumption that resulted from either of the cooler options.

The diagrams illustrate the top three contributors to Styrofoam and cardboard carbon emissions and energy usage. It is apparent from the diagrams that cardboard coolers are more resource intensive than Styrofoam coolers. This unfortunately does not prove the point that we were trying to address by conducting the LCA; however, when we consider the end of life processes and disposal, cardboard is still a more viable option than Styrofoam.

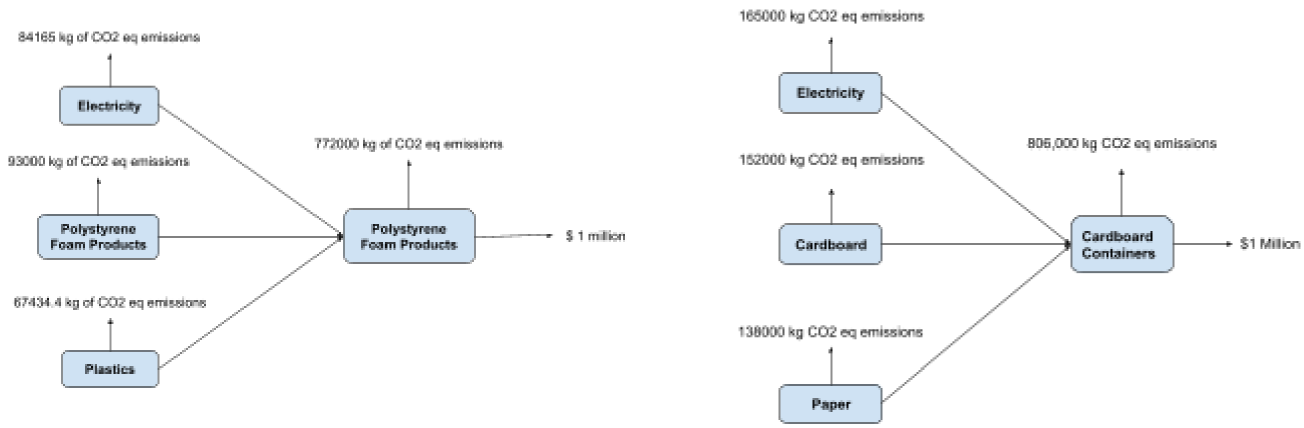


Fig 3&4. LCA results of Carbon Emission (left-styrofoam ; right-carbon)

The informal life cycle assessment shows that while we might have predicted that the foam products would require significantly more resources, this is not the case. In terms of carbon equivalent emissions, the polystyrene containers emitted 772,000 kg of carbon whereas the cardboard containers emitted 806,000 kg of carbon. Additionally, polystyrene containers required 1.88 x 10^10 kilojoules of energy, compared to the 2.89 x 10^10 kilojoules needed for cardboard. This means that in both areas of our informal life cycle analysis, cardboard was the less sustainable option.

This caused us to reevaluate the end of life impacts of Styrofoam and cardboard coolers in order to maintain a more thorough understanding of the true impacts of laboratory cooler procurement. We can recall from previous research that Styrofoam is not only harmful to human and animal health, but also takes a large amount of time to decompose in landfills. Cardboard, on the other hand, is easily degraded and has a minimal impact on the environment and organisms. Both of these impacts lead us to conclude that although cardboard production is more resource intensive initially, Styrofoam has a more detrimental impact in its end of life process, so cardboard is still the most sustainable cooler material.

Deliverables

Open House

As a way of presenting our findings to interested UCLA labs and related projects, our UCLA SAR Green Labs team hosted an Open House via Zoom on May 19th, 2021. After our presentation video, we planned to answer questions about our project findings and initiate a discussion about how UCLA labs could reduce Styrofoam usage. A total of 13 participants participated in the Open House, ranging from lab managers and personnel to stakeholders and students in related projects.

During the Open House discussion, several important ideas were touched upon. One lab member from the Department of Medicine was interested in the possibility of recycling Styrofoam, to which we addressed with explanations as to why Styrofoam's lightness makes it an inefficient recycling product. The lab member also inquired about the possibility of dissolving Styrofoam. For this question, a student from the Bruin Home Solutions described the harms of Styrofoam when decomposed, explaining that after Styrofoam is decomposed, the remaining chemicals can still be harmless.

