

Proposal for Reduction of Single-Use Plastics Usage at University of British Columbia Food Vendors

for

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Abstract

Single-use plastics are polluting the earth, increasing CO₂ levels, consuming energy and water, and littering the land and oceans. Individuals should strive, at a local level, to reduce the amount of single-use plastics used personally and by local businesses.

Food vendors are a major user of single-use plastics, and the local scope of this report is food vendors at the University of British Columbia. Five food vendors at UBC were randomly selected and surveyed for their types of single-use food items used, and this data was extrapolated to discover yearly plastic waste for each vendor. UBC food vendors are contributing to the production of thousands of kilograms of plastic every year that are being used by customers once for eating and then disposed.

Alternatives to single-use plastics include multi-use plastics and single-use biodegradable items. The best option is to replace single-use items with multi-use items. There may be more plastic used to create the multi-use items, or they may be made of metal or ceramic, but every time it is reused, the cost per use and material per use is decreased.

UBC should consider implementing standardized multi-use plastic items across UBC. These items could be used by customers and returned for a deposit as an incentive to return them and not waste them. Vendors can also simply not provide single-use items like plastic cutlery as it is likely that customers have their own cutlery in their homes. This solution will reduce both costs and plastic waste for food vendors.

Introduction

Of the 9.2 billion tons of plastic produced since 1950, more than 6.9 billion tons of it has become waste. Of that waste, 6.3 billion tons of it has never been recycled (Parker, Plastic or Planet?). Of all of that plastic produced, 50% of it is single-use: intended to be used once and discarded (Plastic Oceans International). Because of the massive amount of plastic intended for single use that is not recycled, the oceans are being polluted, CO₂ levels are at an all-time high, and massive amounts of energy produced by non-renewable resources are being wasted. In order to combat this crisis, it is imperative that worldwide plastic dependency is reduced, which can should be started on a local scale at the University of British Columbia.

One of the most common usages of single-use plastics is at food vendors. This report intends to outline how much plastic waste is produced by UBC food vendors and recommend means of plastic waste reduction. This will be done by conducting surveys to see what the average food vendor at UBC uses for food packaging, and investigating alternative food packaging methods. Out of the 43 UBC food vendors, 5 will be surveyed to see what single use plastics are used daily. Recommendations for replacements can then be made that will strive to maximize three criterions: eco-friendliness, reusability, and cost-effectiveness.

Overview of Problem

There are approximately 3 units by weight of CO₂ produced for every unit of plastic produced (Blue). Because 300 million tons of plastic are produced each year, and single-use plastic accounts for 50% of all plastic produced, single-use plastic produces 450 million tons of CO₂ each year (Plastic Oceans International). Compared to the 76 billion tons of CO₂ produced yearly, it can be conclusively said that single-use plastic produces about .6% of all global CO₂ emissions (The Associated Press). This CO₂ production is directly related to climate change and global warming.

Not only CO₂ is polluting the earth; the plastic itself is polluting our land and oceans. This is detrimental to marine life, killing seabirds, fish, and turtles indiscriminately by starving them to death after they ingest inedible plastic or restricting their growth by wrapping around them. It is estimated that 90% of all seabird have plastic in their stomachs (Parker, Nearly Every Seabird on Earth Is Eating Plastic). This is affecting humans as well. Fish are ingesting plastic, humans are eating the fish, and we are ending up with these pieces of plastics inside of us (Bharanidharan). Humans are also drinking plastic because 80% of water samples over 5 continents have been shown to be containing microplastics (Virgin Unite).



Figure 1: Dead albatross, apparently dead from starvation with a stomach full of plastic

In addition to plastics polluting the earth, they also require a massive amount of energy and both renewable and non-renewable resources, which is an unsustainable practice. About 22 gallons of water is required to make one pound of plastic, so about close to 2.5 quadrillion litres of water has been used just to manufacture single-use plastics since 1950 – enough water to supply every Canadian for over 650 years (Parker, Plastic or Planet?) (Grace Communication Foundation). 1.4% of America’s total petroleum consumption and .9% of their total energy consumption goes to making single-use plastics (Parker, Plastic or Planet?). For these three reasons, it is imperative that plastic usage be reduced on a local level as much as possible.

