Plastic-Free Skidmore? A Feasibility of Reducing the Purchasing and Use of Single-Use Plastics on Skidmore College's Campus

Abstract:

Our year-long research investigated the feasibility of Skidmore College becoming a plastic-free campus, in collaboration with student interns working with the non-profit OCEANA. There has not been a plastics-free analysis of Skidmore college's campus, which we found to be surprising. We looked at the current distribution of single-use plastics by vending operations and Dining Services and determined whether or not Skidmore could reduce and replace these items with sustainable alternatives in a typical (non-COVID) year. After doing a literature review of the global implications and impacts of plastics, we conducted action and archival research on campus, such as participating in a plastic clean up and discussion, as well as studying a dining hall invoice and calculating per-item costs of several commonly-used plastic items. We also conducted semi-structured interviews with the larger college community and regional stakeholders, and distributed a college campus survey to over 210 respondents to gauge student perceptions about single-use plastics on campus. Overall, we determined that going plastics-free would provide multiple positive benefits for Skidmore College, including positive optics, economic savings of $115-175 per 1000 uses per item replaced with alternatives, and positive contributions to regional waste management and Skidmore's Sustainability goals. This transition is supported by Skidmore's Student Government Association, which passed a plastics-free resolution to help reduce single-use plastics on campus. We conclude by suggesting several recommendations that the college can adopt, such as having plastics items by request only, implementing the Sustainability Office's *Sustainable Workplace Initiative*--which is currently being drafted--replacing single-use items with compostable, wooden, and/or reusable alternatives, and continued communication between campus community members. Further research and student support should be invested in the issue, as well as dialogue between all actors on campus, in order to prompt Skidmore to reduce its reliance on single-use plastics on campus.

TABLE OF CONTENTS

Page

1.) Introduction:

While most people are familiar with The 3 R's: Reduce, Reuse, and Recycle, recycling is often considered the last option, although at times, feels like the only option---which is why the practice is broken in the United States. In the 1990's, China was bringing cargo ships into the US with goods for sale, and empty plastic water bottles were loaded onto returning cargo ships and thus, the U.S. recycling market expanded. However, in 2018, China's economy evolved and instituted a new plan called the *National Sword*: only purchasing spotless plastic items, perfectly sorted, and accepting 24 fewer types of materials. The recycling market shriveled up, and negatively impacted U.S. recycling markets. The fossil fuel industry is losing a tremendous amount of market share thanks to the emergence and increasing prevalence of renewable energy sources. Now, the fossil fuel industry has resorted to Plan B: copious plastic production, followed by melting plastics and turning them into fuel (Beyond Plastics, 2020).

Plastic is the salvation of the fossil fuel industry. Regaining and maximizing profit within the fossil fuel industry means nothing more than changing the polluting vessel; instead of fueling cars, like other fossil fuel consumptive things, the fossil fuel industry is turning fossil fuels into single-use plastic. A larger problem persists: single-use plastic remains pervasive and degrades human and environmental health. Thus, we encounter a resolution to the daunting question: What is the efficacy of individual action and productivity of collective consciousness? If collective demand can influence and ultimately change the polluting vessel (from vehicle fuel to single-use plastics), we can assume a similar response from the fossil fuel industry when we reject the consumption of single-use plastics. If the fossil fuel industry sustains, what will the next polluting vessel be changed to? Will the response be more elusive and less tangible? Will the market for single-use plastics shrivel up? Before we can answer these questions, we must create the conditions for a reality that prompts such considerations on Skidmore's campus. Increased individual awareness on campus among students, staff, and professors can facilitate pro-environmental behavior on and off campus. Skidmore's collective consciousness behind the plastics-free initiative does not exist inside a vacuum; it's origins are derived from the institutional scale. Colleges and universities around the nation have catalyzed this initiative, and their existence inspires institutions like Skidmore. Institutions are composed of constituents that should take advantage of their capacity to pressure elected officials. Congressmen are aware of anti-plastics bills (see *Break Free From Plastics* bill), and a loud voice paired with decisive, strategic actions is the advocacy that is the key in the democratic process to push legislation.

While our qualitative Action Research focuses on plastics reduction and disposal on college campuses, it is important to understand the broader arena within which plastics production and disposal operates. Since the 1950s, plastic pollution and its proper disposal have been problems that have affected the environment, economics, politics, and society. "Plastic is an inexpensive, plentiful, and versatile man-made organic compound that has grown rapidly in terms of the production and consumption of goods since the 1950s..." (Geyer, Lambeck & Lavender, 2017, p.1). When plastic production took off in the 1950s, it was seen as an opportunity for growth, development, and convenience for the producer and consumer alike. Plastic promised to be cheap, durable, and versatile material that could simply be used and disposed of without second thought. However, as plastic has become more prevalent, the attributes that once made it seem so attractive have posed long-term consequences; because it is not a natural material and is designed to be durable, plastic does not decompose easily. Now, microplastics have been found in almost every corner of the planet, contributing to the

destruction of ecosystems, food chains, and species. Every single piece of plastic produced still exists on Earth.

Since 1967, global plastic production has risen from around 2m tonnes a year to 380m tonnes (Geyer, 2017). Figure 1 shows global primary plastics production (in millions metric tons) according to industrial use sector from 1950 to 2015. Figure 2 is a representation of global primary plastics waste generation (in million metric tons) according to industrial use sector from 1950 to 2015.

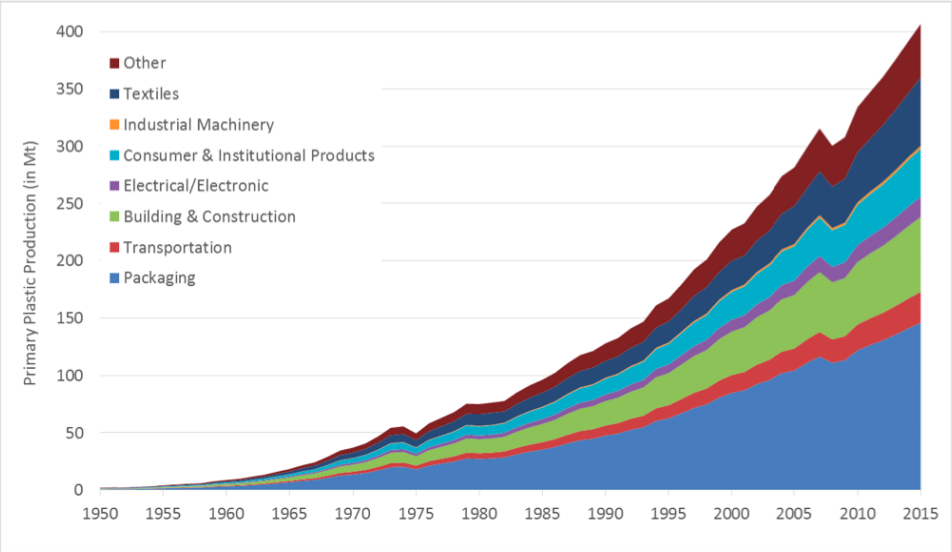

Figure 1: Global primary plastics production (in millions metric tons) by industrial use sector from 1950 to 2015

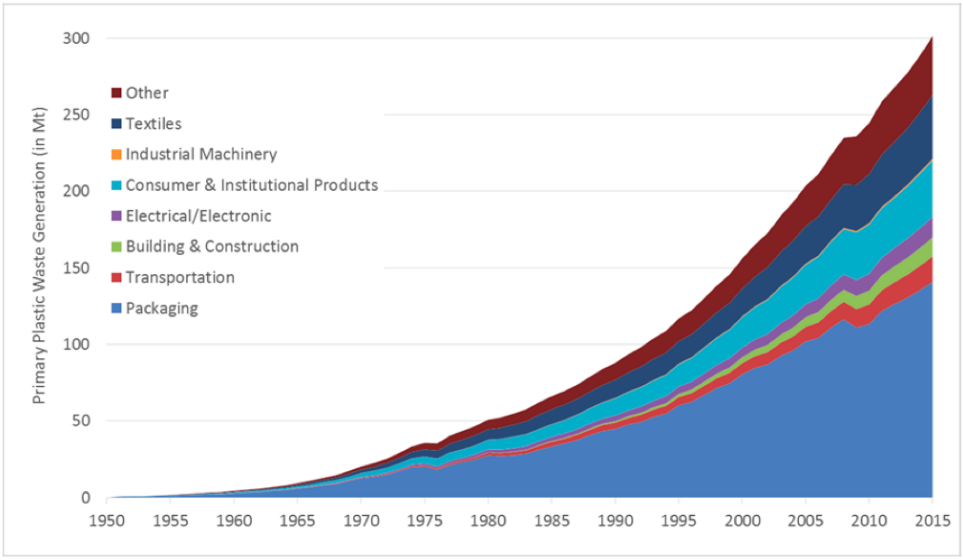

Figure 2: Global primary plastics

waste generation (in million metric tons) by industrial use sector from 1950 to 2015.

Unfortunately, of the 6.3bn tonnes of plastic waste produced since the 1950's, only 9% has been recycled and another 12% incinerated; the rest has been landfilled or scattered throughout the oceans and natural environment. Often, as with disposable coffee cups, drink bottles, plastic wrappers, plastic utensils, and other packets that account for much of the plastic produced in Europe and America, are used for one-off indulgence (single-use plastics). In normal conditions, plastic simply accumulates in the environment, much as carbon dioxide does in the atmosphere. The oceans have been identified as a common pool resource that are susceptible to degradation and over exploitation. In our modern "plastic era" plastic debris in the marine environment has become as much a "commons" and a "tragedy" as is the very oceans they reside in. It is now estimated that 8,300 metric tons of plastic have been produced by humans since the 1950s, and if these rates continue, 12,000 metric tons will be in the natural environment by 2050 (Geyer et al., 2017). 80% of plastic in oceans is sourced from litter, and currently only 8.5% of plastic in the United States is recycled. In the next 8 - 9 years, there will be one pound of plastic for every three pounds of fish in the oceans. Plastic waste can have a negative effect on people, animals, and ecosystems. When plastic waste ends up in the oceans, marine wildlife suffer, and there is an annual death of more than 100,000 marine mammals and turtles and 1 million sea birds (Surfers Against Sewage, 2020). When sea creatures die and suffer from plastic waste, this inevitably rises up the food chain to impact humans. This catastrophe is an environmental, economic, and ethical dilemma: What will happen to the communities that rely heavily on fish as their exclusive food source? Solutions to managing the tragedy of plastic pollution, as any commons, are multifaceted requiring a mixture of regulation, economic/market and community-based efforts. They range from local community efforts to global actions.

As discussed above, plastic waste and its disposal and recycling is a problem, and "...plastic waste exports have flowed from affluent OECD countries to poorer East Asian and Pacific nations, who received 70% of OECD plastic waste in 2016" (Brooks, Wang & Jambeck , 2018, p.1). Developing countries are plagued with plastic waste, which contributes to a systematically unfair and unsustainable system of waste accumulation and treatment. Policies to combat this unfair distribution of plastic waste have been created, but more needs to be done. For instance, in 2017, China, one of the countries which receives the most plastic waste from other countries, banned imported plastic from nonindustrial sources (municipal waste). At that point, many countries, such as the United States, needed to find alternative ways to sell and recycle their plastic waste.

Until businesses and governments are held accountable for the plastic waste crisis, the burden lies on everyday humans to change the single use plastic mentality. A not-in-my-backyard (NIMBY) attitude exists among the human population. Attitudes like this only exacerbate the plastic waste problem because even though the plastic waste may not be in someone's "backyard," the waste is still somewhere on Earth and having a lasting negative impact. Public support runs generally high for this apolitical environmental issue. Risk perceptions can be improved by greater stakeholder involvement and utilization of citizen science and thereby improve the foundation for timely and efficient societal measure (Syberg, 2015).

When the Chinese Government's National Sword policy was passed in 2018, it impacted the US on the federal, state, and regional level. What is the fate of a plastic after it meets a recycling bin? Hint: not new bottles. Peculiarly, plastics are made into things like fleece and sleeping bags after the fact, but only after scrambling US recycling markets searched for alternative markets to occupy. A low-cost input and an output that could retail for dozens of times more, this helps explain the power of the recycling market. When the National Sword was signed into legislation, the recycling market crippled virtually overnight. Recycling plants located in the US now had no vendor to purchase the piled plastic, faced with dealing with the heaps of plastic on their own. This yielded horrifying sights: boats full of plastics drifting around the Pacific waiting for a place to dump it, landfills at overcapacity. If the balance of the recycling market can be so easily disturbed and for the effects to translate into human wellbeing/environmental concerns suggests that we code less to recycling as a tool for mitigating CO2 emissions.

