

Investigating Opportunities for Single-use Plastic Reduction in Nova Scotia Food Services During COVID-19

Prepared for Divert NS by

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List of Acronyms

CDC – Centers for Disease Control and Prevention
CEPA – Canadian Environmental Protection Act
ECCC – Environment and Climate Change Canada
GHG – Greenhouse gas
ESDC – Employment and Social Development Canada
NZWC – National Zero Waste Council
PPE – Personal protective equipment
SUP – Single-use plastic
WHO – World Health Organization

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Executive Summary

The COVID-19 pandemic has caused a surge in societal consumption of single-use plastics (SUPs), particularly within the food service sector. Given the unprecedented nature of the pandemic, many Canadians have shown more concern for public health and safety than the reduction of plastic waste. To follow public health guidelines, many restaurants and cafes have been limited to takeout and delivery orders and have restricted the use of personal reusable items. Fortunately, public health officials and researchers agree that reusable items can be used safely when prioritizing basic hygiene measures. Further, innovative plastic reduction initiatives can be implemented to combat wasteful restaurant practices. Therefore, this study seeks to investigate opportunities to address the increased use of SUPs in Nova Scotia food services sparked by the COVID-19 pandemic.

Using a series of semi-structured interviews and focus groups with various stakeholders, it was confirmed that, prior to the pandemic, many food services across Nova Scotia already had implemented various forms of SUP reduction initiatives, such as using biodegradable alternatives and paper-based products. However, the onset of COVID-19 forced businesses to pause most of these strategies, and instead rely on plastic for their operations. The most notable obstacles to SUP reduction mentioned by participants were operational challenges from COVID-19 restrictions, misunderstanding of local waste management systems, the financial cost of transitioning to zero plastic waste, poorly manufactured alternatives, greenwashing, and the ingrained culture of convenience in today's society. These barriers inhibit businesses from accomplishing zero plastic waste goals, and will continue long-term if not properly addressed.

Based on the challenges and needs identified by participants, it is recommended that food services adopt new operational procedures that build up infrastructure to support SUP reduction strategies. This includes re-introducing reusable items in restaurants and cafes, implementing exchange programs for bulk items and take-out, providing education and awareness to staff and consumers, and sourcing locally accepted SUP alternatives. These strategies are most effective when engrained within business models from the start. However, they can and should be implemented at any time. Food services across Nova Scotia need to be supported by government legislation, third-party resources, and consumer power to adapt their operational procedures accordingly and create behaviour change to reduce SUPs.

Introduction

The rise of the COVID-19 pandemic presented many challenges for food services such as restaurants and grocery stores across Nova Scotia (Alfonso et al., 2021; Patricio Silva et al., 2020; Patricio Silva et al., 2021; Prata et al., 2020). In an attempt to reduce the spread of the virus, the government implemented a precautionary approach with COVID-19 restrictions and guidelines that fluctuated throughout three waves of the pandemic. At their peak, COVID-19 restrictions mandated restaurants to close all in-person services, and grocery stores to operate at a limited capacity across Nova Scotia (Farnell, 2021; Janairo, 2021; MacLean, 2020; Roth et al., 2020). Some municipalities also decided to delay or reverse SUP reduction initiatives, including the new G7 Oceans Plastics Charter, as health and safety concerns were prioritized over environmental initiatives (Adyel, 2020; McCormick, 2020; Walker and Xanthos, 2018).

Initially, knowledge of virus transmission was not well understood. Many food services paused the use of reusable items, such as fabric bags and travel mugs, in fear of transmission (National Zero Waste Council [NZWC], 2021). The plastic industry capitalized on this opportunity by citing older studies and hand-picking certain results to further demonize reusables in society (Hale and Song, 2020; Schlegel and Gibson, 2020). Food services were forced to rely on SUPs to continue their operations. Common SUP products used in food services include plastic bags, straws, takeout cutlery, and plastic food packaging (Walker et al., 2021). COVID-19 also increased a less common source of plastic pollution via single-use personal protective equipment (PPE), such as face masks and gloves (Adyel, 2020; Patricio Silva et al., 2021).

Consequently, plastic use by Canadians has increased 29% throughout COVID-19 (Kitz et al., 2021). The Great Canadian Shoreline Clean-up has reported an increase in single-use food and beverage litter from 15% in 2019 to 26% in 2020 (OceanWise, 2020; 2019). Further, plastic waste generation is expected to rise post pandemic due to a rebound in economic activity (Vanapalli et al., 2021) Food services must adapt to effectively manage their plastic waste as consumers and retailers readjust to the new normal. To address the increase of SUPs due to the COVID-19 pandemic, this study investigates opportunities for SUP reduction in food services across Nova Scotia.

Plastic and Plastic Pollution

Plastic and plastic products have become integrated into modern society ever since their mass production in the 1950s (Beaumont et al., 2019; Davis, 2015). The growth in the market can be attributed to the continuing shift from reusable to SUPs (Geyer et al., 2017). The majority of commercial plastic has a rapid and predominantly linear lifecycle (Achilias et al., 2007; Fuller et al., 2020; Schnurr et al., 2018). To keep pace with societal consumption, the amount of plastic produced has doubled every decade (Geyer et al., 2017). Approximately 40-50% of plastic today is made for a single-use and is discarded immediately after (Geyer et al., 2017). This marketing strategy forms a culture of convenience, as consumers have become accustomed to easily accessible products. Convenience culture promotes unsustainable consumption, particularly with SUPs. Adaptability of plastic has resulted in the displacement and replacement of other common manufacturing items, such as wood and metals (Andry and Neal, 2009). Capitalism has greatly influenced plastic use and consumption. It is less expensive to create new plastic than it is to recycle old plastic, resulting in a significant waste of resources and energy (Ambrose, 2019; Deloitte, 2021).

Decades of overproduction and inadequate waste disposal practices have caused plastic to become ubiquitous within the terrestrial and marine environments (i.e. plastic pollution), generating a number of threats for both the natural and anthropogenic world (Geyer et al., 2017; Law 2017; Pettipas et al., 2016; Xanthos and Walker, 2017). Plastic pollution can alter species distributions, transport invasive species, and cause mortality through entanglement and ingestion (Gall and Thompson, 2015; Welden, 2020). As plastic degrades into microplastics, it can release methane and ethylene when exposed to solar radiation and hydrocarbon gas when exposed to water, contributing to greenhouse gas (GHG) emissions (Royer et al., 2018). Plastic and microplastics are derived from fossil fuels and plastics account for 6% of global oil consumption (Zhu, 2021). Microplastics and GHG emissions are released with every step of the plastic life cycle, from production to waste disposal, contributing to climate change (Walker, 2021a). Microplastics can also enter the food chain into human food and drink (Barboza et al., 2018; Karbalaei et al., 2019). Wit and Bigaud (2019) found that adults can consume up to five grams of microplastics each week. Once ingested, plastic particles can cause respiratory and digestive injury, and can cross cell membranes into the blood-brain barrier which can impact the human placenta (Galloway, 2015; Vethaak and Leslie 2019).

Trends in Plastic Pollution and Waste Management

In 2019, Canada produced approximately 4.6 million tonnes of plastic, while generating 2.8 million tonnes of plastic waste (Deloitte, 2019). Canadians produce more plastic waste per capita than anywhere else in the world, yet only 9% of our plastic is properly recycled (Environment and Climate Change Canada [ECCC], 2020a; Sevunts, 2019; Young 2019). The Government of Canada has no national framework for recycling of plastics; instead, each province is responsible for their own waste management, and each municipality is responsible for their own waste collection (Environmental Defence, 2018; Fawcett-Atkinson, 2021). This fragmented approach to waste management is problematic and difficult to standardise, particularly when Canada strives towards zero plastic waste (Walker and Xanthos, 2018). Provinces have different criteria for waste diversion, which results in disjointed recycling standards across Canada. Further, current waste sorting and processing facilities are ill-equipped to manage the flow of plastics produced from long established plastic manufacturers (Fawcett-Atkinson, 2021).

Unsurprisingly, plastics are amongst the most common anthropogenic items found in the environment during clean-up initiatives across Canada (ECCC, 2020a). On average, eight out of the top 12 items collected annually are SUPs (OceanWise, 2020). The prevalence of plastic in the environment has created problems for the Canadian economy. Plastic pollution can cost up to \$8 billion CAD annually by way of lost economic value and/or environmental damages (Deloitte, 2020; ECCC, 2020b). Expenses could rise to \$11 billion CAD by 2030 if no immediate action is taken to improve Canada's waste management systems (Deloitte, 2019).

At a provincial level, Nova Scotia's disposal rate is almost 50% lower than the Canadian average (Divert NS, 2018). However, the province is no stranger to plastic waste. Plastic accounts for 21% of materials found in Nova Scotia's landfills, equating to approximately 60,000 tonnes annually (Divert NS, 2018; Ashtab and Whyte, 2019). Prior to the implementation of the provincial plastic bag ban on October 30, 2020 (Walker, 2021b), 4% of the waste stream was comprised of plastic bags, equating to as much as 500 million plastic bags annually (Campbell, 2018; Divert NS, 2018).

Similar to the rest of Canada, Nova Scotia does not have the capacity to manage massive quantities of plastic waste. Instead, several businesses have experimented with different types of plastic processing technologies, such as upcycling plastic to synthetic lumber. Municipalities have also exported plastic waste to be recycled in foreign countries with less rigorous standards (Ashtab

and White, 2019; Thomson, 2020). As a coastal province, there is a higher likelihood for plastic waste generated to enter the marine environment. Recent studies have found approximately two million pieces of debris lay on the seafloor in the Bay of Fundy, of which 50% are plastics (Goodman et al., 2020). Despite current plastic management efforts, a more robust strategy to reduce plastic pollution is needed.

