

SUP Halifax: Identifying barriers to reducing single-use plastics in the Halifax Regional
Municipality

By

Priyanka Saira Varkey

Submitted in partial fulfillment of the requirements for the degree
of
Master of Marine Management

at

Dalhousie University
Halifax, Nova Scotia

December 2019

©*Priyanka Saira Varkey, 2019*

Acknowledgements

I would like to begin by thanking my academic supervisor, Dr. Tony Walker for his enthusiasm, support, and patience through the process of writing this graduate project. Thank you for bearing with the delays in my draft chapters and for providing detailed and constructive criticism throughout the year.

To the WWF-Canada (Halifax office) where I had the honor of doing my summer internship, thank you for giving me this opportunity to carry out my research and for fulfilling my dream of working at WWF. To Sarah Saunders, my internship supervisor at WWF-Canada and my ever-supportive mentor, thank you for all your hard work, advice and positivity. Thank you especially for taking the time to give me detailed feedback on my final draft after two full days at a conference. You are truly the Rockstar that you keep calling everyone else.

To the MAP faculty, I am so grateful that I was accepted into this program. Thank you for welcoming me into the MAP family and for helping me expand my knowledge. To the MMM class of 2018-2019, I am so grateful to have been able to share the past 16 months with you and as much as I will be glad to be done, I will miss being in classes with you all. To Breanna Bishop and Sara Vanderkaden, thank you for all the hours of co-chair and TA work amidst working on our own graduate projects. Reanne Harvey, thank you for being my climbing buddy and for being the kindest sweetest soul.

To my wonderful friends, away and nearby, thank you for being patient as I failed to be in touch through this year. Thank you for understanding that I have been busy and for not taking it personally. To my dance families, thank you for being there for me whenever I needed a break and for understanding when I was not around.

To my wonderful family back in India and spread around the world, thank you for always believing in me and for being a constant source of support. A huge thank you to my parents for letting me spread my wings and fly all the way to Canada. Last but certainly not the least, to my partner, Logan Harris, thank you for everything. For your patience in dealing with my stress levels, for grounding me, for remaining calm and supportive no matter how cranky I was, for being there for me at my worst, for making me coffee, tea and food as I spent hours in front of my computer, and for demanding nothing of me through the past 16 months. I could not have done this without you.

Table of Contents

Acknowledgements.....	ii
Table of Contents.....	iii
List of Tables.....	v
List of Figures.....	vi
List of Acronyms.....	vii
Abstract.....	viii
Chapter 1. Introduction to Marine Plastic Pollution.....	1
1.1 Impacts of Marine Plastics.....	3
1.2 Measures Mitigating Marine Plastics.....	4
Chapter 2. Research Context- HRM, SUPs, BIDs and OFNS.....	7
2.1 Management Problem and Research Objectives.....	9
Chapter 3. Methods.....	10
3.1 Surveys.....	10
3.2 Semi-structured Interviews.....	12
3.3 Analyses of Surveys and Interviews.....	12
Chapter 4. Results.....	14
4.1 Community Survey.....	14
4.2 Business Survey.....	19
4.3 Interviews.....	24
4.3.1 Interests.....	24
4.3.2 Barriers.....	27
4.3.3 Reactions to Proposed Federal Ban and OFNS.....	29
4.3.4 Interviewee Recommendations.....	30
Chapter 5. Discussion.....	32
5.1 Interests in SUP Reduction.....	32
5.2 Barriers to SUP Reduction.....	34
5.3 Broader Implications.....	36
Chapter 6. Limitations and Recommendations.....	39
6.1 Limitations.....	39

6.2 Recommendations	40
Chapter 7. Conclusion.....	42
References.....	43
Appendices.....	54
Appendix A. MAP Ethics Approval	54
Appendix B. Community Survey	56
Appendix C. Business Survey	59
Appendix D. Interview Questions	62
Appendix E. Interview Consent Form.....	63
Appendix F. Age Categories	66
Appendix G. BIDs and Business Types of Business Responses	67

List of Tables

Table 1. BIDs and business types of interviewees.....	24
Table 2. Interests in and barriers to SUP reduction as expressed by interviewees	25
Table 3. Interests in SUP reduction divided into categories and sub-categories with interviewee quotes	26
Table 4. Barriers to SUP reduction divided into categories and sub-categories with interviewee quotes	28
Table 5. Recommendations and suggestions by businesses regarding SUP reduction.....	31

List of Figures

Figure 1. Comparison of 2018 National Cleanup Data (GCSC, 2018) with 2019 Point Pleasant Park Cleanup Data (WWF-Canada, 2019).....	3
Figure 2. Study area	8
Figure 3. Screenshot of the Google Forms survey platform with sample questions	11
Figure 4. Chart representing the proportions of respondents according to gender and age.....	14
Figure 5. Frequency of SUP usage in the HRM community	15
Figure 6. Common SUPs used by HRM community.....	16
Figure 7. Commonly used reusable alternatives to SUPs	16
Figure 8. HRM community perceptions of main issues associated with SUPs	17
Figure 9. HRM community’s concerns about reducing SUP use	18
Figure 10. Proportion of food-based business responses.....	19
Figure 11. Common SUPs used by food-based businesses	20
Figure 12 Main concerns of businesses about reducing SUPs	21
Figure 13. Steps taken by businesses to reduce use of SUPs.....	21
Figure 14. List of SUPs businesses were willing to eliminate.....	22
Figure 15. Proportion of SUPs currently used by businesses versus SUPs they were willing to eliminate.....	23

List of Acronyms

BID – Business Improvement District

CCME – Canadian Council of Ministers of the Environment

CPIA – Canadian Plastics Industry Association

EPR – Extended Producer Responsibility

GCSC – Great Canadian Shoreline Cleanup

GESAMP – Group of Experts on the Scientific Aspects of Marine Environmental Protection

GGGI – Global Ghost Gear Initiative

GPML – Global Partnership of Marine Litter

HRM – Halifax Regional Municipality

MEAM – The Skimmer on Marine Ecosystems and Management

NGO – Non-governmental organization

NOAA – National Oceanic and Atmospheric Administration

OFNS – Ocean Friendly Nova Scotia

PE – Polyethylene

PET – Polyethylene terephthalate

POP – Persistent Organic Pollutants

PP – Polypropylene

SUP – Single-Use Plastic

UNEP – United Nations Environment Program

WWF – World Wildlife Fund

Abstract

Plastics are ubiquitous in the marine environment with up to 90 percent of marine debris being composed of plastic. Plastic debris poses a serious threat to the marine environment killing millions of seabirds, thousands of marine mammals and turtles, and countless fish annually. Up to half of all plastic produced is thrown away after a single use. Single-use plastics (SUPs) are persistent in the environment, breaking down into microplastics over time, and constitute most of the top items found during shoreline and community cleanups. The food service industry is a major consumer of single-use plastics (SUPs). Due to its coastal proximity, overuse and improper disposal of SUPs in the Halifax Regional Municipality (HRM) lead to many SUPs ending up in the ocean. Using a mix of quantitative and qualitative methods, this pilot project aimed to identify the main barriers to reducing SUPs in the HRM. Two sets of online surveys gauged interest in reducing SUP usage among community members and food-based businesses in the HRM. Follow up interviews with interested businesses aimed to understand concerns and challenges faced by business owners in their attempt to reduce SUPs. Results indicate overwhelming public interest in SUP reduction as well as concerns among businesses about sourcing alternatives that are appropriate for the HRM. Recommendations include increasing the accessibility of alternatives, a best practices guide for the HRM, and public education. This study can be used as a framework to adapt the Ocean Friendly Nova Scotia (OFNS) initiative for the HRM.

Keywords: marine plastic, single-use plastics (SUPs), food-based businesses, community members, Halifax Regional Municipality (HRM), barriers, interests, Ocean Friendly Nova Scotia (OFNS)

Chapter 1. Introduction to Marine Plastic Pollution

Within a century of being invented, plastic has gained global attention as a serious environmental pollutant, ubiquitous especially in the marine environment (Thompson et al., 2004; GESAMP, 2015; Pettipas, Bernier & Walker, 2016; Geyer, Jambeck & Law, 2017; Law, 2017; Xanthos & Walker, 2017). Plastics are highly versatile long chain synthetic organic polymers that are inexpensive, light, and durable (Thompson et al., 2009; Law, 2017). Although first produced at the beginning of the twentieth century, mass production of plastic did not begin until 1940s and 1950s (Thompson et al., 2009). While the low cost of production, lightweight nature and durability of plastics revolutionized the medical as well as packaging industries, their resulting persistent and easily transportable nature also makes them a serious environmental threat when improperly disposed (Ryan, Moore, Franeker & Moloney, 2009; Law, 2017). Ocean plastic is now widely considered a global crisis due to its deleterious effects on marine organisms, ecosystems and consequently on humans and coastal communities (Derraik, 2002). With an estimated 348 million metric tonnes of plastic having been produced in 2017 (Statista, 2019) and a mere nine per cent of all plastics produced to date being recycled (Geyer et al., 2017), the production of plastic appears to have surpassed our ability to manage its disposal.

Up to 90 per cent of marine debris consists of plastics (Derraik, 2002; Walker, Grant & Archambault, 2006), the majority of which comes from land-based sources (United Nations Environment program [UNEP], 2016). Plastics in the marine environment are broadly categorized into larger macroplastics and smaller fragments (<5mm) called microplastics (Thompson et al., 2004; GESAMP, 2015). Ghost gear, fishing gear that is abandoned, lost or discarded at sea, is estimated to be responsible for 46 to 70 per cent of macroplastics in the ocean (Lebreton et al., 2018; Global Ghost Gear Initiative [GGGI], 2018). Microplastics are further classified as primary microplastics and secondary microplastics; primary microplastics are intentionally manufactured as tiny pieces while secondary microplastics form as a result of fragmentation or weathering of larger items (Arthur, Baker & Bamford, 2009; GESAMP, 2015). Nanoplastics, which are fragments of plastic particles smaller than microplastics, ranging from 1 to 1000 nm (1 nanometer = 10^{-9} meters or one billionth of a meter), is an emerging topic of research (Gigault et al., 2018).

About 50 per cent of all plastics produced are thrown away after a single use (Mathalon & Hill, 2014). Single-use plastics (SUPs), as the name suggests, are items that are used once or only for a short period of time before being discarded (UNEP, 2018b). Often made of low, medium or high-density polyethylene (PE), polypropylene (PP) or polyethylene terephthalate (PET), SUPs are materials that last forever by human timescales but are designed to be thrown away after a single use (Gibb, 2019), an apparent flaw in design. Commonly used SUPs include items such as shopping bags, cigarette butts, straws, plastic cutlery, take-out containers and coffee cups, most of which have reusable alternatives (Canadian Council of Ministers of the Environment [CCME], 2018).

Most items found in shoreline cleanups around the world are SUPs. From 2017 onward, the top ten items found during coastal cleanups internationally were all SUPs (Ocean Conservancy, 2019). In Canada, the Great Canadian Shoreline Cleanup (GCSC) releases an annual “Dirty Dozen” which lists the top 12 items found during shoreline cleanups. In 2018, SUPs accounted for 10 of the 12 “Dirty Dozen” items (GCSC, 2018). A brand audit of plastic trash collected during community and shoreline cleanups at nine locations across Canada identified Nestlé and Tim Hortons as the top polluters in the country for two years in a row (Fiset, 2019). In 2014, nine items among Nova Scotia’s “Dirty Dozen” were SUPs (Pettipas et al., 2016). Preliminary data from a GCSC conducted in September 2019 at Point Pleasant Park, Halifax, NS, revealed 11 of top 12 items to be SUPs (World Wildlife Fund-Canada [WWF-Canada], 2019). A comparison between results from the 2019 Halifax cleanup and the 2018 GCSC reveals consistencies in the types and proportions of the most commonly found items along shorelines both locally and nationally (Figure 1). Globally, cigarette butts and microplastics are frequently the top two items found during shoreline cleanups (WWF-Canada, 2019; Pettipas et al, 2016; GCSC, 2018; Ocean Conservancy, 2019).

Marine plastic pollution primarily occurs as a result of intentional or unintentional expulsion of untreated wastewater, dumping or other mismanagement of solid waste, as well as run-off from land-based activities (UNEP, 2017). While the exact amount of plastic in the ocean is nearly impossible to calculate, the most comprehensive calculation of marine plastic to date estimated that between 4.8 and 12.7 million metric tons of plastic entered the ocean in 2010 (Jambeck et al, 2015). Current estimates indicate that over eight million tons of plastic enter the

ocean annually (UNEP, 2017). Despite these estimates, there remains a lack of reliable comprehensive data on marine plastics (McNicholas & Cotton, 2019). Continued mismanagement of plastic waste combined with increasing coastal populations and projected increases in the frequency and intensity of natural hazards (Neumann, Vafeidis, Zimmermann & Nicholls, 2015) could lead to an increase in the amount of plastic debris in the ocean.

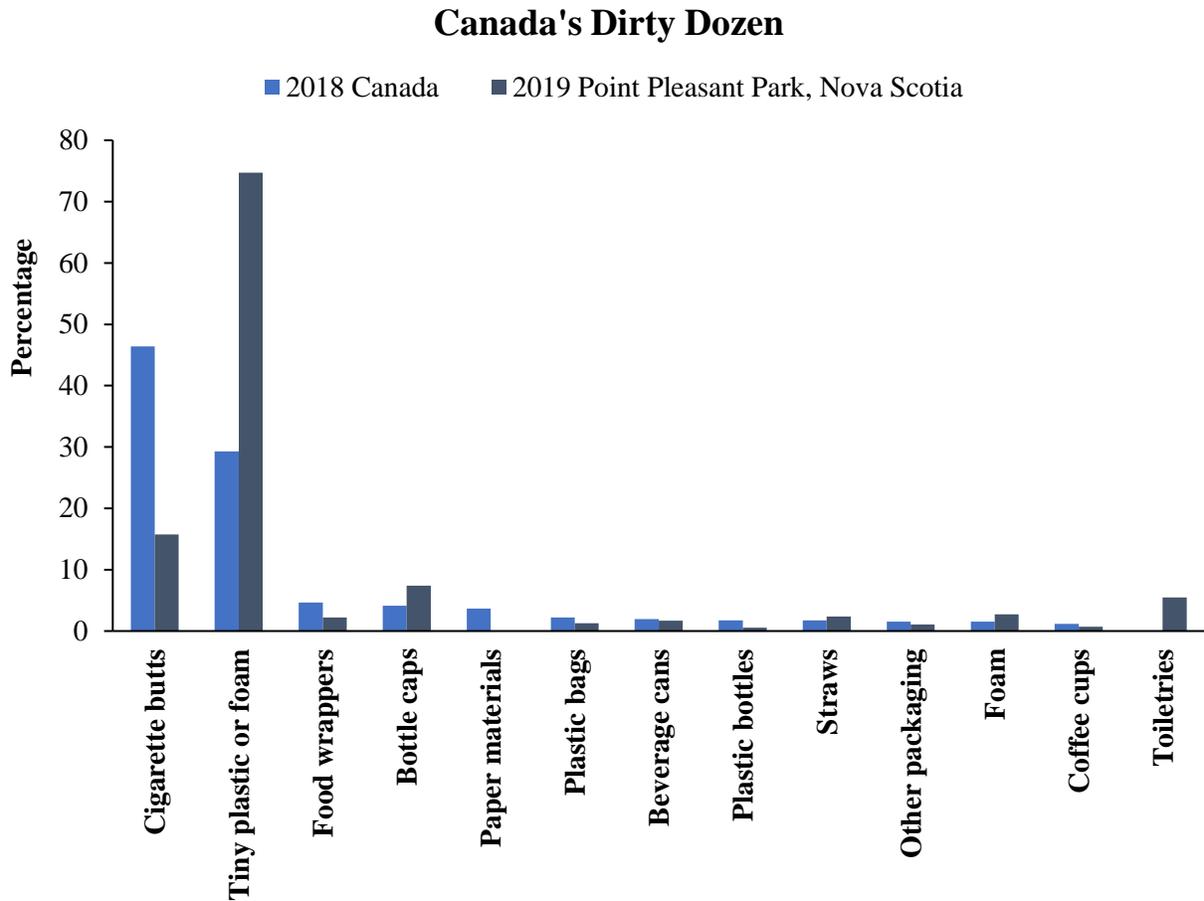


Figure 1. Comparison of 2018 National Cleanup Data (GCSC, 2018) with 2019 Point Pleasant Park Cleanup Data (WWF-Canada, 2019).

1.1 Impacts of Marine Plastics

Marine plastic debris has widespread ecological, social as well as economic impacts (Law, 2017; Beaumont et al., 2019). The accumulation of plastic debris in areas of recreational importance can cause a decrease in the aesthetic value of a place, thus resulting in economic losses to the tourism industry (Gregory, 2009). Based on ecosystem service values and marine plastic stocks, Beaumont et al. (2019) estimated the economic costs of marine plastic to be

between USD \$3300 and \$33,000 per tonne per year. The damage to marine ecosystems caused by plastic littering costs at least USD \$13 billion annually; this includes costs to tourism, fisheries as well as the cost of beach cleanups (UNEP, 2014).

Aside from economic costs and aesthetic impacts, marine plastics pose a serious threat to the marine environment killing millions of marine mammals, sea turtles, sea birds, and countless fish annually (Laist, 1997; Derraik, 2002; Gregory, 2009; Worm et al., 2017). Entanglement and ingestion are the two main types of biological interactions with marine plastic (Laist, 1997) that have been widely studied. The number of marine species documented to have been impacted by marine litter (majority being plastic) has increased from 693 in 2015 to 2249 in 2019 (Gall & Thompson, 2015; Litterbase, 2019). Other impacts include the absorption of persistent organic pollutants (POPs) by marine plastics and the possible introduction of alien species, sometimes caused by a sessile species using marine plastics as transport (Rios, Moore & Jones, 2007; Gregory, 2009). Recent research has revealed that microplastics and nanoplastics have toxicological effects on different organisms, can transfer through trophic levels (Wright, Thompson & Galloway, 2013; Worm et al., 2017; Lu et al., 2019), and have even been found in the human gut (Schwabl et al., 2019). However, data remains scarce for the consequences of humans ingesting microplastics (Schwabl et al., 2019). Due to their persistence in the marine environment and harmful as well as unknown impacts, there is an urgent need to find innovative solutions to mitigating marine plastic pollution at local and global levels (Derraik, 2002; UNEP, 2019).

1.2 Measures Mitigating Marine Plastics

Unfortunately, the plastic problem cannot be solved just by banning all plastics (Worm et al., 2017) and it requires diverse strategies informed by science (Rochman, 2016). Marine plastic pollution is a marine problem that requires land-based solutions (Pettipas et al., 2016) which are broadly categorized into prevention, collection and recovery (CCME, 2018). Prevention of plastic pollution includes finding suitable alternatives to curb the production, distribution and consumption of plastics at the source, collection refers to waste management strategies as well as methods to improve recycling and reuse of plastics, and recovery refers to cleanup efforts to remove plastic from the marine environment (CCME, 2018; The Skimmer on Marine Ecosystems And Management [MEAM], 2019). Strategies to reduce marine plastic pollution

require us to think globally and act locally (Derraik, 2002; Vince & Hardesty, 2016). It is, however, difficult to manage through domestic policy because plastic trash in the ocean does not have geographical and political boundaries (McNicholas & Cotton, 2019).

