REGULATING SINGLE-USE PLASTICS IN BERMUDA:

Policy paper for public consultation

August 2021

"Our planet is broken. Humanity is waging a suicidal war on nature.

Biodiversity is collapsing.

Deserts are spreading.

Oceans are choking with plastic waste.

Apocalyptic fires and floods, cyclones and hurricanes are the new normal"

António Guterres, Secretary-General of the United Nations, December 2020 [1]

GOVERNMENT OF BERMUDA

"The horrific impact of plastic on the environment is a global issue. In the era of the manifested impact of climate change, Bermuda must consistently act to preserve its oceans. To this end, single-use plastics will be eliminated by 2022 and the intervening years will be spent educating the community about recycling and re-usable items and encouraging greater sensitivity to the ocean and its importance to our lives. "

Speech from the Throne, Bermuda, November 2018 [2]

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EXECUTIVE SUMMARY

The Bermuda Government has made a commitment to eliminate single-use plastics (SUPs) in Bermuda by 2022, with a secondary commitment to introduce a charge on SUPs from 2021.

The main commitment, to eliminate SUPs, is made with explicit reference to both the marine environment and climate change. The importance of this link cannot be understated. Tackling global warming is the central objective of the United Nations ("UN") in 2021 and the focus on marine litter has been highlighted as a priority by the United Nations Environment Programme ("UNEP"). There is, however, another element to consider. This is the very real danger that plastics pose to human health when they enter the ocean's food chain - especially in the form of micro-plastics - which threatens our food security.

SUPs comprise over half of the worldwide production of plastic, and they are the top ten most common items found in international coastal clean-up efforts.[3] Bermuda is no different,[4] and although much of the plastic waste in the ocean around us and found on our beaches does not originate in Bermuda, we still need to play our part in the global community's effort to eliminate plastic waste, tackle climate change, and protecting human health.

By eliminating SUPs from entering our island in the first place, we will be:

- Assisting in preserving the oceans through reducing plastic marine litter,
- Contributing to tackling climate change by reducing our consumption of fossil fuels which are used to make and transport plastic, and
- Protecting human health through the use of non-plastic products that will not enter the environment and contaminate the ocean's food chain.

Solutions to the problem of SUPs are not the sole responsibility of government. All stakeholders, including the third sector, the private sector and every resident must play a part in the effort to reduce our dependency on SUPs. To that end more public education is required to highlight the issues. The third sector has already been notably pushing the issue and highlighting the dangers of SUPs to the environment and proposing solutions. However, it is only the government which has the power to enact concrete measures towards plastic reduction through policy, education, legislation and enforcement.

This paper firstly defines SUPs. Next, it looks at the links between plastics and the marine environment, climate change, and human health. The third section looks at the composition of plastics, and examines the post-use alternatives - recycling in particular. Section four takes a look at the circular economy model and examines what aspects are applicable to Bermuda to help understand the next steps for the islands. The fifth section evaluates the options available through comparisons with other jurisdictions and the paper's final section is a conclusion with recommended actions.

In summary, the conclusions from this paper are that:

1) Public information campaigns on SUPs be conducted as soon as practically possible in 2021, continuing through the proposed phases of legislative changes as outlined below.
2) Public consultations be held in 2021 to review the proposed bans and to prepare the discussions for further bans.
3) A SUPs procurement policy be implemented for all departments of the Bermuda Government before the end of 2021 and ahead of legislative bans.
4) Legislation to prohibit the importation of specific SUPs be enacted by early 2022: Phase One.
5) Legislation to ensure that non-plastic alternative products (to plastic products subject to any ban) are fully biodegradable be enacted by the first half of 2022.
6) Legislation to prohibit the sale, distribution, and use of the banned SUPs be enacted by the end of 2022: Phase Two
7) Legislation be enacted to ban the release of helium-filled balloons outdoors.
8) Planned charges or fees on the use of SUPs to be scrapped in favour of the above bans.
9) Public consultations be re-commenced in 2022, or after one year from the first importation ban, to assess the effect of the bans and to consult on the next round of plastic items to be banned.
10) Public education campaigns on the dangers of SUPs be continued throughout 2022.
11) Legislation to prohibit the importation, sale, distribution, and use of further banned SUPs be enacted by the end of 2025: Phase Three

The unprecedented and unexpected effects of the novel coronavirus pandemic have diverted attention and resources away from many initiatives including the commitment to eliminating SUPs in Bermuda. Nevertheless, this commitment must still be honoured, and we must re-double our efforts to ensure it is met. This re-doubling of our efforts is particularly important now that we can see the side-effects of the COVID-19 pandemic when it comes to plastic use – such as a projected 30% increase in waste in 2020 compared to 2019.[5] We must not allow the coronavirus pandemic to undermine efforts to deal with the problem of single-use plastics.

1. INTRODUCTION: What are single-use plastics?

"Of all the waste we generate, single-use plastic bags are perhaps the greatest symbol of our throwaway society. They are used, then forgotten, and they leave a terrible legacy."[6]

The Bermuda Government has recognised the 'horrific impact of plastic on the environment' and has pledged to deal with this through eliminating single-use plastics. But, what are single-use plastics?

There is no one single definition, but single-use plastics (SUPs) are essentially plastic products that are used only once before being disposed. SUPs are goods that are made primarily from fossil fuel–based chemicals (petrochemicals) and they are meant to be disposed of right after use—often, in mere minutes. SUPs are most commonly used for packaging and service ware, such as bottles, wrappers, straws, and bags.[7] As of 2017, roughly 348 million metric tonnes of plastic are produced each year, and this figure is rising.[8] Of this, approximately *half* of all production is specifically for single-use purposes.

Typical single-use plastic items, commonly found as litter in Bermuda

Appendix Three contains a look at one such very ubiquitous SUP – the plastic water bottle. The information presented highlights the impact that this item has in many arenas: on the terrestrial environment where the production takes place, on both the terrestrial and marine environments after production and use, and on the global environment (climate change) due in part to fossil fuel use at all stages of the life of the water bottle.

2. MAKING THE LINK: Single-use plastics, marine litter, climate change and human health

"Human activities lead to several impacts on marine ecosystems, among which a massive input of plastic entering the marine environment. This scenario has the potential to threaten ecosystem health and integrity, also reducing the ability of marine ecosystems to provide good and services on which human well-being relies."[9]

Given that Bermuda is a small island chain, the commitment to change is couched in terms of acting to preserve the oceans in this era of 'manifested impact of climate change'. However, there is a third element to the impact that needs recognising – that of human health. Therefore, the triple foci of the commitment on SUPs in the environment are **marine litter**, **climate change, and human health**. The following chapter looks to understand these issues.

2.1 Marine Litter

Plastic Marine Debris washed up on Bailey's Bay, Bermuda

Located in the North Atlantic Ocean, with no point of land more than approximately 1 kilometre from the ocean, a healthy marine environment is of paramount importance to Bermuda.

Marine plastic pollution has been an area of major scientific research for nearly two decades. In particular, the distribution of micro-plastics, those pieces of plastic measuring less than 5 mm, are of increasing concern because they represent an increasing proportion of marine litter.[10],[11] The longer that larger pieces of plastic remain in the environment, the more they break up and degrade into smaller and smaller pieces, which will remain in the ocean for decades to centuries. Micro-plastics, in particular, are known to interact with a wide range of species (plankton, fish, clams, seabirds, marine mammals) in diverse marine habitats. The amount of micro-plastic in Bermuda is dependent on a complex interaction between the scale of local plastic sources and prevailing environmental conditions that affect the Gulf Stream which is in turn part of the North Atlantic Gyre. Gyres, like the Sargasso Sea, are areas where floating plastic debris is trapped for decades and thus Bermuda's exposure and the impact of the debris is exaggerated.

The United Nations Environment Programme (UNEP) states that marine litter poses 'serious environmental, health, and economic threats to oceans and coastal ecosystems'.[12] This presents a 'unique legal and regulatory challenge … as [marine litter] can originate from diverse land-based and sea-based sources both within and outside' of a country.[13] Around 8 million metric tonnes of plastic are dumped into the oceans each year.[14] Recent estimates are that by 2025 some 250 million metric tons of plastic may be released to the marine environment. The effects of plastic on our oceans are without doubt set to increase . Estimates by the Ellen MacArthur Foundation are that by 2050 the amount of plastic in the oceans will outweigh fish.[15]

Trash, plastic packaging, and other improperly disposed waste from sources on land accounts for 80% of the marine debris found on beaches during clean-ups and surveys. Simply put, 80% of all the plastic debris in the ocean has come from land-based sources, with the remaining 20% from maritime sources (fishing and shipping).[16]

Every year since 2017, plastics have comprised all of the top ten most common items found in international coastal clean-ups.[17] The top ten items (in order of magnitude) for 2019 are: cigarette butts, food wrappers, straws/stirrers, plastic forks, knives and spoons, plastic beverage bottles, plastic bottle caps, plastic grocery bags, other kinds of plastic bags, plastic cups and plates, and plastic lids.[18] The European Union has stated that SUP items comprise 70% of marine litter. In Bermuda, the picture is similar.