Data Section

Data collection methods

The food vendors surveyed for this report were Agora Café, Ike’s Café, Bento Sushi, Starbucks, and Pacific Poke. They were each asked to fill out the survey found in Appendix B. The survey asked the food vendors to detail all of their single-use food packaging, including but not limited to plates, cups, cutlery, straws, bowls, and takeout containers. Each piece of food packaging was then researched to find an approximate cost, and was rated by cost, eco-friendliness, reusability, recyclability, weight, and biodegradability. Daily and yearly usage were approximated, and from these approximations we can glean the total weight of plastic wasted at each food vendor every year. The results were compiled into tables that can be found in Appendix C, and summarized in this section.

Survey results



Figure 2: % by weight of single use food items for Agora Cafe - plastic vs biodegradable

Agora café used the least amount of plastic at zero pieces; all of their disposable items are biodegradable. They also offer incentives for people to bring reusable containers and cups – they offer a \$.25 discount if you bring your own cup or mug, and they charge a \$2.50 “green fee” for using their takeout containers.

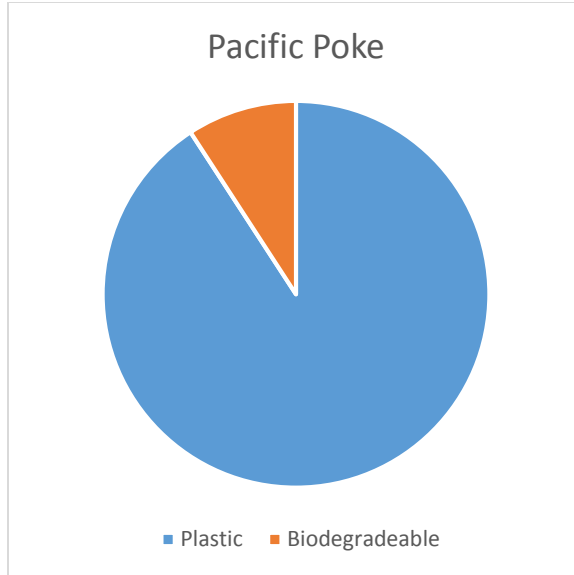


Figure 3: % by weight of single use food items for Pacific Poke - plastic vs biodegradable

Pacific Poke is progressive in that they use bamboo chopsticks and cutlery, but all of their takeout containers are plastic and all of their dishes are served in them. The containers are a thick plastic that can be reused many times, but unfortunately they are designated as single use and are discarded after a single use.

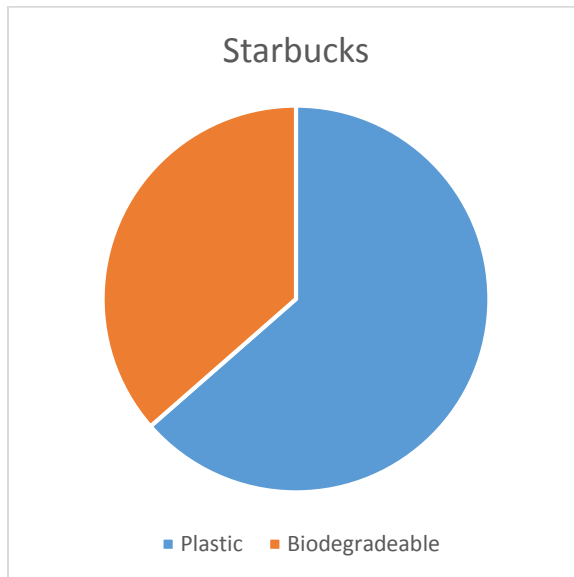


Figure 4: % by weight of single use food items for Starbucks - plastic vs biodegradable

Starbucks uses some eco-friendly materials for their cups and stir sticks but a lot of their food is wrapped in plastic, and all of their cold drink cups and straws are plastic. Even worse is that they instituted a new no-straw policy which is not only being followed, but their solution of a straw/lid hybrid actually uses more plastic than using a standard lid and straw.