Globally, measures to mitigate marine plastic pollution have been adopted at different jurisdictional levels, ranging from international strategies (National Oceanic and Atmospheric Administration [NOAA] & UNEP, 2012), to national regulations like bans and levies (Xanthos & Walker, 2017), to smaller bottom up approaches such as zero-waste businesses and encouraging individual behavioural changes (Clapp & Swanston, 2009). The Honolulu Strategy, developed in 2011, provides a planning framework to reduce the impacts of marine debris globally (NOAA & UNEP, 2012). The Global Partnership of Marine Litter (GPML), launched in 2012, is a platform that aims to bring different stakeholders working on marine litter together to enhance cooperation and implement the Honolulu strategy (GPML, 2018). In 2018, under Canadian presidency, the G7 adopted the Ocean Plastics Charter, a commitment to a more resource-efficient and sustainable management of plastics through five steps: sustainable design, better waste management, education and awareness, research and innovation, and shoreline action (Government of Canada, 2019). In 2019, France took over the G7 presidency and has been an active advocate and leader for the recent commitments against marine plastic litter (European Council, 2019).

For SUP mitigation, strategies varying in range and scope have been introduced at national, provincial or municipal levels typically involving bans or levies on plastic bags, straws, coffee cups, Styrofoam, or microbeads (Xanthos & Walker, 2017). China's ban on importing film plastics in 2018 has led to increased interest in plastic mitigation initiatives among developed countries (Walker, 2018; Schnurr et al., 2018). Internationally, the most common SUP interventions are on plastic bags, with 127 of 192 countries having some form of legislation on plastic bags; additionally, 23 countries have legislation banning specific products, materials or production levels, and 63 countries have mandates for extended producer responsibility (EPR; UNEP, 2018a). Interestingly, actions against plastic bags became a norm in different parts of the world without an international collaborative movement or set policy, through local and regional concerns and bottom-up initiatives, indicating that small local movements can cause a significant global shift (Clapp & Swanston, 2009). Bottom-up initiatives are important contributors to

reduction of land-based sources of marine plastic pollution (Schnurr et al., 2018). Data, however, remains scarce on the effectiveness of bans and other SUP mitigation measures, possibly because most interventions are relatively recent (Xanthos & Walker, 2017; Schnurr et al., 2018).

As of 2017, only two cities and six municipalities within Canada had levies or bans on plastic bags (Xanthos & Walker, 2017). In November 2018, Canada outlined a nation-wide zero plastic waste strategy which envisions a circular economy for plastics keeping it out of the environment (CCME, 2018). Since then, three major announcements have occurred at national, provincial and municipal levels with respect to Halifax, Nova Scotia, which will affect SUP consumption. First, in December 2018, the environment committee of the Halifax Regional Municipality (HRM), Nova Scotia, voted in favor of a city-wide plastic bag ban (Berman, 2018). Second, on June 10, 2019, Prime Minister Justin Trudeau made a commitment that the Government of Canada will ban harmful SUPs by 2021 (“Canada to ban”, 2019, June 10). Finally, on October 30, 2019, Nova Scotia Environment Minister, Gordon Wilson, introduced Bill 152, a legislation to ban SUP bags within the year (Gorman, 2019; *Bill 152*, 2019). While the outcomes of these actions are unable to be measured until they come into full effect, these announcements are likely to have caused some concerns, especially among business owners in Halifax, Nova Scotia.

Chapter 2. Research Context- HRM, SUPs, BIDs and OFNS

HRM (Figure 2a) is a coastal city that is the capital of Nova Scotia. With a population of just over 400,000 people, HRM is the largest Canadian city east of Montreal (Statistics Canada, 2017). HRM has a heavily indented 400 km long coastline which includes Halifax Harbour, one of the “deepest and largest naturally occurring ice-free harbours in the world” (Port of Halifax, 2019). HRM consists of four former municipalities, namely, Halifax, Dartmouth, Bedford and Halifax County, that were amalgamated in 1996 (Halifax, 2019b). Over the recent years, HRM has seen a growing population as well as economy; 2018 had a record two per cent growth in population, and a \$300 million growth in gross domestic product (GDP) to \$19.2 billion (Rankin, 2019). Being a coastal city bordering the Atlantic Ocean, SUPs entering the ocean as a result of overuse and improper disposal is a very real threat for the HRM.

The food service industry is a significant contributor to SUP overuse with majority of the top items found during shoreline cleanups being SUP items used for food or drinks (UNEP, 2018b; Pettipas et al, 2016; GCSC, 2018; Ocean Conservancy, 2019). This is especially true for the fast-food industry where SUPs play a major role in takeout orders in the form of bags, straws, cutlery, other plastic food packaging, and coffee cups (Wu, 2019). This year, a brand audit led by Greenpeace named five fast-food companies, Nestlé, Tim Hortons, Starbucks, McDonald’s, and Coca Cola, as Canada’s top five polluters (Fiset, 2019). While several measures have introduced bans or levies on SUPs, few aim to positively recognize businesses that have taken steps to reduce or eliminate SUPs from their regular use.

The Ocean Friendly Nova Scotia (OFNS) Initiative is a tiered recognition program designed for Coastal Action, an organization based in Lunenburg, Nova Scotia (Coastal Action, 2019). The initiative aims to recognize businesses that have taken steps to reduce or eliminate SUPs from their daily use. Businesses that eliminate three, five or more than eight SUP items from their business will receive the bronze, silver or gold standard recognition decals respectively (Coastal Action, 2019). The goal of OFNS is to inspire change through positive action and recognition. For the first year, the pilot initiative is focusing on food-based businesses in Lunenburg with the goal of eventually expanding it to all businesses across Nova Scotia.

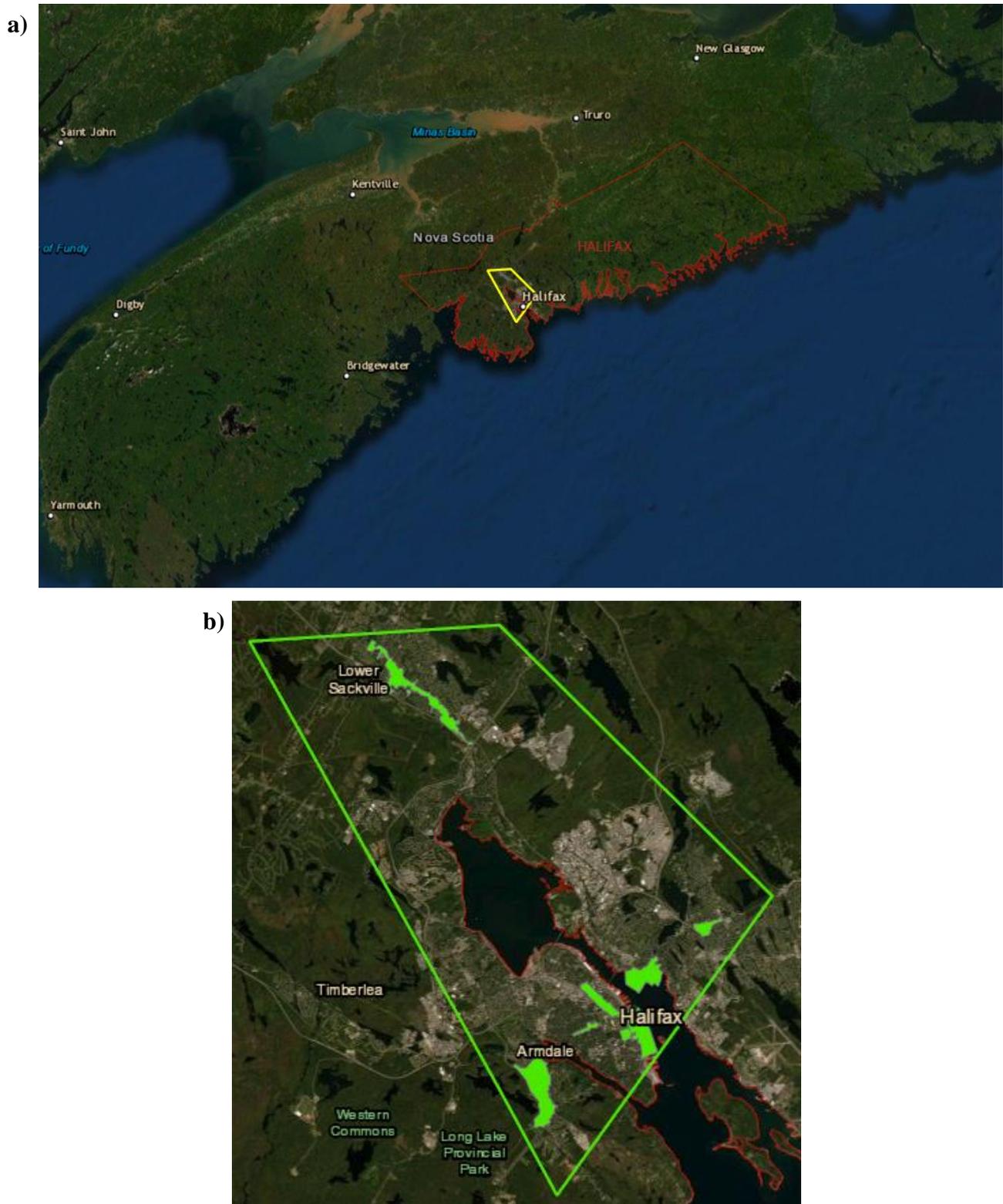


Figure 2. Study area. a) Red outline marks the HRM boundary with the yellow outline encompassing the BIDs. b) Green shapes within the green boundary outline the eight BIDs in the HRM (Created on ArcGIS online)

HRM has eight Business Improvement Districts (BIDs), namely, Downtown Halifax Business Commission, Downtown Dartmouth Business Commission, Spring Garden Area Business Association, Quinpool Road Mainstreet Business Association, North End Business Association, Main Street Business Association, Sackville Business Association and Spryfield Business Commission (Figure 2b; Halifax, 2017). BIDs are specific self-assessing subdivisions of a region in which property and business owners pay additional taxes, typically authorized by state governments (Morçöl & Wolf, 2010; Elmedni, Christian & Stone, 2018). In the HRM, many of the food-based businesses are concentrated within these BIDs. Over the past year, there has been increased interest among the eight BID offices to develop a collaborative initiative to mitigate plastic pollution in the HRM. Through a unique collaboration between Coastal Action, WWF-Canada, Clean Foundation and the BID offices, a project was thus created to adapt the OFNS initiative for the HRM.

2.1 Management Problem and Research Objectives

Modelled on the study that initiated the OFNS program in Lunenburg (Graham et al., 2019), this is a pilot study that aims to identify the barriers to reducing SUPs in the HRM community as well as within food-based businesses in the eight BIDs. Identifying these barriers will help inform SUP reduction strategies as well as provide a framework to adapt the OFNS initiative for the HRM. The study further attempts to explore the issue of SUPs as well as the methodology used for this pilot project in order to provide recommendations for SUP reduction strategies in the HRM. Through a mix of qualitative and quantitative methods using two sets of surveys and semi-structured interviews, this study aims to answer the following primary research question:

What are some of the main barriers to SUP reduction according to community members and food-based business owners in the HRM as determined by this pilot project?

Additionally, this research attempts to answer the following two secondary questions:

- Are the community members and food-based business owners that participated in this study interested in reducing their use of SUPs to mitigate marine plastic pollution?
- What are some public perceptions on the impact of SUPs on the marine environment in the HRM?

Chapter 3. Methods

To address the research questions, this pilot study adapted the methodology carried out for the OFNS initiative in Lunenburg which used a series of surveys and interviews to identify interest in SUP reduction (Graham et al., 2019). Mixing data or methods to corroborate the results of a pilot study is called triangulation in social science research (Olsen, 2004). Methodological pluralism, a form of triangulation, uses a mix of research methods in which qualitative as well as quantitative analyses interact, allowing for access to “different facets of the same social phenomenon” (Olsen, 2004). Using the framework of methodological pluralism, this pilot study thus integrates quantitative data from surveys with qualitative data from semi-structured interviews to understand the barriers to SUP reduction among food-based businesses as well as community members in the HRM.

Following ethics approval on the methodology as well as survey and interview questions from the Marine Affairs Program Ethics Review Committee (Appendix A), this pilot study was carried out in three distinct steps. First, an online community survey via social media gauged the interest among members in the HRM community in reducing their SUP use as well as identified their willingness to support more environmentally friendly practices. Second, an email survey was distributed to food-based businesses in the eight BIDs of the HRM to identify businesses that were interested in participating in plastic reduction initiatives. Finally, businesses that expressed interest in this initiative were contacted for follow-up interviews to understand their concerns and challenges to reducing SUPs in their business.

3.1 Surveys

The two surveys were created using Google Forms, a free online software that collects information through surveys or quizzes (Figure 3). The community survey had a brief section on demographics of the survey respondents, followed by eight multiple choice questions related to the HRM community’s use and dependence on SUPs as well as interest in reducing their SUP use (Appendix B). The survey was anonymous, and respondents had the option to leave the survey at any time; only completed surveys were considered for analysis. Survey respondents also had the option to add additional comments at the end of the survey. The current place of residence was a required question which allowed to select for HRM residents. The community survey was primarily distributed online in June 2019 via three social media platforms, Facebook,

Instagram and Twitter. In-person surveys were distributed at a few community events following which the data was entered into Google Forms. The online community survey remained open until the end of June 2019. Halifax Noise, a social media platform with a large following, shared the survey on June 6, 2019.

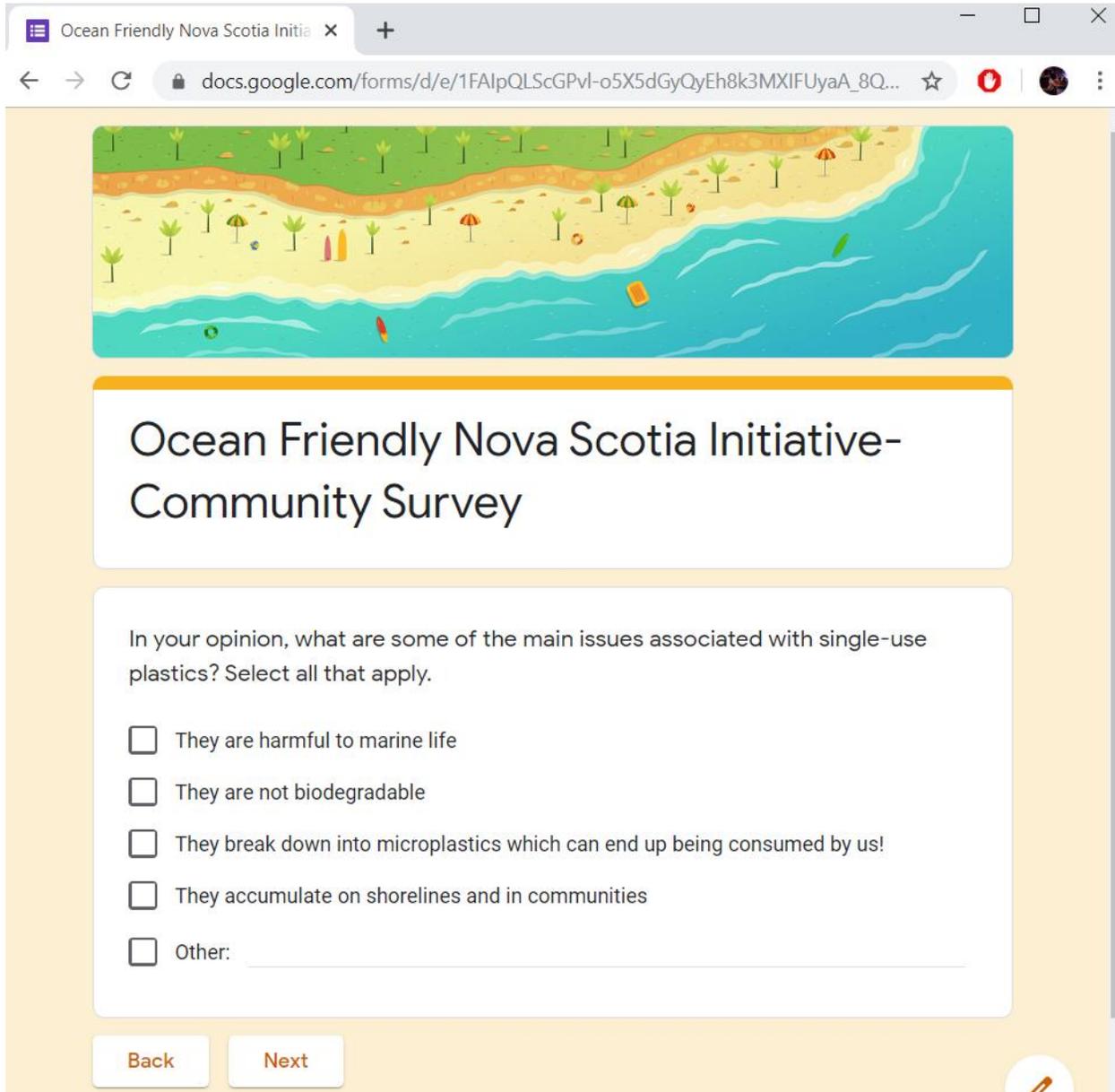


Figure 3. Screenshot of the Google Forms survey platform with sample questions.

The business survey was first distributed by the BID offices to businesses within each of their BIDs in their regular email newsletters. Since the newsletters were sent to all business types

in the BIDs, the first distribution yielded nine responses of which only three were food-based businesses. Following this, recommended food-based businesses in each BID were sent the survey link through targeted emails, which increased the number of responses to 13. Finally, email addresses of all the food-based businesses in each BID were collected either through the BID websites or through the business websites. A mass email was sent out to a list of 158 food-based businesses in the HRM. It is important to note here that not all businesses had emails. The remaining businesses were contacted through an online contact form on their website. In order to keep the methodology consistent, businesses that did not have an email address or a way to contact them electronically through their website were not contacted. The business survey had an initial section which requested the type and location of the business. Following this, the businesses were required to complete seven questions that included both closed and open-ended questions (Appendix C). Businesses had the option to provide their contact information at the end of the survey if they were interested in the OFNS initiative and were willing to be contacted further. The online business survey was launched in June 2019 and remained open until the end of July 2019.

3.2 Semi-structured Interviews

Based on the results from the survey, interested food-based businesses that provided their contact information were then contacted for follow up interviews. Seven interested businesses from six different BIDs were interviewed to discuss challenges faced by them in further detail. The interviews were semi-structured, designed to understand business owner perspectives on the issue of SUPs, their understanding of marine plastics, as well as their interests and challenges around SUP reduction (Appendix D). A couple of the interview questions served to understand business owner reactions to the proposed federal ban on harmful SUPs as well as the OFNS initiative. The interviews were either conducted via telephone or in person. Prior to being interviewed, interviewees were required to sign a consent form confirming that they understood the research objectives as well as the confidentiality of their participation (Appendix E). Through the consent form, permission was obtained to record the interviews for further analysis.

3.3 Analyses of Surveys and Interviews

Initial results from both the business and community surveys were filtered for responses from HRM community members as well as food-based businesses. The survey data was exported

to a spreadsheet on Microsoft Excel for further analysis. The community survey responses were sorted by question, and the data was displayed using graphs to visually represent the different responses. Selective data was then tested for statistically significant differences in the responses using chi-square tests as well as proportion tests. A visual representation of the responses helped to further identify patterns in the community survey responses and to compare it to the business survey as well as interview responses.