Thus marine litter and single-use plastic litter are fairly synonymous, particularly in the Bermuda context with our proximity to the ocean. This has the potential of becoming even more problematic in the age of COVID-19. Much personal protective equipment is made of plastic, including many containing polypropylene, which can take up to 500 years to biodegrade.

2.2 Climate Change

Almost all plastic is derived from materials (like ethylene and propylene) made from fossil fuels (mostly oil and gas). The process of extracting and transporting those fuels, then manufacturing plastic creates billions of tonnes of greenhouse gases. For example, 4% of the world's annual petroleum production is diverted to making plastic, and another 4% gets burned in the refining process.[19] Since we also know that half of all plastic production is for single use plastics, that means that a total of nearly 5% of all the world's oil production goes to creating single-use plastic items.

Growing evidence shows also that the production and incineration of single-use plastics is having a direct impact on global climate change. Nearly every piece of plastic begins life as a fossil fuel, and then greenhouse gases are emitted at each stage of the plastic lifecycle: from fossil fuel extraction and transport, to plastic refining and manufacture, to managing post-consumer plastic waste, and finally with plastic's ongoing impact once it reaches our oceans, waterways, and landscape.[20] In 1990 global greenhouse gas emissions totalled some 34.97 billion tonnes, which increased approximately 3% to 36.81 billion tonnes in the ten years to 2000. However, in the following ten years from 2000 to 2010, global greenhouse gas emissions reached 46.55 billion tonnes – an increase of 26%, with a further increase to 49.85 billion tonnes in just 5 years to 2015. So not only are global greenhouse gas emissions increasing they are increasing quickly, and the production and use of plastics are contributing to the problem.[21]

Flooding in Town Square, St. George is predicted to increase with climate change. Photo: Bernews. October 2017

There is a plethora of research on plastics and climate change, and there is very little doubt that ending the production and use of single-use plastic is therefore an extremely important step in both dealing with marine pollution and addressing a cause of climate change.

2.3 Human Health

In 2013, the European Marine Board published a position paper on linking oceans and human health as a strategic research priority.[22] Successive workshops, such as the Cornwall Oceans and Human Health Workshop in 2014, have stressed the growing evidence of the impacts of oceans and seas on human health and well-being as well as the effects of humans on the oceans, including the effects of plastic pollution.[23]

Evidence continues to grow about the potential harm that micro-plastics in particular are having on human health. Although more research is needed, one study in 2019 conducted by the University of Newcastle Australia, estimated that the average human, consuming every-day food items, may ingest up to 5 grams of plastic a week, or the equivalent of 1 credit cards worth of plastic (See Appendix Four). Most studies infer human impacts based on levels of contamination found in diverse food products in our diets.[24] Other research has indicated potential toxicity to lung cells, the liver and brain cells. [25] However, there is still no compelling direct evidence that plastic ingestion is ubiquitous in human diets, as contradicting methodologies and definitions need to be resolved.[26]

Micro-plastics: These pieces are about 0.5 to 2 mm in size. There are significant quantities of microscopic pieces (<0.1 mm) widely dispersed the ocean and terrestrial environments and consumed by many species. These smaller pieces are potentially the main source of plastic in human diets. "Micro-plastic" image courtesy of Oregon State University / CC BY-SA 2.0.

The dangers to human health not just from micro-plastics include problems associated with the ingestion of other chemicals which are used in the making of many plastic products or absorbed by the micro-plastics from seawater over time. Many lab studies[27] and a few environmental studies[28] have shown that ingested micro-plastics lose some of these chemicals via the digestion process in the consumer. Many of these chemicals are termed "endocrine disruptors", because they can mimic or interfere with animal hormones and cause deleterious effects. The

main concern here is the potential for the chemicals to remain in animal tissues, only to be consumed by a larger animals and thus the chemicals become more concentrated as they work upwards in the food chain with humans sitting at the top of that food chain. This condition exactly parallels the story of DDT in the 1950s and 60s. Locally, studies have found a high percentage of micro-plastics in local fish species.[29]

Perhaps the following quote best sums up the relationship between human health and plastics: "Only we humans make waste that nature can't digest."[30]

2.4 COVID-19

And then came the pandemic. The above discussion on marine litter, climate change and human health would not be complete without reference to the coronavirus disease (COVID-19) pandemic that was declared by the World Health Organization on 11th March 2020. COVID-19 has triggered an estimated global use of 129 *billion* face masks and 65 *billio*n gloves *every month*.[31] If we stitched together all of the masks manufactured already, and projected to be produced, we'd be able to cover the entire landmass of Switzerland.[32] This is already having a detrimental effect on the ocean. When gloves and masks find their way into the ocean, they can easily be mistaken for jellyfish, which is a favorite food of sea turtles. Because of their elastic components, masks also have increased risks of entanglement for a wide variety of fish, animals and birds.[33] In time the PPE will degrade to micro-plastics, adding to the already substantial burden in the ocean. "And", to quote a recent article in the Scientific American "that's just PPE". There has been an increase in single-use plastic generally as a result of the COVID-19 pandemic, such as the increase in use of take-away containers. There are estimates that 2020 will have seen a 30% increase in waste compared to 2019 due, in large part, to plastic waste from the billions of items of PPE and as well due to increased use of take-away containers and the like.[34] In Bermuda specifically, there has been a 46% rise in the amount of plastic waste by weight over the 13 year period from 2006 to 2019[35], so it is highly likely that the percentage of plastic waste has increased even further in Bermuda in 2020 due to the pandemic, just as in other jurisdictions around the world.

3. PLASTICS and PLASTIC "RECYCLING": What are they and how does it work?

"Plastic recycling is a myth"[36]

There can be no doubt about the interrelated threats that plastics have on the marine environment, climate change and human health. The commitment to ending the use of SUPs is but one of a number of options that have been proposed around the world to tackling the problems arising from the use of SUPs. These other options include using 'biodegradable plastic', plastic 'recycling', and re-using plastics to make other products. This section looks at what exactly plastics are made of, and looks at the post-use alternatives, plastic 'recycling' in particular.

3.1 Understanding the types of plastic

There are seven classifications for plastic types. The 'chasing arrows triangle', or 'Mobius loop', is a symbol that often leads to confusion. Many environmentalists believe that its use is deceptive when used in conjunction with plastics. Specifically, the symbol does **not** mean that the plastic product is recyclable, what it does mean however is that you can classify the type of plastic, by the number inside the Mobius loop.[37]

Graphic courtesy 'The Ethical Human'

The reason for identifying the plastic type on the item is because if (and it is a big if) the plastic is being 'recycled', then it is important to keep the types separate because they have different melting points and other characteristics which mean that if different types of plastic are co-mingled during the melting process, the result is an unusable substance. So, it bears repeating, the symbol does not mean the plastic is recyclable.

3.2 What is plastic 'recycling'?

The use of the term recycling in conjunction with plastics is somewhat misleading. In the recycling process, a material is melted down and then reconstituted into a similar form over and over again, thus the chasing arrows or Mobius loop symbol is used. For example, in aluminium recycling, cans are melted down, converted back into sheet metal and then converted into new aluminium cans with the whole process taking less than 60 days from the recycling bin to a new product. During the process, no product is lost; one old can is recycled into one new can and the energy used to make a can from old material produces 95% less effluent and emission than the production of cans from new materials. Plastics on the other hand, *are never truly recycled*. Through chemical intensive application, plastics are converted into other synthetic plastic materials such as fleece fabric or carpeting. It is a process best described as 'down-cycling', or perhaps 'single re-use' because these repurposed plastic products cannot in-turn be converted into new consumer goods and generally end up in land-fills or incinerated.

Additionally, although it's theoretically possible to 'recycle' most plastics through down-cycling / re-purposing, it is at the same time relatively rare. For plastic types 3 through 7 it is especially rare because using virgin material is cheaper than down-cycling / repurposing. Type 1 (PET) and type 2 (HDPE) are the only plastics that are really down-cycled / repurposed. Type 1 containers usually are easy to sort and clean, and they can be used to make a lot of other products, with virgin type 1 feedstock being relatively expensive, thus making the down-cycling / repurposing more viable economically. Type 2 is less attractive to down-cycle but at least the bottles are big and easy to sort out of the waste stream. However, in jurisdictions where there is plastic down-cycling / repurposing (which does not include Bermuda) only around 27% of these type 1 and 2 plastics are 'recycled' / repurposed anyway. 'Recycling' rates for types 3 to 7 are barely around 1-2 % – so essentially they are never 'recycled' or repurposed. Finally, it is important to note that overall only 9% of the world's plastics are 'recycled' or repurposed. By comparison, 53% of aluminium is recycled.