Figure 5: Starbucks' no-straw lid, which actually uses more plastic than a standard lid and straw



Figure 6: % by weight of single use food items for Ike's Cafe - plastic vs biodegradable

It was disappointing to see Ike's café using plastic containers to house their food because they used to serve chicken and pasta in biodegradable containers. They recently removed plastic cutlery and straws from their facility, replacing them with biodegradable alternatives. They have taken a step backwards, however, with their takeout containers, which in general are the largest single-use plastic food item by weight.

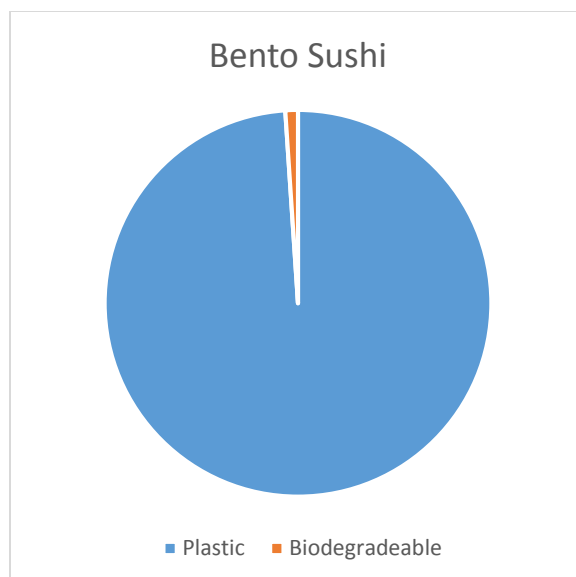


Figure 7: % by weight of single use food items for Bento Sushi - plastic vs biodegradable

The worst offender is Bento Sushi, which uses plastic takeout containers, plastic ramekins, plastic soup cups, plastic chopstick wrappings, and plastic bags for takeout. The only biodegradable item was the bamboo chopsticks themselves.

Data interpretation and summary

A study from Carnegie-Mellon University found that an average of 20.1 patrons visited a café per hour (Bondigas). For this report, 20 patrons per hour will be used for calculating yearly usage of disposable products, along with the standard operating hours of each vendor. See table six in Appendix C for all of this data. Then, the percentages of patrons using each product was estimated. For example, the 2 for Bento Sushi's ramekin usage means that each patron uses an average of two ramekins per order. If an item has a 0, that means that it is not a plastic item and so is not considered. The data in table seven of Appendix C shows the weight per plastic item, and the number in each column under the respective food vendors shows total yearly plastic usage per item in kilograms. The total plastic usage in kilograms is summarized in figure 9. Note that Starbucks was not included in this calculation because this report is intended for the director of the IRES, who has no control over the products used by Starbucks.

