

Recommendations for the Implementation of a Reusable Foodware System in School Nutrition Programs

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Abstract

Even as attention on environmental degradation increases, research has generally overlooked schools, or sites of education, in favor of restaurants, as they are perceived to be more central to the problem of plastic waste. Just at public schools alone, each student produces nearly 67 pounds of plastic waste from disposable lunches, consisting of plastic or styrofoam trays, utensils, and packaging (Manukyan, 2023). There are often barriers when considering the cost of reusable foodware at these schools. This article analyzes the current literature on reusable foodware, specifically in the context of schools but also leveraging the literature on restaurants to determine the main barriers before drawing conclusions on the roles of governments, businesses, and schools to alleviate these costs. Overall, it is found that even without government or financial backing, schools can still reduce costs through the implementation of reusable foodware, but a reusable foodware system would be both more feasible with the help of the other two entities.

Keywords

Sustainability, Reusable Foodware, Single-Use Plastics, Disposable Foodware, Plastic Waste, Environmental Policy, Education

1. Introduction

Public schools in the United States produce more than 14,500 tons of waste each day (Manukyan, 2023). Each student produces nearly 67 pounds of this waste from disposable lunches, which consist of plastic or styrofoam trays, utensils, and packaging (Manukyan, 2023). Disposable foodware, such as the aforementioned

trays, may pose a danger to the students, who may be regularly ingesting microplastics such as styrene. Styrene is listed as a known carcinogen by the National Toxicology Center, and extremely prone to leach into hot foods (Manukyan, 2023). Additionally, these disposables create waste that degrades the environment, increasing plastic pollution. Eventually, these plastics cause environmental degradation through ingestion by animals, disrupt ecosystems, and contaminate food sources. Microplastics also pose a long term risk to humans by spreading pathogens and potentially being linked to cancer (Goswami et al., 2024). However, reusables are often costly and inefficient in public schools, causing school officials to remain in the status quo of disposable foodware.

In the literature, it is increasingly clear that there is a lack of consideration of primary and secondary education sites when discussing reusable foodware. Much of the literature on the issue of reusables is lacking specifically in the context of education, focusing more on comparing the types of policies in practice currently than making recommendations for the future or failing to extrapolate from restaurants to schools. While it may examine the costs and benefits of a reusables program, it fails to consider how schools could work with businesses and government to alleviate some of the burdens reusables may place on schools. This is a crucial question, especially considering the danger young children are exposed to through the microplastics in disposable foodware. Thus, this article will address the question of whether it is both cost and environmentally effective to implement reusable foodware in high schools, and if so, what roles can different actors play in these programs? It will conduct a systematic review of the literature on reusable foodware, spanning articles that examine sustainability comparisons, reusable foodware in restaurants and college campuses, and school packaging waste, in order to address the gap in the literature when considering reusable foodware in school cafeterias. This review begins by discussing current conclusions regarding the benefits of reusable foodware and the challenges regarding their implementation, then comparing environmental trade-offs between reusables and single-use plastics (SUPs) with economic drawbacks, before considering health-related issues that may arise from using reusable foodware, disposable foodware, or a combination of both. This review includes a formal assessment of the current progress in reusable foodware and recommends actions for various entities: corporations, governments, and schools. Further research should be done to support these recommendations, but this article hopes to provide a general outline for the future actions of businesses, government, and schools regarding how to supplement the implementation of reusable foodware.

This article proceeds as follows. The next section will present the methodology when conducting this systematic literature review, followed by a discussion of the literature, focusing on sustainability comparisons and policies enacted in restaurants and college campuses, as well as common concerns about reusables and how they can be addressed. Then, the review will include an analysis of the results of the literature review in the context of schools before providing several recommendations for actions for governments, businesses, and schools. It will conclude by

drawing avenues for future research to supplement this work.

2. Methodology

This article addresses the effectiveness and feasibility of implementing reusable foodware systems in schools. Effectiveness is defined as whether or not the environmental and economic advantages of switching from disposable to reusable foodware outweigh the potential consequences.

To address this research question, a systematic literature review of articles on the topic of reusables was conducted, focusing on how the findings can be applied to considerations of economic, environmental, and health-related costs.