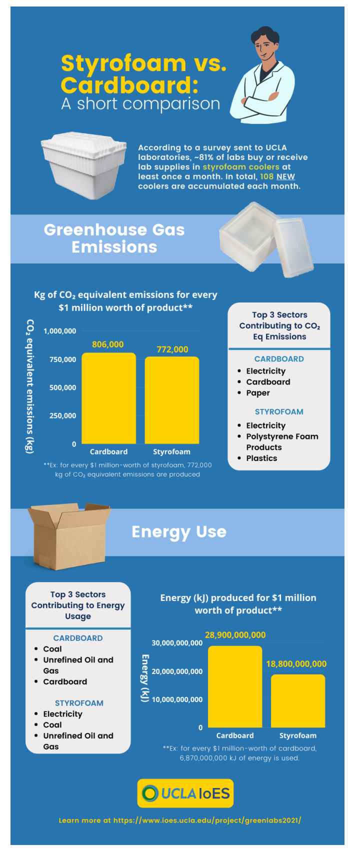
Questions that we were not able to address were questions about the total cost difference between Styrofoam and cardboard packages and the number of Styrofoam packages being purchased by UCLA labs. We were unable to acquire necessary data from the vendors to provide UCLA-specific information about the total cost difference and the number of purchased Styrofoam packages. Thus, we were only able to give information based on our survey, which suggested that labs make orders two to three times a week.

Two suggestions emerged from the discussion to reduce Styrofoam on campus. One was to enforce return labels on packages as part of UCLA policy to promote the reuse of packages.

The second suggestion related to the Bruin Home Solutions Plastic2Food project, where research is focused on mealworms that can eat and decompose Styrofoam products. The project is currently researching ways to remove toxic microplastics in their waste. The implications of both suggestions are promising and are possible ideas to incorporate into future UCLA SAR Green Labs projects.

Infographic

Based on the information we gathered from the life cycle assessment, we created infographics comparing Styrofoam to cardboard with regards to energy use and greenhouse gas emissions (see Appendix E). Although our life cycle assessment results are not perfect due to the inaccuracy and the lack of real-life data as mentioned above, we hope the infographic will be updated and posted in lab buildings and other campus spaces to keep people thinking about the lab supplies packaging and Styrofoam problem as a whole.



Conclusion

From our research, we learned that labs are generally on board for the transition from Styrofoam to cardboard, but their main concern is whether alternatives can be provided by their current vendors of their lab supplies. We also found that biotechnology companies such as Illumina and Thermo Fisher already have plans to move away from Styrofoam coolers towards more environmentally friendly alternatives. However, the efficiency of their action is limited by some unnamed factors and we believe more voices from their customers such as UCLA labs would help to push the process forward.

Moving forward, here are some suggestions and solutions for labs, vendors, and the UCLA campus in efforts of phasing out Styrofoam and making UCLA a 100% sustainable college campus.

Suggestions for UCLA and Labs

From our survey data, we have discovered that UCLA labs are interested in greener alternatives to Styrofoam packaging; unfortunately, they lack the ability to obtain them. The first step for UCLA labs to obtain greener packaging alternatives is to voice their demand to laboratory-supply vendors. Before making a purchase, UCLA lab managers should be encouraged to ask their vendors for non-Styrofoam packaging. Simply showing interest in an alternative product, even if it is not yet available, will induce vendors to prioritize the production and research for these alternatives and to supply them in the market.

UCLA labs can also get involved to reduce their environmental impacts. The data from our Life Cycle Analysis shows that a significant amount of emissions is created from transporting and shipping lab material. Thus, it is environmentally expensive to ship lab materials individually. UCLA labs can help reduce their shipping emissions by ordering in bulk. UCLA labs should be encouraged to communicate with neighboring labs to order together. Another option would be to create a spreadsheet of common lab supplies for a whole research building. Within this spreadsheet, each lab manager can input common supplies they require and make bulk shipment even more environmentally efficient. Other than providing a great benefit for the environment, bulk ordering is also cheaper for research laboratories as each lab splits the shipping cost. However, there is one large drawback with this method from what we have learned from our survey and interview data. Not all labs require the same materials (although most do still require common lab supplies) and some labs (specifically genetics labs) sometimes require immediate shipment and cannot wait to collaborate with other labs to create a bulk shipment. Either way, UCLA labs can at the least create bulk shipments for common laboratory supplies from their vendors to reduce transportation emissions.

As for the university campus itself, UCLA should focus on creating storage spaces to hold Styrofoam products longer. When we first started this project, we learned that recycling groups, such as RecycLA, do not recycle all of the Styrofoam they receive because of Styrofoam's volume to weight ratio. RecycLA simply cannot collect enough Styrofoam in weight to justify recycling. Thus, we should push for UCLA to create a storage space for Styrofoam products. This way, we produce two advantages. One advantage is that recycling groups can collect more Styrofoam to justify recycling. The second advantage is that other lab members can have access to this storage facility to find and possibly reuse Styrofoam packaging products for their shipping needs. This way, UCLA labs can practice reusing Styrofoam products and cut down on Styrofoam consumption.