For the business survey analysis, food-based businesses were categorized as cafés, restaurants or pubs. Restaurants were further distinguished as primarily dine-in or take-out restaurants. The responses from the business survey were again sorted by question and visually represented using graphs. Overarching themes and patterns in the survey data were identified through these visual representations. The business survey was primarily used as a tool to identify businesses that were interested in reducing SUPS, to contact them for follow-up interviews. Data from the semi-structured interviews were first transcribed and anonymized. The data was then coded through a process of thematic analysis as described by Maguire & Delahunt (2017). Themes and patterns in the data were identified to address specific research questions. The emergent themes were compared with results from the surveys to identify the main barriers to SUP reduction in the HRM, and thereby provide recommendations for SUP reduction strategies. The methodology used in this research can be used as a framework to adapt the OFNS initiative for the HRM. Furthermore, the methodology used in this pilot study can be adapted and replicated to expand the OFNS initiative to other regions in Atlantic Canada.

Chapter 4. Results

4.1 Community Survey

The online community survey generated 231 responses, twice the expected number for this pilot study, of which 207 respondents were from the HRM. A sample size of 207 for a population of 400,000 has a margin of error of 6.81 per cent (Checkmarket, 2019). These 207 HRM responses were selected for further analyses. Of these, 80 per cent identified as women (166), 17 per cent as men (36), and the remaining 3 per cent chose not to specify their gender (Figure 4). The majority of the respondents (80 per cent) were millennials or post millennials (Figure 4, Appendix F). A proportion test revealed that the number of millennial and post-millennial respondents as well as female respondents was significantly higher than respondents of other age groups and genders.

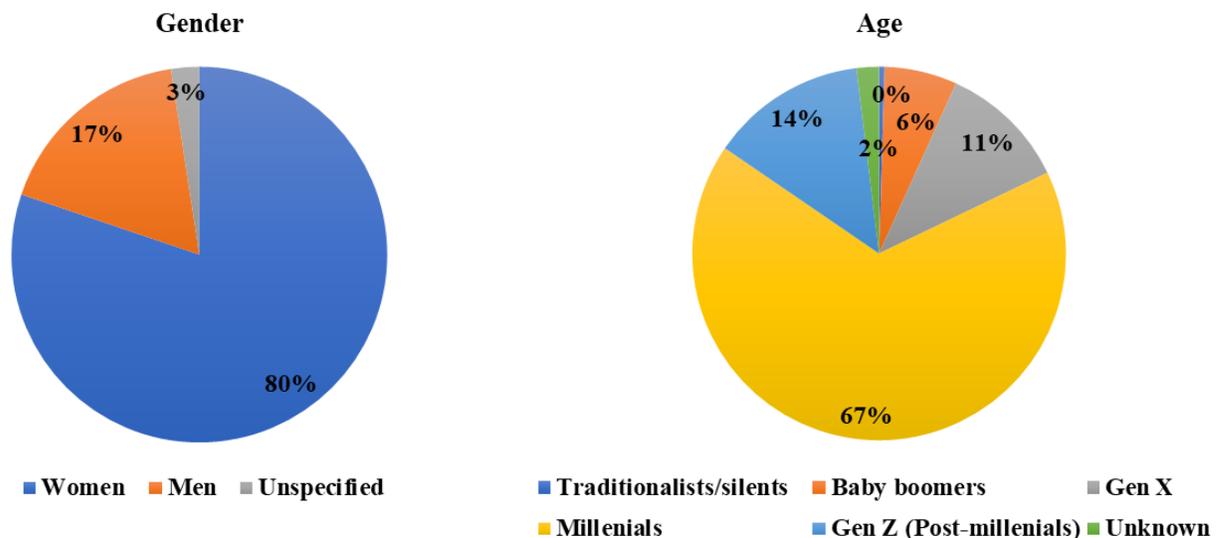


Figure 4. Chart representing the proportions of respondents according to gender (left) and age (right).

When asked whether they would like to see the HRM use less SUPs, almost 98 per cent of the respondents answered positively, with only five responding with a “maybe”. No one responded negatively to this question. Additionally, 75 per cent of the respondents said they would be willing to pay more for environmentally friendly alternatives, 22 per cent responded that they would pay more to an extent, and only 2 per cent were unwilling to pay extra. The majority of the respondents (about 80 per cent) indicated that they used SUPs frequently, ranging from daily to weekly; only three per cent said they use SUPs once a month or less (Figure 5). A

significantly higher proportion of respondents used SUPs multiple times a week or more as compared to those that used SUPs once a week or less.

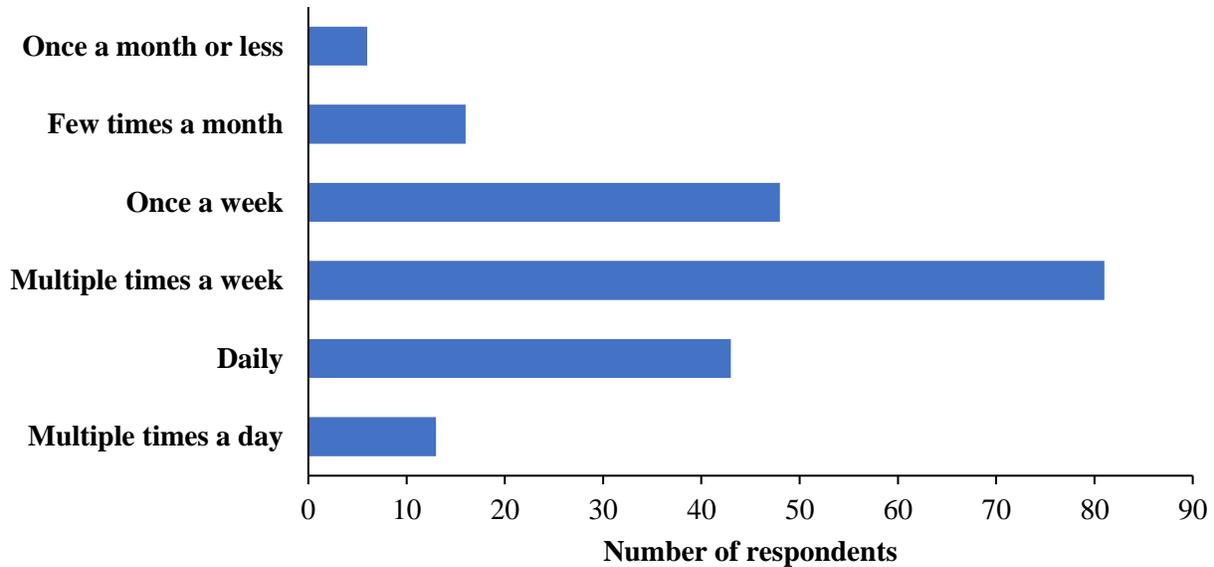


Figure 5. Frequency of SUP usage in the HRM community.

For the questions in which respondents could select all that applies, they had the option to add “other” options in addition to the existing ones. In all the figures with additional options, the respondents added options are denoted by grey bars while the pre-existing options are indicated by blue bars. Respondents were asked to identify the SUP items they most commonly use (Figure 6). “Other plastic packaging”, selected by 61 per cent of the respondents, was identified as the most commonly used SUPs, followed by plastic bags (46 per cent) and take-out containers (38 per cent). Of the options added by respondents, food and grocery packaging were the most common (nine per cent). The respondents were not required to clarify if these were separate from the “other plastic packaging” option, therefore this remains unclear.

Reusable bags and water bottles were the most commonly used reusable alternatives with over 90 per cent of respondents choosing these, while travel mugs and food containers were reported to be used by over 85 per cent of respondents (Figure 7). Here, the most common added options were reusable wraps (e.g., Beeswax) and Ziploc bags. Interestingly, while 93 per cent of respondents ($n=193$) said they used reusable bags, 46 per cent ($n=95$) chose plastic bags as a common SUP used by them. Despite reusable bags being used by most of the respondents, further analysis showed that 43 per cent of reusable bag users ($n=83$) continue using plastic bags.

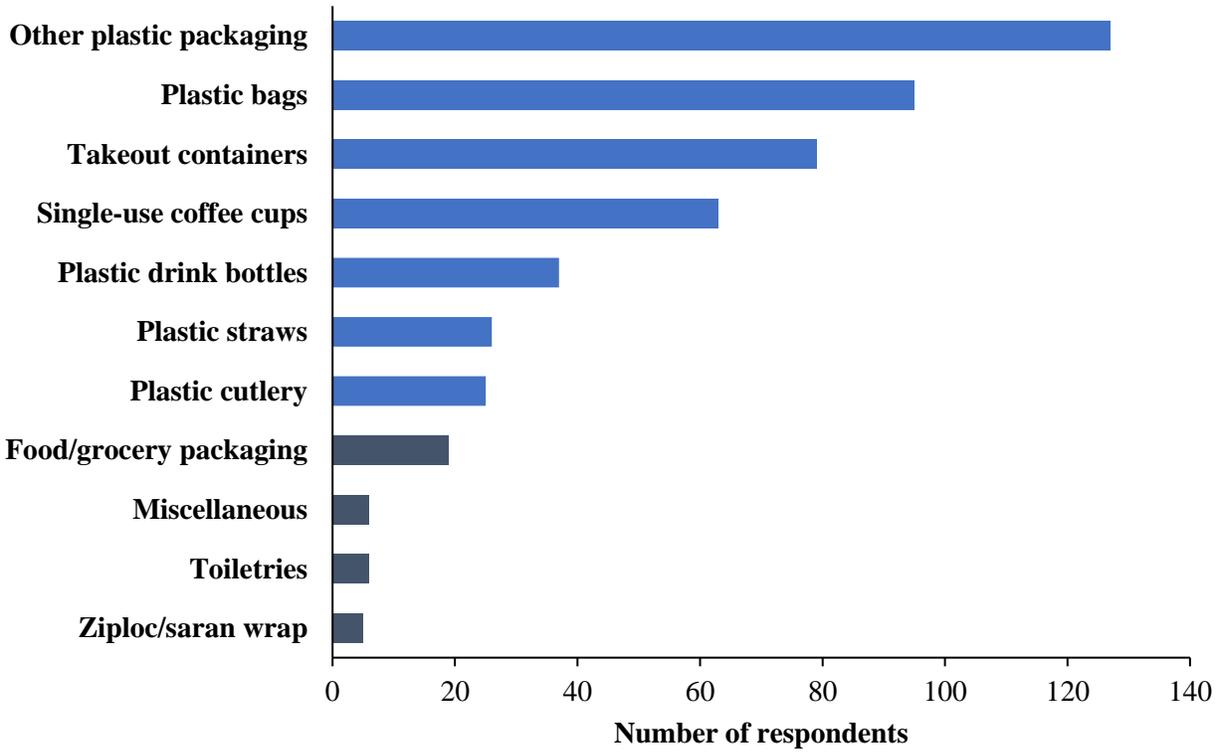


Figure 6. Common SUPs used by HRM community. Blue bars indicate multiple choice options included in the survey; grey bars are additional items added by respondents.

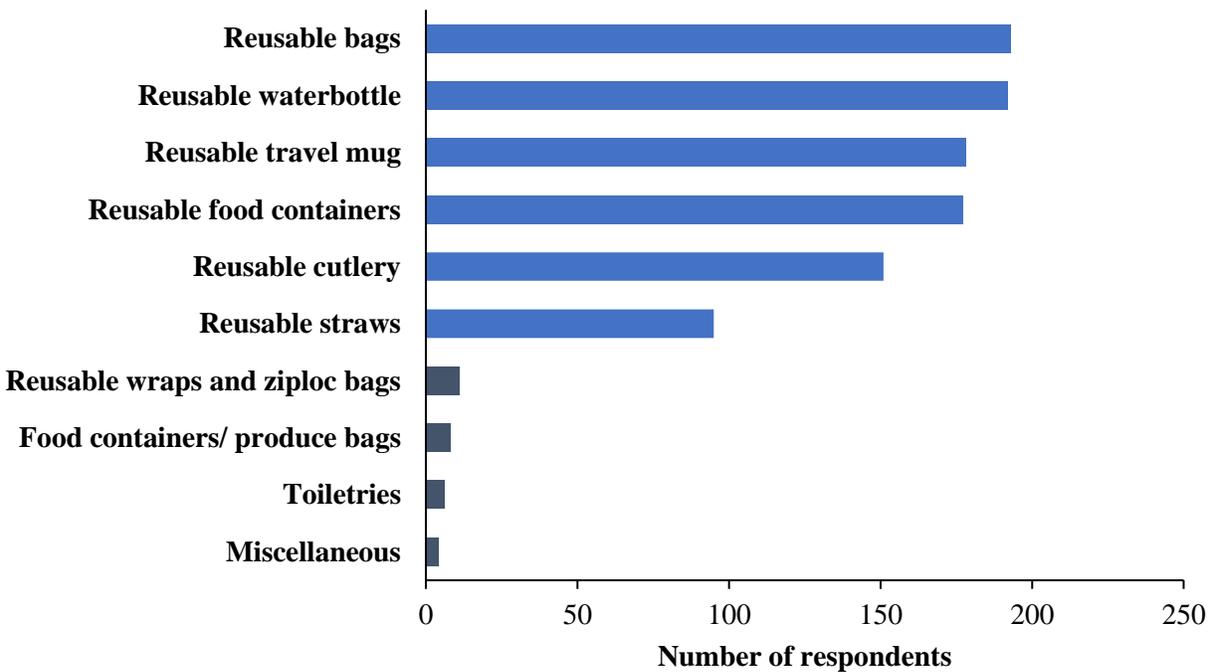


Figure 7. Commonly used reusable alternatives to SUPs in the HRM community. Blue bars indicate pre-given options, grey bars are options added by respondents.

To gauge awareness and perceptions of SUPs, the community survey included a question regarding the main issues associated with SUPs (Figure 8). The most commonly selected response was that they were harmful to marine life (96 per cent), followed closely by plastics not being biodegradable (94 per cent). The issues of accumulation on shorelines and fragmentation into microplastics were selected by 88 and 81 per cent of the respondents, respectively. Respondents again had the option to add other issues surrounding SUPs. The most common issue added by respondents was the use of non-renewable resources to produce SUPs and the economic, ecological and social costs of SUPs (eight per cent), followed by the fact that they were wasteful, unnecessary and “ugly” (seven per cent).

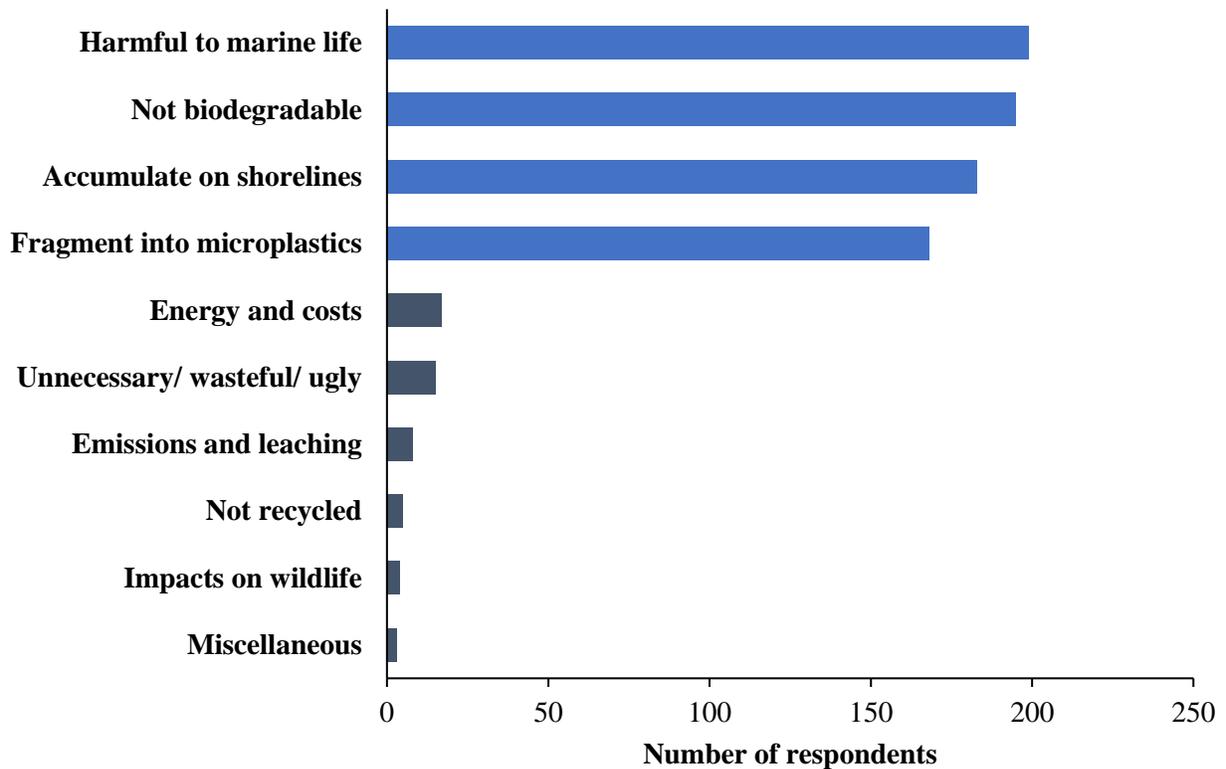


Figure 8. HRM community perceptions of main issues associated with SUPs. Blue bars indicate given options, grey bars were additional options added by respondents.

While the most common response to their concerns about reducing SUP use was that they had no concerns, this only made up 38 per cent of the responses (Figure 9). Interestingly, among the remaining options, the most common concern was that reducing SUPs was inconvenient (29 per cent), followed by the concern that alternatives were more expensive (26 per cent). The most

common added concern was regarding the availability and accessibility of alternative products (13 per cent) which was higher than the concern about food safety, an existing option.

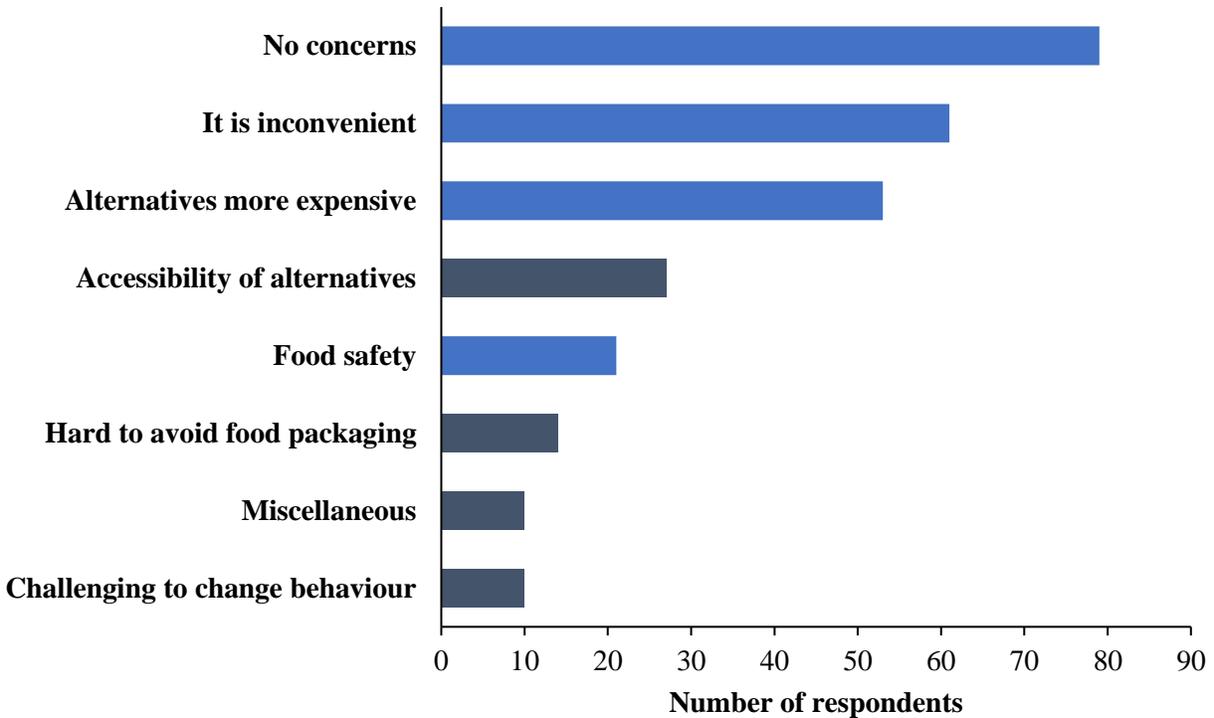


Figure 9. HRM community’s concerns about reducing SUP use. Blue bars indicate options that were included in the survey and grey bars were additional concerns added by respondents.