Plastic Reduction Policies

Within the last decade, multiple levels of the Canadian government have made notable progress in addressing plastic management challenges through action plans and legislation. In 2015, Canada adopted the United Nations 2030 Agenda for Sustainable Development (Employment and Social Development Canada [ESDC], 2019). As part of this movement, environmental protection efforts increased across Canada. The same year, microbeads were classified as toxic under the *Canadian Environmental Protection Act (CEPA)* (Pettipas et al., 2016). In 2018, Canada signed onto the G7 Oceans Plastics Charter with the goal of moving towards zero-plastic waste and mitigating marine plastic (Walker and Xanthos, 2018). This gave direction for legislation. In 2019, Prime Minister Justin Trudeau committed to legislatively banning check-out bags, straws, stir sticks, six-pack rings, plastic cutlery, and plastic food containers under *CEPA* by the end of 2021 (ECCC, 2021; ECCC, 2020b; Walker, 2021b).

Many food services across Nova Scotia have been promoting sustainable actions and implementing SUP reduction initiatives in recent years. Customers were using reusable items and carrying fabric shopping bags, while many retailers were working toward zero plastic waste in an attempt to foster a circular economy (NZWC, 2021). In October 2020, Nova Scotia became the third Canadian province to implement a province-wide plastic bag ban (Government of Nova Scotia, 2021).

Unfortunately, the increasing interest in reducing single-use plastics came to a standstill during the COVID-19 pandemic. COVID-19 restrictions forced food services to rely on plastic products to continue serving consumers. Nova Scotia announced its first cases of COVID-19 on March 15, 2020. Three days later, the provincial government called for the closure of all in-person dining in restaurants; however, take-out and delivery were still permitted (Government of Nova Scotia, 2020). By July 31, 2020, grocery stores were limited to 25% capacity, and masks were

mandatory (Roth et al., 2021). These actions effectively halted the progress of all plastic reduction initiatives.

Research Question and Objectives

The COVID-19 pandemic triggered an increase in the use and disposal of SUPs. Public health guidelines mandating takeout service only, use of PPE, and a fundamental misunderstanding of COVID-19's mode of transmission fueled unsustainable plastic consumption. There is an urgent need to reverse this trend. To address the rise in SUPs due to COVID-19, this study investigates market-based strategies for SUP reduction in the food service sector across Nova Scotia.

The primary research objectives for this study are threefold:

- I. To identify current challenges of SUP reduction in food services during COVID-19;
- II. To develop future opportunities for SUP reduction in food services post COVID-19; and,
- III. To provide recommendations for food services across Nova Scotia to reduce SUPs.

Methods

A combination of semi-structured interviews and focus group meetings were used to understand concerns surrounding SUP use during COVID-19, and potential opportunities for reduction strategies from stakeholders in the food services, waste management, and public service sectors across Nova Scotia. Semi-structured interviews and focus groups have been widely used in qualitative research as a cost-efficient and timely method of elucidating perceptions and opinions of the participant(s) (Jamshed, 2014; Escalada and Heong, 2011; Gill et al., 2008). For this study, the sectors were selected to provide a holistic perspective on the current challenges facing the food industry during COVID-19 from upstream regulations to downstream waste. Participants were recruited for this study under the criteria that they were currently employed in one of the defined sectors, knowledgeable about plastic use and COVID-19 restrictions, and/or had the authority to enact change within their respective organization. Calls for participation were circulated to the Restaurant Association of Nova Scotia, Restaurants Canada, the Retail Council of Canada, grocery store managers and/or supervisors, as well as relevant internal networks of the research team. Regrettably, there was a lack of interest from grocery stores. Participants were

invited to take part in both data collection methods but had the freedom to choose either or both options. Prior to the start of the data collection phase, all participants were required to sign a form consenting to their involvement in the study. Data collection methods were completed in accordance with the Dalhousie University Research Ethics Board (see supplementary material S1).

Semi-structured Interviews

Semi-structured interviews were conducted one-on-one to attain qualitative information regarding behaviours related to SUP use, waste trends, and waste reduction initiatives in food services before and after the onset of the COVID-19 pandemic. The private and semi-structured nature of interviews allowed participants to freely express their ideas and concerns surrounding a zero-plastic waste future. Interview questions were tailored to each sector (see supplementary material S2) and reviewed prior to use by Divert NS, to ensure appropriate and relevant questions were being asked. Interviews lasted approximately 30 minutes and occurred throughout May and June 2021. All interviews were conducted using the video conference platform, Zoom (<https://zoom.us/>), to maintain COVID-19 safety measures. Interviews were audio recorded, transcribed, and anonymized for secure data analysis.

Focus Groups

Two focus groups were conducted following the semi-structured interviews. The focus groups provided a medium for participants to discuss COVID-19 related challenges in SUP reduction, opportunities for SUP reduction during COVID-19, and the development of future strategies and resources for long-term SUP reduction after COVID-19. Participants were divided into two focus groups, to ensure adequate time for all members to convey their thoughts. The online whiteboard application, Mural, was used to generate discussion and organize ideas. It also provided a non-verbal option for members to contribute to the conversation. The focus group structure was reviewed by Divert NS, to ensure appropriate and relevant topics were being discussed. Both focus groups had the same structure and each took approximately one hour. The first focus group was conducted on June 24, 2021 and the second on June 29, 2021, using the video conference platform, Zoom. The focus groups were audio recorded, transcribed, and anonymized for secure data analysis.

Data Analysis

The data gathered from the two collection methods was analyzed through a process of coded thematic analysis as described by Bree and Gallagher (2016). The semi-structured interview and focus group transcripts were exported to their own respective Excel spreadsheets. Each spreadsheet was organized by question/discussion point. Interview questions from each sector were consolidated by topic to group similar themes and ideas. The data was conveyed as a single column of all the comments from the participants. Each individual cell was then reviewed and assigned under a theme and sub-theme. There were no pre-determined themes or sub-themes in place prior to the coding. If a comment fit into multiple themes, the cell was duplicated, and each cell was coded respectively to ensure the prevalence of all themes was reflected. The data was then sorted by theme. Themes from the two data collection methods were then compared to develop recommendations for SUPs use, disposal, and reduction strategies during and after COVID-19.

Results

Semi-structured Interviews

A total of 14 interviews were completed (Table 1). There were seven key questions asked during each interview. The following pie charts illustrate the major themes extracted from the interview sessions. Sub-themes of interview responses were also determined (see supplementary material S3).

Table 1. Semi-structured interview participants ($n=14$).

<i>Number of participants</i>	Sector
<i>1</i>	Academic research
<i>2</i>	Environmental Non-Governmental Agencies (ENGO)
<i>6</i>	Restaurants and Cafes
<i>2</i>	Nova Scotia Environment and Climate Change
<i>2</i>	Nova Scotia Health
<i>1</i>	Municipal Waste management

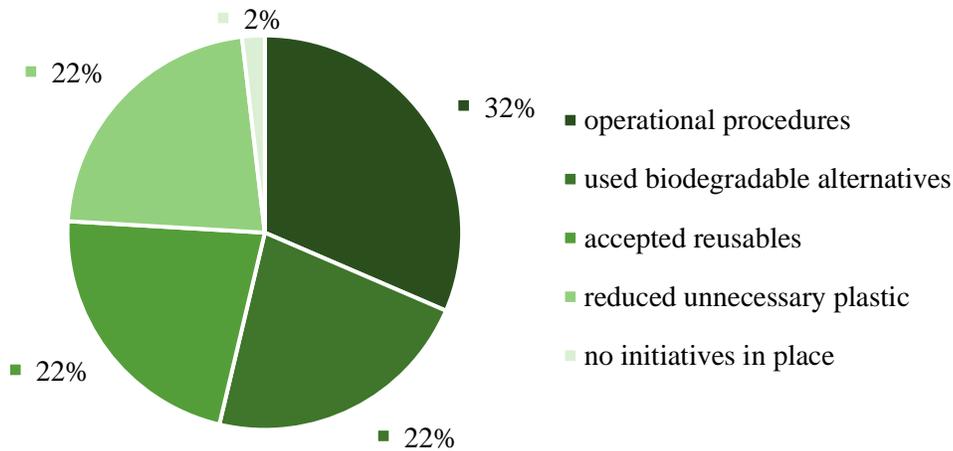


Figure 1. Themes of interview responses to pre-existing SUP reduction initiatives in food services before COVID-19.

The first interview question asked participants to identify any pre-existing SUP reduction initiatives in food services prior to the onset of COVID-19 (Figure 1). A total of 54 participant comments were extracted from the interview transcripts. The prevalence of initiatives was found to be moderately equal across food services before COVID-19. During interviews, 32% of comments (n=17) referenced a variety of operational procedures for plastic reduction. These included implementing internal environmental committees, exchange programs, reducing food waste, switching suppliers, financial incentives, and ingraining these reduction strategies into the business model. Commonly using biodegradable alternatives (i.e., compostables and paper options), accepting the use of reusables, and making active efforts to reduce unnecessary plastic were all referenced in 22% of comments (n=12). Only 2% of comments (n=1) referenced no plastic reduction initiatives prior to the onset of COVID-19.

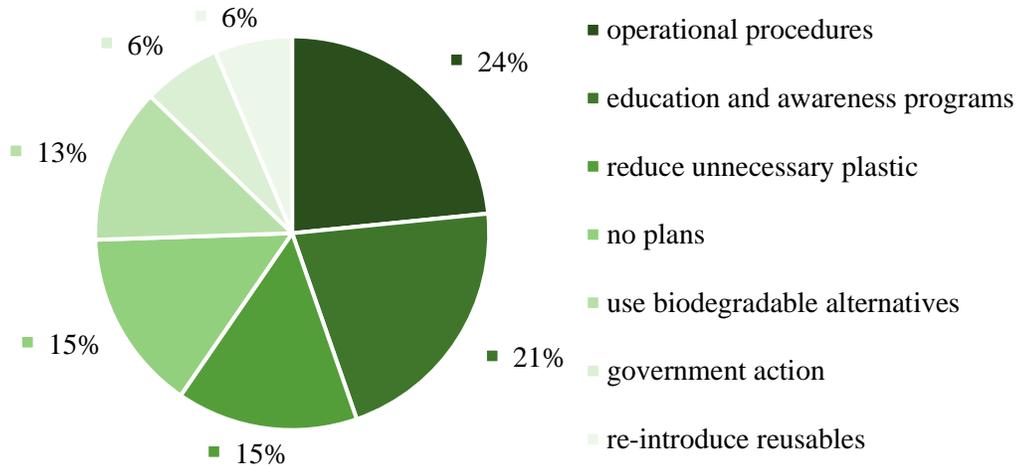


Figure 2. Themes of interview responses to plans for SUP reduction initiatives in food services after COVID-19.