Suggestions for Vendors

To re-emphasize our research, many of UCLA's research laboratories are willing to invest in greener alternatives but lack the choice. Thus, the burden for greener labs falls on the producers (vendors) of lab supplies to provide these products to the consumers (research laboratories) if we are to see major changes in UCLA lab Styrofoam consumption. The most effective way to fix this problem is to streamline the communication between labs and vendors. As previously mentioned, labs should be encouraged to communicate with their vendors to show their interest in packaging alternatives. Meanwhile, vendors must be conscious of their lab manager's desires and be communicative with how or when they can receive them. The best way for lab managers and vendors to reach this understanding is to hold frequent online or in-person meetings where lab managers can address the types of products they need and vendors can express whether these requests can be fulfilled. In these meetings, vendors can also disclose to labs their progress in new packaging alternatives and when they can expect to receive them. These meetings can be as often as once a month or even once every couple of months. The main point of these meetings is to ensure that vendors are making progress with their new packaging alternatives and providing a continuous concern for these alternatives so that they are not easily forgettable. Without any concern or effort to push for greener packaging, vendors do not have the urgency to provide them.

Establishing a consistent meeting time between labs and vendors is difficult. Both parties are either aware or somewhat aware of the environmental impacts that Styrofoam causes. However, neither have an innate desire to make the change. Thus, the UCLA board or government must act as a mediator between the two parties. Since UCLA does not have control over vendors, they must instead require all UCLA labs to establish a meeting time with vendors to discuss these issues.

Future Directions for SAR

Moving forward, we believe that future SAR teams would be quite successful if they encourage more active communication between labs and vendors. Creating a petition for labs to sign that expresses the desire for non-Styrofoam coolers would show vendors that consumers are passionate about greener alternatives. This would nudge vendors to dive deeper into their efforts to reduce waste, and encourage them to make a more tangible difference. Additionally, creating a petition would encourage laboratories to make more conscious efforts to reduce waste in other aspects of their work.

A future SAR team could also establish a pilot program with a lab. Initially when we were deciding on the focus of our project, our team sent out various emails to lab personnel to gauge interest in a cardboard packaging pilot program. Unfortunately, we were unable to do the pilot program because of the Covid-19 pandemic and time constraints; however, we identified that the Jonsson Comprehensive Cancer Center was interested in the idea and would be a viable candidate for a partnership.

Additionally, we believe that it would be largely beneficial for a future SAR team to initiate a University of California wide green labs program so that all of the campuses can collaborate in order to create a larger impact. Particularly, the next SAR Green Labs team could extend a partnership with the LabRats program from UC Santa Barbara. By working together, there would be a wider range of support in the efforts to create more sustainable laboratory practices.

Final Remarks

Although most of our research only reaches the surface of UCLA's Styrofoam problem, we hope to bring awareness to UCLA's students, staff, faculty, and vendors about Styrofoam usage in the endeavor to become a 100% sustainable campus. Phasing out Styrofoam is a worldwide effort, but we can start here.

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Appendices

Appendix A: Link to survey questions sent out to UCLA labs

https://docs.google.com/forms/d/e/1FAIpQLScMFMkA8UzaG3D0xhtpDMgRojMlMIbCmobtgaJT7PQtAoogBA/viewform

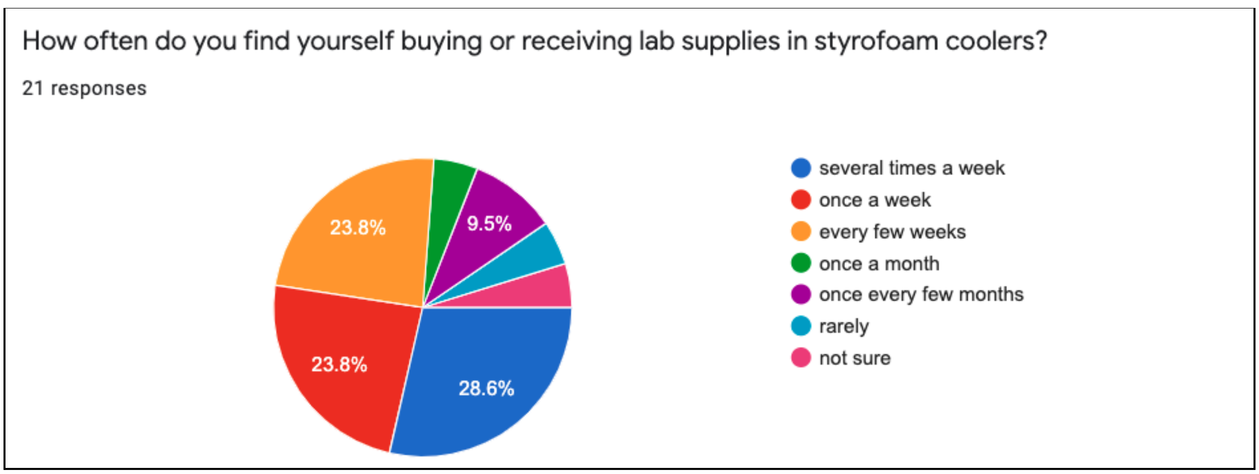
Appendix B

Interview Questions

1. Claire Tsai:
   - Could you tell us more about the current status of UCLA's take back programs and freezer programs? Which vendors participate? How do the programs function? Are they efficient? Is there any room for improvement such as expanding it to more labs or reducing transportation costs?
   - How many vendors do labs tend to have?
   - Are labs open to sustainable alternatives for Styrofoam packaging?
2. Scott Churchman (Thermo Fisher) and Sara Hashimi (Illumina):
   - What are some of your current practices and initiatives for Styrofoam and its alternatives?
   - What are the products that require and do not require Styrofoam coolers? Are there any products that cannot be delivered in cardboard packaging?
   - Do these cardboard coolers have a take-back program in place? What happens to the cardboard coolers after their service?
   - What are the differences in shipping costs between Styrofoam and cardboard packaging?