Until recently the majority of all plastics to be 'recycled' were shipped to China for this process. The export of plastics to China for 'recycling' ended in 2017 when the Chinese Government enacted the "National Sword" policy. Up until this point, much of the plastics imported by China were dirty and unusable for 'recycling' so they were either landfilled or burned in unregulated incinerators for energy generation. The National Sword put an end to the importation of foreign 'recyclable' plastic which resulted in both pushing the responsibility of plastic 'recycling' back onto the plastic waste producing countries and opening the plastic 'recycling' market to new countries.

Pushing plastic 'recycling' back onto the waste producing countries left many plastic 'recycling' programmes unable to continue. In England, more than half-a-million more tons of plastics and other household garbage were sent to waste-to-energy plants and in Australia the recycling industry generally faced a crisis as the country struggled to handle the 1.3 million-tonnes of stockpiled recyclable waste it was planning to ship to China.

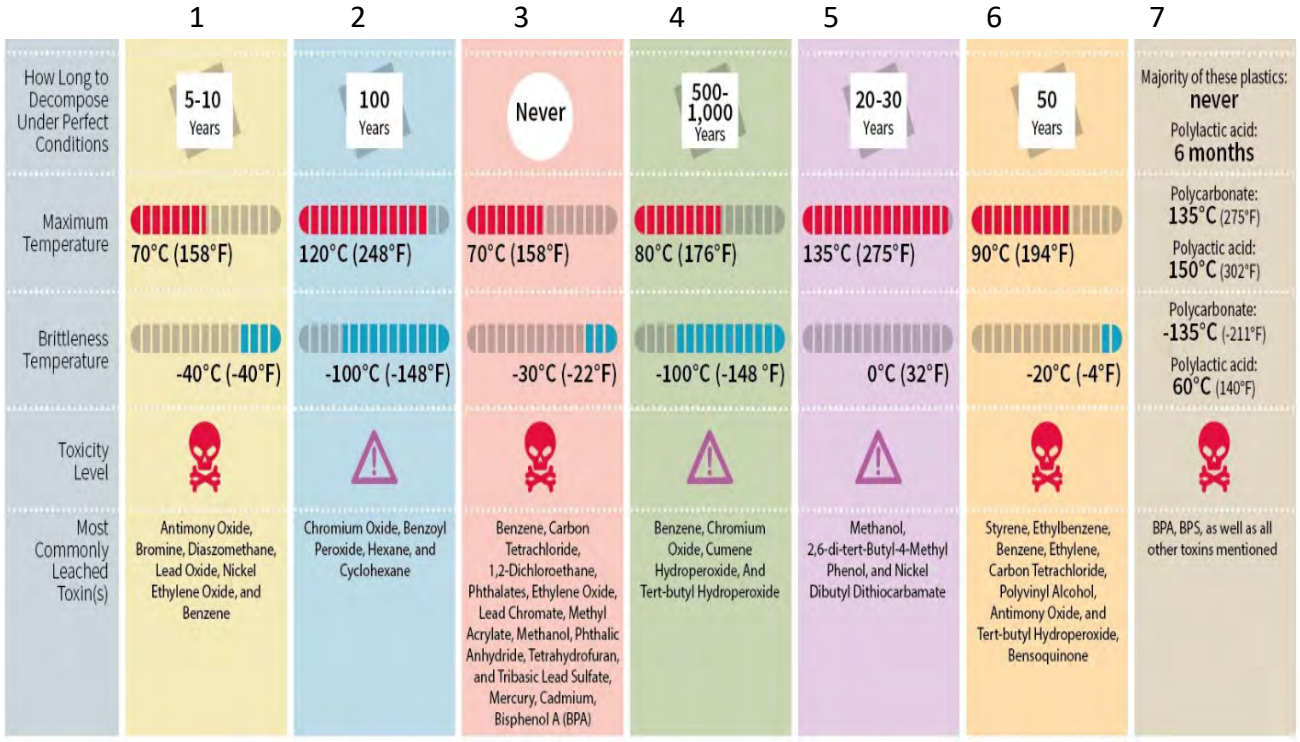
For India, a country that regarded the Chinese National Sword policy as an opportunity to gain valuable materials, the realities of becoming the world's garbage dump were rapidly discovered. Now India's Prime Minister, Narendra Modi, is pursuing an ambitious project to phase out SUPs by 2022 and the importation of waste plastics has come to an end.

In China, efforts to remove the plague of SUPs are pushing research toward biodegradable plastics. These plant-based plastics are in their infancy but already critics question their sustainability due to the diversion of resources from human food production in the form of land, labour and water, and intensive use of pesticides and fertilisers which degrade farmlands.

We can neither recycle nor compost our way out of the global plastics waste crisis, and in Bermuda this is an even more pertinent problem given the lack of a ready US-based market for plastic 'recyclables'.

3.3 Plastic toxicity

Returning to plastic type number in the Mobius loop, it is nonetheless very useful as it is also an indicator of toxicity levels and the decomposition ability of a particular plastic.[38]



Graphic courtesy 'The Ethical Human'

Careful scrutiny of the above table only reinforces the warnings from researchers about the dangers of plastics when they enter the natural environment. The evidence is irrefutable on the harm that plastics cause to the natural environment, potential human health hazards and that plastic production and incineration are major contributing factors to climate change.[39]

3.4 No opportunity for plastic 'recycling'

'Recycling' and repurposing plastics are both very difficult. Rates of 'recycling' / repurposing plastics world-wide are very low. In Bermuda's context in particular, we have no installed manufacturing base to accept potentially 'recyclable' plastics. So there is only one conclusion: the actions required to overcome the problems associated with plastics, and SUPs in particular, lie in *reducing* the use of plastics in the first place.

4. PLASTIC POLLUTION: A comprehensive approach from a circular economy model

"There is no such thing as 'away'. When we throw anything away, it must go somewhere."[40]

This section takes a look at the circular economy model that has been widely discussed in forums around the world, and examines what aspects are applicable to Bermuda to help us understand the next steps for Bermuda.

4.1 Controlling the use and disposal of single-use plastics

The issues of (single-use) plastic pollution, marine litter, and climate change are, as the government has identified, one of extreme importance to an island country like Bermuda, alongside issues of human health.

A UNEP report states that marine litter is the result of many different factors, including 'changing production and consumption patterns, inadequate waste management, and gaps in regulation of waste materials'.[41] In order to reduce plastic pollution and marine litter in particular, a comprehensive response that effectively deals with all these various factors is required. The four main areas to address in a comprehensive approach are: production, use (consumption), removal, and disposal of plastics (waste management and gaps in regulations).

UNEP encapsulates this when it states that 'policies and laws need to address not only the removal of litter but are generally more successful when they govern the production, use, and disposal of products that would otherwise become marine litter.'[42]

In Bermuda's case, there is no plastic production capacity here, therefore the focus cannot be on production but rather on the other three factors:

> The *use* of plastic, the *removal* of litter, and the *disposal* of plastic products.

Thus a comprehensive approach for Bermuda would be a multi-pronged approach targeting these three areas – *use*, *removal* and *disposal*. Of the three, Government can play the largest role in "*use"* and "*disposal*"; controlling what can be used and ensuring correct disposal of those items used. Success in managing "*use*" and "*disposal*" can help mitigate the litter problem, as SUPs make up a large part of our litter composition.

4.2 Understanding the circular economy model

In addition to the factors discussed above, the *use* and *disposal* of plastics, the UNEP has highlighted the need to encompass a circular economy approach, and the two approaches can be understood as complementary.[43] A circular economy model for the plastic production cycle can be summarised as having the following aspects:

Reduce (raw material use to create plastics)
Redesign (design products for re-use or recycling)
Remove (use of SUPs when practical)
Re-use (alternative uses or for refurbishment)
Recycle (to avoid plastics going to waste)
Recover (re-synthesise fuels, carefully controlled incineration for energy production) [44]

Given Bermuda's size, lack of local plastics production and the challenge of finding markets for locally consumed plastics, there is limited scope to influence or take action on the *Reduce* (raw materials use to create plastics) and *Redesign* (in the pre-production phase) aspects of the circular economy. The *Re-use* and *Recycle* aspects of the circular economy similarly are not practical areas of intervention given the knowledge that plastics are generally not 'recycled' but are repurposed / have single re-use and given that Bermuda would be at the mercy of foreign plastic markets.[45] However, where there can be intervention, is in the aspects of *Remove* and *Recover*.