Finally, the survey included a brief explanation of the OFNS initiative and asked if respondents would be more likely to go to an OFNS recognized restaurant. The majority (almost 65 per cent) said they were “definitely more likely” to go to an OFNS recognized restaurant over one that is not, while the remaining responded with “somewhat more likely” (~25 per cent) and “maybe” (~11 per cent). Respondents had the option to include final comments at the end of the survey and 41 participants chose to add additional comments. While many were thankful and appreciative of this research, some others offered a few valuable insights. These included the importance of reducing and reusing over finding alternatives to SUPs and adding to the waste, the need for better regulation for businesses, and concerns about social dimensions and affordability. One respondent commented on the possibility that the results of this survey could be biased because a social media platform such as Halifax Noise (which shared the survey) likely had a “pretty liberal following”, not necessarily representative of the Halifax population. This is an important point that will be discussed in the following chapter.

4.2 Business Survey

The business survey was slow to take off. Slow responses to the business survey at the start could be partially due to this research being conducted in the summer, when most businesses in the HRM are busier. The business survey generated 33 responses of which 26 were from food-based businesses in the HRM. Only these 26 food-based businesses are considered for further analyses (Appendix G). The 26 businesses included cafés, pubs, restaurants (primarily dine-in), restaurants (primarily take-out), a market stall, and a restaurant (dine-in and take-out) plus grocery store (Figure 10). It is important to note that while larger fast-food restaurant chains in the BIDs were included in the recruitment emails, no responses were received from this type of business.

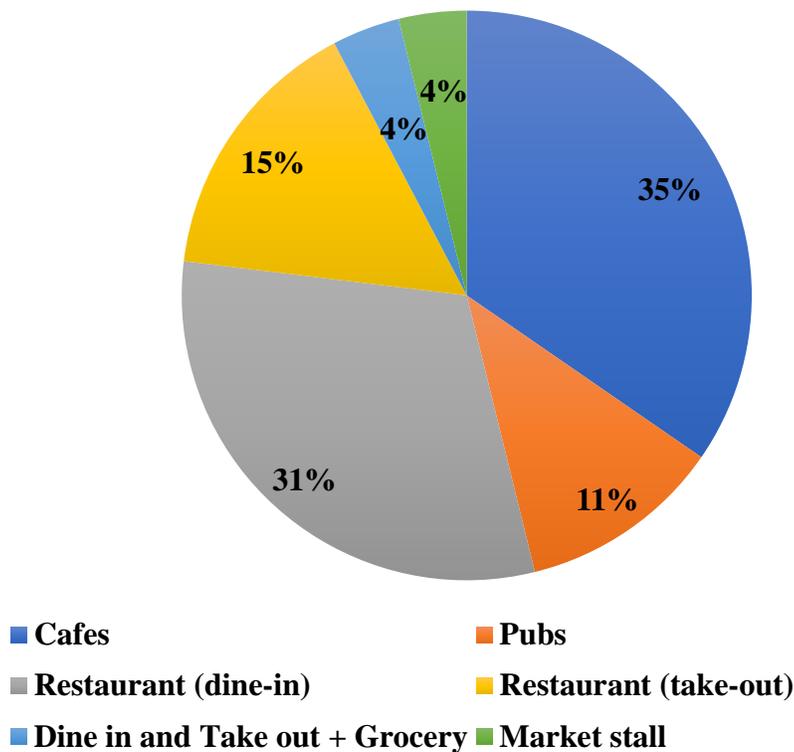


Figure 10. Proportion of food-based business responses.

Among the businesses surveyed, plastic drink bottles were the most commonly used SUP item across the business, with 13 of the 26 businesses using them (Figure 11). Single-use coffee cups and plastic cutlery were the second most frequent with 11 businesses using them, followed by plastic bags and condiment packages used by 8 business respondents. Four of the respondents

still use plastic straws. Another four businesses listed other commonly used SUPs in their business, namely, plant-based plastic cups and cutlery, food containers, bread bags, portion cups, 4-pack can tops, ketchup bottles and garbage bags. Two businesses said they do not use any SUPs at all.

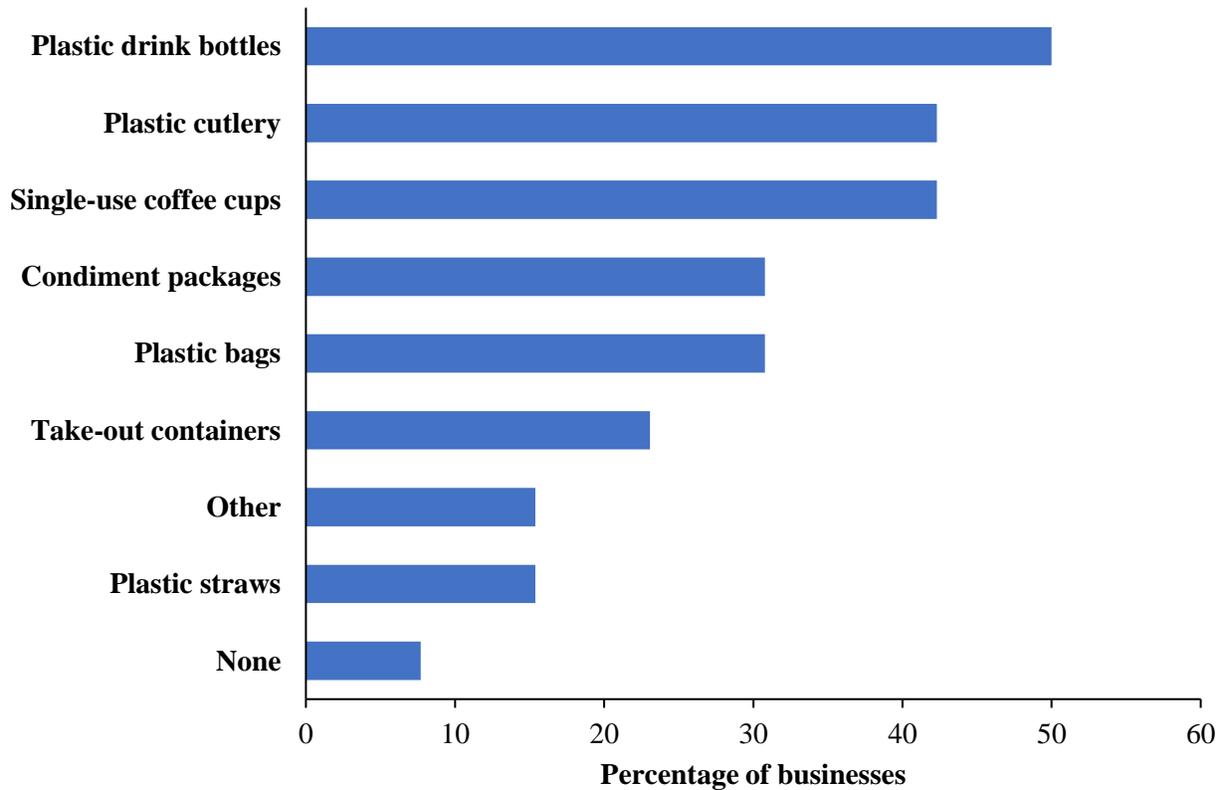


Figure 11. Common SUPs used by food-based businesses.

When asked about concerns and challenges associated with reducing SUPs from their business, three of the listed options – that they had no concerns, that the alternatives were more expensive, and that sourcing eco-friendly alternatives was challenging – had equal number of votes (Figure 12). Five businesses were concerned about losing customers if they were to reduce SUPs from their business. Additional concerns voiced by businesses in this preliminary survey included unnecessary packaging that was hard to avoid and HRM’s inadequate waste management system. Only one business reported that they had not taken any steps to reduce SUPs in their business so far. Of the remaining 25, the most common step taken by businesses was to switch to eco-friendly alternatives ($n=16$). Two of the businesses said they had never introduced SUPs into the business in the first place, two offered discounts on reusable to-go

containers, and the remaining five businesses had either eliminated a few SUPs or reused or repurposed SUPs such as bags and containers (Figure 13). Most of the businesses ($n=24$) were interested in further reducing SUPs.

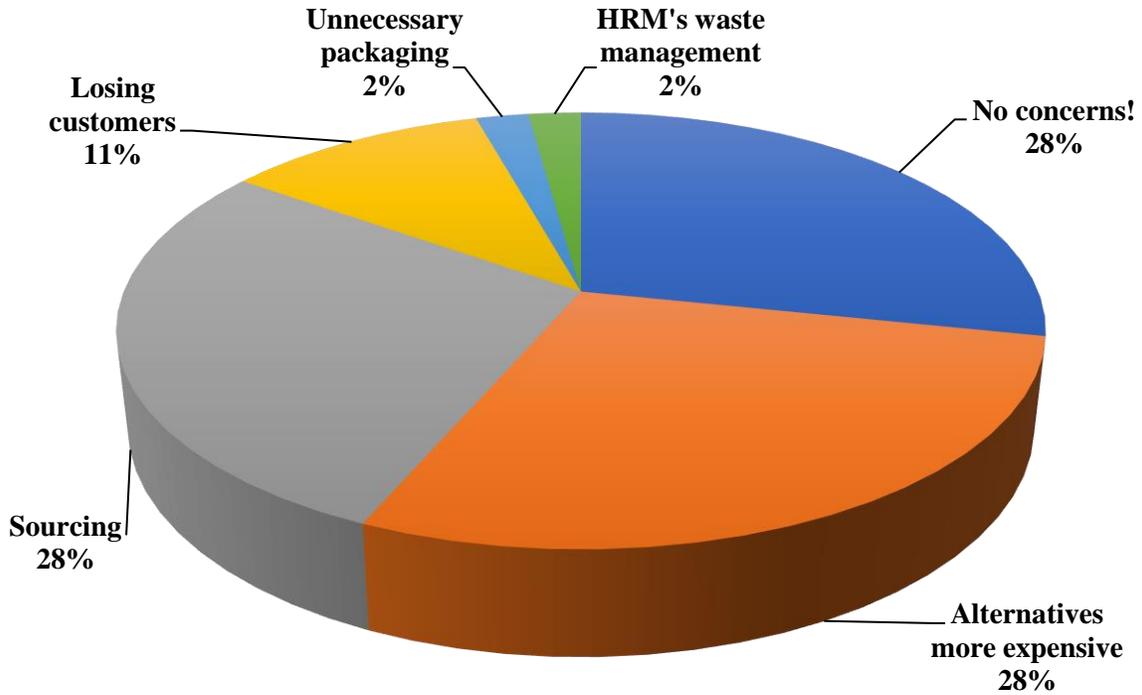


Figure 12. Main concerns of businesses about reducing SUPs.

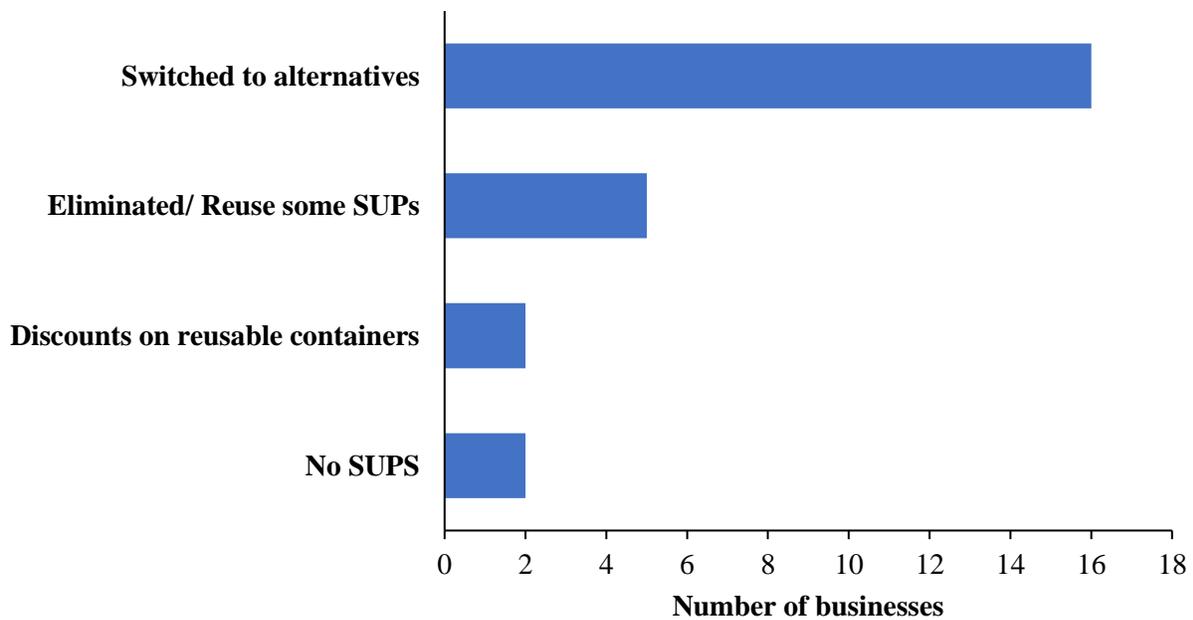


Figure 13. Steps taken by businesses to reduce use of SUPs.

Those that responded positively were asked to elaborate on what type of SUPs they were willing to eliminate (Figure 14). Plastic cutlery was the most commonly selected item followed by straws, bags, drink bottles, take-out containers, single-use coffee cups and condiment packages. Four businesses stated they had already eliminated all the SUPs that they could, while two did not respond to this question. Of the two, one was a package free store, and the other did not provide context. Finally, one business said they would be willing to eliminate all SUPs if they had adequate support. One business added vegetable containers as a SUP item they were willing to eliminate but did not elaborate on this. A comparison between the commonly used SUPs by businesses and those they are willing to eliminate revealed no statistical difference between the two, indicating that most businesses that answered the survey are willing to eliminate the SUPs they use with appropriate resources (Figure 15).

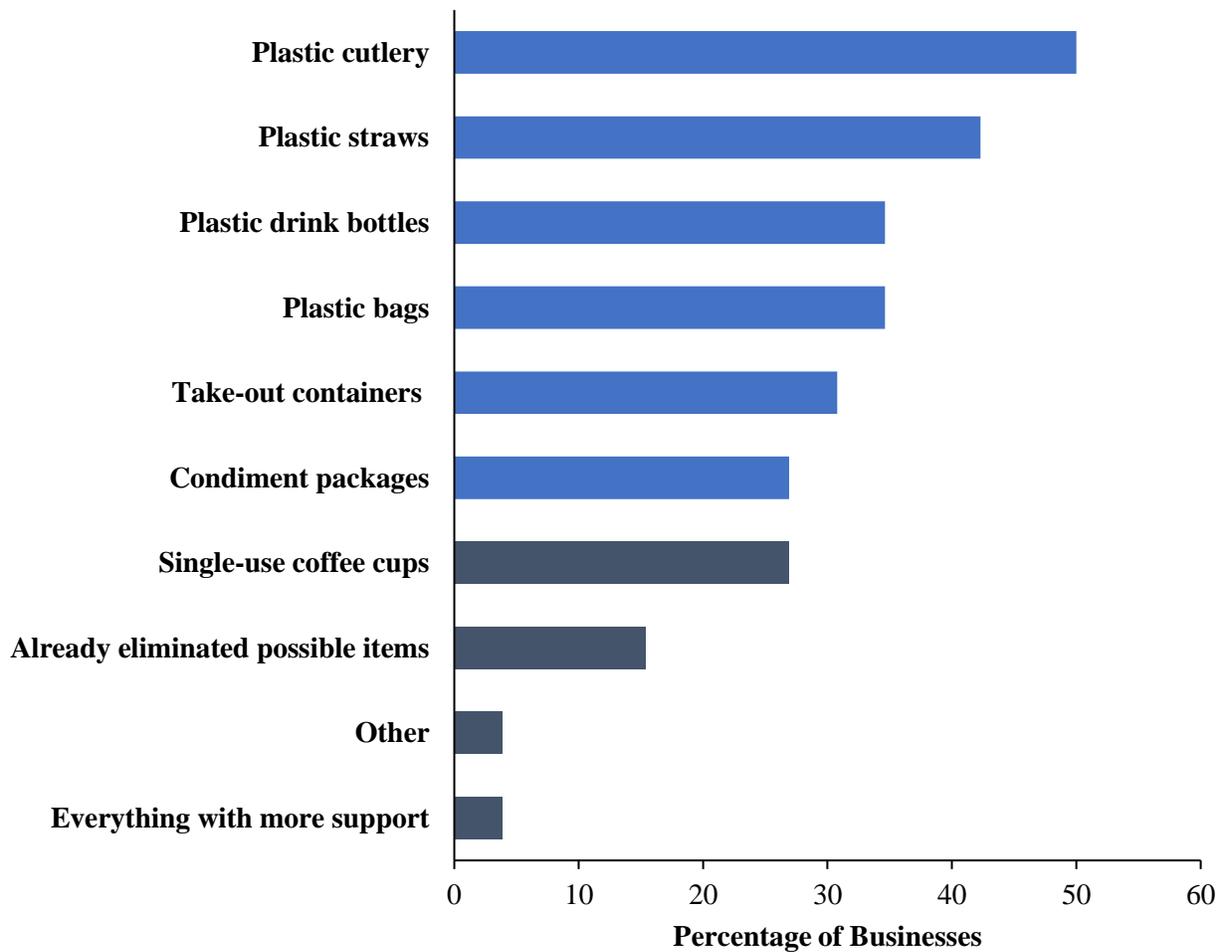


Figure 14. List of SUPs businesses were willing to eliminate.