The second interview question inquired about future plans for SUP reduction initiatives in food services after COVID-19 (Figure 2). A total of 47 participant comments were extracted from the interview transcripts. Encouragingly, most (n=40) of the comments referenced plans for implementing some form of SUP reduction initiative once COVID-19 is over. Interview results found 24% of comments (n=11) focusing on operational procedures and strategies for SUP reduction within food services, such as implementing innovative initiatives, ongoing efforts, and financial incentives. Education and awareness programs were mentioned in 22% of comments (n=12). Participants showed interest in providing education for staff and consumers, conducting research on best practices, and improving messaging on packaging as education-based strategies. Reducing unnecessary plastic was mentioned in 15% of comments (n=7). Reduction-based strategies included less use of plastic based items, limiting plastic available to consumers, and sourcing recyclable material. 15% of comments (n=7) did not report any plans for SUP reduction initiatives after COVID-19. Other planned SUP reduction initiatives include implementing biodegradable alternatives mentioned in 13% of comments (n=6), relying on government legislation in 6% (n=3), and re-introducing reusables in 6% (n=3).

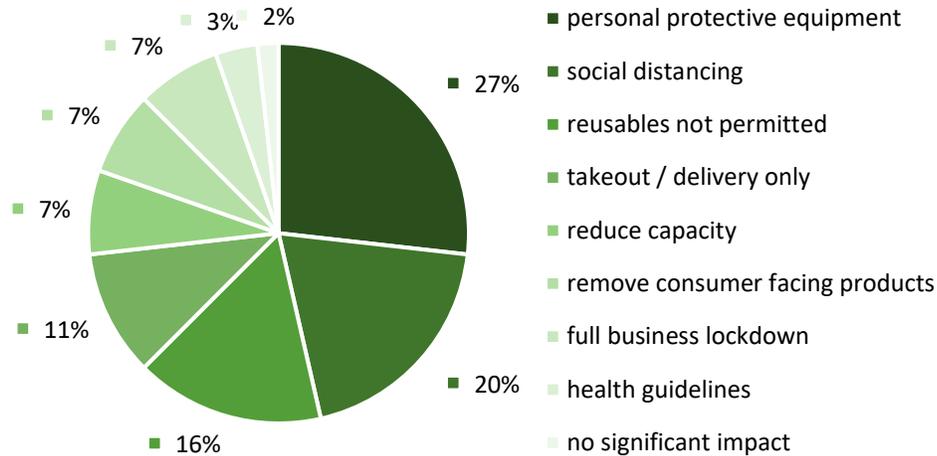


Figure 3. Themes of interview responses to which COVID-19 restrictions and/or guidelines have impacted food services.

The third interview question highlighted which COVID-19 restrictions and guidelines have impacted food services the most (Figure 3). A total of 56 participant comments were extracted from the interview transcripts. PPE was mentioned in 27% of comments (n=15). Food services referenced the increased need for sanitization, face coverings, gloves, and plexiglass dividers to reduce the spread of COVID-19. Social distancing was mentioned in 20% of comments (n=11) with limited contact, guiding arrows, and smaller staff. The uncertainty of reusables was mentioned in 16% of comments (n=9), as food services rejected mugs, plates, bags, and other reusables due to fear of transmission. Limitations to take-out and delivery were mentioned in 11% of comments (n=6). Reduced capacities inside businesses, removing easily accessible consumer products, and full business lockdowns each were mentioned in 7% of comments (n=4). Following general public health guidelines was mentioned in 3% of comments (n=2). Lastly, 2% of comments (n=1) did not acknowledge any significant impacts from COVID-19 regulations.

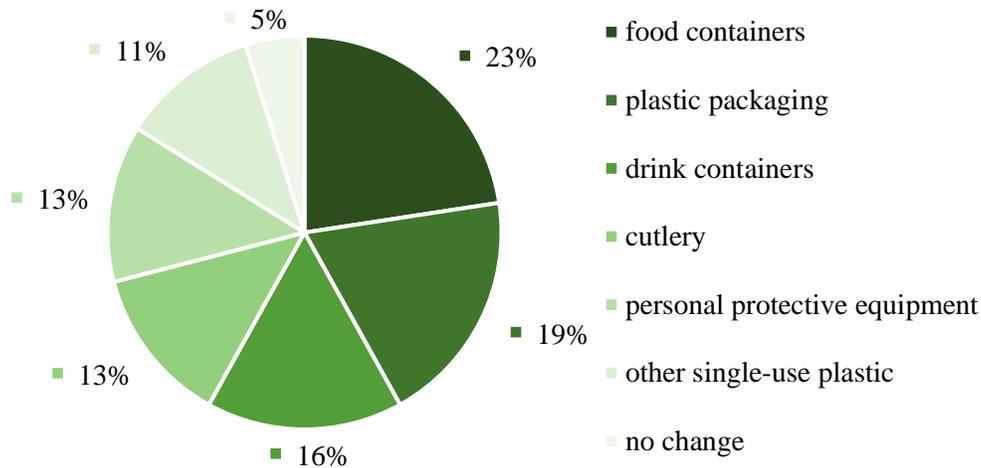


Figure 4. Themes of interview responses to which SUPs have increased in food services since the start of COVID-19.

The fourth interview question identified any changes in the type or quantity of SUPs since the start of COVID-19 (Figure 4). A total of 62 participant comments were extracted from the interview transcripts. An increase in food packaging containers was mentioned in 23% of comments (n=14). Within food containers, interview results indicate plastic for takeout has increased the most, including catering and condiment containers. Further, there is still a presence of Styrofoam in food services. An increase in plastic packaging was mentioned in 19% of comments (n=12). Participants referenced commonly handled products, such as cutlery, are now wrapped in plastic to ensure sterilization. Drink containers, such as bottles and cups were mentioned in 16% of comments (n=10). Increases in cutlery and PPE were both mentioned in 13% of comments (n=8). Participant comments also referenced a general increase in SUPs 11% of the time (n=7). Only 5% of comments (n=3) did not report an increase in any SUPs.

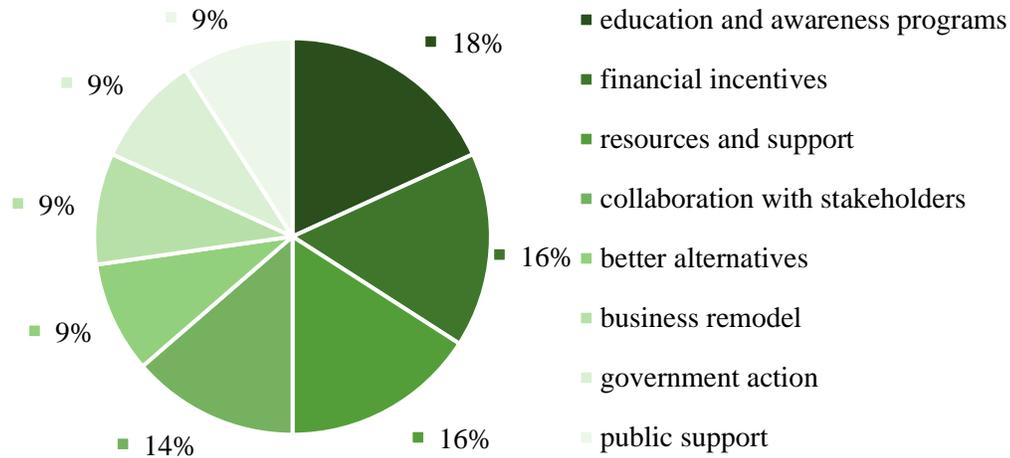


Figure 5. Themes of interview responses to how food services can be better equipped to reduce SUPs.

The fifth interview question asked what resources food services would require to be better equipped to implement SUP reduction initiatives (Figure 5). A total of 44 participant comments were extracted from the interview transcripts. There was an even distribution of ideas from all sectors for how food services can improve plastic management. Education and awareness programs were mentioned in 18% of comments (n=8). Participants explained that understanding the packaging supply chain and researching what alternatives are accessible and compatible for their respective local waste diversion programs is critical for reducing plastic waste. Financial incentives, and available resources and support were both referenced in 16% of comments each (n=7). Participants suggested financial encouragement and incentives for businesses to implement sustainable options would support SUP reduction. Additionally, third party assistance in implementing best practices, or a resource guide for SUP reduction initiatives, were mentioned as potentially valuable resources and supports. Collaboration with stakeholders, such as suppliers, ENGOs, or other food services, was mentioned in 14% of comments (n=6). Sourcing better alternatives, re-modeling the business plan to include SUP reduction initiatives, increasing government legislation, and garnering more public support were all mentioned in 9% of comments (n=4) each, as potential tools for SUP reduction.