These two applicable aspects of the circular economy model - *Remove* and *Recover* - correlate directly with the two applicable UNEP approaches to a comprehensive response to reduce plastic pollution and marine litter - use of plastics (i.e. Remove), and the disposal of plastics (i.e. Recover).

4.3 Remove and Recover

Remove and *Recover* are the two prongs of a comprehensive approach to plastic pollution and marine litter that are applicable to, and workable in, Bermuda.

Recover

Waste management in Bermuda revolves around the use of energy recovery at the Bermuda Government Tynes Bay Waste to Energy Facility. In terms of *Recover*, Bermuda is in a position that may be considered more fortunate than that of many other small island countries. If running at full capacity, Tynes Bay can produce 7.5 million megawatt hours of electricity annually, of which approximately half would be sent to BELCO for distribution to the grid. The 'waste to energy' process is not perfect however, and does produce harmful gases, although the facility adheres to guidelines under its Environmental Operating License issued by the

Department of Environment and Natural Resources and under the direction of the Environmental Authority as per the Clean Air Act 1991. Additionally independent emissions testing is carried out yearly and additional air quality monitoring stations track emissions year round.

It is estimated that Tynes Bay has saved the island from having to landfill approximately two million tonnes of municipal solid waste over the past 27 years.

Although incinerating plastic waste is *not* more sustainable than not producing the waste at all, given the lack of other available options currently available in Bermuda besides the environmentally damaging processes of landfill and marine dumping, the presence of the incinerator in Bermuda, means that in the short-term, *Recover* is addressed.

Remove

Therefore, the focus of the recommendations arising from this paper lies essentially in the first prong, *Remove*, as without the initial use of plastics, the need for recovery diminishes. Therefore, the focus of this policy paper lies in **eliminating the use of single use plastics**.

Plastic bottle on John Smith's Bay bitten by marine life. Photo courtesy Dr. Smith.

5. ELIMINATING THE USE OF SINGLE-USE PLASTICS: Evaluating the options

"The most environmentally friendly product is the one you didn't buy."[46]

In eliminating the use of SUPs, there are at least two overall strategies, both of which the Bermuda Government has mooted: 1) charging a fee for SUPs consumption to reduce demand and usage, and 2) banning SUPs. The following outlines the relative merits of both, concluding with the recommendation of a ban only.

5.1 SUP Fee

In the Speech from the Throne 2017, the government pledged to introduce a charge for SUPs in 2020 in the run-up to a ban on SUPs by 2022.[47] Unfortunately, the impact of the COVID-19 pandemic has significantly affected the ability of the government to implement the charge and the target date has been missed.

This 2-stage approach has been implemented in many jurisdictions around the world, where the form of the charge could be either **voluntary** or **mandatory**. Plastic bags, in particular, are charged for in many countries and therefore provide a useful test case to decide on the efficacy of a charge on SUPs.

A turtle trying to eat a plastic bag - mistaking it for a jellyfish. Photo courtesy forgerecycling.

Plastic bags – as a case study for a charge on single use plastics

Plastic bags, originally designed by Sten Gustaf Thulin in November 1959, were not aimed to be used just once.

The focus of analysis on plastic bags has been on the end of the life cycle, and the waste issue of using plastic bags once and throwing them away. However, in terms of the production of plastic bags, there is a surprisingly low impact on the environment. They are very efficient to make, using a very small amount of oil and extremely low amounts of energy.

Paper bags, on the other-hand, use a lot more energy to make, use a lot more water, and of course require trees to be felled. Additionally, they are heavier to transport which has an effect on the environment – especially for Bermuda which imports all bags.

The production of cotton bags has an even greater impact on the environment. Cotton is intensively grown and requires tremendous amounts of water, but are durable.

In order to have a lower impact on climate change compared to a single-use plastic bag that is actually reused, a paper bag needs to be used at least three times and a cotton bag needs to be used at least 131 times.[48] Of course, this does not account for the effect on the environment after the bags have been used, as cotton and paper bags will biodegrade, whereas the plastic ones will never.

The recommendation therefore, is to forgo producing additional bags in favour of using bags that we already own – over and over again. If a bag breaks mend it.[49] The re-using of bags can be encouraged through setting a charge as has been done in many jurisdictions – either through a voluntary charge or a mandatory charge. Following are two such examples.

<u>Voluntary charge</u>

The EU has set a target use of a maximum 25 bags per person per year.[50] In order to meet this directive, the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management signed an agreement with large retailers and environmental organisations to reduce the use of plastic bags. Retailers have responded in a number of ways including: not providing free bags of any kind, and/or charging for any kind of bag. This voluntary method was accompanied by government support of awareness raising campaigns.

<u>Mandatory charge</u>

Mandatory charges (or a "PlasTax" as it is known in some countries) can require the funds raised to be paid into the government. In Ireland, the government created a special Environment Fund which then uses funds raised for environmental awareness programmes, partnership projects and waste recovery schemes.[51]

A case study by the UNEP[52] on the effect of a PlasTax in Ireland noted the following:

- A study was conducted in 1998 to determine the public's "willingness to pay" (or "WTP") for a plastic bag and it was determined to be €0.024 (around $0.027).
- A tax was introduced in 2002 set at six times the WTP price, €0.15 per bag ($0.17), in order to trigger consumer behaviour change. This was accompanied by a strong awareness campaign.
- The use of plastic bags dropped by 90% within one year of the tax being introduced – from an average 328 plastic bags per person to 21 bags.[53]
- Plastic bags dropped from 5% of national waste to only 0.22% and there was strong public positive perception of the tax.
- After four years however, bag use started rising to 38 bags per person, so the levy was raised to €0.22 per bag ($0.25) with the possibility of raising the cost up to €0.70 ($0.78)

There are very good reasons for introducing a SUP charge, not least because the evidence suggests that there are significantly fewer plastic bags[54] on the seafloor ever since a number of European countries introduced fees on the items, according to a 25-year study from the UK government's Centre for Environment, Fisheries and Aquaculture Science (CEFAS).[55] The study was based on 39 independent scientific surveys of the distribution and abundance of marine litter, and researchers found an estimated 30 percent drop in the number of plastic bags in waters around Norway, Germany, northern France and Ireland.[56] Ireland and Denmark were the first two countries to introduce levies for SUP bags in 2003. A number of European countries followed and in 2015, England became the last country in the UK to introduce a fee. In a statement, Richard Harrington from the Marine Conservation Society said the decrease in the number of plastic bags recorded in the surveys is "very encouraging." "It shows that fiscal measures can work—charging for what was once a free item, often used just once and thrown away, has had a real influence on consumer behavior without genuinely hurting people in the pocket."[57]

5.2 SUP Ban

Whilst charges for the use of SUPs have been shown to reduce their consumption, there are a number of reasons why this may be seen as an unnecessary first step in Bermuda. The experience of our neighbours to the south has been to forego what might become a cumbersome charging system and implement bans.[58] Similarly, In light of the information outlined below, the utility of implementing a fee in Bermuda recedes in favour of an outright ban. Also, the diversity of alternative non-plastic items to replace SUPs continues to grow and their use can be promoted before a ban.

Firstly, the UNEP models clearly show that *Remove* and *Recover* are the two most pertinent factors in the Bermuda context for dealing with SUPs. Whilst charging for the use of SUPs will reduce consumption of these items, implementation, depending on structure, could be an operational cost to this Government gaining only a very small first step in reducing the 8 million tons of plastic waste dumped into the global oceans every year.[59]

Secondly, given the unprecedented impact of the COVID-19 pandemic during calendar year 2020, the government deadline for this charge has passed.

Thirdly, although the charge is seen as a pre-cursor to a ban, increasingly more evidence indicates the need to completely remove SUPs from local commerce altogether. The World Wildlife Fund UK recently tweeted, "Great to see less plastic bags in our oceans, but we need the government to put an end to the use of all avoidable single-use plastic by 2025."

In March, the UK government released a startling report[60] warning that plastic pollution in the world's oceans is projected to increase three-fold within seven years unless action is taken.[61]

There are many examples of countries and large jurisdictions moving towards bans:

- The Austrian government moved away from a charge to an outright ban on most plastic bags from 2020,[62]
- Mumbai has instituted a ban on all SUPs, including all kinds of plastic bags (with and without handles), garbage bags, all one-time use disposable items made up of plastic and thermocol, such as cutlery, plates and bowls, plastic sheets to wrap or store products and plastic pouches to store liquid, non-woven polypropylene bags (a cross between paper and cloth bag), disposable plastic containers used for takeaway, PET bottles (containing soft drinks, mineral water etc.) and with a carrying capacity of less than 500 ml. They have exempted some items such as: Plastic cover/plastic material used at the manufacturing stage, plastic used for medicines, solid waste management and agricultural products, compostable plastic material used for nurseries, horticulture and agriculture, milk bags and plastic bottles used in packaged water industry,[63]
- Vancouver has introduced a 'Green Vancouver' scheme with a Single-Use Item Reduction Strategy, which includes banning SUPs.[64]
- San Francisco airport, which restricted the distribution of SUP straws when the city law went into effect in July 2019, is now banning the sale of plastic water bottles in favour of water in glass, recycled aluminium, or certified compostable materials at all convenience shops, restaurants and vending machines. [65]
- Taiwan is planning a blanket ban on SUP items including straws, cups and shopping bags by 2030, with restaurants facing new restrictions from next year. Consumers will have to pay extra for all straws, plastic shopping bags, disposable utensils and beverage cups from 2025, ahead of a full ban on the single-use items five years later. The government has already banned free plastic shopping bags in major retail outlets including supermarkets and convenience stores, expanding the move to smaller businesses including bakeries and drinks kiosks from this year.