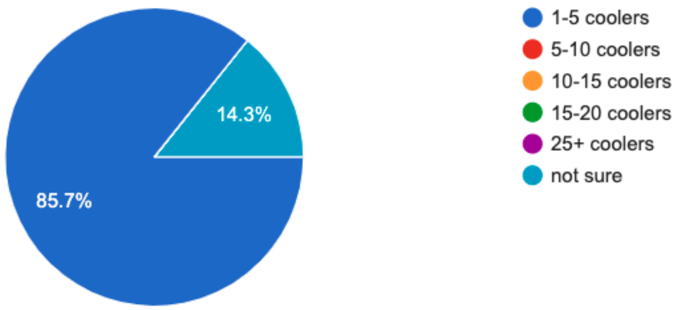
- Are there limitations to products that cannot be dispensed from Thermo Fisher's freezer program on campus?
- Is there any data on the number of cardboard vs Styrofoam coolers shipped to UCLA per week/month over the past couple years?
- What is the coverage rate of labs for the centralized freezer program on campus?
- Do you have data on the energy impacts of the freezer program?
- From the perspective of a lab and biotech person, what is the challenge in making the transition from Styrofoam to alternative solutions? What are your suggestions for labs to reduce reliance on Styrofoam?

Appendix C: Survey results



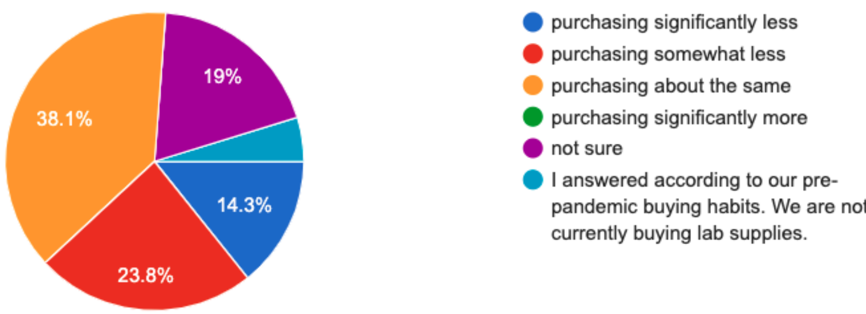
How many styrofoam coolers do you buy/receive at a time?

21 responses



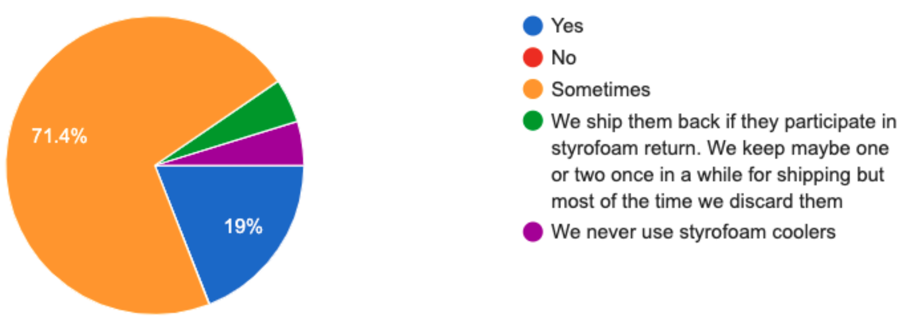
How does this compare to your purchasing habits, pre-pandemic?