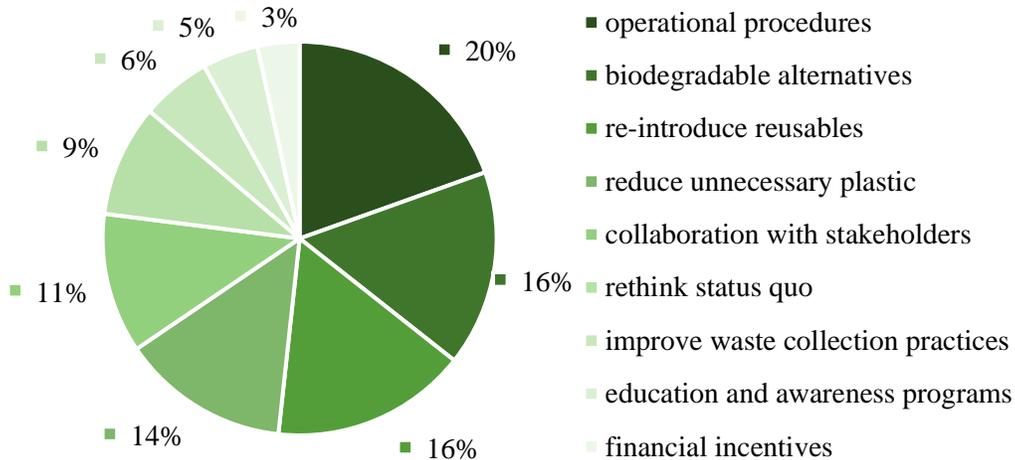


Figure 6. Themes of interview responses to what food services can do now to reduce SUPs.

The sixth interview question identified initiatives and strategies food services can immediately implement to reduce SUPs (Figure 6). A total of 87 participant comments were extracted from the interview transcripts. Interview results found 20% of comments (n=17) suggested operational procedure strategies could influence SUP reduction initiatives. Simple yet effective operational procedure changes included options such as only giving out plastic items on request, setting up exchange programs with suppliers and consumers, promoting reduction efforts to consumers, and implementing new innovative initiatives. Switching to biodegradable alternatives, such as compostables, and re-introducing reusable items into food services were each suggested in 16% of comments (n=14). Other suggested strategies for SUP reduction included reducing unnecessary plastic within food services (suggested in 14% of comments; n=12), collaborating with stakeholders (11%; n=10); contributing to behaviour change (9%; n=8), improving waste management practices (6%; n=5), implementing more education and awareness programs (5%; n=4); and expanding financial incentives (3%; n=3).

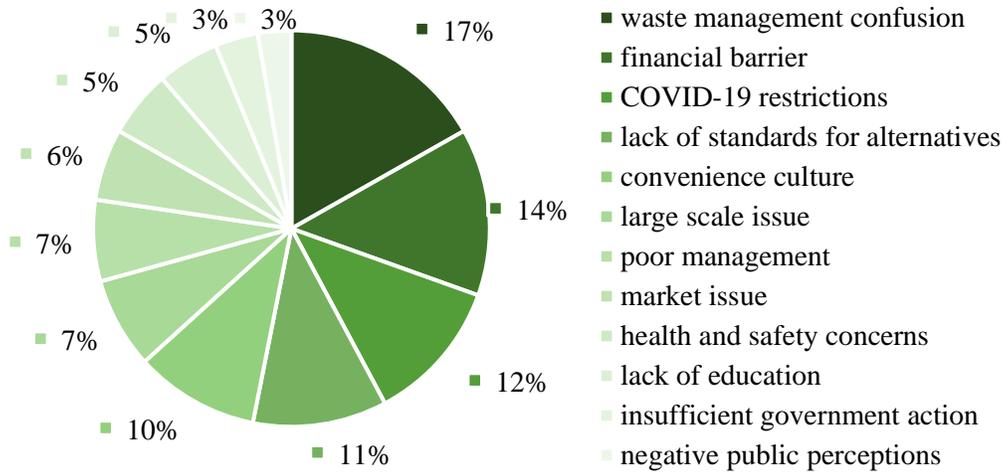


Figure 7. Themes of interview responses to SUP and/or plastic waste concerns in food services.

The seventh interview question asked participants to discuss any concerns surrounding SUPs and plastic waste in food services (Figure 7). A total of 256 participant comments were extracted from the interview transcripts. Confusion surrounding waste management programs and facilities was a concern mentioned in 17% of comments (n=43). Specifically, participants referenced inadequate waste processing facilities for biodegradable alternatives, contamination in the compost, and inconsistency in waste management sorting practices across jurisdictions. The financial cost of switching to zero plastic waste was a concern mentioned in 14% of comments (n=35). Participants expressed concern over the high price of sourcing proper alternatives, and that prices have increased throughout COVID-19. COVID-19 restrictions were a concern mentioned in 12% of comments (n=30). Interviewees noted that food services faced many restrictions related to the pandemic and many struggled to survive. They were limited to takeout/delivery only and put a pause on SUP reduction initiatives. Other barriers to SUP reduction include the lack of any alternative standards mentioned in 11% of comments (n=28), convenience culture in 10% of comments (n=26), the large scale and size of the issue in 7% of comments (n=19), poor management in 7% of comments (n=17), market issues in 6% of comments (n=15), health and safety requirements in 5% of comments (n=14), lack of education in 5% of comments (n=13), insufficient government action in 3% of comments (n=9), and negative public perceptions in 3% of comments (n=7).

Focus Groups

A total of 10 participants participated in the focus groups (Table 2). Four key research questions were discussed based on the primary research objectives. The following pie charts illustrate the major themes extracted from the four discussion questions. Sub-themes of focus group responses were also determined (see supplementary material S3).

Table 2. Focus group participants ($n=10$).

<i>Number of participants</i>	Sector
<u><i>Focus Group 1</i></u>	
<i>1</i>	ENGO
<i>4</i>	Restaurants and Cafes
<u><i>Focus Group 2</i></u>	
<i>1</i>	Environmental Non-Governmental Organizations (ENGO)
<i>1</i>	Restaurants and Cafes
<i>1</i>	Nova Scotia Environment and Climate Change
<i>1</i>	Nova Scotia Health
<i>1</i>	Municipal Waste management

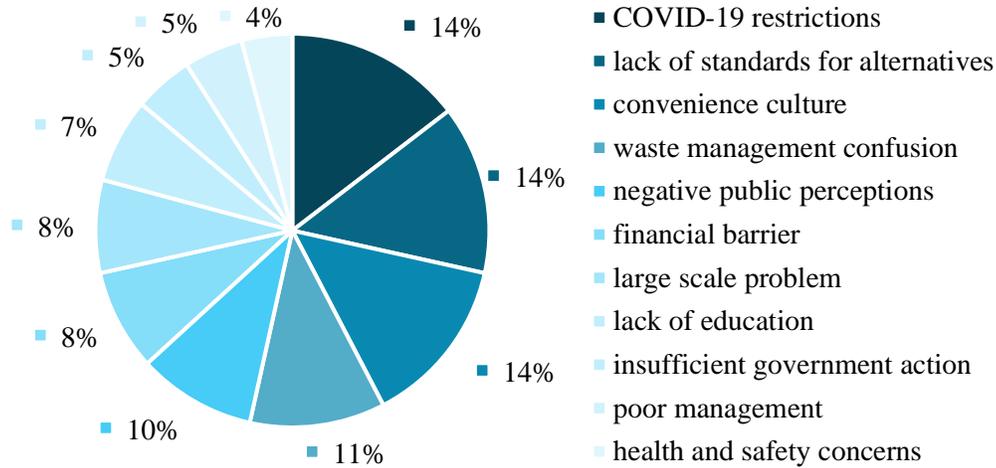


Figure 8. Themes of focus group discussion on challenges to SUP reduction in food services across Nova Scotia

In the first section, participants discussed challenges and barriers to SUP reduction in food services (Figure 8). A total of 143 participant comments were extracted from the focus group transcripts. Challenges triggered by COVID-19 restrictions, lack of standards for alternatives, and convenience culture were equally common barriers, each mentioned in 14% of comments (n=20). COVID-19 restrictions discussed included restrictions on reusables, limiting services to takeout/delivery, and social distancing measures. These kinds of barriers caused many food services to pause SUP reduction initiatives as businesses were focusing on remaining in operation throughout the pandemic. In terms of alternatives, many food services have limited plastic alternative options and many stakeholders expressed that some alternatives have a higher carbon impact than plastic. Often food services have invested in alternatives that are not truly biodegradable, or are not accepted in the local waste stream. The lack of regulated standards for plastic alternatives creates confusion for food services, which gives rise to the threat of greenwashing. Convenience culture has created a barrier for SUP reduction. Many food services will automatically include plastic items (e.g., cutlery) for consumers. Other barriers mentioned include waste management confusion in 11% of comments (n=16), negative public perceptions in 10% of comments (n=14), financial barriers in 8% of comments (n=12), the large scale of the problem in 8% of comments (n=11), lack of education in 7% of comments (n=10), lack of government action in 5% of comments (n=7), poor management in 5% of comments (n=7), and health and safety requirements in 4% of comments (n=6).

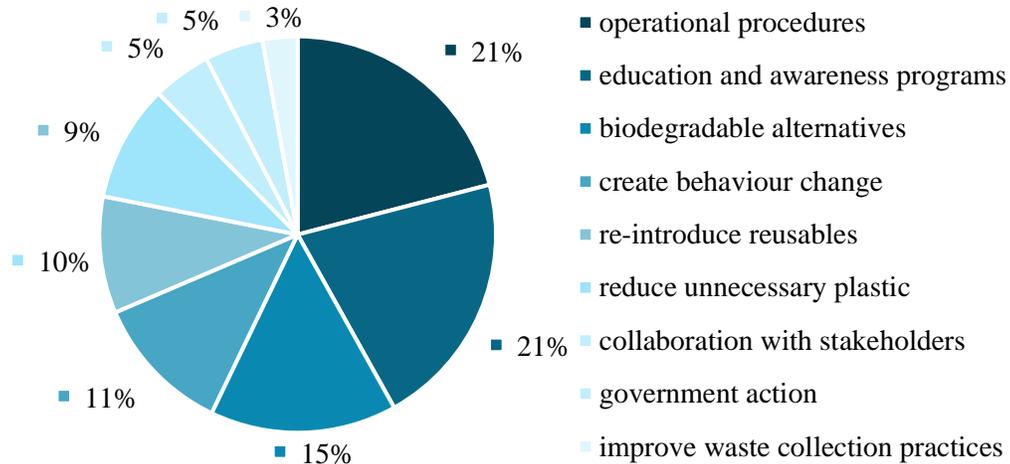


Figure 9. Themes of focus group discussion on existing opportunities for SUP reduction in food services across Nova Scotia.