450 articles were first obtained from Google Scholar, as other search engines either returned non-academic results or were paywalled, using various keywords shown in **Figure 1** below before parsing through them three times to find the most relevant studies. There was no specific date range, but the range of studies found was from 2009 to 2025. The first analysis began with the titles of the articles, looking for keywords relating to plastic waste and foodware, and cutting them down to reach 304 articles. Next, the abstracts of each article were analyzed, scanning for articles with a focus on reusable and disposable foodware to end up with 92 articles, and finally ending with a review of 26 articles after reading through the 92 articles to determine which focused specifically on reusable foodware, through studies or analyses regarding specific policies, environments, or systems. See **Figure 2** for comprehensive data on the number of articles remaining at each step of the process. Relevancy was defined as if an article discussed either economic, environmental, or health tradeoffs of using reusable foodware versus single-use plastics (SUPs). Articles were categorized into several different categories based on the rough topic of the article, the main focus, and the methodology used in each study as shown in **Figure 3**.

The usage of Google Scholar and using mostly open access articles means there may be some studies not represented. Additionally, Google Scholar's indexing criteria and search algorithms are not transparently disclosed, which may introduce systematic biases in the retrieval and ranking of results. Google Scholar also includes a mix of peer-reviewed and non-peer-reviewed materials, which may complicate efforts to ensure source quality, and may overlook less visible but still relevant studies.

This review conducts a systematic literature review of these articles, ensuring a representative sample of articles from all viewpoints in the literature. This analysis includes life-cycle analyses (LCAs) of different foodware types, cost-benefit analyses (CBAs) of said foodware types, and articles analyzing different types of policies and their effectiveness, as well as analyses of specific policies among restaurants and schools to draw conclusions for high schools.

Data was also found on different types of biodegradables, but since the question focuses on reusable foodware, there was no extensive research done on those. However, the general consensus is that biodegradables could be another environmentally healthy alternative, but are often more difficult to acquire and use. Other

notable topics outside the scope were reusable foodware in food delivery services, recycling solutions, and sustainability education methods.

Terms				
"Foodware"	AND	System		
"Reusable"	AND	"Food"	AND	"School"
"Reuse"	AND	"Food"	AND	"School"
"Reusing"	AND	"Food"	AND	"School"
Sustainab*	AND	"Food"	AND	
Sustainab*	AND	"Foodware"	AND	
"Plastic"	AND	Nondispos*	AND	"Food"
"Single"	AND	"Use"	AND	"Plastic"
"Waste"	AND	"System"	AND	"Foodware"

Figure 1. Key search terms.

Stage	Description	Articles Remaining	Articles Excluded	Criteria Applied
Initial search	Articles retrieved from Google Scholar using keywords related to plastic waste and foodware	450	0	Academic sources only
Title screening	Titles reviewed for relevance to plastic waste and foodware	304	146	Contained key terms like plastic, food packaging, reusable, etc.
Abstract screening	Abstracts analyzed for focus on reusable vs. disposable foodware	92	212	Discussion of foodware type or life cycle
Full-text review	Full articles examined for analysis of reusable foodware	26	66	Focused on policies, systems, or tradeoffs (economic, environmental, or health)

Figure 2. Summary of the search.

Name	Topic	Specific Focus	Methodology
Ncube et al. 2021	Businesses	Plastic Waste Generation	Life cycle analysis
Ronzoni et al. 2022	Businesses	Environmental impacts of reusable containers	Real-world simulation and analysis
Smuts et al. 2025	Businesses	Sustainability Roadmap	Roadmap
Fu 2022	Circularity	Recommendations for circularity	Literature Review
Matthews et al. 2021	Circularity	EU Circular Economy Plan	Analysis
Milani 2025	Cost Comparison	Economic costs of reusable foodware	"Cradle-to-grave" LCA approach
Pandit 2014	Cost Comparison	Reusable vs single-use foodware	Cost Evaluation Model Development
Di Paulo et al. 2022	Environmental Costs	Possible substitutes for SUPs	Literature Review of LCAs
Nahar et al. 2023	Environmental Costs	Cleaning reusable packaging	Literature Review
Arijenwa et al. 2025	Environmental Costs	Closed Loop Economies	Review
Yadav et al. 2024	Environmental Costs	Environmental impacts of reusable containers	Life Cycle Assessment
Banu ND	Environmental Costs	Health impacts of SUPs	Literature Review
Moss et al. 2022	Environmental Costs	Reuse and refill solutions	Review
Heiges 2023	Norms/Consumer Opinion	Norm Emergence	Review
Slafra 2019	Norms/Consumer Opinion	Stakeholders	Survey
Mastria et al. 2024	Norms/Consumer Opinion	Consumer sustainability decisions	Survey
Jiang 2022	Norms/Consumer Opinion	Consumer perceptions/opinions	Survey of Honolulu citizens
Palmer et al. 2021	School Waste	Packaging waste in school programs	Structured observation, semi-structured interview
Chabinka et al. 2015	School Waste	Reusable container program	Surveys, Review
Heiges et al. 2022	School Waste	Packaging waste in school programs	Literature Review
Santulli et al. 2020	School Waste	Environmental Education	Model/Simulation
Pang et al. 2009	School Waste	Types of utensils	Cost-Benefit Analysis
Heiges 2023	Types of Policies	Analysis of types of policies	Used the Berkeley Anti-SUD ordinance as a case study
Heiges et al. 2024	Types of Policies	Effectiveness of different types of policies in the Berkeley Anti-SUD Ordinance	Stratified Random Sample
OECD 2021	Types of Policies	Market-based policies	Review
Merry et al. 2022	Types of Policies	Consumer trade-offs of reusable foodware	Model