We remain reliant on incrementalism, but it is being weaponized to stifle progressiveness. How can incrementalism be more efficient on the mitigation approach? We see the massive collection of plastic floating off the coast of California, met with the news title "A teenager's plan to trawl for plastic in the Pacific becomes reality" (The Economist, 2018, p.1). This teens project is an extraordinary example of innovation, yet as stewards of our Earth's physical condition, we face a dilemma when we hear about civic efforts of sustainability and environmentalism. This innovation serves as an excellent medium for environmental education in media; something adults rarely receive or seek out in comparison to their reliance on the Earth's resources. This innovation could be developed to maximize productivity. It instills hope into US citizens that issues as large as climate change effects can be challenged in a boots-on-the-ground way. Even better, this innovation will clear some of the plastic out of the Pacific and relieve the affected aquatic ecosystems of some external pollution pressures. Yet, how efficient can this strategy be if the rate of oceans' plastic input exceeds the rate of point-source collection?

Mitigatory legislation is quite literally compared to the "upstream approach," closely monitoring the problem at the source. Adaptation is reliant on the negative externalities being relatively reliable, controllable, and for combative resources to be stable and plentiful. We understand that there are many implications to reducing plastic production, specifically in relation to the economy. Amidst a lot of sad news, there's a glimmer of light -- there's a very strong new federal bill that could begin to address our plastic pollution crisis in the U.S: The Break Free From Plastic Pollution Act (SB 3263/ HR 5845) is considered to be the gold standard of federal legislation to make meaningful reductions in the amount of plastic pollution in the U.S. This policy proposal pushes for: a circular model to shift the responsibility from local governments to the producers, a national container deposit with a ten-cent national refund for all beverage containers, a ban on export of plastic waste to OECD countries, and a pause on new plastic facilities while federal updates regulations. (Beyond Plastics, 2020).

2.) Purpose Statement:

In addition to the mitigation and adaptation approaches mentioned above, students in colleges across the United States are taking action to decrease single-use plastic purchasing and usage, such as in Haverford, Middlebury, and Wesleyan College in order to decrease plastic

production and demand. Oceana, a national nonprofit organization in the U.S., is attempting to help reduce plastic waste in oceans by promoting plastic-free movements across the country, such as the Break Free from Plastics Pledge (Oceana, 2020).

The purpose of this qualitative Action Research is to better understand the social, political, and economic feasibility of Skidmore banning or reducing the prevalence of single-use plastics on campus. Our research also works to better understand if having Skidmore College go "plastic-free" would offer a variety of other benefits, none of which are exclusive or limited to Skidmore College's campus and property itself. Further, our research hopes to present these outcomes to Skidmore College and the community so that possibly, new policies and procedures can be realized, in order to bolster campus sustainability initiatives in relation to procurement and the management of plastic solid waste.

2.1 Arguments for Single Use Plastics Reduction: Sustainability and Human Health

Changes in purchasing and the extent of use of single-use plastics by Skidmore College could possibly make the college campus a more sustainable enterprise, as it would be reducing a large component of worldwide waste streams. Plastic material specifically makes up a sizable part of the municipal solid waste stream in the United States, an estimate being 10% by mass (Barnes, 2009). However, this number is probably much higher, due to a higher use of plastic materials used for packaging in recent years, in addition to increases in the number of plastic bags and single-use items as a result of safety precautions for COVID-19. Additionally, while plastics make up only a small portion of the entire waste stream in weight, they take up a large portion in volume (Thompson, 2009). Therefore, shifting from single-use plastics to reusable containers, bags, etc. would not only reduce the amount of municipal solid waste being generated on campus and in traditional waste streams, but it would contribute to the campus sustainability goals by adding more reusable and multi-use materials to campus.

On the other hand, reducing the amount of plastics used by Skidmore College would greatly contribute to improving local environmental and human health, as well as larger environmental systems, such as the world's oceans. Plastic contamination of natural environments can be found across a wide range of terrestrial and aquatic ecosystems. Plastics have long lifespans, are persistent in their environments, provide vehicles for invasive species, break down into microplastics, and can attract other pollutants as they decompose (Barnes, 2009; Oceana, 2020; Thompson, 2009). Most of these plastics end up in the world's oceans and shores, in some cases making up 50–80% of all the oceans' and shorelines' waste (Barnes, 2009). As plastics degrade and make their way into bodies of water and the world's oceans, they float, are washed ashore, and are in either case eaten by fish and other aquatic animals, causing various injuries, health complications, and death to wildlife (Barnes, 2009: Thompson, 2009; Zaman, 2011). In addition to the harm this causes these organisms, the plastic they have ingested bioaccumulates in their bodies and tissues, working its way up the food chain until it reaches humans in highly concentrated forms (Zaman, 2011). Plastic production and pollution have a wide variety of known and unknown adverse health effects on humans. Toxic chemicals such as Phthalates and Bisphenol A (BPA) can leach from plastics, such as bottles and other food-grade plastic containers. These toxins have been linked to human health complications such as testicular, prostate, and breast cancers, potential neurological disorders, premature and still-born births, and other birth defects (Zaman, 2011; Thompson, 2009). Subsequently, reducing the

college's use of these plastics will, in turn, reduce the amount of plastic pollution and detrimental health effects that impact human and natural environments.

2.2 Economic Benefits:

Shifting to reusable containers and discarding single-use plastics can potentially have a large effect on the College's finances and make economic sense. By running cost-benefit analyses of single-use plastics vs multi-use alternatives for Skidmore College at multiple levels, it is possible to determine if Skidmore College can save money by switching to alternatives. In addition to the sheer amount of plastics used on campus, and the plastic waste that Skidmore accumulates, the current fulfilment economy promises to generate more plastic waste and increase costs for waste disposal. Therefore, switching away from this waste and economy could have positive financial benefits in the future (both short and long-term). According to Langloss, this can be used not only as incentive for investment into reusables, but also the saved money can be funneled in other projects, such as financial aid or work-study programs, among others. As a result, potential savings from ending purchases of single-use plastics can be used to benefit multiple programs in, around, and off campus (personal communication, October 1, 2020).

Meanwhile, shifting away from single-use plastics has the additional advantage of ending Skidmore's reliance on an unsustainable and unstable technology and market. From a production standpoint, limited fossil fuel reserves, landfill capacity, and single/short use of plastics makes the continued use of plastics in their current capacity unsustainable and non-perpetual (Thompson, 2009). Additionally, with the recent import restrictions of China, (one of the world's largest plastic waste importers and recyclers), on the recycling market, it is estimated that 111 million metric tons of plastic waste will be displaced by 2030 (Brooks et al., 2018.) Continuing to rely on this non-marketable product can have dire economic consequences in the long-run, and it is best that Skidmore, along with other colleges that have already done so, consider reducing or ending the purchasing and use of plastic in light of these policies.

2.3 Local Policy Impacts and Changes:

Whereas part of our project and research is directed to better understand the benefits to Skidmore College itself, our research works in partnership with OCEANA, to direct local policy towards removing plastics to help the environment (Oceana, 2020; B. Langloss, personal communication, October 1, 2020). If Skidmore College goes plastic-free, then it will have a large impact on plastic purchasing and management policies for other colleges and civil society organizations, and has the potential for other constituents to also go "plastic-free." This includes other colleges and school districts that have not, or have partially implemented plastic-free campus initiatives, as well as local businesses and municipalities. Additionally, Skidmore has a large amount of influence on the NY-21 Congressional District. Having the College go plastic free would potentially help to support bipartisan agreement on policies that work to reduce plastic and use in NY state and beyond. Lily Feldman and Brian from Oceana are both working on a plastic campaign which involves Skidmore college. Their campaign and our research will be combined to produce information on whether Skidmore College can go plastic free.

3.) Literature Review:

Both before and during our capstone project, we researched numerous articles, findings, and journal articles that detailed the extent of research into the global plastics abundance

problems on the environment, global health, and the impacts of COVID-19 on the plastics problem. Furthermore, we looked at various campus initiatives that have been done in the past in order to reduce their reliance on plastic products, to varying degrees of success. In compiling an extensive literature review, we can acknowledge previous work that has been done in these areas, address their findings, and state with purpose what it is we hope to add to the existing body of literature by completing our capstone research project.

3.1 Global Plastics Abundance and Environmental Health:

Barnes' "Accumulation and Fragmentation of Plastic Debris in Global Environments" (2009) is an often-cited text that provides a key background to the global plastics problem. This paper details the effect of plastics on global environments, mainly aquatic, ocean, and coastal areas, opening up with the line:

> "One of the most ubiquitous and long-lasting recent changes to the surface of our planet is the accumulation and fragmentation of plastics. Within just a few decades since mass production of plastic products commenced in the 1950s, plastic debris has accumulated in terrestrial environments, in the open ocean, on shorelines of even the most remote islands and in the deep sea" (Barnes, 2009, p.1985).

In addition to this research, it also examines the general characteristics of waste streams and disposal, as well as describing the abundance of plastics in waste streams. The paper looks mainly at the US, having determined that it is difficult to determine types and content of waste streams in other countries. The paper uses various published data, as well as surveys and observations in order to reach its data conclusions and present new data questions. Overall, this paper provides a good background into the general problems of waste management and generation, as well as abundance of plastic in the United States' waste stream. Additionally, it provides the environmental and environmental health component to the argument as to why the use of (single-use) plastics is bad and should be banned or reduced, as it states that …we have made little progress in reducing the release of plastic to the environment (Barnes, 2009).

Building directly off the findings and argument of Barnes (2009) is Thompson's "Plastics, the Environment and Human Health: Current Consensus and Future Trends" (2009). This paper focuses on the environmental and human health effects, as well as the economic unsustainability of plastics. More specifically, it describes 7 focuses: "Plastics as materials; Accumulation of plastic waste in the natural environment; Effects of plastic debris in the environment and on wildlife; Effects on humans; Production, usage, disposal and waste management solutions; Biopolymers: degradable and biodegradable polymer solutions; and Policy measures" (Thompson, 2009, p.2153-2154).

Thompson (2009) provides a detailed background on the overall prevalence of plastics in environments around the world, and how this affects (marine) wildlife. Thompson also includes a note that plastics have the potential to leech toxic chemicals into the environment, which can have detrimental effects on wildlife as well as humans (p.2156-2159). Thompson includes various focuses on reducing plastic use, production, and reliance, such as the 5 R's of plastics (reduce, reuse, recycle, recovery, redesign), and solutions that utilize the public, industry, and policy. For example, the author calls for a redesigning of plastic packaging so that they are more efficient and use less plastics, are streamlined and are labeled in order to be made easier to recycle suggesting a "traffic light" system, where different plastics can be labeled with different colored dots to represent their recyclability (Thompson, 2009, p. 2160). Additionally, the paper

discusses the potential for future plastic policy, "emphasizing the need for policy relating to plastic to weigh societal and economic benefits against environmental and health concerns," (Thompson, 2009, p. 2163). Data for this paper was taken from other published sources and writings and compiled into this report.

Similar to Thompson (2009), Siracusa (2008) gives a background into the overproduction and abundance of plastics, but focuses mainly on advocating for biodegradable plastics. Siracusa et. al 2008 describe the bioplastics market, stating that "Bioplastics development is just beginning; until now it cover[s] approximately 5–10% of the current plastic market, about 50,000 t in Europe." (Siracusa, 2008, p.10). Siracusa argues that while not all biodegradables right now are compostable, nor are they made up of 100% renewable materials, fully biodegradable plastics would require less energy to dispose of than recycling regular plastics. Siracusa also states that bioplastics currently contain more than 50% by weight renewable resources, and claims that *in a 100% renewable system,* (emphasis added), composting plastics would also help grow new products that can be made into biodegradable/compostable plastics (Siracusa, 2008).

Geyer (2017) provides background to how detrimental the plastic problem is in terms of various statistics. Geyer calculates how much the global production of resins has increased over time, and provides a model for how long plastics are used before they reach the end of their lifetimes and are discarded and/or too degraded for use. The history of plastics and plastics production, plastic recycling, plastic incineration, and plastic discard rates are provided within the paper. Overall, Geyer concludes that disposing of plastic has been a problem since it was first invented, and it continues to be an issue which globally affects a huge proportion of people.