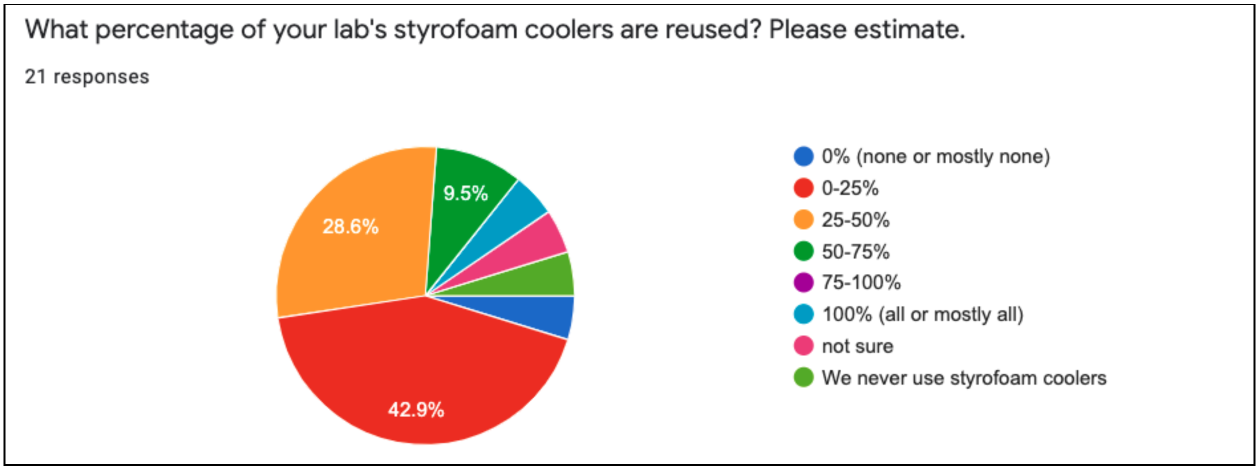
21 responses

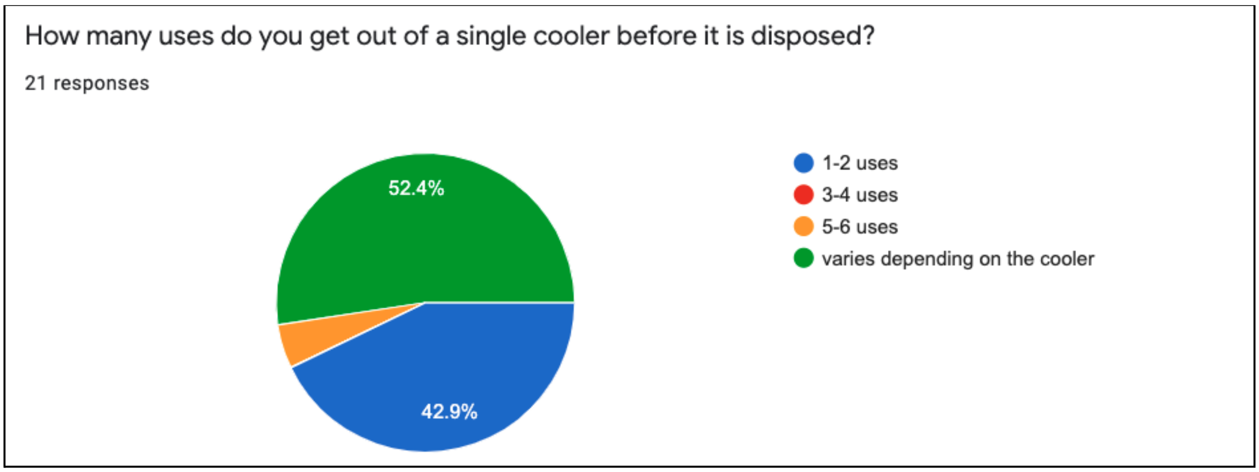


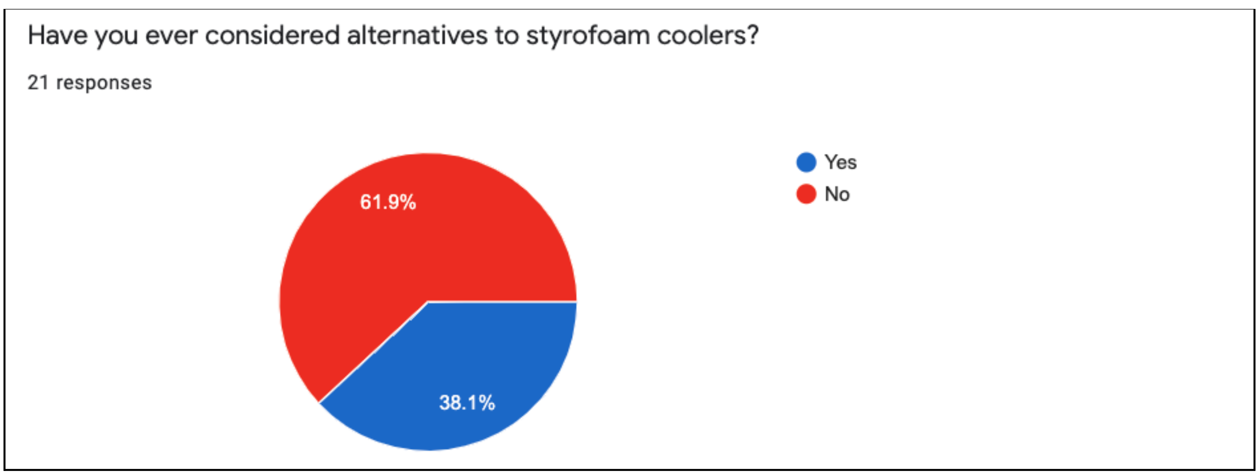
Do you reuse your styrofoam coolers?