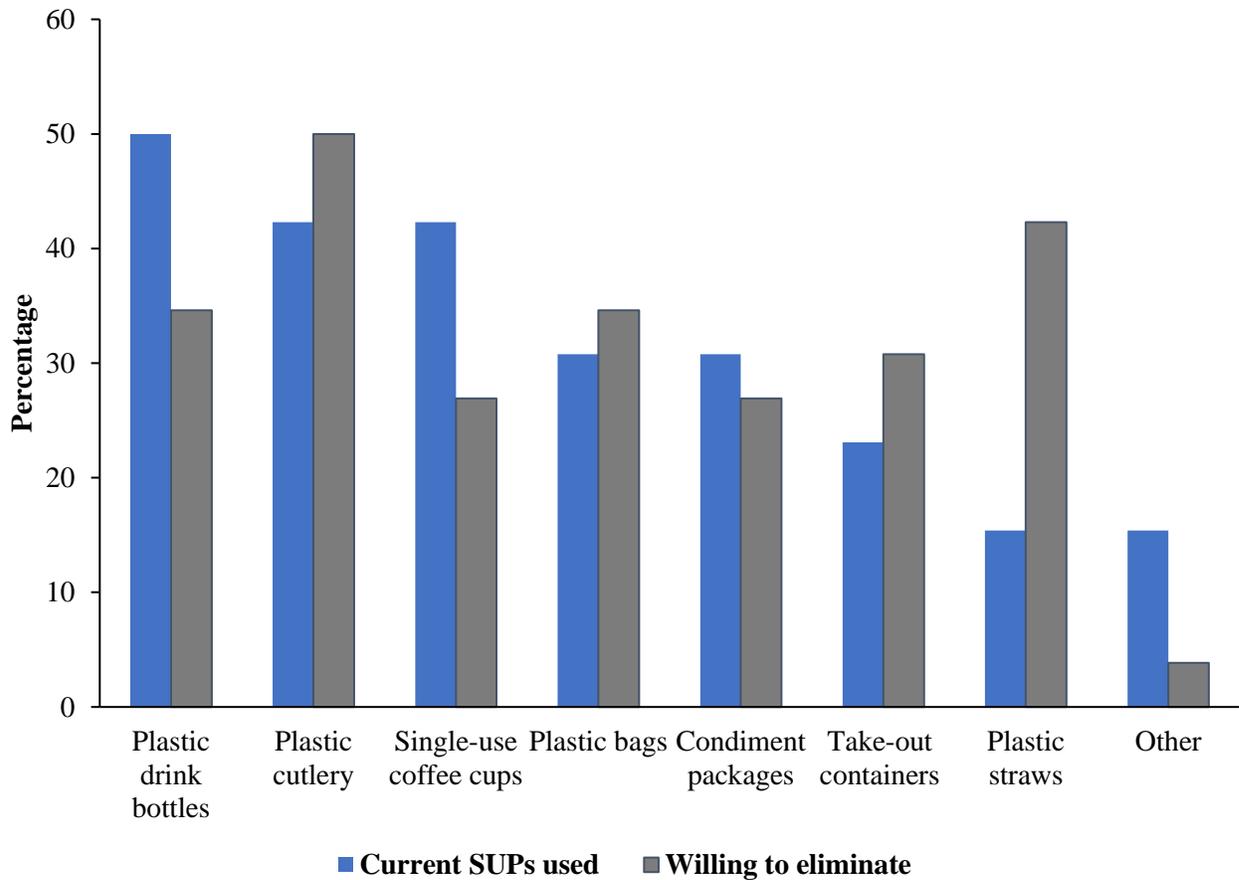


Figure 15. Proportion of SUPs currently used by businesses versus SUPs they were willing to eliminate.

The businesses that indicated that they were interested in further reducing SUPs ($n=24$) were then provided with a brief overview of the OFNS program and asked if they were interested in being a part of it. Of these, 16 businesses expressed definite interest in the OFNS initiative, seven selected “maybe” and only one business was not interested. The businesses then had the option to provide their contact information if they were interested in being contacted for further discussion. Seventeen businesses of the 26 provided their contact information. Of these, 12 had expressed definite interest in the OFNS initiative, four had said “maybe”, and one had not responded to the question. The 17 businesses, representing six of the eight BIDs, were contacted for follow up interviews (Appendix G). The only two BIDs that did not have a representative business were the Main Street Business Association and the Sackville Business Association. Lack of responses by businesses in these two BIDs could be attributed to a lack of independent small food-based businesses within these BIDs.

4.3 Interviews

Seven businesses responded to the interview request and were located in six different BIDs. Either the owners or managers of these food-based businesses were interviewed, depending on their availability (Table 1). The businesses varied by type and had diverse responses to the interview questions allowing for a broad range of views. Overall, these businesses had all expressed interest in reducing their SUPs and in the OFNS initiative. An important distinction here is that all the interviewees were local, independent, and smaller businesses due to the lack of responses from larger corporations and chain restaurants to the business survey.

Business Improvement District (BID)	Business Type	Sample size (<i>n</i>=7)
Downtown Dartmouth	Pub/ Restaurant/ Catering	1
North End	Café	2
Quinpool/ Downtown Halifax	Restaurant (primarily dine-in)	1
Spring Garden Rd	Restaurant (primarily take-out)	1
Spryfield	Restaurant (dine-in and take-out)	1
Spryfield/Spring Garden/Downtown Halifax	Café/ Catering	1

Table 1. BIDs and business types of interviewees

Themes identified during the interview analyses were broadly grouped into interests and barriers surrounding SUP reduction as voiced by the seven interviewees (Table 2). Barriers were further grouped as challenges and concerns of reducing SUPs, while interests were categorized by drivers and steps taken to reduce SUPs. All businesses identified sourcing alternatives as a major challenge and switching to alternatives was the most common step that had been taken to reduce SUPs.

4.3.1 Interests

All seven businesses were interested the issue of SUPs and had either already eliminated or were willing to reduce SUPs from their businesses. Overall, the interviewees were aware of the issues of SUPs, especially the increasing garbage in landfills and the ocean, extremely low

recycling rates, and plastic trash being sent back from developing countries. Among the businesses interviewed, the dine-in restaurants only used SUPs for their take-out items. Cafés used more SUPs on a regular basis, particularly single-use coffee cups. One business owner identified this as a major issue saying that cafés were doing more damage because waste was being generated constantly. Additionally, they mentioned that restaurants often had larger budgets and could, therefore, afford to invest in more expensive environmentally conscious alternatives. Café owners were often struggling to make ends meet, and despite being interested in SUP reduction, were limited by their budget. The overall interest in SUP reduction among the seven businesses was further explored by identifying the main drivers as well as steps taken by these businesses to reduce or eliminate SUPs (Table 2).

Interests		Barriers		
<i>Sample size (n=7)</i>		<i>Sample size (n=7)</i>		
Drivers	5 Awareness/Values	Sourcing alternatives	7	Challenges
	3 Customer interest	Costs	6	
	1 Growing take-out market	Client pushback	3	
Steps taken	7 Switching to alternatives	Knowledge gaps	4	Concerns
	3 Discounts	Time	2	
	3 Buying in bulk	Food safety regulations	1	
	2 Reusing SUP containers			

Table 2. Interests in and barriers to SUP reduction as expressed by interviewees. Interests, divided into drivers and steps taken, are arranged from most to least common (darker to lighter green) while barriers, divided into challenges and concerns, are arranged from most to least common (darker to lighter red).

Five of the seven businesses (71 per cent) stated that environmental awareness and their individual values were the main drivers to reduce SUPs from their business. Additionally, three businesses mentioned that the interests, support and values of their clientele also motivated them to find eco-friendly alternatives. Interestingly, one business said their main driver to considering

environmentally friendly options was the increasing demand for take-out food with the emergence of food-delivery companies like Uber Eats and Skip the Dishes (Table 3). Prior to these take-out services, their restaurant had not considered packaging options as they were primarily a dine-in restaurant. Environmental conscientiousness thus appears to be a major factor driving businesses to take steps to curb their SUP use.

Drivers	Awareness and values	“...the awareness that we had at starting the restaurant, where our goal was to create something that was sustainable, making the best environmental choices along the way...the health of our customers is important, the health of our employees is important, and then the health of our environment...those are our main three focuses.”
	Customer interest	“Well, I just thought about my target audience and I mean, my own values as well. I mean I’m a scuba diver, you know, I am aware of the challenges that we have with plastics and just garbage in general. But I also realize that I thought that my customers would want that.”
	Increasing take-out market	“What instigated the change was...Uber Eats, Skip the Dishes. There’s a whole bunch of them that have really come on in the last two years...They approached us about getting on board their platform... And I was concerned. I said, a) it’s going to be expensive because every meal that goes out has to have its specific packaging. And b) I felt that it was going to really contribute to garbage in our landfills and in our oceans.”
Steps Taken	Switching to alternatives	“Anytime we can use bagasse or paper we do, so our coffee lids now are made from paper...clamshell take out stuff is all bagasse, so really, and our straws have been paper for a really long time. Our burritos, we wrap in paper and we switched to just paper bags.”
	Discounts	“We try to encourage people to bring their own coffee cups. We give a discount for that.”
	Buying in bulk	“We try to buy in bulk, so we are not buying like individual bags of stuff.”
	Reusing SUPs	“We do also reuse a lot of SUP. So, if we get a bucket of peanut butter, we reuse it to store our peanut sauce in, we use plastic buckets for compost and garbage cans...and we try to reuse things until they wear out or crack and we can't use them.”

Table 3. Interests in SUP reduction divided into categories and sub-categories with sample quotes by interviewees.

The main steps taken by businesses included using alternative products, buying in bulk, reusing SUP containers, and offering a discount to customers that brought their own containers. A couple of businesses mentioned that they stopped selling plastic drink and water bottles and were trying to educate and spread awareness among customers. All seven businesses mentioned switching to alternative products over the past several years. The list of alternative products used by these businesses included containers made of bamboo, palm leaves, bagasse or paper, wooden cutlery, paper straws and bags, compostable cups, and plant-based plastic cutlery (Table 4). One business mentioned that they started refilling their dish soap to reduce SUP dish soap bottles, and another said they encourage customers to serve condiments directly onto their dishes from condiment bottles to avoid wastefulness from portion cups. Straws were the only single-use item common to all seven business, all of whom had switched to alternative products. Six businesses (86 per cent) had switched to paper straws while one had invested in compostable plastic straws. One business owner had gone a step further and made their restaurant straw-optional in addition to switching to paper straws. They noticed that in doing so, there had been a significant drop in the number of straws used. Therefore, even though paper straws were more expensive, they ended up saving more as they were going through fewer straws. While switching to alternative eco-friendly products was the most common step taken by businesses, SUP straws were the most common item that was replaced by alternatives.

4.3.2 Barriers

The main barriers faced by businesses when trying to reduce SUP usage were further categorized into challenges and concerns (Table 2). The challenges to reducing SUPs identified were further grouped into costs, sourcing alternatives, and client pushback. Client pushback was mentioned by some businesses, one stating that customers could get quite unpleasant at increased or additional charges to alternatives (Table 4). Reducing SUPs were identified as being easier for some businesses over others, depending on the clientele or target audience. Cost was identified as a challenge by six of the seven businesses (86 per cent). Alternatives to SUPs were more expensive and a couple of businesses explained that with the hospitality industry being a thin margin industry, profits are low, and costs of products fluctuate. The high cost of alternatives to plastic cutlery in particular was brought up by more than one interviewee (Table 4). Finding the right alternatives at a good cost was thus a major challenge to businesses.

Challenges	Sourcing alternatives	"It's made from renewable resources, but then I find out, HRM doesn't even compost them. And I'm paying 45cents per straw! So, I just keep having to do research and finding out that products aren't actually being composted. So why are we spending more money? And why are we putting the price up on our coffee? So, then I get coffee cups without the plastic lining. But then they are too hot to hold so then I have to get Java jackets for all of them. So, I'm creating more waste."
	Costs	"It's extremely frustrating and they're very expensive. Like, I would love to have, you know, the biodegradable cutlery but my goodness, I can't afford it!"
	Client pushback	"We get a lot of pushback from clients because we charge a little bit more."
Concerns	Misinformation	"It's really hard, I think the thing is there's so much information out there right now...people almost laughed at us... You're using the so-called biodegradable, compostable plastic, it's still plastic. Why are you bothering...So it is really really hard to know what to do."
	Time	"The problem with small businesses, of course, is time, right? People are busy and end up doing the easiest thing."
	Food safety regulations	"It is difficult because of the hygiene and food safety regulations"

Table 4. Barriers to SUP reduction divided into categories and sub-categories with quotes by interviewees.

The most common challenge identified by all of the businesses (100 per cent) was sourcing alternatives that were suitable for the HRM (Table 2). For example, compostable plastics or plant-based plastics have been becoming more popular among food-based businesses and every interviewee mentioned using these items. Compostable plastics are, however, not compostable in HRM's waste management facilities, of which almost all the interviewees were already aware (Table 4). While three business owners expressed frustration at this misinformation and oversight, two businesses said they still chose to use them, their justification being that at least compostable plastics wouldn't leach harmful chemicals into the soil in landfills. Three businesses mentioned that there was not an ideal alternative for liquids and had had customers complain about compostable containers with liquids disintegrating. Yet another issue with sourcing alternatives was that suitable products were not always locally available or accessible. One business owner said that they used to have to order in "eco" products from a

company in Toronto which was not feasible. Another stated that their regular distributor does not always have suitable alternatives. A third mentioned that while they were sometimes able to source compostable coffee cups locally, these cups had been harder to find lately, perhaps indicating an increasing demand for eco-friendly alternatives.

Concerns voiced by businesses were grouped into food and safety regulations, gaps in knowledge and lack of time (Table 2). Food and safety guidelines often made it difficult to eliminate wrapping items in plastic as well as order items that were not in excessive packaging. Businesses were also concerned about the conflicting information about safe alternatives to SUPs, making it difficult to identify if a product was actually better for the environment (Table 4). Additionally, with small business owners often working 16-hour days in high stress environments, they had little time to invest in researching suitable alternatives to SUPs. An important point brought up by one business was that often the focus was on individuals and smaller businesses which took the blame away from the larger corporations that produce and distribute plastic packaging in the first place.

4.3.3 Reactions to Proposed Federal Ban and OFNS

The seven businesses were asked what their reactions to the recent Federal Government announcement to ban harmful SUPs by 2021 as well as the OFNS initiative were. Interviewees had mixed reactions to the proposed ban. While four of the businesses thought the announcement was positive and had no concerns about the ban, others were not so sure. Two mentioned that they did not have concerns about the ban but admitted that this was perhaps because the ban would not directly affect them. One business was skeptical of the announcement itself but mentioned that it was a wake-up call and gave people a timeline. Another was doubtful of the potential effectiveness of the ban because they were “banning without a plan” and had not offered reasonable solutions to businesses. A third mentioned that they need to start figuring out how to replace their SUPs now and hoped more alternatives became available soon. If the ban were to come into effect, one business mentioned that industry will need to be held accountable instead of the blame being on small businesses. Skepticism of the federal government’s commitment and whether the ban would become a reality was a comment from more than one business. All the interviewees were generally in favor of the OFNS initiative. A couple of them likened it to a Trip Advisor certificate of excellence and gluten-free or organic certified products.

However, a couple of businesses mentioned that there needs to be a detailed process, as well as more information and guidance for businesses. Overall, businesses mentioned that more people were looking for eco-friendly options and that this would not hurt their businesses.

4.3.4 Interviewee Recommendations

The interviewees had valuable recommendations and suggestions regarding reducing SUPs (Table 5) with public education being the most common followed by collaboration between businesses, support from government, and industry being held responsible. Four businesses (57 per cent) emphasized the need to educate the public to get rid of misinformation and fill knowledge gaps. Two businesses mentioned that they had been trying to raise awareness among their customers. One business emphasized that there was a need for an overall shift in attitude about “how we shop and how we eat outside of our home”. Three businesses (43 per cent) recognized the need for businesses to work together either to buy alternatives in bulk for cost effectiveness, or to provide guidance on eliminating SUPs to each other. One interviewee recommended that a best practices guide on SUP alternatives specific for the HRM would help keep businesses informed and support them in making the right changes.

Government and industry roles were each brought up by three businesses (43 per cent). In addition to providing support to small business, one business recommended that the government should be setting an example for the public through action. For instance, they suggested that government employees should be mandated to bring their own reusable mugs to get their coffees, and that HRM ensures that any catered government events have zero-waste or at least no SUP items. Regarding industries, a business suggested that the packagers be responsible to recycle the packaging they produce instead of the focus being on individual and small business action, while another recommended that local distributors carry environmentally conscious alternatives instead of materials like Styrofoam. Another suggestion was that big companies need to take the lead in reducing SUPs to make a real difference. Additionally, incentivizing small businesses through tax offsets or price regulations was proposed by two businesses as a way to reduce costs for small businesses that could not afford expensive alternatives. The need for accessibility and availability of alternatives was emphasized throughout the recommendations proposed by all the businesses.

Recommendations	Number of Interviewees	Sample Quotes from Businesses
Public education/ Awareness	4	"I still think that there is a lot of confusion though. I mean, I was even confused when I first started buying the compostable cups. I thought they were compostable. I didn't know. And I think that the general public don't know. I think that they don't understand all the implications of running a business and having these products and being able to access them and the cost of them. They don't get it. So, I think more public education would be good."
Businesses to work together	3	"If I did eliminate a single use plastic, it'd be nice to say I eliminated it but also how I eliminated it...building a tool or resource for other people, to make it easier as well...that would be a perk for the businesses to be able to read up on other businesses on how they did it." "If businesses were to come together a little bit more and buy in bulk a lot more, that would be less plastic."
Government mandate/ support	3	"HRM needs to get their act together." "All [government employed] staff should be mandated to bring their own cups. I just think it should be part of being an employee if you are working for the government"
Industry/ distributors	3	"It has to be put on industry. If they're going to package stuff, they've got to be responsible for recycling it." "I think that a place like the Atlantic Wholesale Club, where a lot of small independent business owners shop, they shouldn't be carrying that stuff [Styrofoam]. You know, they should have alternatives for people."
Price regulation	2	"If there was some price regulation, if the government can do some research on how much their costs are...because it's not effective for small businesses"
Attitude shift	1	"It's a shifting of attitude that has to happen first."
Best practices guidelines	1	"Small business owners are super stressed out. And I think if you hand them something brief, not too long...motivating them...why you should be interested. But also, then have resources for them...even have listings of companies. People...ask me where I'm getting my takeout stuff because they don't know where to source it from. And they're interested in doing it."

Table 5. Recommendations and suggestions by businesses regarding SUP reduction.

Chapter 5. Discussion

5.1 Interests in SUP Reduction

Results of this study reveal a substantial interest surrounding the issue of SUPs and their subsequent reduction in the HRM, both within the community members as well as the businesses surveyed. Responses to the OFNS initiative were very positive in both surveys as well as interviews, indicative of the timeliness of this research. The timeliness is further exemplified by the recent SUP interventions introduced at municipal, provincial and national levels. Both the announcement of the proposed federal ban on harmful SUPs as well as the provincial legislation to ban plastic bags occurred during the course of this study (“Canada to ban”, 2019, June 10; *Bill 152*, 2019). The federal ban announcement could have played a role in the increased interest in SUP reduction within the HRM community.

Age and gender demographics of the community survey reveal a higher interest in the issue of SUP reduction among millennial and post-millennial (Gen Z) females. Both age and gender discrepancies are consistent with results from a Canada-wide survey on perceptions and solutions to the SUP dilemma, which had a majority of female responses and found millennials and Gen Z to be more mindful of SUP issues (Charlebois et al., 2019). Since this community survey was distributed primarily via social media, the age disparity could be partially attributed to the predominant age groups using social media platforms such as Facebook, Instagram and Twitter. Gender differences in environmentally friendly practices has been associated with environmental consciousness being considered “unmanly” (Brough et al., 2016). However, the gender disparity could also be indicative of females being more likely to respond to online surveys (Smith, 2008). Although the number of interviews was much fewer, most of the interviewees were female business owners as well. This again aligns with studies that found that females being more mindful of SUP issues (Charlebois et al., 2019). A gender and age bias can therefore not be ruled out for this study.