Brooks (2018) provides background of the negative impacts of plastic around the world. Over half of the plastic intended to be recycled ends up being exported globally. China has imported 45% of plastic waste since 1992 and recently put in place a policy which bans the importation of plastic waste in 2018. This is a problem that affects countries around the world (especially the US) as China has been the biggest buyer of recyclables and other plastic waste. Commodity trade data is used to illustrate the higher-income countries export plastic waste to lower-income countries. This information can be used to demonstrate the extent to which plastic is a global problem and offers ideas and actions for reducing nonrecyclable plastic, redesigning products, and funding domestic management which can mitigate plastic.

Zaman, author of "The Prevalence and Environmental Impact of Single-Use Plastic Products," takes a more specific look at the prevalence and harm of single-use plastics, (particularly packaging/container plastics,) in the environment and in human health (2010). The paper mostly talks about specific effects of toxins in these plastics have on human and animal health, and suggests the often-debated process of bioaccumulation of plastics in fishes reaching up the food chain towards humans. The paper also poses various alternatives and remedies to plastics, ranging from the general and specific "reduce reliance on plastics," to more specific "I.e. impose a tax on plastic products on businesses." (Zaman, 2011, p.5-6). The paper also calls for more research into certain fields like bioplastics and biodegradable plastics, and states that banning plastics would only be feasible after implementing several other prevalent plastic-reduction measures and alternatives (Zaman 2011, p.6-7).

3.2 Plastic in Politics

One of the largest areas of study in the global environmental plastic problem is in marine environment research; where most plastics end up. While discussed previously by authors such as Barnes (2009) and Thompson (2009), Whitehouse and Murkowski (2017) takes the approach that marine debris is one of the few environmental issues of the modern era that has broad bipartisan support for action in the United States Congress. The Environmental Caucus' made significant legislative progress in recent years, and in ocean data collection and monitoring. The Caucus brought these issues into the Save Our Seas Act, which the source names as a "truly bipartisan bill" it cosponsored with six other members of the Senate Oceans Caucus (Whitehouse and Murkowski, 2017).

At the time of this writing, the bill just passed the Senate Commerce, Science, and Transportation Committee unanimously and is heading to the floor for consideration. NOAA's Marine Debris Program already does essential work recovering fishing gear, 43 supporting cleanups, 44 and promoting the Works Committee. The wide support of this bill is understandable, considering how low-reaching the bill is. Part of Oceana's mission is to pass the competing plastics-reduction bill *Break Free From Plastic Pollution Act* (which upon partnership we have inherited as our own,) and it is important to understand the political landscape as we push our initiative towards the Republican NY-21 Congressional District, which will be essential for shifting larger plastic policy in and around Skidmore College.

Similar to Whitehouse and Murkowski, Northup's 2019 "Legislation to Reduce Microplastic Pollution: Understanding the Factors that Facilitated Passage of the Federal Microbead-free Waters Act of 2015" focuses on political action regarding the global plastics problem. Centered around the passage of the Microbead-free Waters Act of 2015, this study offers steps to policy negotiation under the general agreement that a plastic microbead ban was appropriate. The foremost topics of policy negotiation included 1. the definition of plastic microbead, 2. the timeframe for phasing out personal care products containing plastic microbeads, and 3. the preemption of state and local laws.

This study also analyzes the political factors at play during the consideration of the Microbead-free Waters Act of 2015, finding that despite a highly partisan political environment (including stark policy divides on environmental legislation), three political factors allowed the bill to pass rather quickly: stakeholder buy-in, bipartisan support stemming from shared interests to protect the health of the Great Lakes, and finally, sponsorship of the bill by the leadership of the committee of jurisdiction. Skidmore could replicate conditions to appeal to the same three aforementioned political factors. Initial bipartisanship followed by forward-moving incrementalism can lead to progressive policy, as portrayed by the Child Health Insurance Safety Net implemented from 1982–1997 (Flint, 2014).

Although it has been established that plastic pollution itself is viewed negatively by the two leading political parties in the US, discourse on policy solutions remains highly divided. Oftentimes, as depicted in a legislative meeting between Senator Lott and Vice President Al Gore, this division sometimes exists for reasons that do not seem pertinent to policy content. J.L. Hilley recounts this interaction in the journal "The challenge of legislation: Bipartisanship in a partisan world" (2008). Vice President Gore responded forcefully to Sen. Lott, stating that the

administration would insist on having financially solvent polluters pay the major share of cleaning up hazardous waste sites. This position was “anathema to most Republicans, who preferred to have the public pick up rather substantial costs of cleanup.” Representative Gephardt followed, insistent on keeping the peace and calling for “the regular order, including committee consideration” so as to prevent leadership-driven initiatives to end-run Congress (Hilley, 2008, p.32-33). We should prepare for the ideological disparities between Skidmore College/Saratoga Springs (Dem) and the NY-19 District (Rep) when considering the potential policy implementation following Skidmore’s plastic-free initiative.

The behavioral response of consumers--or lack thereof--elicited by the Portuguese plastic carrier bag tax is valuable to note. A study by Martinho et al. in 2017 provides research on plastic bag taxes which may be an option for Skidmore if they cannot go plastic free completely. The results demonstrated a reduction of plastic bag consumption and an increase of reusable plastic bags. However, the consumption of garbage bags increased. The tax had no effect on consumer’s perceptions of litter in the ocean or the negative impact of plastic bags, and instead the tax was agreed upon but also considered extra revenue to the State. The methods were face-to-face surveys conducted near shops, and some of the questions on the surveys may be useful to include in our surveys regarding plastic consumption. Consumers’ behavior is important because if consumers do not want to go plastic free, then it is difficult to go plastic free.

The intertwining of governments and markets is nothing new, but only in the past century have there been noted environmental externalities of this phenomenon. Wen et al.’s study on “Reverse logistics” (2010) looks exclusively at governments and enterprises that choose whether or not to engage in “reverse logistics” that is, reducing, reusing, recycling, repairing, and other operations that increase use, utility, and materials, with a focus on the Chinese economic system. The paper uses various figures and variables to describe the costs/benefits of governments choosing whether or not to punish or fine entrepreneurs, and whether or not those entrepreneurs choose to recycle. The conclusion is that with a higher potential fee or punishment for choosing not to recycle, more businesses will choose to recycle, and demonstrably, the number of fines/punishments enacted will decrease: “So the effective implementation of government laws and regulations can promote the recycle of products packaging” (Wen et al, 2010, p.4). In theory, if a large enough penalty or potential negative effect is held over participating parties, they can be encouraged to reduce plastic use with minimal actual enactment of those penalties.

3.3 Role of COVID-19

Silva (2020) writes, since COVID-19, an increase in single use plastics has occurred. At national and regional levels, plastic reduction has been disrupted by COVID-19. More than 40% of the total production of plastics are single use plastics (SUPs). Since July 2018, 127 countries implemented legislation which targeted SUPs. Bans, restrictions on the manufacture, production, importation, and retail distribution have been some of the policies enacted. Environmental taxes, waste disposal fees or charges, and extended producer responsibility measures are some other plastic reduction policies. However, since COVID-19, reusable containers and bags have brought concerns over cross contamination which have led to withdrawals of SUP bans and fees. Masks have been required in over 50 countries, and disposable masks have increased in production. Cleaning microfibre wipes, disposable feet protection, head caps and cuffs, protective plastic films have all increased in production to avoid contamination by air droplets. Redesigning

plastics and making them bio-based is one solution to the plastic problem during COVID-19. Reusable masks, bags, and other alternatives may lead to less plastic waste. Fees, taxes, and bans on SUPs should remain intact.

According to Hale (2020), single use plastics end up in aquatic ecosystems and result in wildlife mortalities. In medical facilities, single use plastics such as gowns, syringes, and gloves provide protection from infection. The debate between the virus can impact people from surfaces and whether the virus does not live on surfaces exists. Supporters of COVID-19 infecting others through the surfaces propose to lift restrictions on single use plastics because of the health and safety of others. Human-to-human contact would be more likely to spread the COVID-19 than infrequently handled reusable grocery bags, and paper bags is a solution which may be safer than single use plastic grocery bags.

Riccardo (2014) introduces a framework for the integrated design of a food packaging and food distribution network. A sustainable and efficient eco-design solution is provided and compared with traditional single use packaging. The remainder of the paper includes a literature review of studies on sustainability in packaging design and selection, includes a conceptual framework for designing food packages, includes analyzed scenarios and cost benefit analyses, and includes further research. The paper uses a life cycle assessment methodology to evaluate the carbon footprint of packages in the network. Sensitivity analysis is used to determine how drivers and parameters (RPC lifespan, washing rate, waste disposal treatment, network geography) change the environmental and economic impacts.

Ross and Evans (2003) provides a very in-depth view of the exact energy components and inputs that go into creating plastic-based food packaging. Taking a LCA of a type of plastic packaging used by Email Ltd, an Austrian Refrigerator company, the authors look at energy inputs (such as fossil fuels) and waste potential for the various components needed for the packaging, as well a proposed additional component that can be used to increase durability and reusability (high-impact polystyrene (HIPS)). The authors conclude that plastic-based packaging (as opposed to paper and other packaging) can have significant reductions in waste generation and overall energy inputs (more so with HIPS.) Additionally, recycling plastic products can reduce overall energy consumption, while reusing the products reduces this even more.

Similar to Ross and Evans (2003), Arena (2003) looks at plastics recycling in "Italian system of plastic packaging waste recycling, active until 2001, that collected and mechanically recycled the post-consumer PE and PET liquid containers." They worked with Italian Consortium for Packaging (CONAI) and other companies to analyze the effectiveness of this recycling program and system from an energy, environmental, and economic standpoint. Their findings discovered that at the minimum, half (and likely more) of the energy used to manufacture these plastics is recovered from recycling, making the program extremely environmental and cost-effective.

Arena (2003) discusses conventional methods of food packaging and other packaging products, and argues for the justification of recycling plastic containers. According to Arena, shrink-wrap plastic packaging and plastic as substitutes for other packaging is more efficient, overall uses less material, and can be recycled afterwards. While it does not seem to talk about reusing containers first, this can be complied with Ross and Evans to tote the value of recyclables/renewables on campus. However, it is important to note that the savings are more

"general," reflecting overall savings in energy and amount of material used in packaging, which is a benefit more likely to be experienced on the supply side, (like companies and manufacturers, that make these products) as opposed to the demand side, (like Skidmore College and other buyers).

3.4 Campus Initiatives

Miller (2011) provides key research into the use of plastic bags on (the University of Alabama's) college campuses. It details the Oxymoronic and Paradoxical views of plastic (bags), and cognitive dissonance (attitude vs behavior,) that are experienced by students and other members of the local community. Despite majority agreements that plastic bags are harmful and that reusables are good, most reusable bags are not utilized, and students continue to use plastic (bags), as they are too common to evoke a response (blend into the background), and is a more a matter of convenience, rather than not wanting to recycle. The research methods for this paper are well thought out, using IRB approved and edited surveys with a large body of campus, as well as observations in the local community. Research questions are well thought out and mirror our own (with a focus on just plastic bags as opposed to plastics in general), though with minimal initial thought to alternatives.

Choate et al. (2018) looks at the factors that determine plastic single-use water bottle usage at Allegheny College. Overall, the paper determines that simply banning plastic (water bottles) may not be enough for college campuses, since outside influences are always an issue. It instead calls for a (non-specific) multi-item agenda to reduce plastic waste, and cautions that there is no one-size-fits-all solution, such as programs aimed specifically towards certain behavioral changes. As for Allegheny College, the school provided incoming freshmen with large, stainless-steel water bottles, added more refill stations on campus, and increased public knowledge on the safety of tap water. Research was done via an IRB survey to students and members of the campus body, then run through various data analysis and algorithms to sort the data based on different test subject variables, such as class year.

Lopez (2019) details an initiative which included the school of forestry engineering and natural resources. Inventories of waste were characterized over a three year period. There were various activities students and faculty were encouraged to carry out such as challenge recording, skittles with plastic bottles, initiative presentation, and miscellaneous activities. The study showed it is possible to reduce single use plastic consumption and waste generators, equipment, and catering suppliers were important inclusions.