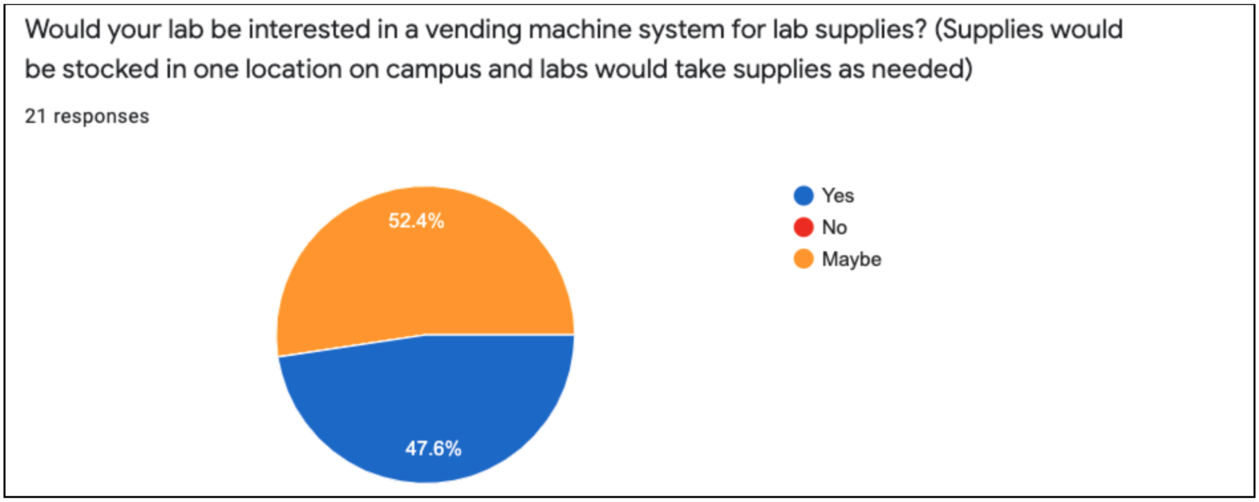
21 responses

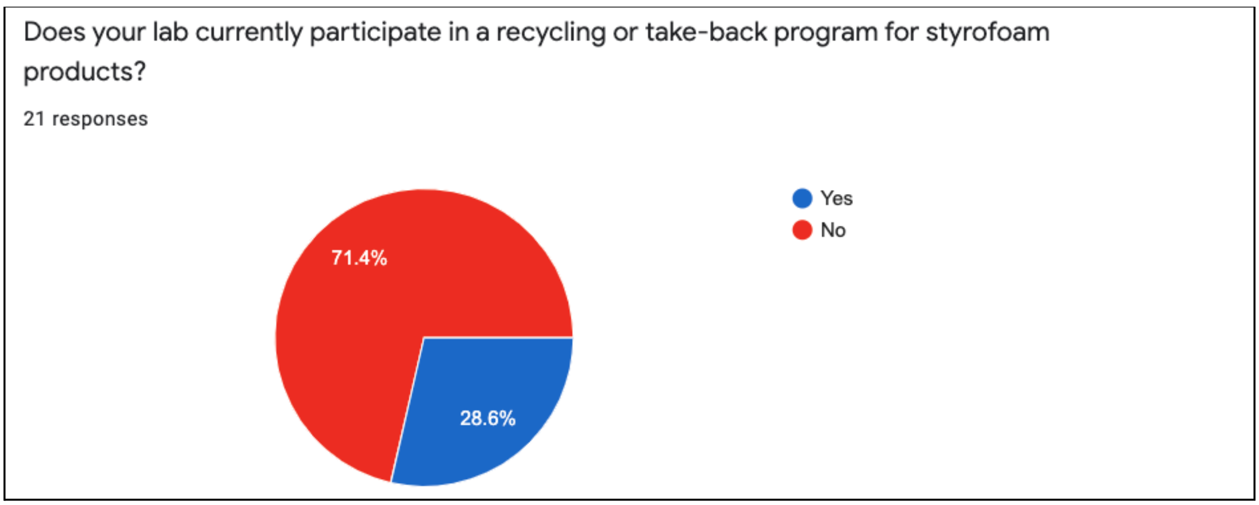


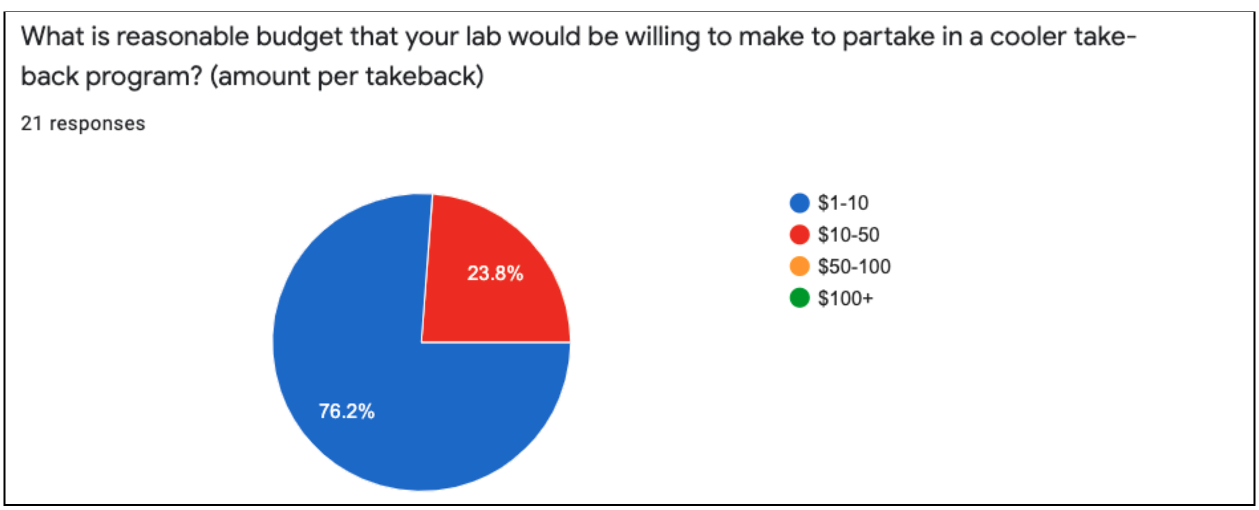

What percentage of your lab's styrofoam coolers are reused? Please estimate.
21 responses
9.5%
28.6%
42.9%
0% (none or mostly none)
0-25%
25-50%
50-75%
75-100%
100% (all or mostly all)
not sure
We never use styrofoam coolers


How many uses do you get out of a single cooler before it is disposed?
21 responses
52.4%
42.9%
1-2 uses
3-4 uses
5-6 uses