Figure 3. Overview of the articles.

3. Results

This section first parses through findings across the articles, starting with sustainability comparisons before delving into the types of policies used generally, then specifically in restaurants on college campuses. After that, it discusses the issues on school campuses before addressing common concerns about reusable foodware.

Across the 26 articles in this review, the majority were published post-2021, with a few published slightly earlier. Many of the articles had a focus on either environmental costs or school food waste, with an equal amount focusing on the types of policies that could be implemented by governments to address SUP waste. The majority were focused on restaurants and how they responded to sustainability challenges, with a few focused on different strategies in college campuses. The ones addressing schools typically focused on plastic waste without considering solutions. In general, the large focus on restaurants is likely because the data is more easily observable and accessible, since schools and universities may be off-limits to outsiders. Most college-specific studies were conducted by students of that college, which resolves the problem of a closed campus. These studies are mostly qualitative, focusing generally on more abstract analyses, although the literature overall includes a large amount of quantitative data regarding sustainability tradeoffs. Additionally, the literature base places a large emphasis on the role of government in sustainability initiatives, which are supplemented with an increased focus on businesses and schools.

3.1. Common Concerns

There are several common concerns from restaurants and school administration associated with reusable foodware. Outside of the environmental concerns, there are concerns about health and cleanliness as well as costs.

In regards to costs, the aforementioned studies have already determined that not only would a reusable system lower prices, reusables will also become more cost efficient when implemented at larger scales. So a system that not only utilizes larger amounts of reusable foodware but also reuses foodware more times will save more money compared to a smaller system with less reuses. This is especially pertinent for public schools, as they may serve hundreds or thousands of students each lunch period, making reusable foodware particularly cost-effective, even when taking into account the upfront cost of an industrial dishwasher.

A large issue with the cleanliness of reusable foodware is the varying standards across the world. The current industry standard in the United States is the adenosine triphosphate (ATP) test, which involves swabbing an area of the surface and inserting the swab into a handheld luminometer device to test for bioluminescence, which when organic matter displays a glow under the device (Guh et al., 2010). This happens because ATP is found in all organic matter and displays bioluminescence when mixed with the enzyme luciferin (Nahar et al., 2022). However, this test is imperfect because the results can vary greatly between user, prac-

tice, and type of residue, as certain types of fouling, such as orange juice or cream cheese, require different amounts of rinse and wash time to pass the test. Even so, tests have determined that material degradation of the foodware is low, even after repeated rinses, so erring on the side of caution in regards to cleanliness is likely viable. This means that concerns about cleanliness may be resolved by simply increasing rinse and wash time or using more rigorous cleaning techniques without worrying about damaging the foodware.

Another large concern stems from the health consequences of reusable foodware if not cleaned properly. However, a 2019 study by Banu shows that the possibility of ingesting microplastics from SUPs is high (Banu, 2019). Lang et al. (2008) found that there is a significant relationship between harmful chemicals found in SUPs and cardiovascular diseases, abnormalities in liver, type II diabetes and carcinomas in adults (Lang et al., 2008). This was later supported by further studies by Stahlhut et al. (2009) and Calafat et al. (2009), who found similar results on the connection between microplastic ingestion and these diseases.