"Plastic free schools is a program that aims to measurably reduce plastic pollution on school campuses around the world, with a special focus on the reduction of elimination of plastic bottles, plastic straws and utensils, and plastic food packaging" (Plastic Pollution Coalition, 2017, p. 19). This manual provides important steps a college should take in order to go plastic free. It talks about going plastic free, campus and community infrastructure, taking action, next steps, education and outreach, and resources and support. With alternatives to single-use plastics, it mentions education as an alternative, refusing single-use items or providing upon request, encouraging reusable items, alternatives through procurement, and cross-disciplinary alternatives.

The project implemented by the Caradine-Taber study aims to reduce plastic waste of the Grab n' Go food service at St. Mary's College of Maryland by stopping the usage of plastic bags and by replacing plastic utensils with compostable wooden utensils. Although on a smaller campus scale compared to all of Skidmore going plastic-free, this study does not analyze the economic prospects of eliminating plastic from the university-setting. However, it does offer insights on the misleading biodegradability of PLA plastics (an alternative to single-use plastics) and the steep cost of this alternative (almost double the cost of petroleum-based products).

Marsh (2007) aligns the mission of a plastic-free initiative with that of the EPA. The EPA considers source reduction the best way to reduce the impact of solid waste on the environment because it encompasses using less packaging, designing products to last longer, and reusing products and materials. The study specifies ways that Skidmore could incorporate more of a regulatory approach (more upstream than the existing recycling program): the inclusion of lightweighting packaging materials, purchasing durable goods, purchasing larger sizes (which use less packaging per unit volume) or refillable containers, and selecting toxic-free products.

Berman (2015) states how single use plastic water bottles significantly contribute to the waste stream; Americans use approximately 50 billion plastic bottles each year, 38 billion of which end up in landfills (Berman, 2015). When compared with sugar-sweetened bottled beverages, single-use plastic water bottles provide a healthy alternative. "According to independent research by the Beverage Marketing Corporation, approximately 73% of the growth in bottled water consumption in recent years has come from those who previously drank caloric drinks, such as soft drinks, juices, and milks" (Berman, 2015, p.1). This study looked at how the removal of bottled water at the University of Vermont and the implementation of a minimum healthy beverage requirement affected the amount of bottled beverages purchased, the healthiness of the beverage choices, and calorie, total sugar, and added sugar consumption. Studying the impacts of plastic water bottles at a university campus is significant to our study. During the months of spring 2012, the control before changes occurred was at this time, beverage changes were changed to 30% healthy beverages in fall 2012, and bottled water was removed from drink options while keeping the 30% healthy beverage ratio in spring 2013. Between Spring 2012 and fall 2012, the number of bottles per capita shipped to the university campus did not change by a lot. When bottled water was banned, during fall 2012 and spring 2013, the per capita number of bottles shipped to campus increased significantly (Berman, 2015). Some bottled water consumers chose to buy sugar-sweetened beverages. The ban did not appear to decrease the number of single use plastic bottles entering the waste stream from the University of Vermont, and instead demonstrated how consumers' preferences add to their liquid calorie and added sugars consumption.

4.) Research Methods

Our qualitative case study action research is a collaboration with the non-profit organization Oceana, in partnership, to reduce the procurement and use of single-use plastics on the campus of Skidmore College. We chose the case study approach as we sought to understand people's lives, perspectives, contextual conditions, and multiple sources of evidence (Yin, 2011, p. 8). Action Research methods can be described as a collaborative approach "as a means to systematic action in an effort to resolve social and environmental conditions" (Creswell, 2003, p. 10). According to Berg (2004), "Action research is one of the few research approaches that embraces principles of participation, reflection, empowerment, and emancipation of people and

groups interested in improving their social situation or condition" (p. 195). Daymon and Holloway explain that action research is "develop[ing] best practice as well as contribut[ing] to new knowledge about professional communication" (p.111). We will be collaborating with Oceana and other stakeholders to understand the design of a plastic free campus and how a plastic free campus is perceived among students, administrators, and other interviewees.

Our research works to better understand the harms that single-use plastics cause on and off campus, and the extent to which economic and environmental benefits can be realized via "going plastic-free." Additionally, by working with Oceana, we were hoping to broaden our outreach to include the larger NY-21 Congressional District, peer and aspirant schools, and influence broader plastic policies at the municipal, district, county, and state levels.

Through source and method triangulation we have compiled our data into a feasibility report/executive summary that culminates in a suite of recommendations that Skidmore College can implement to go "plastic-free." Our discussion and recommendations explore the diversity of factors that currently serve as barriers to going plastic-free, the opinions and perceptions of students, faculty, staff, and college officials regarding making Skidmore College a plastic-free campus, a cost/benefit analysis of the college going plastic free, and easy first steps the college can take to start the initiative.

5.) Research Questions

Five overarching research questions guided this qualitative case study action Research effort:

1. To what extent can Skidmore College reduce its reliance on single-use plastics?

    This is a question that needs to be considered holistically. Our research explored Skidmore College's capabilities based on existing student/administrative needs, campus infrastructure, Skidmore's relationships with Casella and the plastic supplier/s, and finances. This question could be reevaluated/reconsidered on an annual basis to sustain pressure on campus to embrace stronger sustainability initiatives. Apart from Skidmore's **ability** to go plastic free, our research analyzes Skidmore's **willingness** to go plastic free, as well as student demand and preferences.

2. What social and economic factors currently inhibit the college's ability to go single-use plastic-free?

    We hypothesized that these factors might include, but are not limited to: Skidmore's path dependency (the prospect that Skidmore's only history has included plastics; the administration might face difficulty in considering/implementing sweeping policy change), student behavior/culture (unwillingness/inability to change/lack of interest), and financial concerns (cost of alternatives being more expensive than single-use plastics).

3. To what extent can alternatives to single-use plastics be implemented?

For this research question we will specifically orient our data collection around existing literature concerning the safety of reusables (and other alternatives to recyclable/single-use plastics) during the COVID-19 Pandemic.

4. What are the student and administration's opinions in relation to making Skidmore College a plastic free campus?

This question helped us to better understand the initial limitations regarding recommended implementation of the proposed initiative. On the basis of opinions: we will determine where education can be improved on campus, where campus culture can be changed, and how to market/present the initiative to students and administration so as to best appeal to existing perspectives and attitudes.

5. What is the cost/benefit to going plastic free, and where can cost savings be realized and reinvested?

This question is the economic lens that was utilized during our data collection, analysis, recommendations, and conclusions, and a lens through which many environmental initiatives are considered. Cost benefit analysis is an objective, easily translatable consideration supported by Oceana.

6.) Research Respondents and Setting

Our research engaged primarily with the student body, faculty, and staff on Skidmore College's Campus, to capture the respondents that most likely contribute to plastic procurement and use on campus. Off-campus students that physically visited the campus were also included. It was important to collect data from students, as they are the largest of the respondent groups, and are likely the biggest contributors to single-use plastics waste on campus. Additionally, students primarily contribute to, and make up the College culture, which is a key component to analyze and break down for the purposes of this research. They will also be instrumental in voicing further support or momentum for plastic reductions efforts on campus. Faculty, staff, and administrators were also key respondents, as they (directly or indirectly) set and uphold the college's policy in relation to procurement and use of single-use plastic objects. Finally, we contacted a local business and other colleges with similar plastics-reduction initiatives in order to get a better understanding of alternative product implementation, as well as insights into what recommendations should be proposed to Skidmore.

7.) Qualitative Instrumentation and Sampling Techniques

Our case study action research triangulated data collection methods via an online Qualtrics survey, four semi-structured interviews, archival research, and action research methodology, as detailed below.

<u>7.1 Surveys</u>

We created an online Qualtrics survey consisting of 21 questions to obtain the attitudes of Skidmore students, faculty, and staff towards a plastic free campus. This survey was distributed using a purposive sampling method to a core audience of Skidmore students, faculty, and staff across the student body and advertised via email across class lists, weekly bulletins, posters, and

social media, including Facebook, and Instagram. Campus community members responding to the online survey were entered into a raffle for gift cards as an incentive. Out of all survey recipients, we received a total of 210 responses.

7.2 Semi-Structured Interviews and Focus Groups

Semi-structured interviews consisted of approximately four items and took an average 60 minutes to complete. Interview respondents included Young Grguras, from the Post Landfill Action Network; Karina Berkley, a student activist from George Washington University; Jen Natyzak and Levi Rogers, from Skidmore's Sustainability Office; and Charlie Uras, owner of the Barrelhouse Restaurant in Saratoga Springs, New York. Semi-structured interviews were conducted online (via Zoom), in-person, and over the phone, and recorded using a digital voice recorder.

7.3 Action Research

We conducted a plastic waste cleanup in coordination with Oceana's on-campus intern, Lily Feldman. This effort worked to gather physical data in relation to locations of plastic waste on campus. We wrote notes on trace evidence (collected waste represents more than plastics, some plastics degraded or thrown deep into bushes), etc. Plastic waste was collected for a total of two hours, with a drop-off of materials scheduled an hour into the event. Additionally, a plastics art show was conducted with the collected materials to increase campus visibility and awareness of its use of single-use plastic. Finally, an open plastics discussion and forum was conducted in the spring semester to inform campus community members of the research conducted by Oceana's on-campus interns and ourselves.

7.4 Archival Research

We researched and received data from various stakeholders and parts of campus. These included documents such as published statements on sustainability efforts and goals by Skidmore College, Dining Hall invoices and financial data regarding purchases towards single-use plastics and retail, and tonnage/tipping data to Casella were all gathered from the College's websites and offices (for instance, past and more contemporary Campus Sustainability Reports). We then analyzed these findings for facts and figures, as well as calculating costs per item for single-use plastic items for our own cost-benefit analysis. Additionally, we looked at the Dining Hall invoice for single-use plastic items bought from 2018-2019, and used this to create a cost analysis of single use items versus alternatives in our data findings.

(8.) Data Analysis and Limitations

Semi-structured interviews were conducted online (via Zoom), and were recorded using zoom's recording function and digital voice recorders. The recordings from these interviews were transcribed to word processing software (Trint) and then edited to fix any transcribing errors. Data from the Qualtrics surveys was collected, compiled and coded for common responses/patterns of responses/and deviant cases. All open-ended responses on the survey, as well as interviews, were analyzed and were categorized to represent common answers as well as any significant outlier responses (Creswell, 2013). Other more deviant or discrepant information were selected and noted, to increase data validity (Creswell, 2013). These were compiled into quote charts, using representative responses, along with longer descriptive narratives, and Type 1 Tabulations – percentages were assigned to the frequency of many responses (Silverman, 2006).

As per action research, photos were taken of plastic collection and locations on campus, and total amounts of plastic waste were measured and recorded. Archival research was conducted via Skidmore's Sustainability Office annual reports and inventories, as well as the other materials posted on the College's websites. Additionally, research and figures were taken from the Dining Services and the Sustainability Office in dealings with plastic-supplying companies and waste utilities.

Social limitations from COVID-19 do not go unmet within the scope of our study. We hypothesized that one of the most significant implications to launching a plastics-free initiative during this pandemic would be the concern over human health and safety; the rate of production and consumption of single-use plastics has largely increased because single-use plastics are widely considered to be a low-contact vessel (as oppose to reusable vessels). To account for this, we sought out existing peer-reviewed publications to compile a literary analysis as a means to determine the true validity of the notion that single-use plastics are safer than reusable alternatives. COVID-19 also made it more difficult to meet and discuss our findings, as well as potentially limiting our number of survey responses.

Regardless of our conclusions derived from the literary analysis, the limitation of health concerns will remain a barrier to implementing plastics reduction efforts during the COVID-19 pandemic. If we determine that there is no basis to this concern and single-use plastics will be eliminated on campus, then comes the concern of campus optics being compromised--we want to avoid Skidmore College being perceived as an institution that values anything over the health and safety of students and staff.

Our process of quantifying plastic inputs and outputs on campus included data from Skidmore's Dining Services. COVID-19 complicates our communication and outreach efforts, and compromises the degree of communal. We were limited to interviews and did not count the plastics ourselves, so to some degree, we are unable to know the exact amount of plastics (only approximate). Similarly, we could not accurately account for the single-use plastics that students bring from off-campus and discard on-campus. Further constrictions on the study include limited funding for single-use plastics alternatives and finite time to compile data and expand project scope.