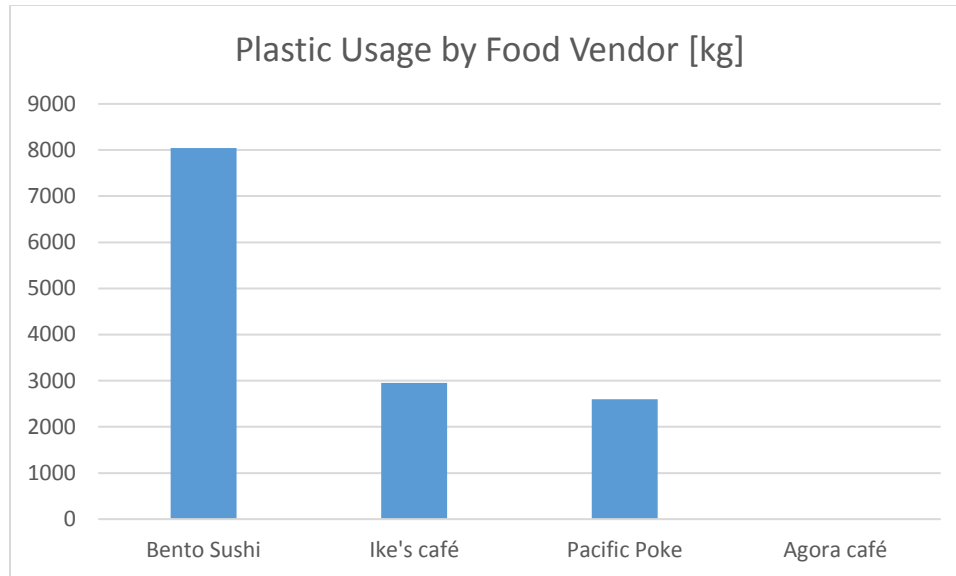


Figure 8: Total plastic usage by sample UBC food vendors by weight

As shown in figure 8, UBC food vendors are producing thousands of kilograms of plastic waste. If global percentages can be assumed, 90% of this plastic will not be properly recycled (Parker, Plastic or Planet?). Even if UBC is much better at recycling than other places in the world, it is naïve to think that there are not significant quantities of plastic ending up in landfills as a direct result of food vendors like the ones in this report.

Proposed Alternatives

Alternative single-use food items

Alternative solutions to single-use plastics is imperative because the need for these products will not simply disappear if they are banned. Recyclable materials should be considered as an absolute minimum, but compostable would be preferential as they break down naturally. Recycling plastic containers can work, but the reality is that over 90% of plastic waste is not recycled (Parker, Plastic or Planet?). Even if they are recycled, our recycling technology is not good enough to boast anywhere even close to 100% efficiency. The best and only truly viable solution is to implement reusable products. Restaurants should have reusable options just like how most grocery stores are offering reusable bags.



Figure 9: Bamboo cutlery used at Pacific Poke

Recyclable alternatives are a step in the right direction from non-recyclable materials like Styrofoam, but there are much better options. Biodegradable containers break down naturally and do not significantly harm animals that ingest them. There are two main types of biodegradable containers: paper and compostable. Paper products can be made from recycled materials, but have a worse impact in production because significant amounts of CO₂ are produced when making paper products, and the chemicals needed to make them impose significant damages to the environment (Spec's Waste Committee). Compostable products can be made from a variety of materials like plants, starch-based materials, bagasse, or microbial source materials. These have the least environmental impact of any material, but they unfortunately cost the most. It is hopeful that the cost of these products will be substantially reduced in the future so companies will be able to save money while simultaneously protecting nature.



Figure 10: Compostable plates, bowls, cups, and cutlery all made from bagasse

With reusable containers, it is important to note that if a reusable container is only used once or twice, it is generally worse than using a single-use container because the reusable container is made from heavier materials in order to last longer. The Costco or Ikea bags are a good example of this; each bag takes probably 50 times the plastic to make compared to a standard plastic grocery bag, so the bag must be repeatedly used to be considered environmentally friendly. Plastic may actually be a better option in some cases because it is substantially more durable than cardboard and can last for many more uses than a paper or cardboard substitute (Carbon Commentary). Alternatively, the material may not necessarily be better just because it is biodegradable. Compostable materials, unlike paper, require oxygen to break down and so cannot biodegrade when they are buried in landfills. Although all of these factors are limitations of reusable containers, the benefits far outweigh the restrictions.