The majority of the survey respondents in the HRM community being willing to pay more for environmentally friendly practices was contradictory to the findings by the Canada-wide study which indicated that most Canadians were not willing to pay more for biodegradable packaging (Charlebois et al., 2019). However, the OFNS report for Lunenburg found that majority of the participants in that jurisdiction were willing to pay more for alternatives (Graham

et al., 2019), perhaps indicative of differing interests in Nova Scotia compared to the rest of the country. Even in the Canada-wide study, residents in Atlantic Canada and British Columbia were found to be more willing than those in other parts of Canada to pay extra for biodegradable packaging (Charlebois et al., 2019). A possible explanation could be that residents of coastal provinces are directly affected by the issue of marine plastic and hence more mindful of waste. However, an argument against hypothetical situations in surveys is that participants often overestimate their willingness to pay indicating a gap between environmental attitude and actual environmental behavior (Johansson-Stenman & Svedsäter, 2012; Moser, 2015). Environmental attitude is often considered a precursor to actual environmental behaviour (Eilam & Trop, 2012). Therefore, the apparent willingness to pay extra for environmentally friendly products on a survey may not be representative of reality.

The survey respondents from the HRM community appear to be highly aware of the environmental impacts of SUPs. A quarter of the respondents adding to the list of issues associated with SUPs emphasizes a higher level of awareness among the respondents and perhaps the HRM community. Harmful impacts of SUPs to marine life and the oceans in particular were brought up by most survey respondents as well as interviewees which could be attributed to the straw campaigns that went viral in 2018 and the many media images of whales, turtles, and seabirds entangled in plastic.

While four businesses that responded to the online survey still used plastic straws, all the interviewees had replaced plastic straws, with one referring to eliminating plastic straws as a “no brainer”. Despite plastic straws often being considered the low-hanging fruit in the overall issue of SUPs, action against straws could lay the groundwork for further SUP legislation (Garfield, 2018). The widespread awareness generated by the war on straws is a story of “psychology, a well-timed turtle and the power of social media” (Ramey & Tita, 2018). The effectiveness of the straw campaign showcases the power of environmental messaging and imagery, that connects individual action to their potential impacts from which people are often disconnected. The straw campaign is an example of grassroots actions and smaller municipal level interventions that grew into a global event with nationwide bans (Schnurr et al., 2018), evidence that individual movements can have widespread impacts.

5.2 Barriers to SUP Reduction

Frequent SUP usage despite the widespread interest in SUP reduction among the HRM community exposes our society's current interdependence on SUPs and the challenges of eliminating or reducing SUPs at an individual level. Reducing SUP usage, therefore, needs to happen not just at an individual or community level. Four of the commonly used SUPs that businesses were willing to eliminate, namely, plastic bags, drink bottles, coffee cups and straws, were among items found most commonly on shoreline cleanups both nationally and within the HRM (Figure 1). While three of the four items may have easily available alternatives and could be replaced by individual action, the fourth, plastic drink bottles, might pose more of a challenge. Finding sustainable alternatives to plastic drink bottles will be up to the industries that package them which reinforces the need to hold industry accountable.

Community survey results indicated that almost half of the people that use reusable bags continue to use plastic bags to some extent. Since no distinction was made between the types of plastic bags, respondents could have been referring to plastic garbage bags, produce bags, or bags used while shopping for non-grocery items. Some may even use plastic bags upon forgetting or not carrying enough reusable bags. Yet, it is concerning that plastic bags, a SUP item that has an easily available alternative, are still being used by so many people that expressed interest in seeing HRM use less plastics. With plastic bags being the second most common SUP item used by the survey respondents in the HRM community, and being a top item found on shorelines, Nova Scotia's legislation on banning plastic bags through Bill 152 (2019), appears to be timely. However, a major barrier to passing legislations and bans are plastics industry lobby groups such as the Canadian Plastics Industry Association (CPIA) and the Canadian Plastic Bag Association (CPIA, 2019; Hager, 2019). These groups advocate for recycling and proper management of SUPs, proposing that SUPs when managed properly are better for the environment than alternatives (CPIA, 2019).

The issue with and interest in sourcing alternatives to SUPs, both for businesses and members of the HRM community, is representative of a general movement towards more environmentally sustainable products. The lack of availability as well accessibility of alternative products to replace SUPs in the HRM was a common concern among businesses and members of the community. In the community survey, the accessibility of alternatives was the only response

in which an additional option surpassed an existing option (food safety) on the survey. Higher concerns about the environmental impacts of SUPs over food safety was also consistent with the Canada-wide findings by Charlebois et al (2019). Curiously, inconvenience was the most common concern about reducing SUP use among the community survey respondents. This perceived inconvenience of reducing SUPs perhaps points to a broader need for a behaviour shift (McNicholas & Cotton, 2019). In addition to a behaviour shift among individuals, local businesses as well as community members need to be able to easily access alternatives to SUPs. While individual and community action are effective at smaller scales, there is still a need for top-down legislation to support these actions in order to affect wide-spread change. A government legislation would perhaps be more effective on those who are unwilling or unmotivated to change.

Another aspect of sourcing genuinely environmentally sustainable alternatives was the issue of so-called “compostable” or “biodegradable” plastics. Recently, there has been an increase in the number of bioplastics or plant-based plastics being sold locally and several businesses in the HRM have been buying them in an attempt to be more environmentally conscious. However, these “compostable” plastics, can only be composted in industrial composting facilities which unfortunately, do not exist in the HRM. This means that these plant-based plastics end up in landfills contributing to waste or in municipal composts making the compost unusable. While businesses seemed conscious of this issue, results suggest that the broader HRM community may not be as informed. Educating the public on the best alternatives specific to the HRM is crucial in trying to bridge gaps in knowledge as well as avoid misinformation and “greenwashing”. Awareness on SUPs and sustainable alternatives will also help to reduce waste management issues that arise from improper disposal of items such as bioplastics. Environmental education can be an essential step to both environmental attitude as well as behaviour (Eilam & Trop, 2012). Education on sustainable alternatives for the HRM will thus support the creation of a community that makes well-informed environmentally sound choices, and hopefully inspire action.

Overall, results indicate that businesses want to be recognized for their efforts while the HRM community is eager to have more environmentally sustainable options, consistent with findings from the OFNS report for Lunenburg (Graham et al., 2019). The competitive nature of

the hospitality industry could work as either a barrier or driver to implement strategies such as the OFNS initiative to reduce SUPs, depending on the target customers of the businesses. While competition between fast-food chains might act as a barrier to SUP reduction (because reducing SUPs isn't necessarily a priority for their target audience), it may motivate smaller environmentally mindful businesses to reduce SUPs sooner rather than later. According to some businesses, this was certainly true for the OFNS initiative. They mentioned that certifying a few businesses would get more businesses on board since no one wanted to risk losing customers. This research helped to identify broader themes that emerged from the interviews and surveys of businesses and the HRM community which will be discussed in the following sections.

5.3 Broader implications

The OFNS initiative is based on a certification model which through positive recognition, incentivizes businesses to reduce SUPs and aims to influence a broader behavioural shift in the long term (Graham et al., 2019). Since the early 2000s, there has been an increasing shift from pollution control to sustainable consumption with eco-labelling and certification schemes gaining popularity as a market-based tool (Bleda & Valente, 2009). These programs give consumers the power to make more sustainable choices while distinguishing businesses, giving them an advantage in the market. Non-state market-driven governance systems such as eco-labels and certification systems are often developed by non-governmental organizations (NGOs) with the goal of creating “environmentally and socially responsible management practices” (Cashore, 2002). Most existing literature on eco-labelling and certification schemes are related to seafood, forestry and agriculture industries. Certifications and recognition programs for plastic reduction have been on the rise over the past year, both locally and globally.

In October 2019, the HRM introduced a business recognition program called “Beyond 3 Rs” to feature businesses that have taken sustainability and waste management to another level through four pillars – waste reduction, innovation, continuous improvement and community impact (Halifax, 2019a). Initiated by the municipality, this program aims to highlight one business that is nominated by the public on a quarterly basis, encouraging more businesses to follow suit and take positive action. In Atlantic Canada, two other organizations that include business recognition components include Debris Free Fundy and Divert NS (Walker, J., personal communication, November 19, 2019). Expanding business recognition programs to drive

positive action by incentivizing businesses throughout Atlantic Canada was identified as a priority action item by the SUP working group at the Clean Ocean Summit 2.0 held in November 2019 (Saunders, S., personal communication, November 19, 2019). Zero Waste Canada (2019), a non-profit grassroots organization located in British Columbia has a Zero Waste Facility Certification program that has a tiered certification system. Similar to the OFNS initiative, it follows a tiered system and is advertised as being open to any facility working toward zero waste at any location, but businesses need to pay to be certified by this program (Zero Waste Canada, 2019). Interestingly, the Surfrider Foundation based in California has a certification program for restaurants called Ocean Friendly Restaurants, also aiming to increase awareness and drive behaviour change (Surfrider Foundation, 2019).

Similar to levies, certification and recognition programs seek to influence a behaviour shift through subtle, non-coercive measures or “nudging policies” (Rivers, Shenstone-Harris & Young, 2017). Globally, there has been increasing research on public perceptions of the marine environment over the past decade, results of which indicate that there is an awareness of the threats to the ocean among the public, with plastic pollution, fishing and increasingly climate change being considered the top threats (Lotze et al., 2017; Environics Research, 2019). Awareness of an issue, however, does not necessarily translate to action. Differing values lead to varied behavioural responses with personal experiences being key to fostering connections to the sea (Jefferson et al., 2014). Therefore, an important limitation to nudging policies is that their effectiveness varies across groups; while people who are already invested in an issue may be more motivated to make lifestyle changes, others often remain unaffected by the nudge (Rivers et al., 2017).

Both legislative as well as non-legislative interventions against SUPs have been rising globally but the actual implementation of these is challenging (Schnurr et al., 2018). Despite the challenges in quantifying the effectiveness of SUP interventions due to their varying scales and jurisdictions, these interventions need to continue along with other actions beyond policy and legislation (Xanthos & Walker, 2017) to combat plastic pollution. A recent study in Atlantic Canada by Goodman et al (2019), estimated 1.8 million pieces of litter on the Bay of Fundy seafloor, 51 percent being plastic. Globally, at least three news stories over the past year reported whales that washed up on shore with their stomachs full of plastic (Parker, 2018; Reuters, 2018;

Borunda, 2019). Apart from the threats to marine life, marine plastic pollution also comes at a huge economic cost especially to the tourism industries. A study of beaches in Orange County, California, demonstrated that reducing marine debris by 25 per cent could save residents about \$32 million dollars just in the three summer months (NOAA, 2019). These examples demonstrate the need for both source reduction as well as clean up strategies to target the larger issue of marine plastic pollution (Rochman, 2016).

The findings from this study are consistent with other similar studies both within Atlantic Canada and Canada-wide. Following the identification of a high interest in the issue of SUPs from a survey conducted in August 2019, Charlottetown, PEI, is working on a plan to develop an education campaign to encourage residents to reduce their SUP use (Stewart, 2019). The Canada-wide survey by Charlebois et al (2019) also indicated high motivation among Canadians to reduce SUPs. Individual action, while important, is likely not sufficient to reduce SUP consumption in the HRM. However, individual and smaller scale SUP reduction strategies and local movements have the potential to inspire change at a larger scale, as seen in the case of movements to minimize use of plastic bags (Clapp & Swanston, 2009) as well as plastic straws (Schnurr et al., 2018). However, due to continued increase in the production of plastic, in addition to other SUP reduction measures, it is imperative that Canada continues to move toward a circular economy (Charlebois et al., 2019) and implements a federal ban on SUPs (Walker & Xanthos, 2018). Mitigation of plastic pollution thus needs a combination of management strategies enforced effectively at different levels of governance and at different stages in the lifecycle of plastics, combined with environmental education and awareness campaigns (Pettipas et al., 2016). Combatting marine plastic pollution is vital to preserve marine and coastal ecosystems, as well as the economy of coastal communities. This requires a holistic approach that includes action from industry and government in addition to individual grassroots movements on SUP reduction.

Chapter 6. Limitations and Recommendations

6.1 Limitations

6.1.1 Survey Bias

Although the survey was made anonymous to reduce bias, there is still a risk of the results not being representative of the HRM population as pointed out by one of the respondents. Surveyor bias is hard to avoid, especially with environmental issues like SUPs because people with an invested interest in this issue are more likely to fill out a survey without incentive. However, the large number of responses within one week of publishing the survey is an indicator of the timeliness and interest in the issue of SUPs. Since the survey was anonymous, there is a higher likelihood that participants responded honestly. Additionally, the limitations of survey methodology cannot be ignored. For example, willingness to pay more on sustainable options does not imply that consumers would pay more in reality when faced with a choice in person. Inferring meaning from survey results thus requires some caution (Barabas & Jerit, 2010) as responses on a survey do not necessarily reflect real-life actions.

6.1.2 Recruitment of Businesses

Recruitment of businesses via email was not necessarily the best methodology. Small food-based business owners often work 16-hour workdays and, as expressed by some of the businesses, are not looking to answer a survey at the end of their workday. Additionally, they get flooded with emails constantly, so it is easy for emails to get lost in their inbox. More than one business suggested that going to businesses in person and making it personal for a business was likely to be more effective. Additionally, email recruitment also meant that only businesses with listed emails were contacted.

The study was initially designed to only include food-based businesses within the eight BIDs because of interest among the BID offices in the OFNS initiative. Despite there being a larger concentration of businesses within the BIDs, this did exclude other businesses in the HRM who may have an interest in the OFNS initiative. Additionally, businesses outside the BIDs may have different barriers to reducing SUPs that were not voiced in this study. The small sample size of interviewees, while offering a broad range of opinions is not necessarily representative of all food-based businesses in the HRM. However, the scope and timeframe of this study did not allow for a much larger sample size.

6.1.3 Non-inclusion of Fast-Food Restaurants

Another limitation of this study is that only the voices of smaller food-based businesses were included. Although fast-food chain restaurants in the BIDs were emailed, there was a lack of response from them. Large chain restaurants are generally bound to the regulations and policies set by their headquarters and addressing reduction of SUPs at that level was beyond the scope of this study. However, with large corporations such as Tim Hortons, Nestlé and McDonald's being named the top contributors to plastic trash found during shoreline and community cleanups (Fiset, 2019), including input from fast-food chain restaurants may have been beneficial to this study.

6.2 Recommendations

The following recommendations were developed based on the results from the surveys as well interviews. Since the interviews had a question related to recommendations from businesses, these recommendations were largely influenced by their responses in the interview. Although addressed specifically for the HRM, these recommendations can be scaled for a larger geographic area or made more specific as needed.

6.2.1 Best Practices Guide for HRM Businesses

A best practices guide that contains information on the best available alternatives to SUPs specific to the HRM would be valuable for local businesses. This helps to prevent confusion among business owners regarding ideal alternatives. Business owners work long hours and unless the issue of SUPs is a priority to them, are unlikely to spend the time and energy to research best alternatives. They need a common resource that can be shared and is updated regularly. The best practices guide could be a living document perhaps developed and managed by an NGO or a collaboration of NGOs; the guide must be easy to follow and contain clear information regarding alternatives to SUPs that are ideal for the HRM.

6.2.2 Accessibility and Availability of Alternatives

The municipality should be required to have alternatives that are appropriate for local businesses and acceptable in the municipality's compost system. Alternatively, HRM could find solutions for compostable plastics, such as transporting them to industrial facilities in other jurisdictions or investing in constructing industrial composting facilities locally. In addition to the list of SUPs that will be banned, the proposed federal ban must offer viable alternatives for

businesses that still use these items. Additionally, the government could offer support such as tax offsets or price regulations for smaller business that will need to invest in alternative products. Having access to alternatives to SUPs that are reasonably priced will ensure that businesses and community members do not have to go out of their way to source a sustainable option.

6.2.3 Public Education and Awareness

Environmental education and awareness may be the key to a larger scale behaviour shift among the public and could help make reusable alternatives to SUPs the norm. The public will need to be educated on the most sustainable alternatives in the HRM to avoid confusion and misinformation. Although the survey respondents in the HRM already had a general awareness of the impact of SUPs and marine plastic pollution, continued education and awareness campaigns will serve to keep them up to date on new information and can help spread this information to the wider community. Educating the public on the importance of marine plastic pollution will additionally, make the HRM community more mindful of overusing SUPs and can help them make appropriate choices.

Chapter 7. Conclusion

This study indicates that there is an appetite for SUP reduction and environmentally conscious alternatives in the HRM as well as support for the OFNS initiative. However, for the OFNS initiative to be effectively implemented in the HRM, smaller businesses require additional support and guidance to access the appropriate SUP alternatives suitable for the HRM. This also requires support from the municipality in making products more accessible. The announcement of the proposed federal ban on harmful SUPs while timely, needs more detailed guidelines in order to be effectively implemented. Additionally, the plastic industry and large-scale distributors need to be held accountable for their actions and the blame needs to be shifted from individuals and smaller businesses.

Identifying barriers and interests in SUP reduction helps to identify broader areas where businesses and the community need support in order to effectively adapt the OFNS initiative for the HRM. Additionally, identifying barriers helps us find suitable solutions to reduce SUPs which in turn reduces the amount of waste being mismanaged and entering our waterways. Reducing the use of SUPs is just one method of mitigating plastic pollution at the source. Mitigation of marine plastic pollution requires a multi-faceted approach at individual, local, national, and global levels. The OFNS initiative rewards businesses for their efforts serving as positive reinforcement for their actions and is one of many methods to facilitate a shift in behaviour which is a vital step for broader change. If the OFNS initiative that is being piloted in Lunenburg, a town of 2200 people can be adapted to the HRM, with a population of 400,000, it can definitely be scalable to all of Nova Scotia, to Atlantic Canada and perhaps even to all of Canada.