The second discussion topic explored existing opportunities for SUP reduction in food services (Figure 9). A total of 105 participant comments were extracted from the focus group transcripts. Existing opportunities were defined as initiatives and/or activities that could be implemented within one year if public health guidelines allow. Operational procedures, and education and awareness programs were both mentioned in 21% of comments (n=22). Small, easy to implement business changes in food services can reduce SUP. These operational procedures could include only giving out plastic items at the consumer’s request, promoting SUP reduction initiatives via technology, social media, and directly to consumers, and implementing a financial incentive for SUP reduction. Using biodegradable alternatives, compostable, and/or paper options was mentioned in 15% of comments (n=16). Creating behaviour change was mentioned in 11% of comments (n=12). Re-introducing reusables into food services was mentioned in 10% of comments (n=10). Reducing unnecessary plastic was mentioned in 9% of comments (n=10). Collaborating with other businesses, suppliers, and consumers was mentioned in 5% of comments (n=5). Government action was mentioned in 5% of comments (n=5). Improving waste collection practices within food services was mentioned in 3% of comments (n=3).

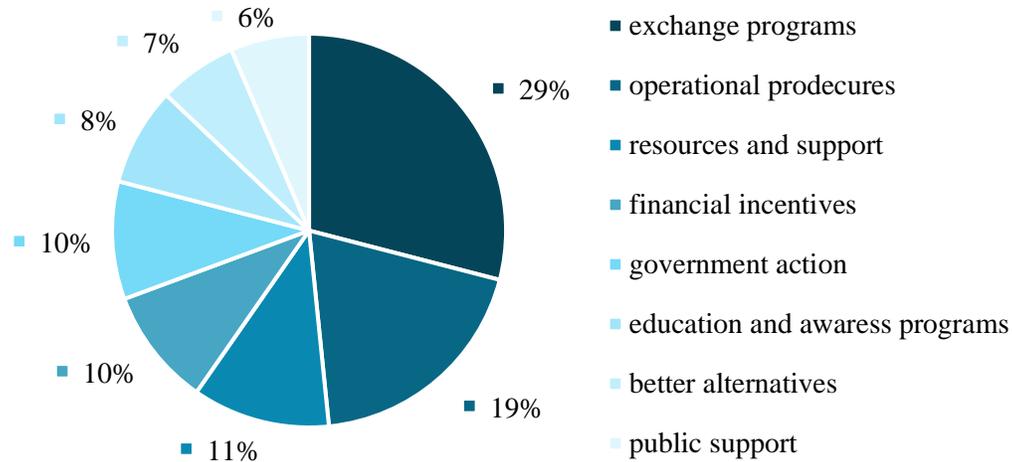


Figure 10. Themes of focus group discussion on future strategies for SUP reduction in food services across Nova Scotia.

The third discussion topic explored the potential for future SUP reduction strategies in food services (Figure 10). A total of 65 participant comments were extracted from the focus group transcripts. Future opportunities were defined as projects requiring more than one year to implement. The most common strategy, suggested in 29% of comments (n=18), was implementing exchange programs in which food services may swap reusable containers with other organizations, consumers, suppliers, and within the business. Remodelling operational procedures was suggested in 19% of comments (n=12). Creating new SUP reduction initiatives and engraining them into the business model was recommended to gradually create behaviour change amongst consumers. Another operational procedure suggested was the development of internal environmental committees to improve business accountability. Better access to SUP reduction resources and supports was suggested in 11% of comments (n=7). Participants proposed that the creation of a SUP reduction resource guide for businesses could reduce confusion among managers and assist them in implementation waste reduction strategies. Improving financial incentives within food services was suggested in 10% of comments (n=6). Supporting government action was suggested in 10% of comments (n=6). Education and awareness programs were discussed in 8% of comments (n=5). Sourcing better alternatives were proposed in 7% of comments (n=4). Increasing public support was suggested in 6% comments (n=4).

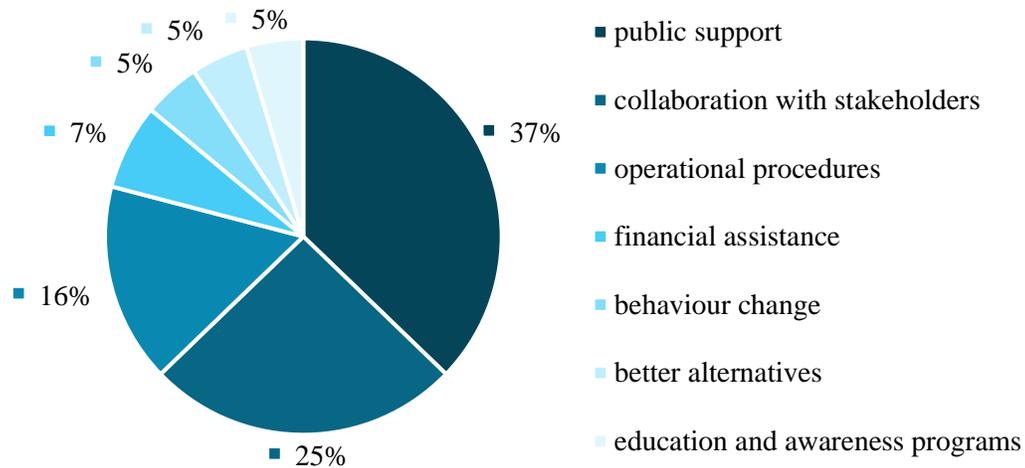


Figure 11. Themes of focus group discussion on resources needed to assist SUP reduction in food services across Nova Scotia.

The final discussion topic highlighted resources and tools required to achieve the goal of zero plastic waste in food services (Figure 11). A total of 43 participant comments were extracted from the focus group transcripts. The need for public support was mentioned in 37% of comments (n=16). Food services require customer buy-in and consumer power to sustain and maintain SUP reduction initiatives. Without buy-in, many initiatives get put on the back burner, and often become increasingly costly to implement. Consumer power can also direct businesses priorities and can be utilized to influence SUP reduction. Collaboration with stakeholders was proposed in 25% of comments (n=11) as a potential way to influence plastic waste reduction in food services. Participants discussed the need for all points of the plastic supply chain, from manufacturing to suppliers to waste management, to collaborate on SUP reduction efforts. Further, participants mentioned that future strategies need to be examined from a top-down holistic approach. Operational procedures were discussed in 15% of comments (n=7). Food services need to revamp their business models and build infrastructure to support SUP reduction initiatives. Receiving some form of financial assistance from the government or a third party was mentioned in 7% of comments (n=3). Creating behaviour change, sourcing better alternatives, and implementing education and awareness programs were each mentioned in 5% of comments (n=2).

Discussion

Misperceptions of COVID-19 Transmission Concerning Reusables

The study results suggest that there is an interest in opportunities for SUP reduction in food services; however, there are a number of challenges to overcome. Although there has been no official sector-specific mandate that requires using SUPs, this study reaffirms that COVID-19 halted, and in some cases reversed, progress made to reduce SUPs in the food service sector in Nova Scotia. This has been a pattern observed in many jurisdictions around the world, with the reversal of policies to reduce SUPs and the increased use of SUPs like plastics containers, plastic utensils, and plastic bags for food takeout (Patricio Silva et al., 2020, 2021; Prata et al., 2020). Much of this increased use of SUPs was due to safety concerns over COVID-19 (Kitz et al., 2021). Given the unprecedented nature of the pandemic, there was a lot of public uncertainty and confusion surrounding transmission of the virus, particularly the risk of COVID-19 transmission from surfaces. During the first wave of the pandemic, studies confirmed that the COVID-19 virus can survive on surfaces for days, and guidance issued by the World Health Organization (WHO) at the time stated COVID-19 can spread through contaminated surfaces (van Doremalen, 2020; World Health Organization, 2020). However, as research and evidence accumulated throughout the pandemic, knowledge about the mode of transmission for COVID-19 has changed.

With ongoing research, COVID-19 has been determined to spread primarily via aerosol droplets when infected people cough, sneeze, or talk (Hatmi, 2021; Lewis, 2021; Siordia, 2020). If preventive measures and sanitizing routines are maintained, the risk of COVID-19 infection from contact with a contaminated surface is less than 5 in 10,000, which is lower than the surface transmission risk for the common flu (Lewis, 2021; Singh et al., 2021). Therefore, this science-based evidence undermines the argument to use SUPs as a health measure to prevent COVID-19 transmission. The Government of Nova Scotia in collaboration with Restaurants Canada have provided guidance to prevent COVID-19 in the form of a re-opening resource for food service operators. As per the re-opening plan, it is mandatory for servers to wear a mask, use approved cleaning and products and procedures, and maintain two-meter physical distancing whenever possible (Restaurants Canada, 2021). Third-party support and resources for best practices can assist food services in operating a safe and sustainable business.