9.) Data Collection and Findings

9.1 Stakeholders' Perspectives

Name	Organization	Position
Young Grguras	Post Landfill Action Network	Regional Director
Karina Berkely	George Washington University	Student Activist
Jennifer Natyzak and Levi Rogers	Skidmores Sustainability Office	Sustainability Coordinators

Charlie Uras	The Barrelhouse	Restaurant Owner

Table 1: Interviewed Stakeholders and Organizations

During our research process, we reached out to the following stakeholders for information regarding single-use plastics reduction efforts. Young Grguras has extensive experience working with colleges around the nation to invigorate colleges and universities to transition towards single-use plastics free. The Post Landfill Action Network (PLAN) provides institutions with an operational framework and template that guides them towards an efficient pursuit of a plastics-free horizon. For Karina Berkely, the "plastic free" horizon has become a reality for George Washington University. Berkeley is a student activist who has sewn the aspiration to be single-use plastics free into GWU's administrative framework, and provided us insights in regards to amending campus vending contracts. We worked extensively with Jennifer Natyzak and Levi Rogers, who are the Sustainability Coordinators of Skidmore's Sustainability Office. They were instrumental to our decision-making process by providing us with the strengths and weaknesses of prior student-led initiatives on campus. Charlie Uras manages The Barrelhouse, a Saratoga restaurant that greets it's customers with alternatives to single-use plastics sourced from the vendor "FoodStix". The following compiled data is a collection of qualitative information gathered to facilitate institutional change.

9.2 Dialogue & Discovery

We found that our research question and greater initiative works in conjunction with Skidmore College's 2015-2025 Campus Sustainability Plan and specifically promotes the fulfillment of the campus's Waste Goal. This goal provided us a framework to operate within--this proved advantageous by helping us understand the extent to which Skidmore has fulfilled this Waste Goal. The goal is twofold, calling for a 60% waste diversion rate from routine operations and a 50% diversion rate for special projects (Skidmore 2019). Our initiative is concerned with maximizing the waste diversion rate for routine operations which currently rests at 32%, despite a slew of completed efforts to further this goal. Several completed initiatives include: a revision of Skidmore's purchasing policy to encourage the purchase of some goods with higher recycled content; a transition to a zero-sort recycling program in September 2013 with Casella Resource Solutions; and the installation of 18 water bottle refill stations around campus to encourage the use of reusable bottles. This initiative would increase Skidmore's waste diversion rate, and pressure the Waste Goal to meet and surpass 60%. By aspiring to meet and create more ambitious sustainability goals, Skidmore can expect to progress as an institution that prides itself in its pro-environmental behavior and practices.

Skidmore's Sustainability Plan is not the only framework internalized by campus operations that would be furthered. Skidmore's Plastic-Free Campus initiative supports several facets of the UN's Sustainable Development Goals (SDGs), which professors in the Environmental Studies and Sciences Department also incorporate into their curriculum. The actions of this institution should align with its environmental philosophies. Here are the Goals outlined in the SDGs that would be furthered by this initiative:

Global Goal #3: Good health & Well-Being

- When we consume food and drink from single-use plastic containers, we are exposed to chemicals connected to the public health crisis of our time, including ADD/ADHD,

obesity, and cancer.

Global Goal #10: Reduced inequalities--Plastic production and plastic pollution are environmental and social justice issues

- Plastic production damages local communities where plastic is made with toxic air and water pollution.
- Fossil fuel companies are locating new and expanded plastic production facilities near existing fossil fuel infrastructure, which includes targeting the Gulf Coast, the Ohio River Valley, Appalachia, and other frontline and fenceline environmental justice communities. These plastic industrial sites have a disproportionate impact on low-income communities, rural communities, and communities of color

Global Goal #12: Responsible Consumption & Production

- Compostable and reusable alternatives mitigate the impacts of the broken recyclable market, whereas plastic bottles are "downcycled" into other materials such as polyester clothing, carpeting, decking material, etc., that are most likely never recycled again

Global Goal #13: Climate Action

- Most plastics are made from virgin (not recycled) materials created from chemicals sourced from fossil fuels, including an oversupply of fracked gas, which is leading to a global boom in new plastic production. Plastic production fuels the climate crisis through the release of greenhouse gases.

Global Goal #14 and #15: Life Below Water and Life on Land

- Plastics and microplastics harm wildlife, land, rivers, lakes, shorelines, and oceans.

The institutional shift towards plastic-free spaces has commenced, and there little case to be made relating the success of this transition to the location, focus, and size of institutions that have embraced this shift. Table 2 is a visualization of several colleges and universities that employ plastic-free initiatives. We expected a disproportionately high concentration of initiatives to be among small, coastal institutions that are environmentally focused. However, the shift is just as prevalent within institutions that: don't see the impacts of plastics in oceans; have a high number of undergraduate students; and are not necessarily environmentally-focused. The plastic catastrophe is not going anywhere, and this transition will continue to popularize among institutions. Grguras's job with PLAN didn't exist ten years ago, and "campuses didn't even think about eliminating single-use plastic ten years ago. So, the change can happen quickly" (Young Grguras). It is in Skidmore's best interest to begin the transition now, and delaying this initiative is a disservice to Skidmore's Sustainability Goal and risks the optics of Skidmore as an environmentally-conscious institution.

Name of College	**Inland or Coastal**	**Focus**	**Size**
College of the Atlantic	Coastal	Environmentally Focused	355
Eckerd College, Florida	Coastal	Non-Environmentally Focused	2007

SUNY ESF	Inland	Environmentally Focused	1812
Sterling College	Inland	Environmentally Focused	643
University of California	Inland	Non-Environmentally Focused	31543
Marshall University	Inland	Non-Environmentally Focused	9415
Emory College	Inland	Non-Environmentally Focused	7118

Table 2: Institutions of Higher Education with Plastic Free Initiatives

9.3 Economic Findings:

We reached out to Dining Services during our research, who provided us with the following invoice data for single-use plastic items for the 2018-2019 school year. We wanted to make sure this reflected a typical year of operations, instead of the most recent invoice, which would contain increased single-use plastic purchases as a result of COVID-19. Using the purchasing data, we were able to calculate a per-item cost, as well as an average price per plastic item (Figure 3). After calculating the per item price of several common single use plastic items, we compared them with pricing data of alternatives products available online, such as products from Foodstiks. We were able to come up with the following cost analysis, which found an average savings of $115 - $175 per 1000 uses per plastic item replaced with alternatives (Table 3). This does not include costs saved from less disposal costs and other waste management techniques that alternatives and reusables are exempt from.

Sales by Item

For Date Range: 1/1/19-12/31/19

hill & markes SINCE 1906 WHOLESALE DISTRIBUTORS INC.
P.O. BOX 7 • 1997 ST. HWY. 55 • AMSTERDAM, NY 12010
800-836-4455 • www.hillnmarkes.com • Fax: 888-842-1207

Customer: 965 DAC3 SKIDMORE DINING SERVICES

Product	Product Description	Qty	Sales	$ PER ITEM (Rounded up)
BWP542WF	5x4x2.25 ECO WINDOW;KRAFT CONTAINER 300/CS	15	$775.35	$ 0.17
BWPNATF608RAVTWF	8x6x3 ECO WINDOW KRAFT;CONTAINER 200/CS	122	$5,737.66	$ 0.24
EFB1063MED	10x6x3 5# SNACK PACK;LUNCH BOX WHITE 175/CS	2	$119.23	$ 0.34
FABGS64	4 COMPARTMENT SQUARE;CLEAR CONTAINER 300/CS	3	$216.18	$ 0.24
GENAD24	&24oz CLEAR PLAST FLAT;HINGE LID DELI CONT 200/	28	$1,135.40	$ 0.20
GENAD24F	&24oz CLEAR PLAST DOME;HINGE LID DELI CONT 200/	3	$121.95	$ 0.20
GENAD32F	&32oz CLEAR PLAS DOME;HINGE LID DELI CONT 200/		$0.00	
GENAD48	&48oz CLEAR PLAST FLAT;HINGE LID DELI CONT 200/	118	$7,640.22	$ 0.32
GENFP024	&24oz SMART SET BLK RECT;MICRO PLAS CONT 300/CS	8	$302.00	$ 0.13
GENFP932	&LID, CLEAR FOR FP024 &;FP032 PLAS CONT 300/CS	8	$272.96	$ 0.11
INLTS202	HOAGIE SAFLOC HINGED;PLASTIC CONTAINER 150/CS	12	$634.73	$ 0.35
INLTS32RN	32oz TAMPER EVIDENT CLR;RND BOWL W/DOME LD 150/C	26	$1,626.77	$ 0.42
INLTS8CCR	**8oz TAMPER EVIDENT CLR;RND CONT W/ FLAT LD 272/	7	$464.70	$ 0.24
INLTSSB3R	SAFE-T-FRESH 4 CMP CLR:CONTAINER 252/CS	1	$130.98	$ 0.52
ROYTGCR24B	24oz BLACK/CLEAR PLAST;COMBO MICRO RND 150/CS	2	$64.46	$ 0.21
SLOKH12AJ800	&12oz PAPER COMBO CONT;SYMPHONY 250/CS	34	$1,777.32	$ 0.21
SLOKH16AJ800	16oz PAPER COMBO CONT;SYMPHONY 250/CS	21	$1,133.30	$ 0.22
SLOKH8AJ8000	&8oz PAPER COMBO CONT;SYMPHONY 250/CS	3	$137.70	$ 0.18
SQP3525	9.5X5X5 RED CHICKEN BARN;TAKE OUT BOX 125/CS	1	$49.66	$ 0.40
	NetChoice 414037 6-Piece Heavy Weight Cutlery Kit, Polystyrene, Black; 250/Case	?	$41.98	$ 0.17
				AVERAGE: $0.26

Figure 3: Skidmore College Dining Hall's 2018-2019 Invoice for Single-Use Plastics. The invoice of the largest provider of single-use plastics on campus--the Dining Hall--was instrumental in our quantitative research. Annually, Skidmore spends $25,000 for single-use plastics to be implemented in the Dining Hall, with the average item priced at $0.26. This is a cost isolated to this institution, but even further: when we consider the life of this plastic after it leaves Skidmore campus, the cost climbs and accumulates between waste disposal costs, human and environmental health impacts (which are far less quantifiable). The economic, social, and environmental burdens will be shifted to less-equipped communities and ecosystems when these single-use plastics leave Skidmore.

Cost/Piece Dining Hall Single-Use Plastic Sustainable Alternative	Cost/Piece	Cost/1000 sets
Plastic Clamshell	$0.32	$320.00
Alternative Clamshell	$0.24	$240.00
Plastic Cups	$0.21	$210.00
Alternative Cups	$0.09 - 0.15	$90.00 - $150.00

Plastic Utensils	**$0.17**	**$170.00**
Alternative Utensils	**$0.195**	**$195.00**
		Total Savings: $115 - $175

Table 3: Saved Costs/Maximized Returns: Comparing Single-Use Items with Cost-Competitors. This is an excellent visualization of the economic feasibility of shifting suppliers. Here, we extrapolated the costs of three single-use plastics that we saw on the dining hall's invoice and compared them with the cost of three price-competitive alternatives offered by a local restaurant. Upon comparison, we see that the switch from plastic to compostable items per 1000 sets would save Skidmore somewhere between $115 and $175. We predict this figure to accrue quickly, saving money and furthering the waste sustainability goal.

9.4 Public Perceptions

The following graphs and tables were derived from the results of our student, staff, and faculty surveys. Included in these data tables include public perceptions and willingness for Skidmore to go single-use plastics free and other plastics reduction programs, the distribution of survey respondents by college community demographics, and quote charts responding to why respondents would or would not agree with different degrees of proposed plastics reductions efforts. These quotes were broken up and divided based on topic, and if they were in favor or against the proposed plastics reduction method. As a disclaimer, topics that did not receive any associated quotes for a particular question omitted from the quote chart. Similarly, not all topics received corresponding negative responses.