varies depending on the cooler


Have you ever considered alternatives to styrofoam coolers?
21 responses
61.9%
38.1%
Yes
No

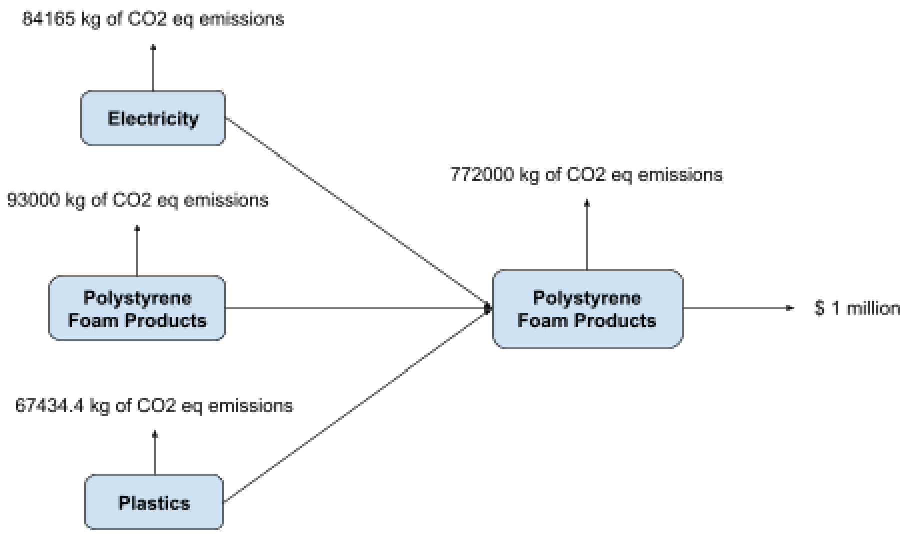

Would your lab be interested in a vending machine system for lab supplies? (Supplies would be stocked in one location on campus and labs would take supplies as needed)
21 responses
52.4%
47.6%
Yes
No
Maybe


Does your lab currently participate in a recycling or take-back program for styrofoam products?
21 responses
71.4%
28.6%
Yes
No