Other jurisdictions are in the process of formulating bans. California mooted legislation in 2019 that would commit to a 75% reduction in plastic state-wide within 10 years, by requiring manufacturers to ensure that all single-use packaging produced, sold and distributed in

California is fully recyclable or compostable by 2030.[66] The lawmakers however did not act on the legislation before the end of the session, leaving the legislation to fail.[67]

Closer to home, a number of Caribbean states have instituted bans on SUPs including Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, Jamaica, and St. Lucia.

An albatross chick with its stomach full of plastic.[68]

5.3 What SUPs should be banned?

Reviewing the actions of similar small island jurisdictions in the Caribbean shows that the items banned in different countries has varied. Appendix Two contains a fuller overview of the bans, the legislation and other relevant information, however the following summary shows the difference and commonalities across the region:

Country	Overview	Items Banned
Antigua and Barbuda	Since 2016, the country has been implementing incremental bans of various plastic item	Single-use plastic bags and Styrofoam containers first, followed by bans on importation and use of food service containers including clamshell and hinge containers, hot dog containers, bowls, plates, and hot and cold beverage cups. Further ban on the importation and use of plastic utensils (spoons, forks and knives), straws, fruit trays, meat trays, vegetable trays, and egg cartons
Bahamas	Since 2020, the Environmental Protection Act has been used to prohibit the importation, distribution, manufacture, possession, selling, supply, or use of single use plastic items	Plastic bags, Styrofoam, utensils, straws. Additionally, there has been a ban on the release of gas filled balloons outdoors
Barbados	Incremental bans on various plastic products started in 2019	Ban on the importation, manufacturing, distribution and use of all SUP carrier bags with the dimensions at or below 24 x 24 inches. Ban on importation of polystyrene foam food and beverage containers. Ban on the importation and manufacture of plastic drinking straws. Petro-based, SUP cups, cutlery, straws, egg trays and plates. Ban on the sale, retail and use of Styrofoam containers used in the culinary retail industry (including egg trays)
Belize	Initiated a phased approach over a period of a year from 2019. 3 months after the law – Prohibition on importation of prohibited products 6 month after the law – manufacturing of prohibited products	Styrofoam: clamshells, food containers, soup containers, plates, bowls, cups, lids, trays. Plastic: carrier bags, plates, trays, containers, lids, cutlery, straws

	9 month after the law – sale of prohibited products A year after – possession of prohibited products.	
Dominica	01 January 2019 with a six month phase out period for items imported before 31 December 2018	Lids, Cups, Single Use Styrofoam/Plastic Containers, Disposable plastic cutlery, and drinking straws
Grenada	Have used progressive bans since 2018 starting with importation, followed by manufacturing and selling bans	No importation of any Styrofoam products. Feb - ban on import and manufacture of SUP shopping bags with handles. Mar - ban of the sale of Styrofoam. April - ban of the sale of food in or with Styrofoam. Dec - ban on the sale or offer for sale of single use plastic shopping bags with handles
Guyana	Banned importation of Styrofoam in 2016	Use, manufacture, importation and distribution of all Styrofoam products including cups, plates, egg cartons, meat and vegetable trays, hot and cold beverage cups.
Jamaica	In 2020, Jamaica instituted one ban on certain plastic items	All petro-based plastic bags with the exception of those used for the packaging of pharmaceuticals, medicines, hygiene and the preservation of food. All tetra pack straws
Saint Lucia	Three consecutive years bans in 2019, 2020, and 2021	Ban on the importation of disposable trays, hinged take-away containers, bowls, cups, plates, cup lids, bowl lids and Styrofoam disposable plates. Then ban on the importation of disposable forks, knives, spoons, straws, stirrers and egg cartons. Ban on the manufacture, use, distribution and sale of food containers, bowls, cups, plates, cup lids and bowl lids. Last ban on the manufacture sale, use and distribution of disposable forks, spoons, knives, straws, stirrers and egg cartons
St. Vincent and the Grenadines	Only one ban so far made in 2018	Styrofoam containers that are used to sell and package food and beverage
Trinidad and Tobago	Ban on importation of all polystyrene products in 2019 but local manufacturers are being given time to phase out the manufacture	All polystyrene products

Bermuda has no plastic manufacturing industries to consider, therefore the application of a straightforward ban on importation can be used, as in some Caribbean countries. However, taking the lead from the range of items banned, Bermuda could well look to enacting legislation that encompass a wider number of products given the lessons learnt at other jurisdictions and also given our relatively late entry into enacting SUP bans.

The following items all should be considered under such an importation ban, as some alternative non-plastic products exist, lessening the impact on vendors and consumers. It is recognised that this list is not exhaustive, but rather should be considered a *minimum* baseline from which to start:

- Styrofoam products. These include food service containers (e.g. clamshell and hinge containers, bowls, plates, hot and cold beverage cups and egg cartons).
- Plastic utensils. These include cups, spoons, forks and knives, lids, straws and stirrers.
- Plastic bags. Careful consideration needs to be given to the definition and scope included.
- Plastic trays. These includes trays for fruit, meat and vegetables.
- Plastic water bottles and other plastic beverage bottles. Exceptions can be made for large plastic water bottles that are returned and refilled.
- Plastic single-serving food sachets such as mayonnaise and ketchup sachets.
- Plastic-lined paper cups and food containers.
- Products containing micro-plastics (e.g. industrial abrasives used in sandblasting, household abrasives that contains micro-beads and facial scrubs and other cosmetics that contains micro-beads).
- Plastic single-use beverage pods (e.g. coffee and tea pods).
- Plastic-stemmed cotton buds.
- Oxo-degradable plastic[69]
- 'Biodegradable' plastic[70]

Additionally, the release of helium-filled balloons outdoors should be banned.

Following the introduction of the ban on importation, a suitable period should be given to allow current stocks to be used up, to promote the use of non-plastic alternative products, and after this period then a ban on the sale, distribution, and use should be implemented.

Simultaneously, consultations should begin on understanding how the next round of bans for dealing with more 'difficult' SUP items (such as plastic containers for food items, plastic containers of household products such as laundry detergents, and cosmetic products such as shampoo and conditioner containers). It is important to not only recognise the volume of waste created by using such items in plastic containers, but also to identify and promote alternatives that are already available such as powdered laundry detergent, bars of soap, shampoo and conditioner, and foods in glass jars. To institute a ban on the 'easier' items such as plastic cutlery and plastic take-away containers is important but it should only be seen as a first step in preparing the way for bans on the more 'difficult' items such as food and other products in plastic containers.

The reports from many of the Caribbean countries highlighted the importance of on-going and accessible public information campaigns. Therefore, additional focus should be on immediately starting on-going education campaigns, to precede the bans, to highlight the alternatives available such as products in glass containers, products in powder form in cardboard boxes (such as detergent) and products in bar form (such as shampoo and conditioner). Such campaigns will complement the consultations as we move towards the second round of bans.

In closing, it is recognised that there may be scope for very limited exemptions to the bans (i.e. where a ban would not apply). Examples include where the product is required in the interest of public health and hygiene (including exceptional circumstances such as disaster recovery) and where there is a genuine and demonstrated need for the use of prohibited products (e.g. the use of straws by disabled persons).

6. CONCLUSIONS

"It's pretty amazing that our society has reached a point where the effort necessary to extract oil from the ground, ship it to a refinery, turn it into plastic, shape it appropriately, truck it to a store, buy it and bring it home, is considered to be less effort than what it takes to just wash the spoon when you're done with it." – Unknown

As can be seen from the preceding chapters, addressing the issue of single-use plastics does not have a simple one-shot solution. The issue is complex and there are multi-faceted approaches that need to be taken. However, the evidence is irrefutable concerning the interconnection between plastic production, use and waste, and impacts on the environment (climate change and marine litter) and human health. We need to act now.