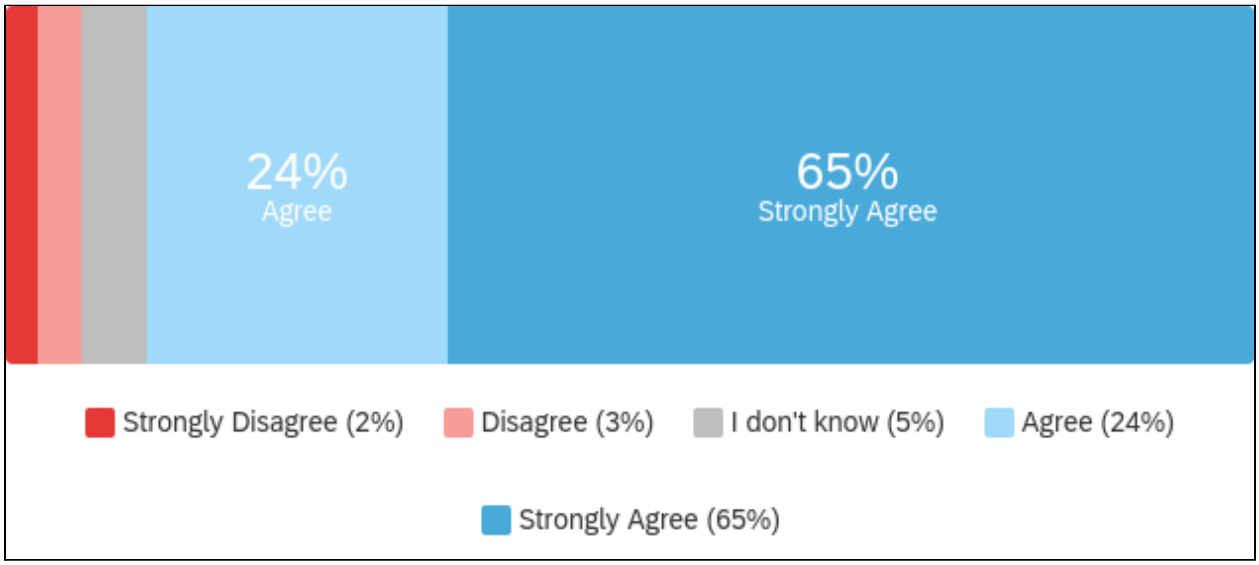

Figure 4: Percentage of Respondents by Category for "I would be supportive of Skidmore College becoming a "Plastic Free Campus" out of 200 responses.

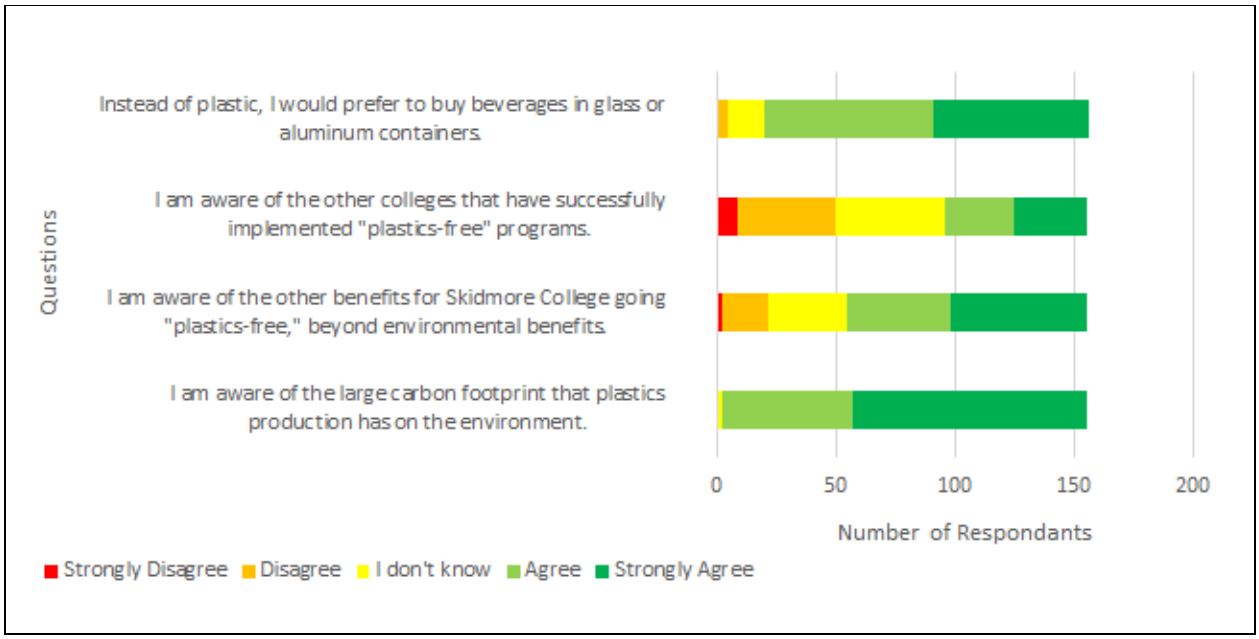

Figure 5: Number of Respondents to Various Public Perceptions about Plastics and Plastics Reduction Efforts

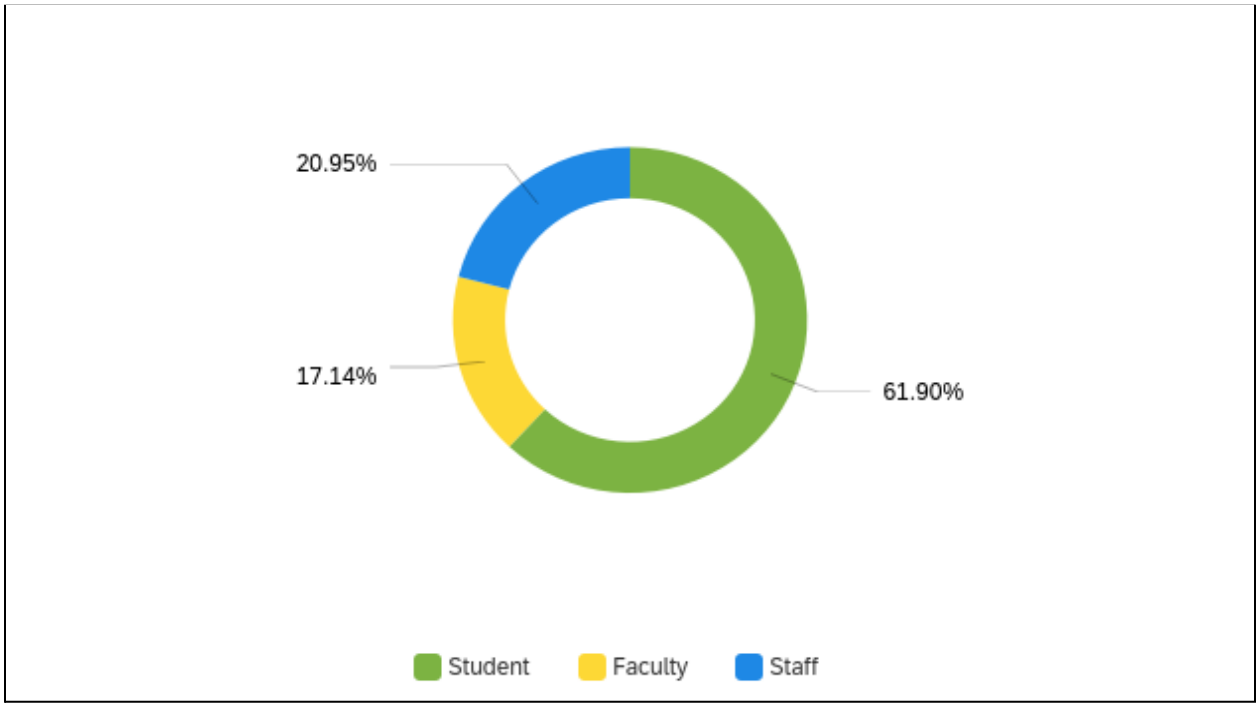

Figure 6: Community Group Demographics by Percent of 200 Survey Respondents. The majority of survey responses came from community members that identified as students.

Positive Response to a Plastic Ban	Negative Response to a Plastic Ban

Everyone needs to do their part to create a more sustainable world and getting rid of single-use plastic items is a step in the right direction.	Mainly, again, access, as it would make certain things more mental labour heavy for me. Some products that are single use plastics are ones I use when I physically don't have the energy to make the better choice and need a quick solve because I'm too overwhelmed.
I feel that reusable utensils and takeout containers would be just as useful as well as hygienic and i think it would be more beneficial to the environment	Banning plastic bottles would negatively affect me because plastic bottles can be closed but aluminum cans cannot make it a potential spill hazard on my desk and keyboard. However, the availability of fountain drinks that can be poured into non-disposable containers would make this less of a negative but it would have to be widely available like the soda machines are.
There are so many other plastics alternatives that are cheaper AND better for the environment	Just cost and resources. There's not enough time to eat nutritiously or heat up food. Some offices on campus don't even have break rooms to do meal prep or sit down privately.
Skidmore's student, staff, and faculty culture is defined by people who are dedicated to social change. Transitioning to non-plastic products and reusable items aligns with these values, since plastics rely on climate- and community-destructive fossil fuels and pollution. Furthermore, it is entirely feasible to transition with more reusable items and 100% compostable wares.	The impact on me personally wouldn't be a huge deal, but it's nice to have plastic utensils to fall back on on days when I just can't bring myself to deal with dishes. I use the ones sold on campus currently, though, which are actually reusable. Idk if a ban would affect those. Also I like to reuse plastic bags as liners for my wastebasket, otherwise it gets gross.
I would not have the guilt.	Not all faculty and staff are able to take a sit-down meal in the dining hall or Spa. Eliminating the ability for take-away options will change how employees can interact with food options on campus.

Table 4: Qs 2A/2B. "Please describe the reasons why or why not you would be supportive of Skidmore College becoming a "Plastic Free Campus." Responses by Positive or Negative Decisions

Sustainability	Accessibility/ Convenience	Economic Costs	Skidmore College Culture	Skidmore College Policy/Politics	Behavior	Mental Health
Plastic waste is harmful for the environment in a variety of ways and can hurt both people and the planet.	I feel that reusable utensils and takeout containers would be just as useful as well as hygienic and i think it would be more beneficial to the environment	There are so many other plastics alternatives that are cheaper AND better for the environment	I think it is important to reduce waste when feasible, and I definitely think it's feasible at Skidmore with a little bit of thought and passion from the administration and students	Skidmore is a part of the global system of unsustainable consumption and consumerism, and as a college campus it is a place of innovation and moral impetus, and with that we have the responsibility to do the work to make our operations responsible for people and the planet.	I think college is a time when a lot of students are developing a sense of autonomy, so spending 4 years in an environment of no plastic would (I believe) set more of us up to continue with those practices post-college, too.	My housemate doesn't drink water from anything except single use plastic water bottles (no tap cups or britta) and it's super wasteful and driving me insane

Everyone needs to do their part to create a more sustainable world and getting rid of single-use plastic items is a step in the right direction.	Sustainability Use of metal utensils is accessible	I am sure there are budgetary constraints, but can't imagine they are insurmountable	Skidmore has always made great strides in ensuring a "green" campus environment. By taking this step towards a plastic free environment it would not only emphasize our college's beliefs towards supporting a healthy planet, but it would also benefit the campus itself by minimizing litter and trash around campus.	Institutional changes are likely more effective than individual ones, and as long as there are still ways to do what people need to do, it seems like a good idea	Collective change can be easier (and more powerful) than individual change.	it's so sad seeing so many plastic food containers when there are so many more sustainable options out there. i feel like everywhere i go i see a plastic bottle on the ground. i always feel guilty taking a to go box back to my dorm when the sustainability office is right there.
Plastic doesn't disappear once it leaves our sight. Plastic is a huge problem for animals, people, and the environment. I think Skidmore has the resources and platform to make a difference and a statement.	Plastic is an accessibility issue. Many ppl w/ disabilities need items such as straws for various reasons and cannot use alternatives. I would be supportive of a campaign to reduce plastic use on campus, but a ban would be harmful.	I would be supportive of either become plastic free or developing ways that we might repurpose the plastics. Also, there is likely to be long term savings.	It would allow for a large, campus wide initiative that would make a significant impact on the waste and plastic usage of Saratoga.	Because we as a society have a huge plastic waste problem that is wreaking havoc on our ecosystems. I have been trying to incorporate low wastes practices into my life but at the end of the day it's on governments and institutions (like Skidmore) do something about our pollution problem, the blame shouldn't fall on individuals.	If you don't make plastic an option, people will adapt and we will all be better off for it.	
	I think it's a great initiative and could substantially help the environment! I do worry that it's not completely possible because of the needs of certain students, accessibility and financial issues and when in quarantine the inability to use reusable items.	It is good for the environment, but it is a little hard and costly to be plastic-free.	Single-use plastics are a huge issue on campus and have only gotten worse with the pandemic. I think it would be possible for Skidmore to eliminate single-use plastics, and this would greatly reduce our impact as well as set an example for other schools.	Plastic is extremely detrimental to the environment and as a small private college, Skidmore is in the position to at least significantly reduce their plastic consumption, starting with d-hall.	I always feel guilty taking a to go box back to my dorm when the sustainability office is right there.	
I think there are so many alternatives to plastic and Skidmore has the funds to invest in these alternatives	I do not trust Skidmore college to go plastic free with any attention to the needs of disabled folk. I do not trust Skidmore to find reliable and or sustainable sources as they already have large issues sourcing packaging as is.	I would support a Plastic Reduction Campus, but not a plastic free campus. To go plastic free is just not a reality. To many things are pack with plastic and the price difference would be passed on to the customer.	I try to live a low waste lifestyle and Skidmore makes that extremely difficult.	Skidmore has both the resources and student support to go plastic-free. The college should get a headstart on a plan that will inevitably become more popular in the coming years. I also think this will make the college more attractive to prospective students.		