Arguably, the long-term health consequences of single-use plastics are far more severe than the risk of unwashed dishes, especially when using an industrial dishwasher that lowers the chance of subpar cleanliness. Additionally, using the third-party service if possible would continue to decrease the chances of a health crisis, since people are often more thorough when profits are on the line, and these systems can be held accountable by investors and consumers. This would make reusable foodware the obvious health-conscious option.

3.2. Sustainability Comparisons

The 26 articles yielded several different life-cycle analyses and cost-benefit analyses (LCAs and CBAs), which analyze the environmental and economic costs of reusable foodware compared to disposable foodware. By providing an estimate of the costs switching to reusable foodware would save, these analyses can help determine whether or not it is worthwhile to consider the switch. Although the specific amounts varied, each article found that reusable foodware had a significantly lower environmental footprint than single-use plastics, even when considering water usage. Studies typically used either tons of plastic or e-BEP, which is the environmental break-even point, calculated in the number of uses the item needs to undergo to break-even from an environmental standpoint, to measure the environmental footprints of reusable and disposable foodware (Milani, 2025). Other studies calculated environmental footprints in terms of kilograms of CO₂ saved (Di Paolo et al., 2022). They often used functional units that contained a reusable place setting (i.e., plate, cup, cutlery, tray mat, and napkin) (Genovesi et al., 2022). Studies found that to hit their environmental break-even point, reusable foodware had to be reused between 3 - 14 times (Hitt et al., 2023) or 37 times (Snyder & Park, 2024), which is relatively low, meaning restaurants or schools will likely hit this point very easily.

These studies recommended that implementation of reusables be prioritized in

areas of high density to achieve most effectiveness. A study on food crates discovered that while reusables were significantly more environmentally healthy when reused many times, a large portion of responsibility fell on the shoulders of consumers to change their habits (Del Borghi et al., 2020). Companies promoted reusable bottles and told consumers to eat healthier, yet these companies often failed to take any concrete action themselves. When focusing on the producer side, a similar study tested a compromise in a model that minimized environmental impacts and costs by combining single-use plastics and reusables in food packaging so that the system would not have to be entirely different (Ncube et al., 2021). This model, implemented in the Emilia-Romagna region in Italy, found that a ratio of 47.7% reusable packaging to 52.9% disposable packaging resulted in a carbon dioxide emission decrease of 45.1%. While more research is necessary to come to a concrete conclusion, Bortolini et al. has estimated that this ratio will minimize costs and environmental impacts while still maintaining the freshness associated with plastic packaging (Bortolini et al., 2018).

3.3. Cost Effectiveness

While some may believe that single-use plastic foodware is less costly, a study by Milani in 2025 shows that may actually be false. Several case studies conducting economic analyses of using reusable foodware versus disposable foodware have determined that small businesses can save \$3000 to \$22,000 annually by utilizing a reusable foodware system instead of disposable foodware, even when factoring in the cost of an industrial dishwasher, which is around \$3899 to \$3392 annually and the accompanying dishwashers' salaries, around \$31,000 annually (Upstream Solutions, 2024).

Although these studies have been conducted in the context of small restaurants, it is reasonable to believe that similar conclusions can be drawn for schools. Two Minnetonka schools, in a case study of switching to reusables, found that they saved \$3000 the first year and even dropped foodware costs per student from \$6.89 to \$4.83 (Cioci, 2014). Even though schools, particularly public schools that are experiencing the sustainability crisis outlined in the introduction, do not typically operate for profit like restaurants, foodware costs should be similar for both. While schools and restaurants may procure disposable foodware from different manufacturers and more research should be done by the specific establishments looking to switch to reusable foodware, costs are likely similar and will conclude similarly.

3.4. Types of Policies

Policy solutions are separated into two main categories: creative and destructive. Creative policies support localized movements towards an end goal, incentivizing participation. Destructive policies aim to erode the current, unsustainable policies, changing regimes and industry staples. (Heiges et al., 2024). This review primarily analyzes destructive policies, such as a ban on SUPs, as they are the main

instruments that governments, businesses, and schools can use and craft policies around (Heiges, 2023). This is likely because destructive policies are more. This analysis focuses largely on destructive policies due to this reason to lessen the administrative tolls and ensure the desired results. Further research should be done on creative policies and how they could support business innovations, but the intersections between the focus of this review are destructive policies and the response to them.