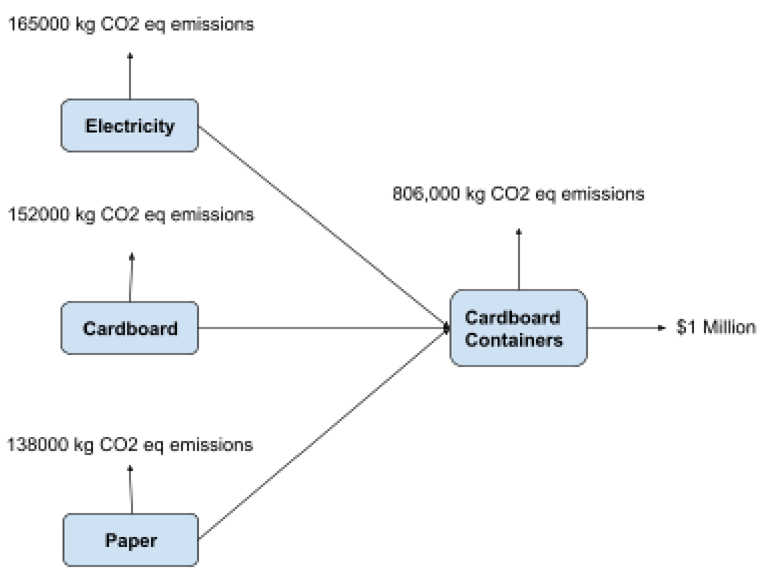

What is reasonable budget that your lab would be willing to make to partake in a cooler take-back program? (amount per takeback)
21 responses
23.8%
76.2%
$1-10
$10-50
$50-100
$100+

Appendix D: Life Cycle Assessment Results

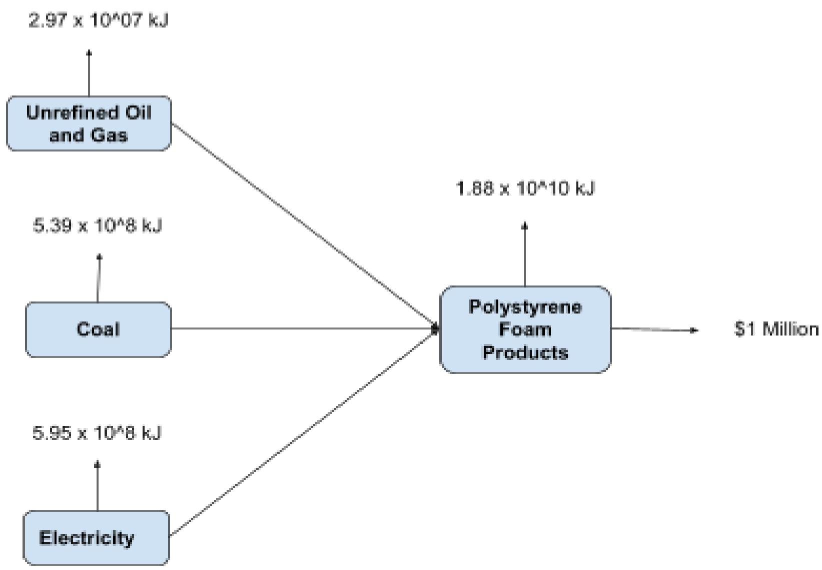
Styrofoam Carbon Equivalent Emissions



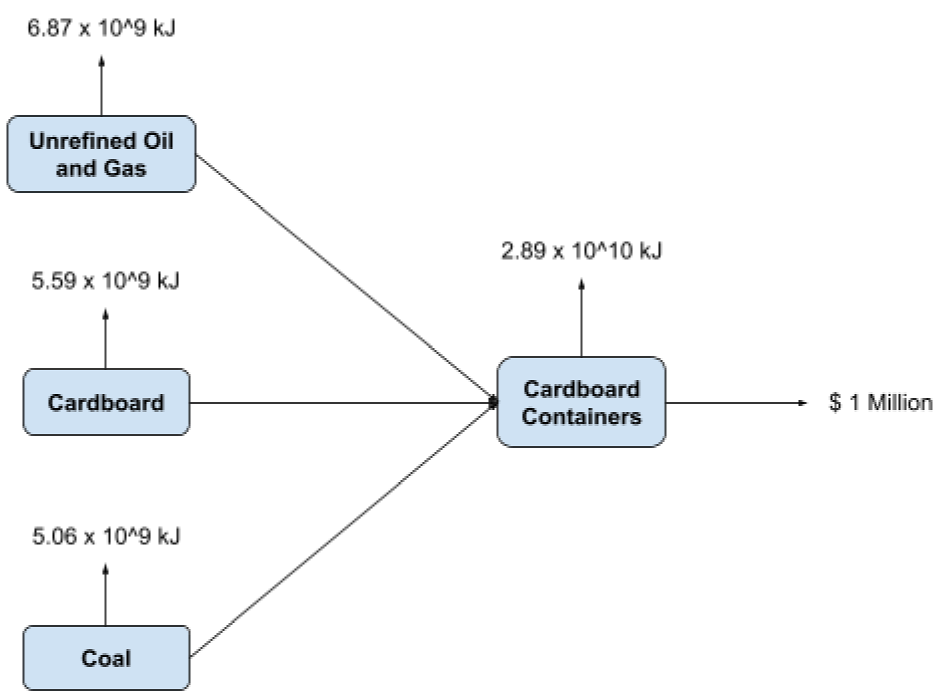
Cardboard Carbon Equivalent Emissions



Styrofoam Energy Consumption



Cardboard Energy Consumption



Appendix E: Informational Styrofoam vs. Cardboard comparison graphic