A reusable plastic container is more expensive and uses more plastic if it is only used once, but upon reuse it is a much better option. Utilized correctly, multi-use plastics produce the least amount of CO₂ and dump the least amount of waste into the oceans. However, one issue with reusability is feasibility and availability – mass adoption is required to reap the benefits. If UBC standardized the reusable containers to be used at all food vendors, the cost, waste, and pollution would drop considerably. UBC could implement a deposit system where the customer pays a deposit when they buy food for takeout, and they would get that money back when they return the takeout container.



Figure 11: Reusable containers from the University of Connecticut; discounts are provided from use

Cost comparison

For cost savings this report will focus on takeout containers as they are the majority of plastic waste at food vendors, and they have the largest cost associated with them. There are a few main materials used for takeout containers: Styrofoam, single-use plastic, reusable plastic, and single-use paper. It is an unfortunate reality that a better compostable material is not currently available on the market for a feasible price. In figure 12 it is shown that the cheapest option is Styrofoam by far, with single-use plastic and paper being about the same in second place, and reusable plastic being the most expensive. Styrofoam is not a viable option as it is banned by use at UBC due to its tendency to not be able to be composted or recycled. Reusable plastic differs from single-use plastic because it is made from thicker material to provide better durability. From figure 12 it is clear that single-use paper containers are approximately the same price as single-use plastic, and because of this, there is no reason to be using a non-compostable material.

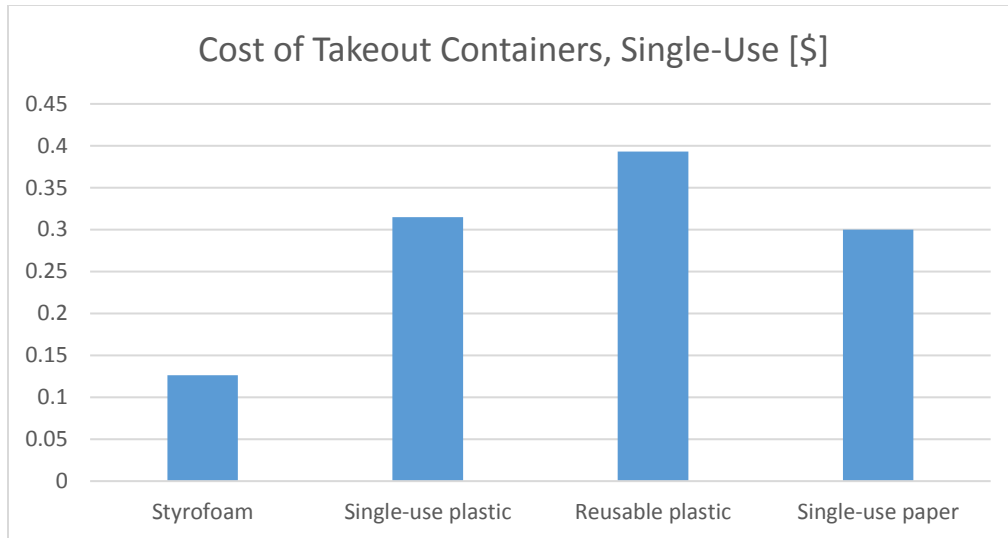


Figure 12: Cost of takeout containers by material

The best choice from single-use plastic, multi-use plastic, Styrofoam, or single-use biodegradable takeout containers is to use multi-use containers. Every additional use that a reusable container gets drops the cost when compared to a single-use container, and reduces the amount of plastic required per use. A reusable container only has to be used one additional time in order to be cheaper and more eco-friendly than a recyclable single-use plastic container or a biodegradable single-use paper container, and it only has to be used four times in order to lower its cost per use below that of a Styrofoam container.

Best alternatives

This report recommends that the most eco-friendly and cost-effective solution is introducing common, reusable food items across UBC. Multi-use takeout containers could be supplied by and returned to any food vendor, and UBC can implement a deposit system that can ensure customers return these containers after use. Because they will be reused, this will lower the cost of business while reducing the environmental impact. This solution is by far the most eco-friendly and cost-effective method to reducing the prevalence of single-use plastics at UBC food vendors.