References

- Arthur, C., Baker, J. & Bamford, H. (eds). (2009). Proceedings of the International Research Workshop on the Occurrence, Effects and Fate of Microplastic Marine Debris. Sept 9-11, 2008. NOAA Technical Memorandum NOS-OR&R-30. Retrieved from https://marinedebris.noaa.gov/sites/default/files/publications-files/TM_NOS-ORR_30.pdf
- Barabas, J., & Jerit, J. (2010). Are survey experiments externally valid? *American Political Science Review*, 104(2), 226-242. doi:10.1017/S0003055410000092
- Beaumont, N. J., Aanesen, M., Austen, M. C., Börger, T., Clark, J. R., Cole, M.,... & Wyles, K. J. (2019). Global ecological, social and economic impacts of marine plastic. *Marine Pollution Bulletin*, 142, 189-195. doi:10.1016/j.marpolbul.2019.03.022
- Berman, P. (2018). Halifax one step closer to banning single-use plastic bags. *CBC News*. Retrieved from <https://www.cbc.ca/news/canada/nova-scotia/halifax-plastic-bag-ban-1.4935992>
- Bill 152, *Plastic Bags Reduction Act*. (2019). 63rd Assembly, 2nd session. Retrieved from <https://nslegislature.ca/legislative-business/bills-statutes/bills/assembly-63-session-2/bill-152>
- Bleda, M., & Valente, M. (2009). Graded eco-labels: A demand-oriented approach to reduce pollution. *Technological Forecasting and Social Change*, 76(4), 512-524. doi:10.1016/j.techfore.2008.05.003
- Borunda, A. (2019). This young whale died with 88 pounds of plastic in its stomach. *National Geographic*. Retrieved from <https://www.nationalgeographic.com/environment/2019/03/whale-dies-88-pounds-plastic-philippines/#close>
- Brough, A. R., Wilkie, J. E. B., Ma, J., Isaac, M. S., & Gal, D. (2016). Is eco-friendly unmanly? The green-feminine stereotype and its effect on sustainable consumption. *Journal of Consumer Research*, 43(4), 567-582. doi:10.1093/jcr/ucw044

- Canadian Council of Ministers of the Environment. (2018). *Strategy on zero plastic waste*. Retrieved from https://www.ccme.ca/en/current_priorities/waste/waste/strategy-on-zero-plastic-waste.html
- Canada to ban harmful single-use plastics and hold companies responsible for plastic waste. (2019, June 10). *Justin Trudeau, Prime Minister of Canada*. Retrieved from <https://pm.gc.ca/en/news/news-releases/2019/06/10/canada-ban-harmful-single-use-plastics-and-hold-companies-responsible>
- Canadian Plastics Industry Association. (2019). *Single-use plastic bans*. Retrieved from <https://www.plastics.ca/PlasticTopics/IndustryIssues/PlasticBagBans>
- Cashore, B. (2002). Legitimacy and the privatization of environmental governance: How non-state market-driven (NSMD) governance systems gain rule-making authority. *Governance: An International Journal of Policy, Administration, and Institutions*, 15(4), 503-529. doi:10.1111/1468-0491.00199
- Charlebois, S., Walker, T. R., McGuinty, E., & Music, J. (2019). Single-use plastic packaging in the Canadian food industry: Perceptions and possible solutions. (Unpublished report). Dalhousie University, Halifax, NS.
- Checkmarket. (2019). *Sample size calculator*. Retrieved from <https://www.checkmarket.com/sample-size-calculator/>
- Clapp, J., & Swanston, L. (2009). Doing away with plastic shopping bags: international patterns of norm emergence and policy implementation. *Environmental Politics*, 18(3), 315-332. doi:10.1080/09644010902823717
- Coastal Action. (2019). *Ocean Friendly Nova Scotia*. Retrieved from <https://www.coastalaction.org/ocean-friendly-nova-scotia.html>
- Derraik, J. G. B. (2002). The pollution of marine environment by plastic debris: a review. *Marine Pollution Bulletin*, 44(9), 842-852. doi:10.1016/S0025326X(02)00220-5
- Eilam, E., & Trop, T. (2012). Environmental attitudes and environmental behavior – Which is the horse and which is the cart? *Sustainability*, 4(9), 2210-2246. doi:10.3390/su4092210

- Elmedni, B., Christian, N., & Stone, C. (2018). Business improvement districts (BIDs): An economic development policy or a tool for gentrification. *Cogent Business & Management*, 5(1). doi:10.1080/23311975.2018.1502241
- EnviroNics Research. (2019). *Public opinion on marine protected areas*. Retrieved from http://assets.wwf.ca/downloads/public_opinion_on_marine_protected_areas_enviroNics.pdf?_ga=2.52460139.2132672003.1574215057-1585508673.1524156024
- European Council. (2019). *G7 summit, Biarritz, France, 24-26 August 2019*. Retrieved from <https://www.consilium.europa.eu/en/meetings/international-summit/2019/08/24-26/>
- Fiset, M. (2019, October 9). Nestle, Tim Hortons top Greenpeace Canada's plastic polluter list for second year. Retrieved from <https://www.greenpeace.org/canada/en/press-release/26011/nestle-tim-hortons-top-greenpeace-canadas-plastic-polluter-list-for-second-year/>
- Gall, S. C., & Thompson, R. C. (2015). The impact of debris on marine life. *Marine Pollution Bulletin*, 92(1-2), 170-179. doi:10.1016/j.marpolbul.2014.12.041
- Garfield, L. (2018, July 9). Banning plastic straws sounds annoying, but here's why it's a fight cities must win. *Business Insider*. Retrieved from <https://www.businessinsider.com/why-are-plastic-straws-being-banned-2018-7>
- GESAMP (2015). *Sources, fate and effects of microplastics in the marine environment: a global assessment*. Kershaw, P. J. (Ed.). IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection. Rep. Stud. GESAMP No. 90, 96 p. Retrieved from https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/GESAMP_microplastics%20full%20study.pdf
- Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7). doi:10.1126/sciadv.1700782
- Gibb, B. C. (2019). Plastics are forever. *Nature Chemistry*, 11, 394-395. doi:10.1038/s41557-019-0260-7

- Gigault, J., ter Halle, A., Baudrimont, M., Pascal, P., Gauffre, F., Phi, T., ... & Reynaud, S. (2018). Current opinion: What is a nanoplastic? *Environmental Pollution*, 235, 1030-1034. doi:10.1016/j.envpol.2018.01.024
- Global Ghost Gear Initiative. (2018). *Putting ghost gear on the global agenda in 2018*. Retrieved from <https://www.ghostgear.org/news/2018/12/18/putting-ghost-gear-on-the-global-agenda-in-2018>
- Goodman, A. J., Walker, T. R., Brown, C. J., Wilson, B. R., Gazzola, V., & Sameoto, J. A. (2019). Benthic marine debris in the Bay of Fundy, eastern Canada: Spatial distribution and categorization using seafloor video footage. *Marine Pollution Bulletin*. doi:10.1016/j.marpolbul.2019.110722
- Gorman, M. (2019, October 30). N.S. passes legislation banning single-use plastic bags. *CBC News*. Retrieved from <https://www.cbc.ca/news/canada/nova-scotia/ns-passes-legislation-single-use-plastic-bag-ban-1.5340192>
- Government of Canada (2019). *Ocean Plastics Charter*. Retrieved from <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html#toc4>
- Graham, S., Graham, S., Letchford, C., Smith, J., & Tweel, N. (2019). Reducing single-use plastics in Lunenburg- A Coastal Action initiative. (Unpublished report). Dalhousie University, Halifax, NS.
- Great Canadian Shoreline Cleanup. (2018). *2018 Annual Report*. Retrieved from <https://www.shorelinecleanup.ca/storage/resources/gcsc-2018annualreport-190416.pdf>
- Gregory, M. R. (2009). Environmental implications of plastic debris in marine settings – Entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. *Philosophical Transactions: Biological Sciences*, 364(1526), 2013-2025. doi:10.1098/rstb.2008.0265
- Hager, M. (2019, July 11). Top B.C. court quashes Victoria's ban on single-use plastic bags. *The Globe and Mail*. Retrieved from <https://www.theglobeandmail.com/canada/british-columbia/article-bc-cities-urge-province-to-ban-plastic-bags-after-appeal-court/>

- Halifax. (2017). *BID contributions fund: 2017-2018 recommended awards*. Retrieved from <https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/171128rc1441.pdf>
- Halifax. (2019a). *Beyond 3Rs business recognition program*. Retrieved from <https://www.halifax.ca/home-property/garbage-recycling-green-cart/education-outreach/beyond-3-rs-business-recognition>
- Halifax. (2019b). *Your city*. Retrieved from <https://www.halifax.ca/about-halifax/newcomers/your-city>
- Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law. (2015). Plastic waste inputs from land into the ocean. *Science*, *347*(6223), 768-771. doi:10.1126/science.1260352
- Jefferson, R. L., Bailey, I., Laffoley, D. d'A., Richards, J. P., & Attrill, M. J. (2014). Public perceptions of the UK marine environment. *Marine Policy*, *43*, 327-337. doi:10.1016/j.marpol.2013.07.004
- Johansson-Stenman, O., & Svedsäter, H. (2012). Self-image and valuation of moral goods: Stated versus actual willingness to pay. *Journal of Economic Behavior & Organization*, *84*(3), 879-891. doi:10.1016/j.jebo.2012.10.006
- Laist, D. W. Impacts of marine debris: Entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: J. M. Coe & D. B. Rogers (Eds.), *Marine Debris* (pp. 99-139). New York, NY: Springer.
- Law, K. L. (2017). Plastics in the marine environment. *Annual Review of Marine Science*, *9*, 2015-229. doi:10.1146/annurev-marine-010816-060409
- Lebreton, L., Slat, B., Ferrari, F., Sainte-Rose, B., Aitken, J., Marthouse, R., ... & Reisser, J. (2018). Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic. *Scientific Reports*, *8*(4666). doi:10.1038/s41598-018-22939-w
- Litterbase. (2019). *2249 species are affected by litter (1,199 publications)*. Retrieved from <https://litterbase.awi.de/interaction>

- Lotze, H. K., Guest, H., O’Leary, J., Tuda, A., & Wallace, D. (2018). Public perceptions of marine threats and protection from around the world. *Ocean and Coastal Management*, 152, 14-22. doi:10.1016/j.ocecoaman.2017.11.004
- Lu, L., Luo, T., Zhao, Y., Cai, C., Fu, Z., & Jin, Y. (2019). Interaction between microplastics and microorganism as well as gut microbiota: A consideration on environmental animal and human health. *Science of the Total Environment*, 667, 94-100. doi:10.1016/j.scitotenv.2019.02.380
- Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *Aishe-J*, 8(3). Retrieved from <https://ojs.aishe.org/aishe/index.php/aishe-j/article/view/335>
- Mathalon, A., & Hill, P. (2014). Microplastic fibers in the intertidal ecosystem surrounding Halifax Harbor, Nova Scotia. *Marine Pollution Bulletin*, 81(1), 69-79. doi:10.1016/j.marpolbul.2014.02.018
- McNicholas, G., & Cotton, M. (2019). Stakeholder perceptions of marine plastic waste management in the United Kingdom. *Ecological Economics*, 163, 77-87. doi:10.1016/j.ecolecon.2019.04.022
- Morçöl, G., & Wolf, J. F. (2010). Understanding business improvement districts: A new governance framework. *Public Administration Review*, 70(6), 906-913. doi:10.1111/j.1540-6210.2010.02222.x
- Moser, A. K. (2015). Thinking green, buying green? Drivers of pro-environmental purchasing behavior. *The Journal of Consumer Marketing*, 32(3), 167-175. doi:10.1108/JCM-10-2014-1179
- National Oceanic and Atmospheric Administration. (2019). *Economic study shows marine debris costs California residents millions of dollars*. Retrieved from <https://marinedebris.noaa.gov/research/economic-study-shows-marine-debris-costs-california-residents-millions-dollars>
- National Oceanic and Atmospheric Administration & United Nations Environment Programme (2012). *The Honolulu strategy: A global framework for prevention and management of*

- marine debris*. Retrieved from <https://wedocs.unep.org/bitstream/handle/20.500.11822/10670/Honolulu%20strategy.pdf?sequence=1&isAllowed=y>
- Neumann, B., Vafeidis, A. T., Zimmermann, J., & Nicholls, R. J. (2015). Future coastal population growth and exposure to sea-level rise and coastal flooding – A global assessment. *PLoS One*, *10*(3). doi:10.1371/journal.pone.0118571
- Ocean Conservancy. (2019). *International Coastal Cleanup 2019 Report: The Beach and Beyond*. Retrieved from <https://oceanconservancy.org/wp-content/uploads/2019/09/Final-2019-ICC-Report.pdf>
- Olsen, W. (2004). Triangulation in social research: Qualitative and quantitative methods can really be mixed. In M. Haralambos & O. M. Holborn (Ed.), *Developments in Sociology*, *20*, (pp. 103-118). Retrieved from <http://research.apc.org/images/5/54/Triangulation.pdf>
- Parker, L. (2018, November 21). Sperm whale found dead with 13 pounds of plastics in its stomach. *National Geographic*. Retrieved from <https://www.nationalgeographic.com/environment/2018/11/dead-sperm-whale-filled-with-plastic-trash-indonesia/>
- Pettipas, S., Bernier, M., & Walker, T. R. (2016). A Canadian policy framework to mitigate plastic marine pollution. *Marine Policy*, *68*, 117-122. doi:10.1016/j.marpol.2016.02.025
- Port of Halifax. (2019). *Fact Sheet*. Retrieved from <https://www.portofhalifax.ca/about-us/resources/fact-sheet/>
- Ramey, C., & Tita, B. (2018, August 7). The summer of plastic-straw bans: How we got there. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/articles/the-summer-of-plastic-straw-bans-how-we-got-there-1533634200>
- Rankin, A. (2019). Halifax gets bigger, younger, richer: Halifax Partnership's annual index report. *The Chronicle Herald*. Retrieved from <https://www.thechronicleherald.ca/news/local/halifax-gets-bigger-younger-richer-halifax-partnerships-annual-index-report-323090/>
- Reuters, T. (2018, June 3). Sick whale with dozens of plastic bags in stomach dies. *CBC News*. Retrieved from <https://www.cbc.ca/news/technology/whale-plastic-bags-stomach-thailand-1.4689830>

- Rios, L., Moore, C., & Jones, P. (2007). Persistent organic pollutants carried by synthetic polymers in the ocean environment. *Marine Pollution Bulletin*, 54(8): 1230–1237. doi:10.1016/j.marpolbul.2007.03.022
- Rivers, N., Shenstone-Harris, S., & Young, N. (2017). Using nudges to reduce waste? The case of Toronto's plastic bag levy. *Journal of Environmental Management*, 188, 153-162. doi:10.1016/j.jenvman.2016.12.009
- Rochman, C. M. (2016). Strategies for reducing ocean plastic debris should be diverse and guided by science. *Environmental Research Letters*, 11(4). doi:10.1088/1748-9326/11/4/041001
- Ryan, P. G., Moore, C. J., Franeker, J. A. V., & Moloney, C. (2009). Monitoring the abundance of plastic debris in the marine environment. *Philosophical Transactions of The Royal Society B Biological Sciences*, 364(1526), 1999-2012. doi:10.1098/rstb.2008.0207
- Schnurr, R., Alboiu, V., Chaudhary, M., Corbett, R. A., Quanz, M. E., Sankar, K.,... & Walker, T. R. (2018). Reducing marine pollution from single-use plastics (SUPs): A review. *Marine Pollution Bulletin*, 137, 157-171. doi:10.1016/j.marpolbul.2018.10.001
- Schwabl, P., Köppel, S., Königshofer, P., Bucsics, T., Trauner, M., Reiberger, T., & Liebmann, B. (2019). Detection of various microplastics in human stool: A prospective case series. *Annals of Internal Medicine*, 171(7), 453-457. doi:10.7326/M19-0618
- Smith, W. G. (2008). Does gender influence online survey participation? A record-linkage analysis of university faculty online survey response behavior. *ERIC Document Reproduction Service No. ED 501717* (2008). Retrieved from <https://files.eric.ed.gov/fulltext/ED501717.pdf>
- Statistics Canada. 2017. Halifax, RGM [Census subdivision], Nova Scotia and Halifax, CTY [Census division], Nova Scotia (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. Retrieved from <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>

- Statista. (2019). *Global plastic production from 1950 to 2017 (in million metric tons)**. Retrieved from <https://www.statista.com/statistics/282732/global-production-of-plastics-since-1950/>
- Stewart, D. (2019, October 24). Charlottetown to develop education campaign based on results of single-use plastic survey. *The Guardian*. Retrieved from <https://www.theguardian.pe.ca/news/local/charlottetown-to-develop-education-campaign-based-on-results-of-single-use-plastic-survey-367735/>
- Surfrider Foundation (2019). *Ocean Friendly Restaurants*. Retrieved from <https://www.surfrider.org/programs/ocean-friendly-restaurants>
- The Global Partnership of Marine Litter. (2018). *The global partnership on marine litter platform*. Retrieved from <http://marinelitternetwork.com/the-partnership/>
- The Skimmer on Marine Ecosystems An Management. (2019). *What works to reduce marine plastic pollution? What we know and what we need to do*. Retrieved from https://meam.openchannels.org/news/skimmer-marine-ecosystems-and-management/what-works-reduce-marine-plastic-pollution-what-we#_ftn3
- Thompson, R. C., Olsen, Y., Mitchell, R. P., Davis, A., Rowland, S. J., John, A. W. G.,... & Russell, A. E. (2004). Lost at sea: Where is all the plastic? *Science*, *304*(5672), 838. doi:10.1126/science.1094559
- Thompson, R. C., Swan, S. H., Moore, C. J., & vom Saal, F. S. (2009). Our plastic age. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), 1973-1976. doi:10.1098/rstb.2009.0054
- United Nations Environment Programme. (2014). *Valuing plastic: The business case for measuring, managing and disclosing plastic use in the consumer goods industry*. Retrieved from <http://wedocs.unep.org/handle/20.500.11822/9238>
- United Nations Environment Programme. (2016). *Marine plastic debris and microplastics – global lessons and research to inspire action and guide policy change*. Retrieved from <http://wedocs.unep.org/handle/20.500.11822/7720>

- United Nations Environment Programme. (2017). *Sustainable development goals: Policy brief*. Retrieved from https://wedocs.unep.org/bitstream/handle/20.500.11822/22331/SDG_Brief_001_MarPollution.pdf?sequence=1&isAllowed=yf
- United Nations Environment Programme. (2018a). *Legal limits on single-use plastics and microplastics: A global review of national laws and regulations*. Retrieved from <http://wedocs.unep.org/handle/20.500.11822/27113>
- United Nations Environment Programme. (2018). *SINGLE-USE PLASTICS: A Roadmap for Sustainability*. Retrieved from https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1
- United Nations Environment Programme. (2019). *United Nations Environment Assembly of the United Nations Environment Program*. Retrieved from <http://wedocs.unep.org/bitstream/handle/20.500.11822/28471/English.pdf?sequence=3&isAllowed=y>
- Vince, J., & Hardesty, B. D. (2016). Plastic pollution challenges in marine and coastal environments: from local to global governance. *Restoration Ecology*, 25(1), 123-128. doi.org/10.1111/rec.12388
- Walker, T. R. (2018). China's ban on imported plastic waste could be a game changer. *Nature*, 553, 405. Retrieved from <https://www.nature.com/articles/d41586-018-00933-6>
- Walker, T. R., Grant, J., & Archambault, M. (2006). Accumulation of marine debris on an intertidal beach in an urban park (Halifax Harbour, Nova Scotia). *Water Quality Research Journal of Canada*, 41(3), 256-262. doi:10.2166/wqrj.2006.029
- Walker, T. R., & Xanthos, D. (2018). A call for Canada to move toward zero plastic waste by reducing and recycling single-use plastics. *Resources Conservation and Recycling*, 133, 99-100. doi:10.1016/j.resconrec.2018.02.014
- Worm, B., Lotze, H. K., Jubinville, I., Wilcox, C., & Jambeck, J. (2017). Plastic as a persistent marine pollutant. *Annual Review of Environment and Resources*, 42, 1-26. doi:10.1146/annurev-environ-102016-060700

- Wright, S. L., Thompson, R. C., & Galloway, T. S. (2013). The physical impacts of microplastics on marine organisms: A review. *Environmental Pollution*, 178, 483-492. doi:10.1016/j.envpol.2013.02.031
- Wu, L. (2019, June 30). The impact of banning single-use plastics on the Canadian fast-food industry. *Forbes*. Retrieved from <https://www.forbes.com/sites/lesliewu/2019/06/30/the-impact-of-banning-single-use-plastics-on-the-canadian-fast-food-industry/>
- WWF-Canada. (2019). *Great Canadian Shoreline Cleanup Data Card*. (Unpublished data).
- Xanthos, D., & Walker, T. R. (2017). International policies to reduce plastic marine pollution from single-use plastics (plastics bags and microbeads): A review. *Marine Pollution Bulletin*, 118(1-2), 17-26. doi:10.1016/j.marpolbul.2017.02.048
- Zero Waste Canada (2019). *Zero Waste Certification*. Retrieved from <https://zerowastecanada.ca/zero-waste-certification/>

Appendices

Appendix A. MAP Ethics Approval

Marine Affairs Program
DALHOUSIE UNIVERSITY

Marine Affairs Program Ethics Review Standing Committee Letter of Approval

June 5, 2019

Dear Priyanka,

MAPERSC #: MAP2019-04

Project Title: Mitigating marine plastic pollution through encouraging reductions in the use of single-use plastics in local businesses and the HRM community

Effective date: June 5, 2019

Expiry date: June 4, 2020

The Marine Affairs Program Ethics Review Standing Committee 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 until the date 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.