Market-based regulations, as destructive policies, employ economic incentives such as taxes, fees, and charges to shape producer and consumer behavior. They can be applied to upstream materials, intermediate products, or final products such as bags, cutlery, and bottles. They may also be implemented as waste-based fees, such as “pay-as-you-throw” systems. The Irish tax on plastic bags paved the way for widespread awareness and buy-in. In Italy, a charge on plastic wraps and bags encouraged consumers to switch to biodegradable or compostable plastic bags instead (Arijeniwa et al., 2024). These regulations incentivize innovation through offering continuous incentives to manufacturers to make substitute products. However, their effectiveness depends on consumer price sensitivity, the prevalence of available substitutes, and exemptions design. Revenue from these policies can also fund public acceptance in the event that they are made for environmental use.

Regulatory policies, while still categorized as destructive policies, specifically prohibit the sale, production, or use of plastics. Prohibitions on specific products (i.e., straws or carrier bags), product-feature prohibitions (i.e., as thin bags), prohibitions on specific materials (i.e., oxo-degradable plastics), or prohibitions on middle ingredients (i.e., microbeads in personal care products) are examples (Heiges et al., 2024). In addition, there are regulations calling for material content, such as recycled or biodegradable content. Plastic bag bans are the most common, though their environmental impact depends considerably on the footprint and availability of alternatives. Case studies indicate that the bans have a capacity to reduce littering of plastics by 34% - 89%. Policy measures are typically more costly and less diverse than market instruments, as they mostly involve bans or regulations, which can be inflexible and generally more costly for the market writ large. However, policy measures also align better with the precautionary principle, which encourages sustainability initiatives to err on the side of caution, as they have more predictable effects.

Voluntary measures consist of non-legally binding arrangements of companies, governments, or non-governmental organizations (OECD, 2021). They can take the form of public voluntary schemes, government-industry negotiated agreements, or corporate unilateral commitments, many of which aim to deal with plastic packaging. Though not enforceable in a legal sense, they can be made more effective by peer pressure, public revelation, and the promise of future regulation. Historical evidence indicates that voluntary programmes do reduce waste and promote eco-innovation, but are less effective than necessary regulation and work

best as complements.

The majority of policies evaluated in the subsequent sections are market-based or regulatory policies. The main focus is on how they may be implemented by governments and affect businesses and schools, as voluntary policies are less controllable.

3.5. Current Policies and Ordinances

Many restaurant policies react to these destructive policies, employing methods to comply with bans, taxes, or regulations. In case studies like Berkeley's anti-SUD ordinance, which required reusable foodware in restaurants, compostable foodware for takeout, and charged a 25-cent fee for disposable cups, it is clear that there are a few concerns with a total ban on SUPs (Borsi, 2022).

The most notable challenge restaurants experienced with Berkeley ordinance is a possible issue with the disability justice community, who emphasized providing sufficient accommodations and utensils for people with disabilities to use if necessary. The 2023 anti-SUP movement, which advocated for the elimination of single-use plastics and specifically included removing plastic straws, brought up an important concern about the necessity of straws for disability accommodations (Heiges, 2023). Plastic straws were deemed necessary as they are flexible enough to prevent accidents yet do not disintegrate, ensuring that no harm comes to people with disabilities through danger of choking or stabbing. Similarly, local restaurants were concerned about increased labor costs due to added dishwasher salaries.

Another possible system is a third-party system that acts as a reusable provider that delivers the reusable foodware and retrieves it to do the maintenance on behalf of the consumer (Milani, 2025). This 2025 analysis by Milani found that a system where two to three food service establishments serve approximately 300 meals per day, six days a week drops the cost for the third-party system below that of single-use foodware. This model could reduce annual foodware costs by approximately \$6552. This system would entail a third-party business that would supply the reusables and once returned, clean them, ideally daily. Even with the costs of transportation, the carbon footprint would be significantly lower than that of SUPs.

Current policies are heavily restaurant focused, with the literature focusing on how they respond to certain policies like taxes and bans. Generally, these policies have been relatively effective, even if a total ban is impossible due to safety concerns. Simulations and studies like the aforementioned third-party system have also been tested on restaurants, allowing us to observe the possibilities and draw conclusions to other environments.