In a Greenpeace USA statement released in June 2020, a group of over 125 virologists, epidemiologists, and health experts from 19 countries agreed that the risk of transmitting COVID-19 via surface contact was slim, and reusables were safe and should be encouraged (Greenpeace

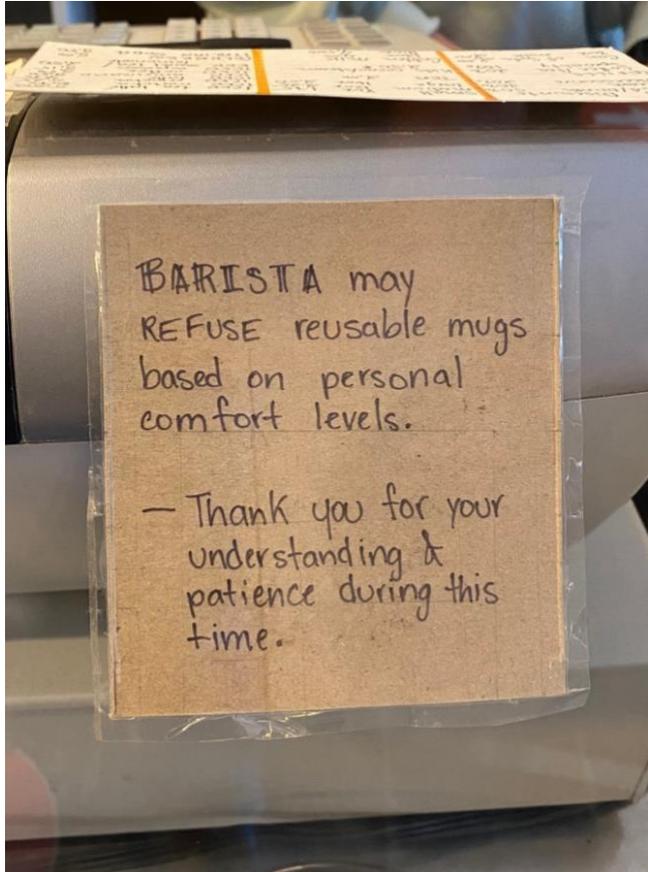


Figure 12. Reusable item notice in a coffee shop in Nova Scotia.

USA, 2020). Unfortunately, despite reassurances from experts that the risk of transmission of the virus through contact with contaminated surfaces is low (Centers for Disease Control and Prevention [CDC], 2021; Greenpeace USA, 2020; NZWC, 2021), there is still some uncertainty surrounding use of personal reusable containers, such as coffee mugs, within food services (Harris, 2021). Participant comments indicate that accepting reusables inside a business depends on the individual perspective of the staff member, and their assessment that the item is clean. For example, a coffee shop in Nova Scotia wrote a notice to communicate to customers that reusable mugs may or may not be accepted based on the comfort levels of the staff due

to safety concerns (Figure 12). It is critical that these misperceptions surrounding COVID-19 transmission be corrected. The re-introduction of processes to allow the use of reusables is an immediate opportunity for SUP reduction in food services.

Convenience Culture and Behaviour Change

Results suggest that convenience culture has made a resurgence in food services, which has been fueled by challenges brought on by COVID-19 restrictions. COVID-19 has altered our daily living and consumption habits. Businesses were forced to change their operational procedures to follow social distancing guidelines and service limitations. Environmental goals and sustainability initiatives went on the backburner during COVID-19 as businesses struggled to

remain open (University of Guelph, 2021). Pausing SUP reduction initiatives skewed perceptions of zero plastic waste and slowed progress towards a circular economy (Vanapalli et al., 2021). Consumers were restricted to only take-out and delivery food and drink options for months at a time throughout the waves of the pandemic. Participant comments indicated that during these times, food services maintained standard to-go practices as convenience culture continued to persist in society. Businesses provided SUPs, such as cutlery and straws; however, this practice became increasingly wasteful as many consumers were eating to-go food at home and did not need SUPs.

All local businesses have the ability to reject convenience culture by modifying operational procedures and implementing SUP reduction initiatives back into daily activities and functions. In this case of convenience culture, providing SUPs to the consumer should be the exception, as opposed to the default. Over time, consumers will become familiar with the new standard, and our dependence on SUPs can be successfully phased out by making “green” behaviours the social norm and eliminating convenience culture (Borg et al., 2020). Influencing behaviour change within food services can help reduce consumption of plastics (Huang, 2016). Results indicate SUP reduction initiatives are most effective in the food services sector when ingrained within the business model from the start. However, changes to business operational procedures can and should be implemented at any point. Making an active effort to alter and adapt operational changes gradually over time to support environmental goals and sustainability initiatives is a continuous opportunity for SUP reduction in food services.

Lack of Standards for Alternatives and Waste Management

Results suggest there is a great deal of confusion and concern in food services surrounding alternatives to SUPs and how they are managed by waste facilities, as standards are not consistent across Nova Scotia. Biodegradable plastics, or “bioplastics”, are commonly marketed as a sustainable alternative to SUP. However, the recyclability of any bioplastic is heavily dependent on its base design and raw materials (Jia, 2020). Although most bioplastics claim to be biodegradable, the current degradability of bioplastics in the environment do not have sufficient rates of deterioration to reduce plastic pollution (Vanapalli et al., 2021). Further, local waste facilities may not have the capabilities to process bioplastics, and instead they end up contaminating the recycling and/or composting stream (Perennia, 2021).

An issue that was perhaps amplified by increased take-out and delivery in food services was confusion around what food container packaging options are acceptable SUP alternatives for businesses. Participant comments indicate bioplastics are problematic in waste sorting. Municipal composting facilities are often unable to distinguish between normal and bioplastics, resulting in “compostable plastics” being banned in many Nova Scotian communities. However, some jurisdictions like Shelburne Municipality and the Valley Waste Resource Management will accept compostable plastic bags that have a specific logo indicating compliance with Biodegradable Products Institute standards (supplementary material S4). The mismanagement of plastic waste and differences in waste management between jurisdictions results in plastic contamination at processing facilities, especially when people travel between regions (Prata et al. 2020).

Understandably, participant comments indicate businesses are also concerned about the financial cost of switching to SUP alternatives. Bioplastics are expensive to purchase and integrate, and can only compete with SUPs in terms of costs if oil prices are high (Goldsberry, 2020; Ambrose, 2019). COVID-19 has led to a crash in global oil prices, which also decreased the price of creating SUPs (Ebner and Iacovidou, 2021). With SUPs being the most inexpensive available material for take-out containers, many food services fall back to using them. Losing customers to a less expensive competitor is a real threat for restaurants, many of whom have small profit margins. Businesses might be more likely to switch to environmentally friendly alternatives if the government is able to subsidize the additional costs as an incentive. Perception and behaviour change toward sustainability and climate-friendly behavior can be significantly influenced by government policy or regulations. (Adeyanju et al., 2021).

Limitations and Considerations

This research was conducted during the COVID-19 pandemic. COVID-19 may have dissuaded potential participants from participating in the data collection process as many food services were closed or had competing priorities. As such, the participants in this study represent a fraction of the sectors to which they belong and those who participated were likely already concerned about SUPs which could introduce bias in the data. Due to scheduling and availability, the participants in the two focus groups did not represent a strong distribution of sectors. Rather,

participants ended up being grouped together by sector, resulting in similarly minded people being in the same focus group. This, unfortunately, reduced the potential for debate and discussion between sectors. One major contributor to SUP use during COVID-19 in the food services sector was grocery stores (Helmer, 2021a). All grocery store supervisors and/or managers contacted for participation in this study did not respond. This is a knowledge gap and an opportunity for future research.

Recommendations

Based on responses from the semi-structured interviews and focus groups, the following recommendations are presented for food service SUP reduction strategies in Nova Scotia:

- 1. Adopt operational procedures that reduce business reliance on plastic products:** Operational procedures that tolerate the use of plastic for convenience should be phased out. This includes automatically giving out SUPs to consumers, using plastic-based materials inside the business, and excessive plastic packaging. Additionally, businesses should consider creating an environmental committee to spearhead the sustainability initiatives. Altering business operations to eliminate unnecessary consumer-facing plastic will help to reduce the public demand, and thus encourage behaviour change. Businesses can utilize external resources to assist in reducing SUPs. Divert NS provides funding to municipalities to support waste reduction educators, local experts who understand local waste diversion programs and facilities. Coastal Action's *Ocean Friendly Nova Scotia Initiative* is a business recognition program that offers consultation and provides resources to assist businesses' transition away from SUPs and their development of a plan for achieving sustainability goals (Varkey et al., 2021).
- 2. Build infrastructure around exchange programs:** Exchange programs for takeout containers as well as coffee mugs are becoming increasingly common in larger Canadian cities like Toronto. Food services can create exchange programs in which the business swaps take-out containers with consumers, or bulk food containers with suppliers. Businesses can also reach out to third party organizations, such as Suppli and Muuse, that manage exchange programs for them (Muuse, 2021; MySuppli, 2021). Common formats

involve the business signing up for a membership with the third party to get access to their reusable containers. After consumer use, the containers can be dropped off at designated locations to be cleaned and sanitized by the third party and returned to the restaurant for reuse (Chung, 2018). Exchange programs can largely eliminate the need for single-use containers within food services (Chung, 2021). Exchange programs provide a solution for eliminating plastic take-out containers.

3. **Promote education and awareness to staff and consumers:** Education on plastic issues can support food services in making informed decisions and create accountability for the plastic used. Ensuring food services understand best practices for environmental sustainability, such as being familiar with local alternative options and waste processing standards, can assist in reducing SUPs within their businesses. In Nova Scotia there are a number of ENGOs that provide training materials in SUP reduction for food services. Divert NS offers a free education for businesses through a network of local waste reduction educators. They are local experts that can teach businesses about best waste management practices within their municipality (Divert NS, 2021).
4. **Re-introduce reusables:** Food services are strongly encouraged to return to serving customers with reusable items, such as mugs, containers, and water bottles. Health officials and researchers have confirmed that reusables are safe to use in food services with sanitary precautions in place. Notable businesses including Starbucks and Target have already returned to using reusables in stores (Harris, 2021; Helmer, 2021b). Businesses should advocate for reusables as new scientific evidence becomes available, thereby emphasizing that SUPs are not inherently safer than reusables. Accepting reusables can eliminate the need for disposable take-out items, particularly coffee cups.
5. **Source SUP alternatives in consultation with waste facilities:** The use of biodegradable alternatives in food services is preferred over SUPs. This can include bamboo cutlery, packaging made from mushrooms, or other alternatives manufactured with paper-based material, sugarcane, and/or wheat grains (Mushroom Packaging, 2021). Biodegradable alternatives alleviate the pressure on local waste management systems by diverting material to the compost and reducing the flow of plastic. The use of environmentally friendly products should be encouraged in food services as much as possible. It is essential that businesses collaborate with local waste managers to find SUP alternatives that are accepted

by their facilities, otherwise businesses run the risk of investing in the wrong alternative. The development of a province-wide guide for waste management may help reduce confusion and contamination and improve recycling capabilities.