For the other food items, like cutlery, straws, and cups, similar alternatives can be provided. For in-house dining, metal cutlery and plastic cups can be provided. For takeout, food vendors can provide the food in reusable containers but forego the cutlery as most customers already have cutlery in their homes. Vendors providing hot and cold beverages can encourage customers to use reusable cups with discounts, or by implementing an environmental tax when disposable cups are provided. Switching all single-use items to disposable ones is the key for minimal environmental impact and the lowest cost.

Conclusion and Recommendations

Summary and interpretation of findings

Food vendors at UBC are the cause of a considerable amount of plastic waste, providing the means to put thousands of kilograms of plastic per year into landfills. There are places like Agora Café which are plastic-free, but other eateries like Bento Sushi provide about 8000kg of plastic to customers every year, and it is up to the customer to either recycle the containers or send them to landfills. There are many food item options for food vendors to consider. These options include:

- Single use recyclable
- Single use biodegradable
- Single use non-recyclable and non-biodegradable
- Multi-use recyclable

The best solution is multi-use items. Metal cutlery, ceramic plates and bowls, and thick plastic reusable takeout containers are all good examples that will reduce the environmental impact and cost of eating at food vendors. Implementing multi-use items for cups, bowls, takeout containers, and other food items will reduce both the vendor's environmental impact and their expenditures.

Recommendations

It may seem counter-intuitive to implement thicker plastic containers at food vendors, but these reusable containers are not only cheaper, but generate less CO₂, require less energy to produce, and overall have a lower negative environmental impact than any other type of container after being used only four times. To ensure that these containers are reused, a deposit system can be implemented much like how beverage cans can be returned for credit.

For replacing other single-use items, cutlery can be replaced with metal cutlery in-house and vendors can simply rely on customers to have their own cutlery at home and not supply them. Reusable cups can be encouraged, and discounts can be provided when customers bring their own.

Food vendors will be happy to make these changes as it will save them money, and UBC can advertise itself as being a more eco-friendly community. Implementing standardized plastic takeout containers across UBC campus will reduce the negative environmental impact that UBC food vendors have and could establish a model for other universities and cities to copy.

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Appendix B: Survey

Single-use plastic usage for UBC food vendor _____

Hi, I am an undergraduate student at UBC tasked with a technical writing project. This survey is intended to collect data for a report that aims to reduce plastic waste at UBC food vendors. The report will be addressed to all owners of UBC food vendors on UBC campus. The data from this survey will provide me with the amount of plastic waste that each vendor produces per year so I can suggest alternatives that will reduce that amount. This survey contains tabular values to fill out based on what kind of plastic disposable items are used. Your response is voluntary and personally anonymous, but your answers will be linked to the food vendor you represent. Thank you for taking the time to take this survey.

Takeout containers

- Material: _____
- Recyclability: _____
- Cost: _____

Cutlery

- Material: _____
- Recyclability: _____
- Cost: _____

Cups

- Material: _____
- Recyclability: _____
- Cost: _____

Straws

- Material: _____
- Recyclability: _____
- Cost: _____

Plates/bowls

- Material: _____
- Recyclability: _____
- Cost: _____

Other

- Type: _____
- Material: _____
- Recyclability: _____
- Cost: _____

Appendix C: Data

Data interpretation:

- Plastic non-recyclable – plastic items without a recyclable symbol on them
- Plastic recyclable – plastic items with a recyclable symbol on them
- Plastic reusable – plastic items intended for multiple uses
- Biodegradable – items made of paper, wood, bamboo, avocado, etc
- N/A – food vendor does not offer this product