3.6. College Campus Policies

On college campuses, studies have considered both regulatory and voluntary policies. A research team at Dalhousie University analyzed the feasibility of a reusable

foodware campaign (Chabinka et al., 2015). Several possibilities were explored in this study: selling a student or staff member their own reusable container to use, providing containers external to the university, and upgrading existing infrastructure to reduce the need for disposables. Although these products can be expensive, especially for students, there are models to make it financially feasible. For example, the University of Maryland employs a system in which students pay a deposit on a reusable container, as well as receiving a discount of \$0.25 cents each time a reusable container is used (Department of Dining Services, 2014). The deposit is then returned when the container is returned and washed by the school.

College campuses generally use reusables for on-campus dining, so the necessity and impact of further implementation of reusable foodware is decreased. However, studying reusables on these campuses is useful since they are frequently used for studies on reusable foodware and secondary education can draw conclusions from the practices of colleges and universities.

3.7. Differences in Environment

Reusable foodware is advantageous for several reasons: health, environmental, and even possibly cost benefits. Both environments that the literature focuses on, restaurants and universities, however, are fairly distinct from high school cafeterias, especially in public school districts.

Restaurants and school cafeterias differ in size, typically, as well as budget restrictions, menus, and time. School cafeterias are often more frenzied as they may serve hundreds or thousands of students at a time, while restaurants typically serve significantly less. This means that restaurants may have more time and money to dedicate to foodware considerations compared to schools. Additionally, the implementation of additional fees or taxes in restaurants is possible as consumers are typically aware upfront about the increase in price, but in schools, many students are unaware about prices and thus additional fees or taxes will be difficult to utilize.

College campuses and school cafeterias have many differences as well. On college campuses, it is far more feasible to sell each consumer their individual reusables, or provide a “bring-your-own” (BYO) foodware container system (Merry et al., 2012). However, in school cafeterias, it would be nearly impossible to implement a similar system, especially if it relied on the students to make the change to reusable foodware themselves.

Despite these differences, there are conclusions that can be drawn from these environments to address challenges and concerns within schools.

3.8. School Concerns

In school nutrition programs, there are a few key concerns regarding the implementation of reusables. While a large concern for schools is cost-effectiveness, they may also be concerned about cleanliness and safety.

However, a large part of this packaging waste at the school level is actually out

of the control of schools and a larger question of manufacturers. Many cafeterias receive the foodware and food itself pre-packaged in plastic packaging from the manufacturers (Palmer et al., 2021). Because of this, much of the waste actually originates from producers and is disposed of by schools once the meals are served. However, schools can still take steps to reduce disposable foodware even if they cannot directly address disposable packaging of food items by manufacturers, such as replacing SUP trays and utensils for reusables ones.

4. Discussion and Recommendations

4.1. Overview

When considering sustainability initiatives and methods for implementing a system of reusable foodware, it may seem obvious to focus on the role of governmental action first and foremost. However, there are opportunities for businesses and schools to supplement any policies from governments to increase the effectiveness and feasibility of a transition to a reusable foodware regime. These three are the most directly relevant entities, who each exert influence over certain parts of the current disposable foodware regime. Governments are able to directly regulate the market, while businesses have potential for further innovation and creativity and schools are the ones directly affected.

4.2. Recommendations for Businesses

While some may believe that sustainability initiatives are generally driven by governments and businesses play a seemingly less important role in sustainability initiatives. As identified above, however, much of the packaging is determined at the manufacturers level instead of the school level (Palmer et al., 2021). This means that such businesses should take a much more active step towards implementing policies focused on sustainability. The change must begin at the beginning of the manufacturing process to make any concrete difference, since plastic packaging may be determined at different levels of the process.

Focusing on sustainability, however, does not mean that businesses must forgo profits. A 2025 study by Milani found that the reusable foodware system had the opportunity to be profitable, if at least 1248 sets of reusable foodware are leased per day. At this price point, the system is estimated to generate a profit of \$0.02 per place setting, which results in \$33,228 annually. The place settings can be leased at \$0.20 per place setting, which is \$0.07 less than the average price for single-use place settings, making it cost effective for both a third-party reusable foodware system but also the consumers, in this case schools and restaurants.

Another business-driven sustainability initiative is resource mobilization, most notably in the form of venture capital (Heiges, 2023). Some firms, like Circulate Capital and Closed Loop Partners, are specifically dedicated to sustainability initiatives like waste management, waste minimization, and the circular economy. According to these firms, venture capital has been able to increase plastic pollution prevention, carbon dioxide equivalent emissions avoidance, waste managed,

value-added plastics, new jobs, and new capacities through strategic investments that these companies may not have received through other avenues.