Due to the lack of space, one issue that has not been addressed in this paper at length is the issue of public education. Anecdotally, given the measures already taken by the supermarkets and take-away food vendors for example, the Bermuda public is becoming increasingly aware of the problems of SUPs. Feedback from the implementation of bans in Caribbean countries also highlights the importance of public education campaigns. Therefore, the importance of co-ordinated and on-going public education and information campaigns cannot be understated and should be addressed from the start. All bans should be preceded by public consultation, but also supported with public education campaigns.

The following is a summary of the actions that should be taken in Bermuda now, based on a review of similar jurisdictions and based on the available evidence on the harms caused by plastics in and to the environment:

1. Hold public consultations in 2021 to review the proposed bans and to prepare for further bans.
2. Simultaneously hold public education campaigns regarding the problems with SUP. The campaigns should continue throughout the consultation period, the implementation period and beyond.
3. As a precursor to national policies, introduce a government-wide procurement policy on SUPs before the end of 2021 (See Appendix One).
4. Legislate a ban on the importation of SUP products and Styrofoam products with a fixed period proscribed thereafter for utilising existing stock (e.g. a phase-out period of six months). This would be the first phase, to be enacted by 2022.
5. Legislate by 2022 to ensure that non-plastic alternative products to single-use plastic products subject to any ban are fully non-industrially biodegradable.

6. Legislate a ban on the sale, distribution and use of SUP products and Styrofoam products to begin immediately after the phase-out period at the end of 2022. This is phase two.
7. Legislate a ban on the release of helium-filled balloons outdoors.
8. Planned phase of charges or fees on the use of SUPs be scrapped in favour of the above bans.
9. Re-commence public consultations after one year from the first importation ban to assess the effect of the bans and to consult on the next round of plastic items to be banned.
10. Continue public education campaigns on the dangers of SUPs for the environment and human health, including the effect they have on climate change, and with particular attention given to informing and educating about micro-plastics.
11. Legislate by the end of 2025 to prohibit the importation, sale, distribution, and use of further banned SUPs (phase three).

In closing, it must be reiterated that whilst the unprecedented and unexpected effects of the novel coronavirus pandemic have diverted attention and resources away from many initiatives including the early commitment to eliminate single-use plastics, nevertheless the commitment to eliminating SUPs must still be honoured. We must re-double our efforts to ensure it is met. This re-doubling of our efforts is particularly important now that we can see the side-effects of the COVID-19 pandemic when it comes to plastic use – such as the projected 30% increase in waste in 2020 compared to 2019 due, in large part, to plastic waste from the billions of items of PPE.[71] The government must not allow the coronavirus pandemic to undermine efforts to deal with the problem of single-use plastics. Rather it should take the opportunity provided by the pandemic to start to address all the issues associated with human (over) consumption in general and begin to take the necessary steps to move Bermuda towards a low-polluting, more sustainable society.

"The world is changed by your example, not by your opinion." – Paulo Coelho

APPENDIX ONE

An example of a Bermuda Government Single-Use Plastics Policy

- **Introduction**
    - It is recognised that:
        - Consumer plastic items are cheap, hygienic, and durable.
        - Plastic production is a contributor to climate change.
        - Plastics cannot biodegrade and are major pollutants when they enter our seas and natural environment.

    - As one of the largest employers in Bermuda, the Bermuda Government is committed to leading the way in reducing and removing single-use plastics (SUPs) in all government departments by the end of 2021. Public funds must be diverted away from purchasing SUPs wherever possible.

    - There are areas within the Bermuda Government that will need to use some SUPs (e.g. personal protective equipment, hygiene products) but we will work to reduce and remove avoidable consumer SUPs wherever viable and practical.

- **Defining single-use plastic**
    - 'Single-use plastic' (SUP) is a wide-ranging term. It includes all products made wholly or partly of plastic, which are typically intended to be used just once and / or for a short period of time before being disposed of.
    - For the sake of this policy, we are focussed on removing 'consumer SUPs', i.e. plastics which are used by consumers as opposed to plastics with applied or industrial uses, such as toner cartridges and food packaging.
    - We will focus on removing consumer SUPs, which are avoidable and / or which have viable and sustainable market alternatives. These include but are not limited to:
        - Plastics used for catering and the take-away food market
            - Single-use sachets (e.g. condiments, milk, sugar)
            - Plastic cutlery (knives, forks, spoons), boxes and plates
            - Cups, bowls and lids made wholly or partially from plastic
            - Water bottles
            - Straws and stirrers
            - Coffee and tea pods

        - All Styrofoam products including food service ware, e.g. clamshell and hinge containers, bowls, plates, hot and cold beverage cups and egg cartons.
        - Plastic trays, including trays for fruit, meat and vegetables
    - Plastics used for cleaning:
        - Single-use non-refillable containers, e.g. hand soap, cleaning products
        - Wipes containing plastic
        - Abrasives using and containing micro-plastics
    - Plastics used around the office:
        - Envelopes
        - Plastic wrapping for brochures
    - Plastics used in packaging:
        - Single-use packaging from deliveries
        - Single-use carrier bags
    - All oxo-degradable products[1]
    - All 'biodegradable' plastic products[2]

- **Application of the policy within government**
    i. Voluntary "sustainability champions" will be introduced across the government departments. They will meet monthly for the first six months and then quarterly thereafter.
    ii. Sustainability champions from each government department will collaborate with and learn from the progress of each other and work together to identify best practice and constantly look for opportunities for improvement.
    iii. This policy applies to all relevant sourcing of new requirements and suppliers across government.
    iv. At the same time, the departments of the Bermuda Government will identify which existing contracts contain avoidable SUPs and work with the relevant suppliers and facilities managers to source and implement alternative products across all departments.

[1] Oxo-degradable plastics are plastic materials that includes additives which through oxidation lead to the fragmentation of the plastic material into micro-fragments or to chemical decomposition. Oxo-degradable is not the same as bio-degradable. Some disadvantages of oxo-degradable plastic include needing an industrial composter and a separate waste stream.

[2] ''Biodegradable' plastic: a plastic capable of undergoing physical, biological decomposition, such that it ultimately decomposes into carbon dioxide (CO2), biomass and water. There are various standards (such as in the European Union) for packaging recoverable through composting and anaerobic digestion. However, these plastics, like oxo-degradable plastics do not compost in a household setting, but need industrial composting.

v. As a minimum, all SUPs will be replaced with viable alternatives, unless there are compelling circumstances in operational and custodial properties that prevent us from doing so.
vi. In the long-term, the Bermuda Government aims to reduce and remove avoidable disposable products altogether and instead encourage more sustainable practices.
vii. The Bermuda Government will continue to assess whether there are other SUPs, beyond the list outlined in 2.iii that are avoidable and / or have viable and sustainable market alternatives.
viii. "Avoidable" means the use of a product made of a certain material which is not essential. An example would be plastic cutlery, for which single-use wooden cutlery or re-usable metal cutlery are readily available alternatives.
ix. The Bermuda Government will identify other SUPs that do not currently have a suitable alternative available, we will seek to reduce the quantity of plastic used instead.
x. The goal of removing SUP must not be done in a vacuum; wherever plastic is being removed or replaced with an alternative, we will ensure that an appropriate waste removal procedure (if required) is put in place and adequate signage is provided to educate consumers.
xi. The government in-house ban on SUP would include plastic brought in by staff. However, we would allow a transition period to encourage staff to reduce the amount of plastic brought in by raising awareness and encouraging behaviour change.

NOTES:

The above is an example of a draft example of a single-use plastics policy for consideration by the Bermuda Government.

Voluntary Recycling Champions already exist in each government department and these persons should be involved in developing a SUP policy. They can transition to becoming 'sustainability champions' and be given time to review, edit and revise the policy – subject to any further guidance from the Minister / Cabinet.

Once this preliminary draft policy on government SUP usage has been reviewed and edited by the Recycling (Sustainability) Champions, the final draft policy can be sent for consultation with the Head of the Public Service and others ready to be adopted across the Bermuda Government before the end of 2021.