Sincerely,

Claudio Aporta, Chair

Post MAPERSC Approval: On-going Responsibilities of Researchers

After receiving ethical approval for the conduct of research involving humans, there are several ongoing responsibilities that researchers must meet to remain in compliance with University and Tri-Council policies.

1. Additional Research Ethics approval

Prior to conducting any research, researchers must ensure that all required research ethics approvals are secured (in addition to this one). This includes, but is not limited to, securing appropriate research ethics approvals from: other institutions with whom the PI is affiliated; the research institutions of research team members; the institution at which participants may be recruited or from which data may be collected.

2. Reporting adverse events

Any significant adverse events experienced by research participants must be reported in writing to Marine Affairs Program Ethics Review Standing Committee within 24 hours of their occurrence. Examples of what might be considered “significant” include: an emotional breakdown of a participant

during an interview, a negative physical reaction by a participant (e.g. fainting, nausea, unexpected pain, allergic reaction), report by a participant of some sort of negative repercussion from their participation (e.g. reaction of spouse or employer) or complaint by a participant with respect to their participation. The above list is indicative but not all-inclusive. The written report must include details of the adverse event and actions taken by the researcher in response to the incident.

3. Seeking approval for protocol / consent form changes

Prior to implementing any changes to your research plan, whether to the protocol or consent form, researchers must submit a description of the proposed changes to the Marine Affairs Program Ethics Review Standing Committee for review and approval.

4. Submitting final reports

When the researcher is confident that no further data collection or participant contact will be required, a Final Report (template attached) must be submitted to Marine Affairs Program Ethics Review Standing Committee. After review and approval of the Final Report, the ethics file will be closed.

5. Retaining records in a secure manner

According to the application, researchers must ensure that both during and after the research project, data is securely retained and/or disposed of in such a manner as to comply with confidentiality provisions specified in the protocol and consent forms. This may involve destruction of the data, or continued arrangements for secure storage. Casual storage of old data is not acceptable.

It is the Principal Investigator's responsibility to keep a copy of the MAPERSC approval letters. This can be important to demonstrate that research was undertaken with Board approval.

Please note that the Marine Affairs Program Ethics Review Standing Committee will securely store your project file for 5 years after the study closure date at which point the file records may be permanently destroyed.

6. Current contact information and university affiliation

The Principal Investigator must inform the Marine Affairs Program Ethics Review Standing Committee of any changes to contact information for the PI (and supervisor, if appropriate), especially the electronic mail address, for the duration of the MAPERSC approval. The PI must inform Marine Affairs Program Ethics Review Standing Committee if there is a termination or interruption of his or her affiliation with Dalhousie University.

7. Legal Counsel

The Principal Investigator agrees to comply with all legislative and regulatory requirements that apply to the project. The Principal Investigator agrees to notify the University Legal Counsel office in the event that he or she receives a notice of non-compliance, complaint or other proceeding relating to such requirements.

8. Supervision of students

Faculty must ensure that students conducting research under their supervision are aware of their responsibilities as described above, and have adequate support to conduct their research in a safe and ethical manner.

Appendix B. Community Survey

Ocean Friendly Nova Scotia Initiative- Community Survey

Consent and Information Form

You are invited to take part in a research study being conducted by Priyanka Varkey, a graduate student in the Marine Affairs Program at Dalhousie University. This is a pilot project that aims to use community surveys to understand the HRM community's perceptions of the impacts of single-use plastics on the marine environment and its interest in reducing use of single-use plastics. The results of this study, funded by WWF-Canada, in collaboration with the Coastal Action Foundation and Clean Foundation, will be used to adapt the Ocean Friendly Nova Scotia Initiative for the HRM.

As a participant in the research you will be asked to fill out this survey answering questions related to your use of single-use plastics. The survey is anonymous and will take about 5 mins to answer. All responses will be saved on a secure server and be processed using a statistical software. Your participation in this research is entirely your choice. You are welcome to stop the survey at any time if you no longer want to participate. I will not include any incomplete surveys in my analysis. However, once you submit your completed survey, I will not be able to remove the information you provided because the surveys are completed anonymously.

Information that you provide to me will be collected anonymously, which means that there will be no questions asked in the survey that asks for identifying details such as your name or email address. Only my supervisor and I will have access to the survey results. I will describe and share general findings in my graduate project.

The risks associated with this study are no greater than those you encounter in your everyday life. There will be no direct benefit to you in participating in this research and you will not receive compensation. The research, however, might contribute to new knowledge on ways to effectively mitigate single-use plastics in the marine environment. If you would like to see how your information is used, please feel free to visit the Marine Affairs page on the Dalhousie University website after April 30, 2020 and there will be a copy of my graduate research on it.

If you have any questions, please feel free to contact me at priyanka.varkey@dal.ca or my supervisor, Dr. Tony Walker, at trwalker@dal.ca.

If you have concerns about the ethics of this study, or your potential participation in it, please feel free to contact the Marine Affairs Program Ethics Review Standing Committee, Dalhousie University, at 902-494-3555, or email at marine.affairs@dal.ca.

If you choose to complete this survey, please click 'Next'.

The Ocean Friendly Nova Scotia Initiative

Marine plastic pollution was declared a planetary crisis by the United Nations in 2017. Up to 50% of all plastic litter in the ocean is estimated to be caused by single-use plastic items.

Single-use plastic items such as plastic bags, coffee cups, take out containers, plastic straws and cutlery, as well as cigarette butts are among the most common items found during shoreline cleanups. This garbage ends up in our waterways, polluting the environment, killing wildlife and affecting human health. More consumers are interested in eco-friendly options and are turning to sustainable alternatives to single-use plastics. The Ocean Friendly Nova Scotia (OFNS) Initiative, created by Coastal Action Foundation, is a tiered certification system that recognizes businesses that eliminate three or more single-use plastics from their daily distribution.

This survey, created for the Ocean Friendly Nova Scotia (OFNS) Initiative, is meant for all people living in the Halifax Regional Municipality (HRM). It will be used to better understand interests and concerns surrounding single-use plastics reduction in the HRM.

Demographic

Age: ____ Gender: _____ Place of residence: HRM Other

Questions

1. In your opinion, what are some of the main issues associated with single-use plastics?
(Select all that apply)
 - They are harmful to marine life
 - They are not biodegradable
 - They breakdown into microplastics which end up being consumed by us!
 - They accumulate in communities and shorelines
 - Other: _____

2. What are the most common single-use plastic items you use? (Select all that apply)
 - Plastic bags
 - Take-out containers (Styrofoam or other plastic)
 - Single-use coffee cups
 - Plastic cutlery
 - Plastic straws
 - Plastic drink bottles
 - Other plastic packaging
 - Other

3. On average, how often do you use single-use plastics?
 - Multiple times a day
 - Daily
 - Multiple times a week
 - Once a week
 - A few times a month
 - a month or less

4. What concerns, if any, do you have about reducing your use of single-use plastics? Select all that apply.
- The alternatives are more expensive
 - I am concerned about food safety
 - It is inconvenient
 - No concerns!
 - Other
5. What alternatives to single-use plastics, if any, do you use? (Select all that apply)
- Reusable bags
 - Reusable water bottle
 - Reusable coffee mug
 - Reusable food containers
 - Reusable straws
 - Reusable cutlery
 - Other: _____
6. Are you interested in seeing the HRM use less single-use plastics?
- Yes
 - No
 - Maybe
7. The Ocean Friendly Nova Scotia program is a tiered certification system that recognizes restaurants and cafés that have eliminated three or more single-use plastics. Would you be more likely to go to an Ocean Friendly certified business over a regular business?
- Definitely
 - Somewhat more likely
 - Maybe
 - Less likely
 - No way!
8. Would you be willing to pay more to support environmentally friendly practices (e.g. 10 cents more for a compostable container)?
- Yes
 - No
 - To an extent
9. Do you have any additional comments, questions or concerns about this survey?

Appendix C. Business Survey

Ocean Friendly Nova Scotia Initiative- Business Survey

Consent and Information Form

You are invited to take part in a research study being conducted by Priyanka Varkey, a graduate student in the Marine Affairs Program at Dalhousie University. This is a pilot project that aims to identify businesses that are interested in being recognized for their efforts in reducing single-use plastics. This study, funded by WWF-Canada, in collaboration with the Coastal Action Foundation and Clean Foundation, aims to adapt the Ocean Friendly Nova Scotia Initiative for the HRM.

As a participant in the research you will be asked to fill out an online survey answering questions related to your use of single-use plastics. The survey is anonymous and will take about 5 mins to answer. If you are interested in this initiative, there is a section at the end where you can enter your contact information for us to follow up with you. Should you choose to disclose your information, your identity will remain confidential to my supervisor and me. Only my supervisor and I will have access to the survey results. I will describe and share general findings in my graduate project while ensuring that your identity remains undisclosed.

Your participation in this research is entirely voluntary. You are welcome to stop the survey at any time if you no longer want to participate. I will not include any incomplete surveys in my analysis.

If you do not include your contact information, the survey results are completely anonymous, and you will not be able to withdraw your results once you submit the survey. However, if you include your contact information in the survey and choose to withdraw at a later date, please let me know before September 1, 2019. After September 1st, I would have begun my analysis and it will be too late to withdraw your response.

The risks associated with this study are no greater than those you encounter in your everyday life. There is no compensation for participating in this research. If you would like to see how your information is used, please feel free to visit the Marine Affairs website after April 30th, 2020 and there will be a copy of my graduate research on it.

If you have any questions, please feel free to contact me at priyanka.varkey@dal.ca or my supervisor, Dr. Tony Walker, at trwalker@dal.ca. If you have concerns about the ethics of this study, or your potential participation in it, please feel free to contact the Marine Affairs Program Ethics Review Standing Committee, Dalhousie University, at 902-494-3555, or email at marine.affairs@dal.ca.

If you choose to complete this survey, please click “Next”.

The Ocean Friendly Nova Scotia Initiative

Marine plastic pollution was declared a planetary crisis by the United Nations in 2017. Up to 50% of all plastic litter in the ocean is estimated to be single-use plastic items. Most items commonly found during shoreline cleanups are those used by the food industry, including straws, bags, coffee cups, and take out containers. This garbage ends up in our waterways, polluting the environment, killing wildlife and affecting human health. Consumers and businesses are both increasingly adopting more sustainable practices and reducing their single-use plastic use. Businesses should be recognized for these efforts! That's where the Ocean Friendly Nova Scotia (OFNS) Initiative comes in. Created by the Coastal Action Foundation, this tiered certification system encourages reducing single-use plastic use in cafés and restaurants and gives recognition for these positive changes.

1. Type of Business

- Café
- Restaurant (primarily take-out)
- Restaurant (primarily dine-in)
- Pub
- Other: _____

2. What single-use plastics does your business use? (Check all that apply)

- Plastic bags
- Take-out containers (Styrofoam or other plastic)
- Single-use coffee cups
- Plastic cutlery
- Plastic straws
- Plastic drink bottles
- Condiment packages
- Other:

3. Has your business already taken steps to reduce its use of single-use plastics (e.g. have you switched from using plastic to paper straws, do you offer a discount for bringing your own coffee cup, do you only give bags when customers ask)?

- Yes
- No

4. If yes, please elaborate on steps taken by your business to reduce single-use plastics.

5. Are you interested in further reducing single-use plastics at your business?

- Yes
- No

6. If yes, what would you be willing to eliminate? (Select all that apply)

- Plastic bags

- Take-out containers (Styrofoam or other plastic)
- Single-use coffee cups
- Plastic cutlery
- Plastic straws
- Plastic drink bottles
- Condiment packages
- Other:

7. The Ocean Friendly Nova Scotia tiered certification system is voluntary and allows choice in which types of single-use plastics to stop offering (or have already stopped offering) at each tier. Are you interested in participating?

- Yes
- No
- Maybe

8. As a business owner, what concerns, if any, do you have about reducing single-use plastics? (Check all that apply)

- No concerns! I am absolutely on board
- The alternatives are more expensive
- Customers may go to other stores if we don't offer bags/straws, etc.
- Sourcing eco-friendly alternatives
- Other:

9. Do you have any additional comments regarding the initiative or single-use plastic reduction?

10. If you wish to be contacted to get the OFNS certification set up please fill out your name, the name of your business and contact information here:

Name: _____
 Business Name: _____
 Contact information: _____

Appendix D. Sample Interview Questions

1. Can you tell me a little bit about your business and what role single-use plastics play in the everyday functioning of your business?
2. You mentioned some steps taken by your business to reduce single-use plastics in the survey. Could you please elaborate on these? (What are they, driver, barriers)
 - a. What was your main driver (or drivers) to reduce single-use plastics from your business? Why do you think it is important to reduce single-use plastics?
 - b. What are some barriers you have faced in your attempt to eliminate/reduce single-use plastics from your business?
3. Do you have any concerns regarding the recent announcement of the ban to be implemented by 2021 on harmful single-use plastics announced by the Federal Government?
 - a. Do you see this announcement of a future ban as a motivator to act sooner rather than later?
4. **Briefly explain the Ocean Friendly Nova Scotia initiative.** If you were to adopt the tiered certification, how do you see it affecting your business?
 - a. Do you foresee any negative impacts of eliminating single-use plastics from your business?
5. Do you have ideas on how to get more businesses and people on board to eliminate single-use plastics?
6. Do you have any further questions about this initiative?

Appendix E. Interview Consent Form

Informed Consent Form for Interview

Project title: Identifying interests and concerns surrounding single-use plastic reduction among local business owners and community members in the HRM- A pilot project.

Lead researcher:

Priyanka Varkey, Master of Marine Management Candidate, priyanka.varkey@dal.ca

Supervisor:

Tony Walker, Assistant Professor, trwalker@dal.ca

Funding provided by: WWF-Canada, Marine Plastics internship

Introduction

You are invited to take part in a research study being conducted by Priyanka Varkey, a graduate student in the Marine Affairs program at Dalhousie University. Choosing to participate in this research is voluntary. There will be no negative impact on you whether or not you participate in this research. The information below outlines what this research will entail. You may withdraw at any time during the interview and choose not to continue. Please feel free to direct any questions you have about this study or your role in the study to my email priyanka.varkey@dal.ca.

Purpose and Outline of the Research Study

Ocean plastic was declared a planetary crisis by the United Nations in 2017. Plastic debris pose a serious threat to the marine environment killing over a million sea birds, over 100,000 marine mammals and turtles, and countless fish through ingestion or entanglement. Single-use plastics are estimated to form about 50 percent of the plastic debris in the ocean. Despite increasing awareness of the issue, single-use plastics continue to be produced, distributed, used, and disposed. Due to its proximity to the coast, the overuse and improper disposal of single-use plastics in the Halifax Regional Municipality (HRM) inevitably leads to them entering the ocean.

The Ocean Friendly Nova Scotia (OFNS) initiative, a tiered certification system created by Coastal Action Foundation, aims to recognize businesses attempting to reduce their use of single-use plastics. OFNS created a tiered-certification system that is being piloted in Lunenburg, Nova Scotia in which business owners are being recognized for eliminating three or more single-use plastics. This pilot project aims to gauge the interest of the HRM community members and business owners, specifically cafés and restaurants, in reducing single use plastics. The project will attempt to explore this issue through a series of semi-structured interviews and surveys in the business improvement districts (BIDs) of the HRM. Results of this study will be used to inform and adapt the Ocean Friendly Nova Scotia initiative for the HRM.

Who Can Take Part in the Research Study

You have been invited to take part in this interview because you are a local business owner in the

HRM, and you have expressed interest in reducing your single-use plastic use.

What You Will Be Asked to Do

Participants will be asked a series of questions related to their perceptions of single-use plastics and their interest in eliminating/reducing your single-use plastic use. The interview will be conducted via telephone or in person (depending on the participant's location and availability) and will take a maximum of 1 hour.

Possible Benefits, Risks and Discomforts

This study aims to provide a framework to set up an Ocean Friendly Nova Scotia certification system in the HRM. If your business wishes to participate, you could receive a bronze, silver, or gold decal as well as certificate that recognizes your efforts to mitigate single-use plastic. This could benefit your business by giving you more publicity and recognition for being environmentally friendly. The risks associated with this study are minimal. Some questions might cause a mild discomfort and you are welcome to skip a question or withdraw from the interview should you feel uncomfortable.

Compensation / Reimbursement

Participation is voluntary and there will be no monetary compensation.

How your information will be protected:

The only people who have access to your answers will be myself and my supervisor. Your personal information will only be used to contact you and for internal records. Your participation in this study is confidential and this will be ensured by anonymizing the documents containing your interview information. This will be done by replacing your name with an alpha numeric code on documents that will be used for data analysis. Any handwritten field notes and audio-recordings (provided you permit this) will be stored according to the alpha-numeric code that has been assigned to you. All the initial electronic documents containing your name will be stored on an encrypted USB. Any hard copies and interview data used will be stored in a locked filing cabinet.

If You Decide to Stop Participating

You are free to leave the study at any time. If you decide to stop participating at any point in the study, you can also decide whether you want any of the information that you have contributed up to that point to be removed or if you will allow us to use that information. You can decide up to September 1, 2019 if you want us to remove your data. After that time, it will become impossible for us to remove it because I will have begun analyzing the data.

How to Obtain Results

This study will be complete by December 2019. If you would like to a summary of the results, you can contact me via email. The results will also be made available to the public on the [Marine Affairs](#) Program page on the Dalhousie website after April 30th, 2020.

Questions

If you have any questions or concerns about the study, please contact me at Priyanka.varkey@dal.ca. If you wish to be contacted for further correspondence for this

initiative, please leave your contact information below.

If you have concerns about the ethics of this study, or your potential participation in it, please feel free to contact the Marine Affairs Program Ethics Review Standing Committee, Dalhousie University, at 902-494-3555, or email at marine.affairs@dal.ca.

Signature Page

Project Title: Identifying interests and concerns surrounding single-use plastic reduction among local business owners and community members in the HRM- A pilot project.

Lead Researcher: Priyanka Varkey, Graduate student, Marine Affairs Program.
E: Priyanka.varkey@dal.ca

I, _____, have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I understand that I have been asked to take part in an interview that will occur at a location acceptable to me.

I agree to take part in this study. My participation is voluntary, and I understand that I am free to withdraw from the study at any time, until September 1, 2019.

Name

Signature

Date

1. I agree that my interview will be audio-recorded.

- a) Yes
- b) No

2. I agree that direct quotes of things I say may be used without identifying me.

- a) Yes
- b) No

Appendix F. Age Categories

Generation	Year of Birth	Age	Number of Respondents
Traditionalists	<1945	>74	1
Baby boomers	1946-1964	55-73	13
Gen X	1965-1980	39-54	23
Millennials	1981-1996	23-38	138
Gen Z (Post-millennials)	1997-present	0-22	28
Unknown	-	-	4

Appendix G. BIDs and Business Types of Business Responses

Business Type	Business Improvement District	Number of Respondents
Café	Downtown Halifax	2
	North End	3
	Quinpool	1
	Spryfield/ Downtown Halifax/ Spring Garden	1
	Unknown	1
Café and catering	Unknown	1
Food court vendor	Downtown Halifax	1
Market stall	Unknown	1
Pub	Downtown Dartmouth	1
	North End	1
	Unknown	1
Restaurant (primarily dine-in)	Downtown Dartmouth	1
	Downtown Halifax	2
	Quinpool	1
	Quinpool/ Downtown Halifax	1
	Spryfield	1
	Unknown	2
Restaurant (primarily take-out)	Spring Garden	1
	Unknown	2
Restaurant (takeout and dine-in) plus grocery	Unknown	1