Table 1: Data acquired on single use food items at Agora Cafe

Agora Café	Straws	Hot cups	Cold cups	Cutlery	Chopsticks	Plates	Bowls	Food bags	Ramekins	Takeout boxes	Takeout bags
Plastic non-recyclable											
Plastic recyclable											
Plastic reusable											
Biodegradable		X	X	X			X	X		X	
N/A	X				X	X			X		X

Table 2: Data acquired on single use food items at Pacific Poke

Pacific Poké	Straws	Hot cups	Cold cups	Cutlery	Chopsticks	Plates	Bowls	Food bags	Ramekins	Takeout boxes	Takeout bags
Plastic non-recyclable											
Plastic recyclable							X		X	X	
Plastic reusable											
Biodegradable				X	X						
N/A	X	X	X			X		X			X

Table 3: Data acquired on single use food items at Starbucks

Starbucks	Straws	Hot cups	Cold cups	Cutlery	Chopsticks	Plates	Bowls	Food bags	Ramekins	Takeout boxes	Takeout bags
Plastic non-recyclable	X			X							X
Plastic recyclable		X	X						X		
Plastic reusable											
Biodegradable		X		X				X			
N/A					X	X	X			X	

Table 4: Data acquired on single use food items at Ike's Cafe

Ike's Café	Straws	Hot cups	Cold cups	Cutlery	Chopsticks	Plates	Bowls	Food bags	Ramekins	Takeout boxes	Takeout bags
Plastic non-recyclable	X										
Plastic recyclable									X	X	
Plastic reusable											
Biodegradable		X		X				X			
N/A			X		X	X	X				X

Table 5: Data acquired on single use food items at Bento Sushi

Bento Sushi	Straws	Hot cups	Cold cups	Cutlery	Chopsticks	Plates	Bowls	Food bags	Ramekins	Takeout boxes	Takeout bags
Plastic non-recyclable				X	X						X
Plastic recyclable							X		X	X	
Plastic reusable											
Biodegradable					X						
N/A	X	X	X			X		X			

Table 6: Estimated patrons per year and estimated usage per patron per visit

	Bento Sushi	Ike's café	Pacific Poke	Agora café
Hours opened/week	60	84.5	45	27.5
Yearly hours open minus stats	3000	4225	2250	1375
Yearly patrons	60000	84500	45000	27500
Straws	0	0.2	0	0
Hot cups	0	0	0	0
Cold cups	0	0	0	0
Cutlery	0.2	0	0	0
Chopsticks	1	0	0.8	0
Plates	0	0	0	0
Bowls	0.5	0.2	0	0
Food bags	0	0	0	0
Ramekins	2	0.5	0.5	0
Takeout boxes	2	0.5	1	0
Takeout bags	1	0	0	0

Table 7: Plastic weight per item and total yearly plastic consumption per food vendor

	Plastic weight [kg]	Bento Sushi	Ike's café	Pacific Poke	Agora café
Straws	0.002	0	33.8	0	0
Hot cups	0	0	0	0	0
Cold cups	0.03	0	0	0	0
Cutlery	0.008	96	0	0	0
Chopsticks	0.001	60	0	36	0
Plates	0	0	0	0	0
Bowls	0.025	750	422.5	0	0
Food bags	0	0	0	0	0
Ramekins	0.004	480	169	90	0
Takeout boxes	0.055	6600	2323.75	2475	0
Takeout bags	0.001	60	0	0	0

Table 8: Total yearly plastic usage per food vendor, in kilograms

Bento Sushi	Ike's café	Pacific Poke	Agora café
8046	2949.05	2601	0

Table 9: Comparison of costs of equal sized takeout containers made from different materials

Container material	Box quantity	Box price	Unit price	Citation
Styrofoam	150	18.95	0.1263333	(Supply Box)
Single-use plastic	200	62.95	0.31475	(Supply Box)
Reusable plastic	150	58.99	0.3932667	(Supply Box)
Single-use paper	200	59.99	0.29995	(Supply Box)