Similar policies can be found in the Kauai County Government (Hawaii, USA) and various departments of the UK Government, such as the Ministry of Justice.[72]

APPENDIX TWO

Caribbean SUP Comparisons

(These are available in an XLS spreadsheet format)

Antigua and Barbuda

Overview	Since 2016, the country has been implementing incremental bans of various plastic items
Date of first ban	8th July 2016
Items banned	Single-use plastic bags and Styrofoam containers
Date(s) of second / subsequent bans	2017 and 2018
Items banned in second / subsequent bans	2017 - Ban on importation and use of food service containers including clamshell and hinge containers, hot dog containers, bowls, plates, and hot and cold beverage cups. 2018 - ban on the importation and use of plastic utensils (spoons, forks and knives), straws, fruit trays, meat trays, vegetable trays, and egg cartons
Other information	Exemptions on the importation and use of "naked" Styrofoam coolers by airline carriers private charters and large cruise liners

Bahamas

Overview	Environmental Protection Act used to prohibit the importation, distribution, manufacture, possession, selling, supply, or use of single use plastic items and to ban release of gas filled balloons outdoors
Date of first ban	1st Jan 2020
Items banned	Plastic bags, Styrofoam, utensils, straws, mass balloon releases
Date(s) of second / subsequent bans	*
Items banned in second / subsequent bans	*
Other information	Tariff (Amendment) (No. 2) Act, 2019 removed import duties for compostable, recycled and biodegradable replacement items. Youth Activism Workshops held by BPM
Biodegradable Information	Definition of "oxo-biodegradable" when used in relation to a single use plastic bag, means plastic that biodegrades through a two stage process where (a) in the first stage, additives in the plastic help to catalyse and accelerate oxidation, which aids in the breakdown of polymer chains in the plastics to smaller and wettable fragments; and(b) in the second stage, microorganisms access the carbon and hydrogen making the remaining fragments biodegrade into carbon dioxide, water and biomass, leaving no plastic or harmful residues behind
Applicable Legislation	Environmental Protection (Control of Plastic Pollution) Act, 2019
Consultations	Ministry of the Environment collaborated with Bahamas Plastic Movement (BPM) but had own social media, education and public engagement campaigns https://www.bahamasplasticmovement.org/
PR Campaigns	https://www.plasticfree242.com
Positive Take-aways	Bahamas Plastic Movement on YouTube
Challenges	Inadequate law enforcement, and suggested training police officers and environmental officers. Banned items still in the supply chain that is unregulated.

Barbados

Overview	Incremental bans on various plastic products started in 2
Date of first ban	Monday, 1 April 2019
Items banned	Ban on the importation, manufacturing, distribution and use of all single-use plastic carrier bags with the dimensions at or below 24 x 24 inches. Ban on importation of polystyrene foam food and beverage containers. Ban on the importation and manufacture of plastic drinking straws
Date(s) of second / subsequent bans	Jul-19
Items banned in second and subsequent bans	Petro-based, single-use plastic cups, cutlery, straws, egg trays and plates. Ban on the sale, retail and use of Styrofoam containers used in the culinary retail industry (including egg trays)

Belize

Overview	Initiated a phased approach over a period of a year. 3 months after the law – Prohibition on importation of prohibited products 6 month after the law – manufacturing of prohibited products 9 month after the law – sale of prohibited products A year after – possession of prohibited products
Date of first ban	2019
Items banned	Styrofoam: clamshells, food containers, soup containers, plates, bowls, cups, lids, trays. Plastic: carrier bags, plates, trays, containers, lids, cutlery, straws
Date(s) of second / subsequent bans	The subsequent bans have been shifted six months on due to COVID-19
Items banned in second / subsequent bans	*
Other information	The subsequent bans have been shifted six months on due to COVID-19.
Biodegradable Information	Taskforce set up to set standards
Applicable Legislation	Environmental Protection (Pollution from Plastics) Regulations, 2020
Consultations	Internal discussions (solid waste management, Ministry of trade and Investment, Ministry of Tourism), discussions with importers, manufacturers, and retailers
PR Campaigns	*
Positive Take-aways	Time frames for phase-out approach were agreed in advance with importers, manufacturers etc. Early formulation of how the legislation would be implemented is so helpful to avoid starting at a disadvantage
Challenges	Need to have meaningful talks with ministry of Trade and Investment (or equivalent) to know what could be affected by the proposed phase-out or ban. Need to understand what the importers and manufacturers concerns are. Consider having two separate application forms, 1 for restricted/prohibited products and 1 for biodegradable products

Dominica

Overview	
Date of first ban	01 January 2019 with a six month phase out period for items imported before 31 December 2018
Items banned	Lids, Cups, Single Use Styrofoam/Plastic Containers, Disposable plastic cutlery, and drinking straws
Date(s) of second / subsequent bans	*
Items banned in second / subsequent bans	*
Other information	Select biodegradable products have been given a 0% customs duty rate: lids, cups, single use containers, cutlery, drinking straws, reusable shopping bags, as well as trays, dishes, plates, cups and the like, of paper or paperboard or bamboo
Biodegradable Information	Process being implemented by the Dominica Bureau of Standards for authenticating imports of biodegradable products. Importers must produce certification of the products from suppliers which will indicate the composition of the products and rate of decomposition. All Biodegradable products must have a 50% decomposition ratio
Applicable Legislation	Cabinet decision leading to an Order from AG's Chambers using the Supplies Control Act
Consultations	Public Consultations – importers, retailers, vendors, retailers, hotels, restaurants, and the general public Government departments involved were: Customs, AG Chambers, Waste management, Bureau of Standards
PR Campaigns	1. Video Public Service Announcements circulated through social media and television from December 17 to January 2019. 2. Informational digital media prepared for Print and Online Newspapers and for distribution to communities. 3. Eight (8) Radio Ads (English and Creole) aired from December 2019 to March 2019. Ads resumed from June to August 2019. 4. Music Video for Jingle (plastic ban and no litter) in August. 5. Talk show programmes with stakeholders 6. Outreach programmes 7. Ministry of Tourism procured 10,000 re-useable bags for Earth Day. Collaborated with Ministry of Environment with promotional activities. 8. Review consultation with stakeholders in June 2019. 9. Ministry of Finance procured 60,000 re-useable bags for the entire public in a "Go Green Dominica" campaign in Feb 2020
Positive Take-aways	The response of the public toward the Plastic ban has been very positive. Most retailers and food service establishments made the switch before the end of the phase out period.
Challenges	End of phase-out period had to be adjusted due to high levels of previously imported stock of Styrofoam

Grenada

Overview	Have used progressive bans starting with importation, followed by manufacturing and selling bans
Date of first ban	2018
Items banned	No importation of any Styrofoam products
Date(s) of second / subsequent bans	February, March, April and December 2019
Items banned in second / subsequent bans	Feb - ban on import and manufacture of single-use plastic shopping bags with handles. Mar - ban of the sale of Styrofoam. April - ban of the sale of food in or with Styrofoam. Dec - ban on the sale or offer for sale of single use plastic shopping bags with handles
Other information	*

Guyana

Overview	Banned importation of Styrofoam in 2016
Date of first ban	2016
Items banned	Use, manufacture, importation and distribution of all Styrofoam products including cups, plates, egg cartons, meat and vegetable trays, hot and cold beverage cups.
Date(s) of second / subsequent bans	*
Items banned in second / subsequent bans	*
Other information	*

Jamaica

Overview	Have instituted one ban on certain plastic items
Date of first ban	1st January 2020
Items banned	All petro-based plastic bags with the exception of those used for the packaging of pharmaceuticals, medicines, hygiene and the preservation of food. All tetra pack straws
Date(s) of second / subsequent bans	*
Items banned in second / subsequent bans	*
Other information	Exemptions: plastic bottles used in the production of juices. Paper and other non-plastic straws.

St. Lucia .

Overview	Three consecutive years bans in 2019, 2020, and 2021
Date of first ban	1st August 2019
Items banned	Ban on the importation of disposable trays, hinged take-away containers, bowls, cups, plates, cup lids, bowl lids and Styrofoam disposable plates
Date(s) of second / subsequent bans	1 August 2020 and 1st August 2021
Items banned in second / subsequent bans	2020- Ban on the importation of disposable forks, knives, spoons, straws, stirrers and egg cartons. Ban on the manufacture, use, distribution and sale of food containers, bowls, cups, plates, cup lids and bowl lids. 2021 - ban on the manufacture sale, use and distribution of disposable forks, spoons, knives, straws, stirrers and egg cartons
Other information	*

St. Vincent and the Grenadines

Overview	Only one ban so far made in 2018
Date of first ban	2018
Items banned	Styrofoam containers that are used to sell and package food and beverage
Date(s) of second / subsequent bans	*
Items banned in second / subsequent bans	*
Other information	*

Trinidad and Tobago

Overview	Ban on importation of all polystyrene products but local manufacturers are being given time to phase out the manufacture
Date of first ban	1st Jan 2019
Items banned	All polystyrene products
Date(s) of second / subsequent bans	*
Items banned in second / subsequent bans	*
Other information	*

APPENDIX THREE

The harm of plastics in and to the environment: the plastic water bottle[73]

ONE: PLASTIC DOES NOT BIODEGRADE

Plastic cannot be recycled by living organisms in the ocean easily or quickly. Instead, a combination of the sun's energy and environmental factors like wave action and battering with other floating objects fragment the plastic object down into smaller and smaller pieces (known as micro-plastics). A plastic bottle in the ocean may take up to 1000 years to break into microscopic pieces that will either be very slowly degraded by bacteria and/or sink into deep ocean sediments and be buried forever.