Businesses have an important role, particularly in supplementing creative policies by innovating new strategies to decrease the cost of reusable foodware and other sustainability initiatives through investments and business ventures.

4.3. Recommendations for Governments

Governments, on the other hand, can do a larger amount of the direct work by passing certain policies to incentivize environmentally healthy practices. Through environmental taxes and mandatory charges, governments can curb the use of disposable foodware (OECD, 2021). For example, they may introduce mandatory charges on single-use plastic products, perhaps at the manufacturer level to avoid placing too much pressure on schools alone. Because the majority of current policies target final goods, rather than intermediate goods, a multi-layered charge on disposable products, spread across each stage of the manufacturing process, may be more effective in reducing plastic waste while spreading the burden across multiple industries. Most policies implement a charge or tax on a finished product, usually during the sale of the product to consumers.

The aforementioned taxes and charges have been destructive policies, aimed at removing the current single-use plastic regime (Heiges, 2023). Governments, however, can also utilize creative policies by providing grants or subsidies to school districts so that they are able to either afford the cost of an industrial dishwasher (around \$3899 and \$3392 annually) as well as the accompanying dishwashers' salaries (around \$31,000 annually), or establish a business relationship with a third-party system (Milani, 2025).

However, policies must be specific to avoid offsetting the environmental costs instead of eliminating them. If producers have readily available alternatives that are equally environmentally harmful or worse, the policy has largely backfired. For example, a 2018 study by Stephenson found a ban on SUD plastic bags was found to increase single-use disposable paper bags by 35%. Similarly, a recently-enacted ban on SUD plastic bags in New Jersey showed a drop in SUD bag usage, but many retailers, specifically online grocery delivery companies, lacked a return system for reusable bags, which means consumers now have hundreds of reusable bags they are unable to reuse (Toeniskoetter, 2022). As these bags have a higher GHG footprint than SUD bags, the policy, although initially deemed successful, has evidently failed to increase environmental sustainability efforts (Heiges, 2023).

Due to these alternatives, market-based policies may be more effective than regulatory policies. This is because while market-based policies like taxes may provide producers with the opportunity to innovate, regulatory policies such as bans often drive producers and consumers to turn to alternatives, negating the effects.

4.4. Recommendations for Schools

The recommendations for schools are relatively straightforward, however, they

can be split into two sections: recommendations for primary and secondary education and recommendations for higher-level education.

For primary and secondary education, budgets are more limited and they are more reliant on governments and businesses to comfortably implement measures like reusable foodware. However, when considering the merits of reusable foodware, it is clear that even taking into consideration costs of an industrial dishwasher and the cost of paying dishwashers' salaries, schools may still be able to save money (Milani, 2025). Of course, this may differ from school to school, as each school may procure their current foodware from different manufacturers at different prices, so further research should be done on manufacturers in certain areas, possibly by schools looking into the implementation of reusable foodware systems.

As for higher-level education, many colleges and universities already implement reusables in dining halls and cafeterias. However, as shown in the cases of Dalhousie University and the University of Maryland, there are issues with single-use plastic takeaway containers, such as consistency and accountability. Universities may choose to implement a similar system as these universities by either utilizing a deposit system where students can rent a container by placing a deposit that is then returned upon returning the container or a system of slightly raised food prices in return for a reusable container than students can then keep (Chabinka et al., 2015). The second method may be less consistent in terms of reuses, but also less administratively stressful and complicated. Students may also receive discounts or coupons upon reusing a container, which can incentivize more consistent reuse.

Focusing on primary and secondary education may foster a generation of environmentally-conscious students as there are opportunities to teach them about these initiatives especially when implementing them, which has the potential to shape the direction of future sustainability initiatives.

5. Conclusion

After examining the current literature on reusables, focusing on how governments, businesses, and schools can work together in the context of education, it is clear that there are some important gaps. Further research should be done to put these recommendations in the context of specific areas, as costs and common concerns likely vary across different regions. Specifically, further studies should look to answer more specific questions about what type of ban or regulation, i.e., on what material or product is the most inclusive and effective. It may also be informative to conduct more thorough research on current disposable foodware manufacturers and how they compare to reusable foodware suppliers. Overall, it is evident that solving the ongoing sustainability crisis is only possible if these different sectors work together.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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