Conclusion

This study explores challenges and opportunities for SUP reduction in food services across Nova Scotia both during and after the COVID-19 pandemic. Government restrictions and public health guidelines have triggered a backslide in societal consumption of SUPs. Initial uncertainties and excessive misinformation on the transmission of the virus caused many food services to rely on plastics to remain in operation. Fortunately, ongoing research contributes to improved understanding of COVID-19. As food services adapt to living with COVID-19, businesses are now being encouraged to return to pre-pandemic SUP reduction efforts such as accepting reusables, using biodegradable alternatives, and phasing out SUPs. However, businesses often need external assistance in moving from intention to action.

The results highlight the need for all sectors to work together at all levels of the plastic supply chain from manufacturers to businesses to processing and disposal facilities in order to reduce the flow of SUPs. Creating behaviour change and combatting convenience culture comes from implementing a variety of SUP reduction initiatives. It is recommended that food services update their business models to better support operational programs and initiatives that re-introduce SUP reduction for both suppliers and consumers. Food services have a responsibility to address their plastic use, and make the necessary adjustments to reduce their plastic waste.

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Supplementary Material

S1. Dalhousie Research Ethics Approval.

Social Sciences & Humanities Research Ethics Board Letter of Approval

April 27, 2021
Shen Molloy
Management\School for Resource and Environmental Studies

Dear Shen,

REB #: 2021-5567
Project Title: Investigating Strategies for the Food Services Sector to Reduce Single-Use Plastic (SUP) Waste Sparked by the COVID-19 Pandemic

Effective Date: April 27, 2021
Expiry Date: April 27, 2022

The Social Sciences & Humanities Research Ethics Board has reviewed your application for research involving humans and found the proposed research to be in accordance with the Tri-Council Policy Statement on *Ethical Conduct for Research Involving Humans*. This approval will be in effect for 12 months as indicated above. This approval is subject to the conditions listed below which constitute your on-going responsibilities with respect to the ethical conduct of this research.

Effective March 16, 2020: Notwithstanding this approval, any research conducted during the COVID-19 public health emergency must comply with federal and provincial public health advice as well as directives from Dalhousie University (and/or other facilities or jurisdictions where the research will occur) regarding preventing the spread of COVID-19.

Sincerely,



Dr. Karen Foster, Chair

S2. Interview questions.

Food services

1. Pre-pandemic, were there any initiatives to reduce or eliminate single-use plastics from your place of work?
2. Are there any plans to reduce or eliminate single-use plastics at your place of work after the pandemic?
3. What COVID-19 restrictions have been imposed on your place of work?
4. Has there been a change in the type or amount of single-use plastics use at your place of work since the start of COVID-19?
5. What are the most common plastic items used at your place of work since COVID-19?
6. How do you dispose of plastic waste at your place of work?
7. Do you have any concerns surrounding single-use plastics or plastic waste at your place of work?
8. Do you have any other comments about reducing single-use plastics in your place of work?

Government (ECCC/Health)

1. Talk about your role and what you do as <<position title>> at <<organization name>>
2. What COVID-19 restrictions have been imposed on food services?
3. What is the government's stance on reusable items during the pandemic?
4. Are there any plans to address the increase in plastic use after the pandemic?
5. How can food services be better equipped to reduce or eliminate single-use plastics?
6. What can food services do now to reduce plastic use while maintaining public health guidelines?
7. Do you have any concerns surrounding single-use plastics or plastic waste in food services?
8. Do you have any other comments about reducing single-use plastics in food service?

Waste Management

1. Has there been a change in the amount of single-use plastics in the waste stream since the start of COVID-19?
2. What are the most common plastic items found in the waste stream since COVID-19?
3. How can food services better manage plastic waste to avoid problems in the waste stream?
4. Do you have any concerns surrounding single-use plastics or plastic waste in the waste stream?
5. Do you have any other comments about reducing single-use plastics in the food services sector?

Academic/ENGO

1. Talk about your role and what you do as <<position title>> at <<organization name>>
2. Pre-pandemic, what strategies were food services implementing to reduce or eliminate single-use plastic use?
3. How can food services be better equipped to reduce or eliminate single-use plastics?
4. What can food services do now to reduce plastic use while maintaining public health guidelines?
5. Are there any plans to assist food services in reduce or eliminate single-use plastic after the pandemic?
6. Do you have any concerns surrounding single-use plastics or plastic waste in the food sector?
7. Do you have any other comments about reducing single-use plastics in the food services sector?

S3. Sub-themes of interview responses.

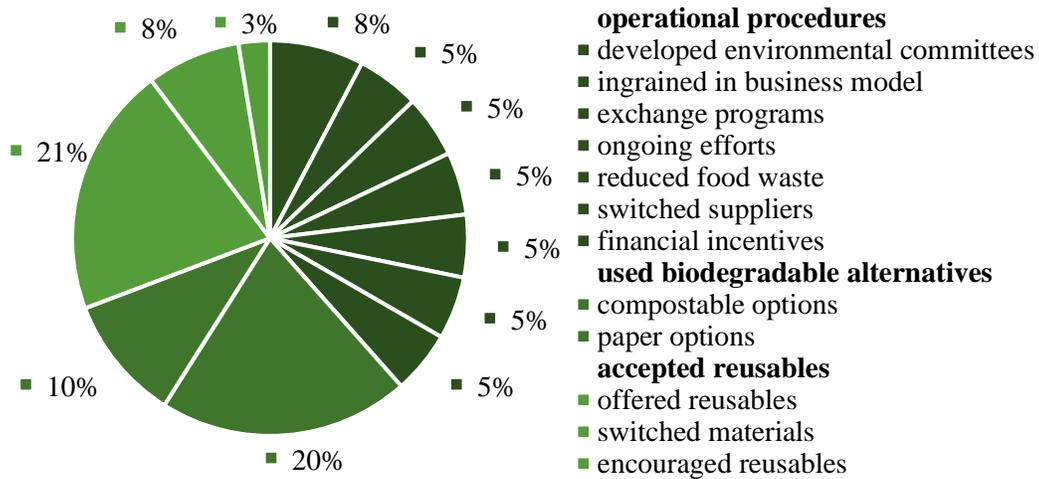


Figure 1b. Sub-themes of interview responses to pre-existing SUP reduction initiatives in food services before COVID-19.

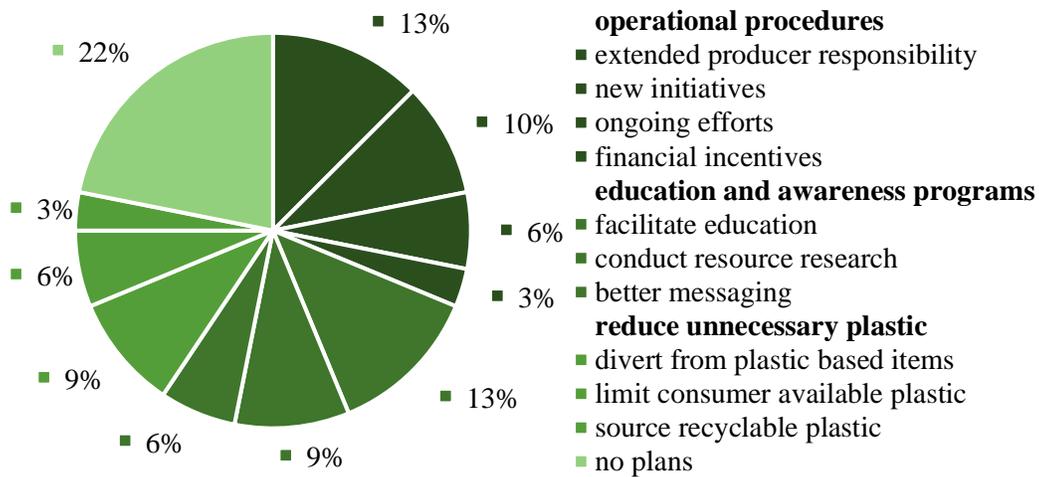


Figure 2b. Sub-themes of interview responses to plans for SUP reduction initiatives in food services after COVID-19.

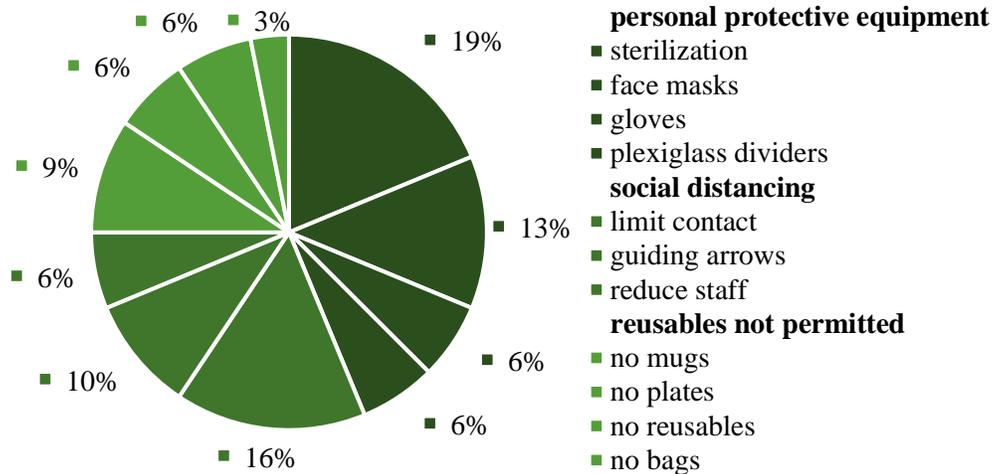


Figure 3b. Sub-themes of interview responses to which COVID-19 restrictions and/or guidelines have impacted food services.