TWO: PRODUCTION OF PLASTIC REQUIRES FOSSIL FUELS

Plastic production requires the use of non-renewable fossil fuels. Plastic bottles are no exception to this. Most plastic bottles are made from a plastic known as PET (polyethylene terephthalate), which is produced from oil. Worse yet, the production of plastic bottles isn't the only time when energy is wasted. In fact, energy is used during the entire lifespan of a plastic bottle: This includes the energy used for transportation, storage, and the final disposal of the bottle. In the USA, about 76 million barrels of oil are needed to manufacture, transport, store, and dispose of the plastic bottles used for bottled water annually. That's enough oil to fuel 4.3 million cars for one year.

Worldwide, the energy embedded in our use of bottled water is equivalent to 450 million barrels of oil each year (based on statistics from 2012). That's enough to fuel 25.5 million cars for one year. Fossil fuels are of course non-renewable, and they contribute to greenhouse gas emissions and climate change. There is no question that they're bad for the environment.

THREE: CREATES PLASTIC POLLUTION AND HARMS MARINE ECOSYSTEMS

Nowadays, plastic bottles can be found littered almost anywhere you go. The sheer number of plastic bottles sold each day means that many of them end up being improperly disposed of. It is important that we do not underestimate the severity of this problem. Plastic bottles are currently the 5th most commonly found trash item at coastline cleanups (by quantity), making up a sizable portion of the total plastic pollution in oceans.[74]

In fact, most plastic that is littered eventually ends up in the ocean. Even plastic on land, far from an ocean, eventually gets blown or washed by rain into drainage networks or rivers and eventually carried into the ocean. As noted above the plastic bottles eventually degrade into micro-plastics. Over time, these micro-plastics can absorb waste chemicals on the surface of the ocean, such as herbicide and pesticide residues, and become more toxic, affecting animals that eat the plastic in error.

Animals like seabirds, fish and whales can mistake plastic in the ocean for food. Since plastic will degrade into smaller and smaller pieces even the smallest organisms, like zooplankton and fish larvae, will consume micro-plastics.

When an animal consumes enough plastic, their digestive systems can get clogged up, eventually starving them to death. Sometimes, the uneven shape and size of plastic pieces could even choke animals, like sea turtles, to death. Once plastic is ingested by an organism, the digestive process can release toxic chemicals associated with the plastic into the gut and the chemicals are absorbed into the consumer's body mass. In this way both the chemicals and the plastics can move up along the food chain when the animal is eaten by another. When predators eat prey with plastic in their systems, the plastic gets passed along into the next animal in the food chain but the concentration of the toxic chemical keeps increasing in the animals further up the chain.

For example, let's say that zooplankton consume micro-plastics, then small baitfishes that eat lots of zooplankton are eaten by small tunas which are then eaten by sharks. In this way the effects of great quantities of micro-plastics are concentrated further up in the food chain

In the North Pacific alone, an estimated 12,000 to 24,000 tons of plastic[75] end up in fish each year. Over 1 million seabirds and 100,000 (one hundred thousand) marine mammals die from ingesting plastic yearly.[76] In a recent study of >250 baitfishes and their predators in Bermuda ~40% contained micro-plastics in their guts (Dr. S.R. Smith, BAMZ).

Seafood with plastic or toxic chemicals in their bodies can be passed along to humans as well, as we are the top predator in the oceans. There is concern that the ingestion of micro-plastics and

the associated toxic chemicals in fishes may have long-term negative health consequences for us. If we continue to trash our oceans, the plastics we use and toss could come back and bite us.

FOUR: CONCLUSION

Of course, the easiest way to solve our plastic problem is to simply stop using SUPs like plastic bottles. This, in turn, means reducing our consumption of bottled water. One way to reduce our usage of bottled water is to use a reusable water bottle. Instead of buying packages of bottled water, you can buy a single reusable bottle to reuse over and over again. This not only helps save the environment, but also helps save money in the long run.

Examples of mostly plastic free, reusable water bottles

APPENDIX FOUR

Micro-plastics in human placentas

In a 2019 study conducted by the University of Newcastle Australia, it was estimated that the average human, consuming every-day food items, ingests 5 grams of plastic a week, or the equivalent of 1 credit cards worth of plastic. This plastic is ingested both orally and via inhalation from various sources; and, according to the study, one of the largest culprits is drinking water derived from a variety of sources including groundwater, surface water, tap water and bottled water.[77]

Additionally, some of the marine life consumed by humans may well contain microplastics. Experiments show that for marine and other wild-life, microplastics block digestive tracts, and with stomachs stuffed with plastic, some species starve and die. In addition to these effects, microplastics have been observed to attract free-floating pollutants that wash off the land and into our seas—such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and heavy metals. Once on the surface of plastics they readily transfer into fish and other consumers with humans at the top of this food-chain.[78]

Transference of ingested plastics from mother to foetal placenta and organs has been observed when pregnant rats were exposed to nano-polystyrene plastic particles. Research into the presence of plastics in rat foetuses showed a clear transference from mother to offspring within 24 hours of inhalation. These nanoparticles were further observed beyond the mother foetal boundary of the placenta in the foetal liver, lung, kidney, heart and brain tissue after inhalation by the mother. Both foetal and placental weights reduced during pregnancy following the introduction of nano-plastics.[79]

Similarly, a recent peer-reviewed study undertaken at a research hospital in Italy involving 12 consenting pregnant women found, for the first time, the presence of micro-plastics in human placenta. It is important to note that, as a means of controlling transference of plastics during delivery, to avoid potential contamination with plastics, a plastic free protocol was used replacing gloves and bedding items with cotton and clamps and other instruments with metal alternatives. It is suspected that these plastics may reach the human placenta from both inhaled and ingested plastics but it is currently unknown whether or not human infant organs contained these micro-plastics.[80]

Studies into the long-term effects of plastic consumption via ingestion suggest that sexual function, fertility, and cancer causing mutations may be among the results. In vitro research has demonstrated toxicity to lung cells, the liver and brain cells.[1] For foetuses, the transference of plastics from the mother may disrupt the complex immunological mechanism in place that allows the foetus to determine self from non-self; or the ability to continuously adapt to changes in the maternal environment, an important developmental mechanism.[81]

APPENDIX FIVE

Bermuda's Waste

This Appendix on Bermuda's waste contains information regarding the generation, management and composition of waste in Bermuda.

Generation

The total waste collected in 2019 was 86,400 tonnes representing a 7.9% decrease from 2018. Household waste accounted for 28,800 tonnes of waste for 2019 while waste from other sources accounted for 57,600 tonnes (Table 1).

Table 1: Generation of Waste by Source (1,000 metric tonnes)

GENERATION OF WASTE BY SOURCE: 2018-2019		
Indicator (1,000 mT)	2018	2019
Total amount of waste	93.80	86.42
Waste from households	31.27	28.81
Waste from other origins	62.53	57.61

Management

The Waste Management Section of the Ministry of Public Works follows a Comprehensive Waste Management Strategy (CWMS) to divide waste handling into:

1. Waste reduction
2. Recycling
3. Composting
4. Energy from waste (Incineration)
5. Land creation (Landfilling)
6. Special disposal of hazardous waste

In 2019 1,500 tonnes of waste were recycled, 15,000 tonnes of horticultural waste were composted, 64,900 tonnes of waste were used to generate electricity and 10,000 tonnes of waste were land-filled (Table 2).

Table 2: Management of Municipal Waste (1,000 metric tonnes)

MANAGEMENT OF MUNICIPAL WASTE: 2018-2019		
	Year	
Indicator (1,000 mT)	2018	2019
Total amount of waste	93.8	86.4
Amounts going to:		
Recycling	1.5	1.5
Composting	13.0	10.0
Incineration	69.3	64.9
Landfilling	10.0	10.0

Household Waste Composition

Household waste audits have been conducted periodically using the same methodology each time, by the Waste Management Section of the Ministry of Public works since 2006. The purpose of these audits is to determine trends in household waste composition in order to adjust resource allocation if needed, to determine waste disposal behaviours answering questions about compliance with various waste regulations and contributing to knowledge about participation in the household TAG recycling programme. Since 2006, the percentage of plastics by weight in household waste has increased from 13% to 19%, an increase of 46%.

Table 3: Household Waste Composition

HOUSEHOLD WASTE BY TYPE: 2014 - 2019		
	Year	
Indicator	2014	2019
Total (%)	100.0	100.0
Paper, paperboard	29.0	27.0
Textiles	17.0	4.0
Plastics	13.0	19.0
Glass	9.0	13.0
Metals	6.0	5.0
Other inorganic material	9.0	8.0
Organic material	17.0	24.0

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Cover photo courtesy Dr. Struan R. Smith. Plastics on a Bermuda beach.