We use way too much plastic on campus and there are not enough efforts to look for other effective products that can do the same job as the plastics sustainably .			This would restrict dining services in a lot of way, plus the vending would be impacted going plastic free. I think it's a great idea to reduce, but plastic free is a bit drastic in the reality of what is going on and the situation in the virus.	Skidmore's student, staff, and faculty culture is defined by people who are dedicated to social change. Transitioning to non-plastic products and reusable items aligns with these values, since plastics rely on climate- and community-destructive fossil fuels and pollution.		

Table 5: Qs 2A / 2B "Please describe the reasons why or why not you would be supportive of Skidmore College becoming a "Plastic Free Campus" Responses by Category. Positive responses are colored green, and negative responses are colored red.

Sustainability	Accessibility/ Convenience	Economic Costs	Skidmore College Culture	Behavior	Mental Health
I would feel better about my carbon footprint	The reduction of single-use plastics would positively affect me because it would not consume so much space in my trash can and I wouldn't have to keep all the utensils I had to get from the breakfast bags	Food price items will increase	I would be happy to live on a campus that is conscious of its plastic use and dedicated to finding alternatives and reducing its plastic waste. I would prefer to use reusable items and not have to waste single-use items.	It would force me to get in the habit of not relying on single use plastics and get me ready for transitioning out to a low impact lifestyle	I don't think it would make much of a difference in my daily life but it would make me feel better about my impact on the environment.
Getting rid of single use plastic will help all of us.	I think right now especially during COVID reducing single use plastic is better than banning. Students need to be in the go, and food needs to be transported efficiently.		I'll feel better about the college I chose. I'll feel better about the planet and my future. I want Skidmore to be more green.	It would both force me to stay strict with myself as I try to achieve a more plastic-free lifestyle	Makes me feel sad and hopeless
Hopefully by reducing single-use plastic people will be more aware about how much waste they are causing and will use more eco-friendly things	The reduction of single-use plastics would positively affect me because it would not consume so much space in my trash can and I wouldn't have to keep all the utensils I had to get from the breakfast bags		I try my best not to use them but I see plastic containers piled in trash cans outside of burgers and dhall. Especially since COVID, there has been a ton of single use plastic in trash cans all over campus.	Providing more sustainable and reusable options to replace single-use plastics would allow me to reduce my waste and wastefulness, reducing clutter in my room and reducing the overflow of garbage bins.	Reducing them would make me happier. I feel strongly about recycling correctly and seeing others doing it wrong frustrates and angers me.

It would make me feel better about my impact on the environment.				.	Reducing single-use plastic would make me feel more relieved that we are not contributing to destroying the earth

Table 6: Q7A / 7B "Please describe the reasons why reducing single-use plastic item availability on campus would positively or negatively affect you" Responses by Category. Positive responses are colored green, and negative responses are colored red.

Sustainability	Accessibility/Convenience	Economic Costs	Skidmore College Culture	Skidmore College Policy/Politics	Behavior	Mental Health	Indifference
If single-use plastic was banned on campus, I think it would reduce the amount of litter that can accumulate in places like Spa and in Northwoods. There isn't a ton of litter, but I think that any litter at all is still too much.	It would create more accessible reusable options.	I think when you buy something, like a drink from Burgess for example, you're buying the item plus the plastic. In the long run what I've learned from others is that you'd be saving a few cents each time which would add up later on.	I would feel proud of our college for taking action against plastic use.	It would reassure me that our campus is committed to sustainability.	It would help me get into more of a habit of using reusable water bottles and other items	I honestly feel good about myself when I use my reusable bamboo utensils for lunch. They were a gift so it also makes me happy to think about the person who gave them to me.	Wouldn't really have an affect on me
It would help to reduce plastic in our environment. I think many of the single use plastic items available today could be traded for environmentally friendly packaging. Water for example.	An all out ban may negatively impact disabled students and students with weakened immune systems who need single use products to keep themselves safe. I think not an all-out ban, but a severe reduction from the college would be best.	It would require of me to find a more long term item that I should be using anyways, which would likely allow for long term saving.	I don't know if they should be banned, but it should be a by-request thing.	Again, because Skidmore would be making positive steps and when I do need to get something on campus I will not have to worry that it will be encased in plastics	Would help me avoid single use plastic as a whole.	I wouldn't worry that people are using single-use plastics without being conscious of it, of disposing of them afterwards, etc.	I don't use them anyway, so I wouldn't be affected. I do recognize this is a privileged perspective to have though!
This would benefit me in the same way as reducing them, just to a better extent. Waste would be reduced, bins would be less overloaded, and reusable options are overall more convenient.	Banning plastic bottles would negatively affect me because plastic bottles can be closed but aluminum cans cannot making it a potential spill hazard on my desk and keyboard.	We would be forced to purchase other more expensive sustainable items out there passing on the cost to the customer.	I would like to see Skidmore as a place where students and faculty are all in agreement about the negative impacts of plastics and they are willing to do something about it	I would love to be attending an institution that did nothing contribute to the problems that single use plastic cause for the Earth	it would force me to be creative and resourceful	I would not have the guilt.	I don't really need them so not having them as an option would be good.
Banning plastic on campus would positively affect me because I would not have to	Just cost and resources. There's not enough time to eat nutritiously or heat up food. Some		It would be difficult for planning things like drinks and takeout on campus but would be a good step	I would prefer to have the default option be to use reusable items or that the stores on	It would force me to think about my own habits more and do better.	I would feel better about skidmore and my impact on the	The impact on me personally wouldn't be a huge deal, but it's nice to have

feel like I need to re-use every single utensil/carton/bag I get from the campus that is plastic. I know that re-using plastic is not the best.	offices on campus don't even have break rooms to do meal prep or sit down privately.			campus make more of a priority to ensure students who can don't waste single-use items.		environment	plastic utensils to fall back on on days when I just can't bring myself to deal with dishes.
Better for the environment.			There may not be acceptable substitutes	Policies can be challenging at Skidmore. We would need a commitment to canned water or some other realistic and accessible alternative to even consider a policy ban.		Some products that are single use plastics are ones I use when I physically don't have the energy to make the better choice and need a quick solve because I'm too overwhelmed.	I'm just the consumer. I will buy whatever is available to me.

Table 7: Qs 8A / 8B "Please describe the ways in which banning single-use plastic sales on campus would positively or negatively affect you" Responses by Category. Positive responses are colored green, and negative responses are colored red.

10.) Recommendations

We propose the following recommendations for initial steps that Skidmore College could implement on campus. One recommendation is having "Plastic by Request," which gives Skidmore students, faculty, and staff the option to partake in single-use plastic consumption if needed. Otherwise, the default option will be reusables and sustainable alternatives as opposed to plastics. Another recommendation is to implement the *Sustainable Workplace Initiative* which includes a series of recommendations that would improve the sustainability of working spaces, including having utensils in office spaces.

Undoubtedly, there should be changes implemented to vending operations on campus; the other largest distributor of single-use plastics on campus other than Dining Services. According to Karina Berkley, "Vendors want to maintain their consumer base. College kids are a pretty consistent stream of consumers. And so if college students really care about having a plastic free campus, you know, they're going to want to purchase from vendors who have reusable options. And so, that's another front on which students want to purchase from vendors that don't sell reusable or single use plastics. It's another economic incentive for the university to adopt." Skidmore College could focus on facilitating sustainable vending contract options and provide alternatives to single-use plastics. Lots of options for alternatives are now becoming available through distributors, including canned water options from our contract with Pepsi (Jennifer Natyzak) and sustainable utensil companies like Foodstiks (Charlie Usas). $25,000 is the total annual cost to maintain single-use plastics in the Dining Hall. This cost is isolated to this institution, but even further: when we consider the life of this plastic after it leaves Skidmore campus, the cost accumulates between waste disposal costs and human and environmental health impacts (which are far less quantifiable). The burden of these economic, social, and environmental impacts will be shifted when these plastics leave Skidmore to reside in less-equipped communities and ecosystems.

We found that it is extremely important to have student surveys & solidarity/support regarding the Plastics Free movement. According to George Washington University's student activist Karina Berkley, "the trajectory of student involvement at GW first took place in our student association, where our student association passed a resolution saying that it would not give any money to student organizations that used Single-Use Plastics at their events. And so from there, the student association then passed another resolution that just called for the university to have more water refilling stations so that we could reduce and eventually phased out our use of single use, plastic water." Young Grguras states, "administrators want to know about what the students want...and that's where a lot of the campaign work happens."

In order for change to occur, Skidmore's bureaucracy has to be involved and actively support the initiative. According to Young, "the idea behind having a presidential commitment is that it gets the whole school on the same page in regards to what we're doing with plastic. And it prevents any type of pushback that you'd get from just like players in it." At George Washington University, "the university started a single use plastics task force. And the aim of this task force was to develop some plan of how the university would either reduce or eventually phase out or use plastics" (Karina Berkley). Students, faculty, staff, and others need to be on the same page; "Everybody who's involved with plastic on campus needs to be in the same room so we all understand where we're headed. If you think about the way plastic moves on campus, it's touched so many hands" (Young Grguras).

There must be a continued collaboration between students, administration, sustainability office, procurement, dining hall and all other groups on campus. Young Grguras states,"the purpose of this proposal is to aspire: It's not going to be perfect, and the college and students are going to figure it out as it goes along" and "the movement works at the city level, the community level, and the national level. This is the essential mindset to getting the groundwork of the plastics reduction established, and working in conjunction with all campus community groups with this in mind is very important." Karina Berkley states, **"**collective support and collective effort is definitely one of the morals of the story." Therefore, inducing a positive communal impact should be considered or incorporated into each decision made. Skidmore. On the other hand, we also recommend that Skidmore College takes the initiative to reduce or ban single-use plastics by a certain deadline that they specify to the students, faculty, and staff, so that they be held accountable.

Regarding some of the concerns about Skidmore College becoming plastic free, one described people with disabilities such as, "many people with disabilities need items such as straws for various reasons and cannot use alternatives." Similar to George Washington University, "there were logistical issues and concerns surrounding the ban, specifically accessibility for students with certain disabilities who often rely on single-use plastic straws. That was the main concern. And so, we eventually communicated this concern to members on the Single-Use Plastics Taskforce and there would be, I guess, like, an exception for Single-Use plastic straws, considering that one, they don't really comprise that big a proportion of plastic waste anyway and to the whole point of environmental justice is to improve the material conditions of the people who need it most. And making accessibility to straws harder isn't making anybody's life any easier" (Karina Berkley). We are not looking to exacerbate the

hardships of those with disabilities, and we will make an exception, so they will still be able to use any single-use plastic items they need.

11.) Discussions/Conclusions:

11.1 Research Discussions

Overall, the sources that we uncovered in our literature review provided us with the base framework to conduct our research. For example, Thompson provides a lot of good detail and backgrounds on all of the listed focuses of the paper, and is very useful in justifying plastic banning, correcting misconceptions, and recommending courses of actions. The proposed solutions in this paper fall a bit short, however, for the purposes of our paper, in that they describe *what* should be done, rather than *how*, and/or they focus on groups (I.E. scientific design and industry).