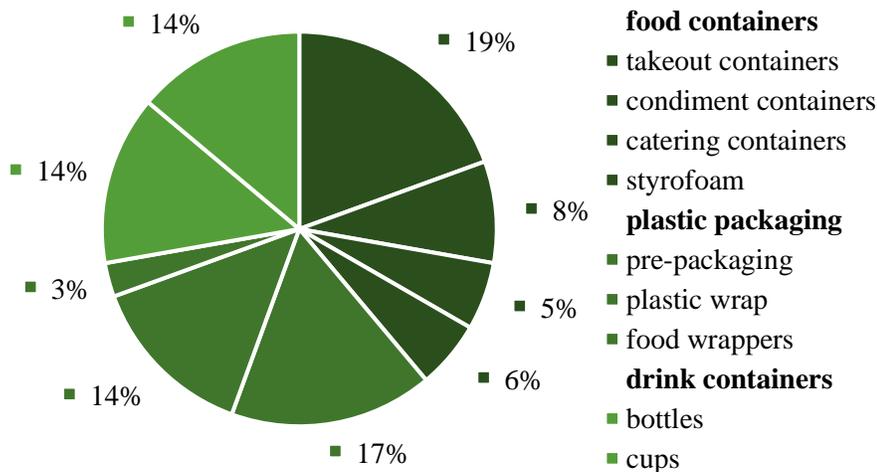


Figure 4b. Sub-themes of interview responses to which SUPs have increased in food services since the start of COVID-19.

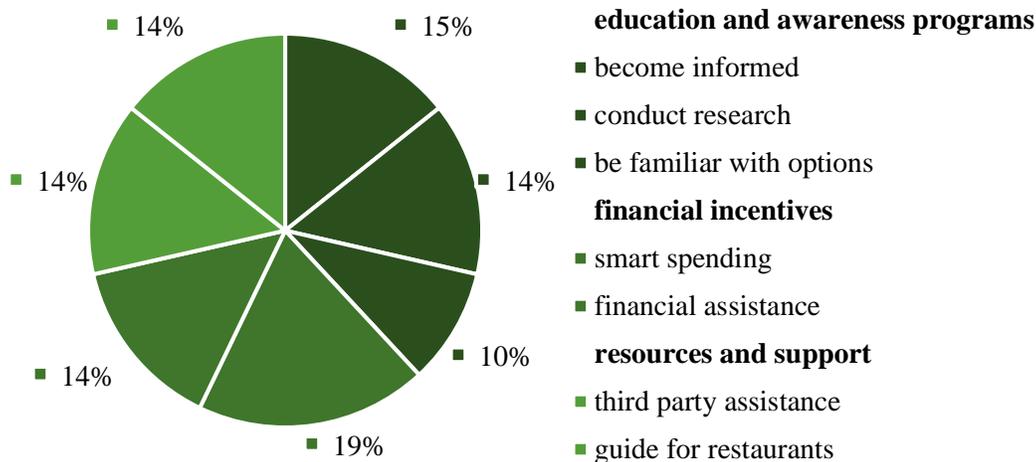


Figure 6b. Themes of interview responses to how food services can be better equipped to reduce SUPs.

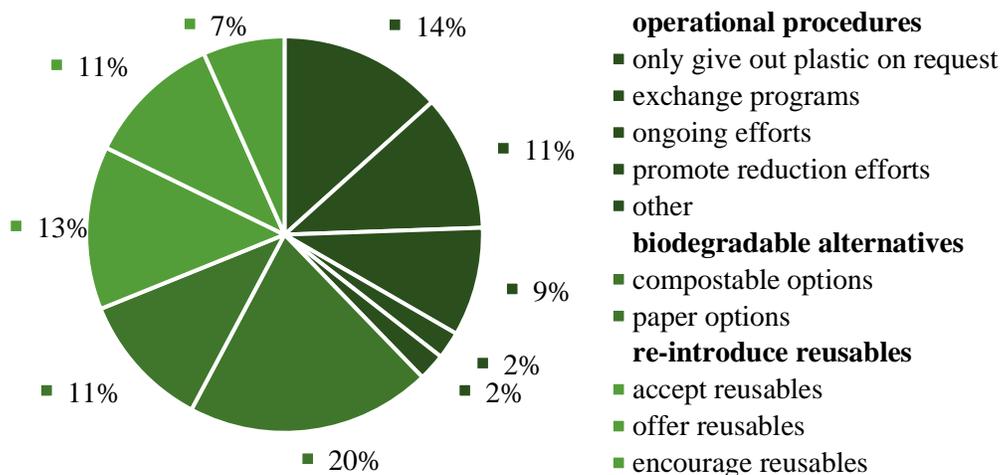


Figure 7b. Themes of interview responses to what food services can do now to reduce SUPs.

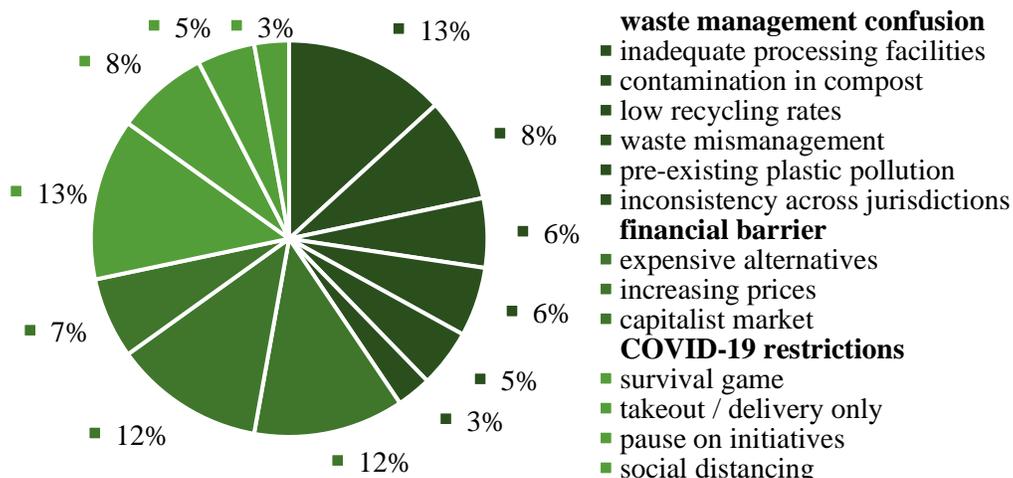


Figure 8b. Themes of interview responses to SUPs and/or plastic waste concerns in food services.

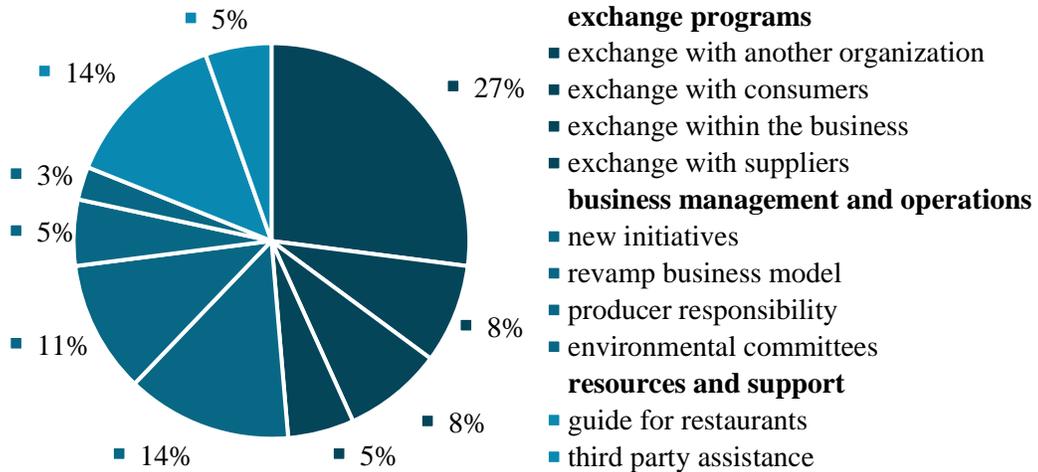


Figure 11b. Themes of focus group discussion on future strategies for SUP reduction in food services across Nova Scotia.

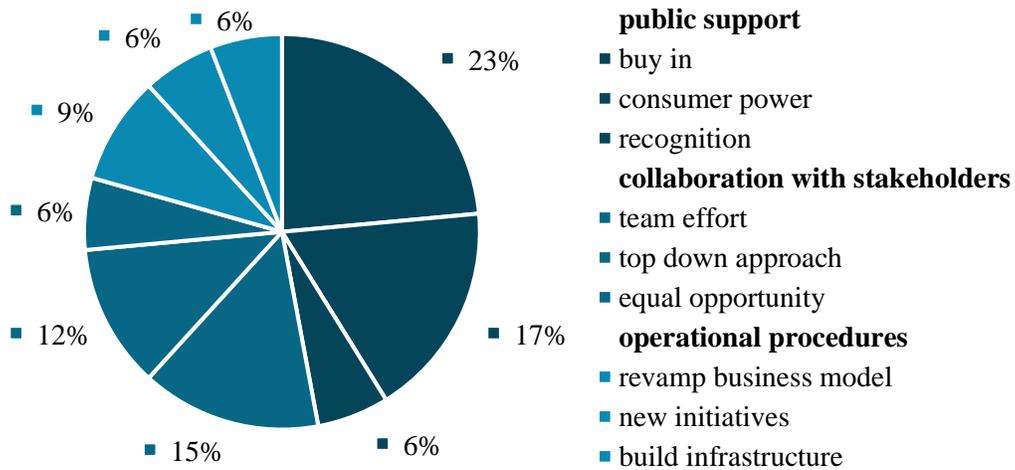


Figure 12b. Themes of focus group discussion on resources needed to assist SUP reduction in food services across Nova Scotia.

S4. Biodegradable Products Institute Certified Compostable Logo