Additionally, sources like Choate's paper and findings can be specifically useful to Skidmore's future efforts to go plastic free for a variety of reasons. To start, Allegheny College could be added to a list of aspiriant colleges to look towards when designing plastic reduction on Skidmore's campus, and their work can be mirrored here. Second, what applies to plastic water bottles can also apply to plastic bags or other single-use plastics. More research is needed linking behaviors surrounding these objects, but like plastic bags, can be used as a case study or mirror for the larger problem of plastics. Third, the detailed data gathering survey methods and data analysis might be used to guide our survey process and data analysis. Fourth, the paper briefly provides some additional direct research on green college campuses and responsibility of higher education to support social changes. Finally, the paper offers a comparable counter-perspective to the idea of plastic-reductions or banning on Skidmore's Campus, outlining a potential pitfall to actually increase single use items existing on campus or brought in from outside. This may require us to rethink our strategy to prevent this or include additional programs to affect single-use plastic behavior beyond the ban, as outlined in the paper.

We are a bit dubious of Siracusa's claims of the benefits of biodegradable and compostable plastics, as most of these plastics currently in the market leach toxic chemicals and microplastics into the environment when they degrade. Although composting and biodegrading plastics rather than recycling them is cheaper, the paper doesn't seem to consider or address the costs of producing new plastics that the act of recycling offsets? More research into exact types of plastics in use here is needed, and alternative items and reusable items should be prioritized over these types of plastic items.

11.2. Research Conclusions

Based on the positive supportive responses for a plastic free campus, there is overwhelming support by the Skidmore College students, faculty, and staff. This includes a new Student Government Association resolution which is "A Resolution of Support for Skidmore Plastic Free Zone Project," and the intent is to support a "Break Free from Plastic" pledge that would phase out unnecessary single-use plastic items on campus over time. Skidmore students' support for a plastic free campus included reasons such as sustainability goals, accessibility, economic costs, mental health, institutional change, and positive changes in behavior.

A plastic free Skidmore College would also create a positive impact on waste management on Skidmore College and in Saratoga Springs and hopefully provide the framework to influence other campuses to become more sustainable too. It is bad optics for Skidmore if we don't jump on it now. Skidmore will eventually need to go plastics-free; so why not now, during a time when the operations of waste management are dynamic, and we are providing the framework. Skidmore would be at the forefront of pro-environmental initiatives/behavior. According to Karina Berkley, **"** it would actually be saving the university money because they wouldn't have to dedicate so much of a proportion of their operations budget to waste management."

We have gained valuable insight from Young Grguras, Karina Berkley, and Charlie Uras, and they have influenced sustainable change for other colleges to follow. Eckerd College inspired the city of St. Petersburg, Florida, to also write a similar pledge for their city. Marshall University works closely with their community and an organization called Ohio River Valley Environmental Coalition. They're able to work with them and Marshall is going to be running and installing an industrial compost facility that should be able to take waste from the community. The Break Free from Plastic movement, which is global, started in the Philippines. The change to reduce or ban plastics would provide positive optics for Skidmore's commitment to waste reduction and promote Skidmore Sustainability Goals. Additionally, there would be an economic benefit to going plastic free and cost savings for Skidmore College of approximately $115 - $175 per 1000 uses.

In conclusion, as the college considers implementing a single-use plastics reduction, further research and student support should be invested in the issue, as well as dialogue between all actors on campus. It is imperative that all parties on campus be included in this discussion, so that no one is left out and that everyone is informed on what changes are taking place. Constant student support and pressure are needed in order to prompt Skidmore to reduce its reliance on single-use plastics on campus, and connections with stakeholders and other aspiring institutions should continue to be cultivated and tended to. While it may take time to have single-use plastic items banned on campus, implementing our recommendations and following up with community support, petitions, and dialogue will help move the college along towards this goal.

Bibliography:

Arena, U., Mastellone, M. L., & Perugini, F. (2003). *Life cycle assessment of a plastic packaging recycling system.* The international journal of life cycle assessment, *8*(2), 92.

Arvanitoyannis, I. S., & Bosnea, L. (2004). *Migration of Substances from Food Packaging Materials to Foods.* Critical Reviews in Food Science and Nutrition, *44*(2), 63-76.

Barnes, D. K., Galgani, F., Thompson, R. C., & Barlaz, M. (2009). *Accumulation and fragmentation of plastic debris in global environments.* Philosophical Transactions of the Royal Society B: Biological Sciences, *364* (1526), 1985-1998.

Berg, B.L., 2004. *Qualitative Research Methods for the Social Sciences.* Pearson Education Inc, Boston.

Berman, E. R., & Johnson, R. K. (2015). *The unintended consequences of changes in beverage options and the removal of bottled water on a university campus.* American journal of public health, 105(7), 1404-1408. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4463390/

Break Free From Plastic Pollution Act (SB 3263/ HR 5845)
https://beyondplastics.org/article/the-break-free-from-plastic-pollution-act/

Brooks, Amy L., Wang, Shunli., Jambeck, Jenna R. (2018). *The Chinese import ban and its impact on global plastic waste*. Science Advances. Volume 4. 2018.

Caradine-Taber, S. (2015). *Greening the Grab n'Go: Reducing the Plastic Waste of Dining Services at St. Mary's College of Maryland*.
https://mdsoar.org/handle/11603/3116

Chaabane, A., Ramudhin, A., & Paquet, M. (2012). *Design of sustainable supply chains under the emission trading scheme.* International journal of production economics, 135(1), 37-49.

Choate, B., Davis, B. Y., & Verrecchia, J. (2018). *Campus bottled water bans, not always the solution.* International Journal of Sustainability in Higher Education.
https://www.emerald.com/insight/content/doi/10.1108/IJSHE-06-2017-0089/full/html

Creswell, J.W., 2003. *Research Design: Qualitative, Quantitative, and Mixed Methods approaches.* Sage Publications, London.

Davoudi, S. (2000). *Planning for waste management: changing discourses and institutional relationships.* Progress in Planning, 53(3), 165-216.
https://www.sciencedirect.com/science/article/pii/S0305900699000239

Daymon, C., Holloway, I., 2011. *Qualitative Research Methods in Public Relations and Marketing Communications.* Routledge, USA.

Geyer, Jambeck, Jenna R., Law, Kara Lavender. (2017). *Production, use, and fate of all plastics ever made.* Science Advances. Volume 3.

Hale, R. C., & Song, B. (2020). *Single-use plastics and COVID-19: scientific evidence and environmental regulations*. https://pubs.acs.org/doi/full/10.1021/acs.est.0c02269

Hilley, J. L. (2008). T*he challenge of legislation: Bipartisanship in a partisan world*. Brookings Institution Press

Hotchkiss, J. H. (1997). *Food‐packaging interactions influencing quality and safety.* Food Additives & Contaminants, *14*(6-7), 601-607.

J.V. López. (2019). *Transferring the plastic-free forestry school environmental experience to the classroom as a component of environmental education in higher education: a case study.* Environmental Innovation Group. Universidad Politécnica de Madrid *(SPAIN)*.

Kandziora, J. H., Van Toulon, N., Sobral, P., Taylor, H. L., Ribbink, A. J., Jambeck, J. R., & Werner, S. (2019). *The important role of marine debris networks to prevent and reduce ocean plastic pollution.* Marine pollution bulletin, 141, 657-662. https://www.sciencedirect.com/science/article/pii/S0025326X19300499

Marsh, K., & Bugusu, B. (2007). *Food packaging—roles, materials, and environmental issues.* Journal of food science, 72(3), R39-R55.

Martinho, Graça. Balaia, Natacha. Pires, Ana. (January 26 2017). *The Portuguese plastic carrier bag tax: The effects on consumers' behavior.*

Miller, K. E. (2011). *Student attitude and action regarding the single-use plastic shopping bag on the University of Alabama campus* (Doctoral dissertation, University of Alabama Libraries). https://ir.ua.edu/bitstream/handle/123456789/1048/file_1.pdf?sequence=1

Northrup, A.K. (2019) *Legislation to Reduce Microplastic Pollution: Understanding the Factors that Facilitated Passage of the Federal Microbead-free Waters Act of 2015.* State University of New York at Albany, ProQuest Dissertations Publishing. https://search.proquest.com/openview/7f5037cd86a6b9f6b5b3685f5002058a/1?pq-origsite=gscholar&cbl=18750&diss=y

Oceana. (2020.) *Plastics: Ending single-use plastics: How you can help save our oceans from plastic pollution.* https://oceana.org/our-campaigns/plastics

Plastic Pollution Coalition and Post Landfill Action Network. (2017). *Plastics Pollution Coalition Manual.* 1-75. https://www.postlandfill.org/wp-content/uploads/2017/01/Plastic_free_campus_updated_intro.pdf

Riccardo Accorsi Alessandro Cascini Susan Cholette Riccardo Manzini Cristina Mora. (June 2014). *Economic and environmental assessment of reusable plastic containers: A food catering supply chain case study.* International Journal of Production Economics. Volume 152. Pages 88-101.

Ross, S., & Evans, D. (2003). *The environmental effect of reusing and recycling a plastic-based packaging system.* Journal of Cleaner Production, 11(5), 561-571.

Samuel S. Flint, *How Bipartisanship and Incrementalism Stitched the Child Health Insurance Safety Net (1982–1997),* Health & Social Work, Volume 39, Issue 2, May 2014, Pages 109–116, https://doi.org/10.1093/hsw/hlu019

Silva, A. L. P., Prata, J. C., Walker, T. R., Campos, D., Duarte, A. C., Soares, A. M., ... & Rocha-Santos, T. (2020). *Rethinking and optimising plastic waste management under COVID-19 pandemic: Policy solutions based on redesign and reduction of single-use plastics and personal protective equipment.* Science of the Total Environment, 742, 140565. https://www.sciencedirect.com/science/article/pii/S0048969720340870

Silverman, D., 2006. *Interpreting Qualitative Analysis: Methods for Analyzing Talk, Text and Interaction*. Sage, London.

Siracusa, V., Rocculi, P., Romani, S., & Dalla Rosa, M. (2008). *Biodegradable polymers for food packaging: a review.* Trends in Food Science & Technology, 19(12), 634-643.

Skidmore College. (2015). *Sustainability Plan (2015-2025).* https://www.skidmore.edu/sustainability/documents/2015CampusSustainabilityPlan.pdf

Skidmore College. (2019). *Skidmore College Annual Report (2018-19).* https://www.skidmore.edu/sustainability/inventories-reports/2018-19AnnualReport.pdf

Surfers Against Sewage (2020:) *Plastic Free Communities.* https://www.sas.org.uk/plastic-free-communities/

Syberg, K., Khan, F. R., Selck, H., Palmqvist, A., Banta, G. T., Daley, J., Sano, L., & Duhaime, M. B. (2015). *Microplastics: addressing ecological risk through lessons learned*. Environmental toxicology and chemistry, 34(5), 945–953.

The Economist, *Marine litter: A teenager's plan to trawl for plastic in the Pacific becomes reality.* Science & technology, 2018. https://www.economist.com/science-and-technology/2018/09/13/a-teenagers-plan-to-trawl-for-plastic-in-the-pacific-becomes-reality

Thompson, R. C., Moore, C. J., Vom Saal, F. S., & Swan, S. H. (2009). *Plastics, the environment and human health: current consensus and future trends.* Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1526), 2153-2166. https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2009.0053

Wen, L., Yunxian, H., Anan, M., & Yuguo, H. (2010, June). *Reverse logistics: The game between government and distribution centers on recycling products packaging*. In 2010 7th International Conference on Service Systems and Service Management (pp. 1-4). IEEE. https://ieeexplore.ieee.org/abstract/document/5530264

Whitehouse, S., & Murkowski, L. (2017). *Picking Up the Pieces: Congress's Role in Combating the Global Issue of Marine Debris*. Roger Williams UL Rev., 22, 352. https://heinonline.org/HOL/Page?collection=journals&handle=hein.journals/rwulr22&id=368&men_tab=srchresults

Wong, S. (2017). *China's National Sword policy and its future ban on certain types of plastic scrap are affecting global markets*. Recycling today. https://www.recyclingtoday.com/article/national-sword-china-plastics-recycling/

Zaman, T. (2010). *The prevalence and environmental impact of single use plastic products. Public Health Management & Policy: An Online Textbook,* 11th edition Retrieved November, 23, 2011. https://scholar.googleusercontent.com/scholar?q=cache:i4ai3xZwN_YJ:scholar.google.com/+alternatives+to+single-use+plastics&hl=en&as_sdt=0,33