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## Policy responses to reduce single-use plastic marine pollution in the Caribbean

C. Andrea Clayton<sup>a,\*</sup>, Tony R. Walker<sup>b</sup>, Joana Carlos Bezerra<sup>c</sup>, Issahaku Adam<sup>d</sup>

<sup>a</sup> Caribbean Maritime University, Kingston, Jamaica

<sup>b</sup> School for Resource and Environmental Studies, Dalhousie University, Halifax, Canada

<sup>c</sup> Community Engagement Division, Rhodes University, South Africa

<sup>d</sup> Department of Hospitality and Tourism Management, University of Cape Coast, Cape Coast, Ghana

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## ABSTRACT

Caribbean economies depend heavily on a healthy marine ecosystem, but the region includes ten of the top global marine polluters per capita. Regional marine pollution is driven by illegal plastic waste dumping due to poor waste management systems with limited recycling, and weak enforcement. Governments recognize the impacts of marine debris on their social and economic well-being and have responded with policies to curb plastic pollution. Most focus on bans of single-use plastic and polystyrene, which comprises ~80% of Caribbean marine litter. However, there is little comparative analysis of policy responses to determine their efficacy. This paper reviews current policies in 13 English-speaking Caribbean countries, exploring tools used and process of implementation. Eleven have introduced legislative policies, with seven including fines and penalties for non-compliance. All successful policies involve multiple tools, including primary stakeholder engagement, sufficient lead time between policy announcement and implementation, and extensive public education campaigns.

### 1. Introduction

Since the 1950s, the growth in plastic production and use has outpaced most other materials. Plastic polymers are versatile, lightweight, hygienic, durable and (in some forms) degradation-resistant and can be molded and utilized in a very wide range of applications (UNEP, 2018a). Global production was 359 million metric tons in 2015 (Geyer et al., 2017). Plastic consumption varies significantly between regions, from 100 kg/person per year in North America (mostly packaging) to 20 kg/person per year in Asia (Nara, 2018). There are numerous concerns associated with the use of plastics, largely with regard to their impact on the environment and human health when discarded (Jambeck et al., 2015; Karbalaei et al., 2018; Borrelle et al., 2020). Only a small fraction is currently recovered and recycled, resulting in plastic leakage and environmental pollution (Barboza et al., 2018). Much ends up in landfills or illegal dump sites. In 2010, an estimated 8 million metric tons of mismanaged plastics leaked into the ocean (Jambeck et al., 2015), and emissions may reach up to 53 million metric tons per year by 2030 (Borrelle et al., 2020). Much of this mismanaged plastic is caused by single-use plastics (SUPs). SUPs are used for many applications, including food packaging such as grocery bags, food containers, bottles,

straws, cups, cutlery and other items intended to be used only once before they are discarded (Schnurr et al., 2018). Recently, the COVID-19 pandemic has created another source of SUP plastic pollution from mismanaged personal protective equipment (PPE) such as masks and gloves (Prata et al., 2020; Patrício Silva et al., 2020).

Accumulation of SUP waste in the environment has become a major problem, both because of the tonnage and the ability to resist degradation; most forms of plastic are not biodegradable, and so persist in the environment (UNEP, 2018a, 2018b). In most Caribbean nations plastic waste is disposed of in landfills, dumped illegally or ends up in the ocean where they continue to fragment into microplastics (Caribbean Policy Research Institute, 2017; UNEP, 2018b, 2018c; Ambrose et al., 2019; Diez et al., 2019). Microplastics, with a diameter <5 mm cause concern, because they can enter the human food chain via seafood (Barboza et al., 2018; Karbalaei et al., 2018, 2020; Morrall et al., 2018). Primary microplastics are manufactured (e.g., microbeads), while secondary microplastics are produced via fragmentation and weathering of macroplastics. It is almost impossible to recover microplastics, so they persist in the environment for centuries (GESAMP, 2016). Much of the current commercial fish stock including cod and mackerel now contain microplastics (FAO, 2016; Karbalaei et al., 2019), including those in the

\* Corresponding author.

E-mail addresses: [aclayton@faculty.cmu.edu.jm](mailto:aclayton@faculty.cmu.edu.jm) (C.A. Clayton), [trwalker@dal.ca](mailto:trwalker@dal.ca) (T.R. Walker), [issahaku.adam@ucc.edu.gh](mailto:issahaku.adam@ucc.edu.gh) (I. Adam).

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coastal and marine environments of the Caribbean (Morrall et al., 2018). The levels of microplastic consumption in the Caribbean are therefore likely to be high, given that fish forms an important part of the diet in most Caribbean nations (Waite et al., 2011; Caribbean Regional Fisheries Mechanism, 2016).

There are other human and ecological impacts that result from plastic mismanagement. For example, when burned, plastics release toxic chemicals into the air which can cause cancers, respiratory and other health problems if inhaled (Women in Europe for a Common Future, 2005; Zaman, 2010). Some chemicals (including BPA and phthalates) can cross the placenta in pregnancy, resulting in growth retardation and neurological harm to babies (Koushal et al., 2014). Finally, plastic waste can create an additional hazard simply because it is impervious to water. Some of the poorest communities in the Caribbean lack proper sanitation or waste collection systems, so plastic garbage accumulates and leaks into the environment. It traps rainwater in stagnant puddles, which are ideal breeding sites for disease-carrying insects like the *Aedes aegypti* mosquito, which is prevalent in the region. This results in disease spread, like Zika, Dengue and Malaria (Plastic Soup Foundation, 2016; Ewing-Chow, 2019).

### 1.1. The Caribbean

The Caribbean region is a group of states and territories in or bordering the Caribbean Sea, with a total population of 43 million (Otieno, 2018). The region contains approximately 7000 islands, islets, reefs and cays (Boudreau et al., 2012), along with Belize, Guyana and Suriname, which are mainland states with a Caribbean coastline. Only 239,681 km<sup>2</sup> (8.7%) of the regions total area of 2,753,000 km<sup>2</sup> is dry land, which makes the marine territory much larger than the land terrain. For example, the maritime territory in Jamaica is approximately 235,000 km<sup>2</sup> which is 21 times larger than the island itself (Creary, 2007). The Caribbean Sea is a primary transshipment route with direct access to the Panama Canal, a major gateway for transporting cargo. It is also a primary source for fish and fisheries products, providing socio-economic opportunities through direct and indirect employment, primarily in Guyana (31%), the Bahamas (11%) and Trinidad and Tobago (7%). Exports of fish and fishery products add significantly to the regional GDP, contributing US\$111.2 million to Guyana's economy in

2017 (Lusher et al., 2017; FAO, 2020), US\$87.7 million to the Bahamas in 2017 (FAO, 2020), and US\$27 million in 2016 to that of Trinidad and Tobago (FAO, 2020). Additionally, the Caribbean region is a major tourism destination. The climate and beaches help make the region one of the top tourist destinations in the world (Diez et al., 2019), and the destination for roughly half of the global cruise tourism. In 2018, the region received about 25.68 million tourists. The industry generated US \$32 billion dollars for the region, making it a major source of income, and by far the largest source of employment (United Nations World Tourism Organisation, 2020).

The region is organized into 30 different democratic political entities (CARICOM, 2020) which include 12 independent countries and 18 dependent territories. Each country is shaped, to some extent, by the colonial past, which established English, Spanish, Dutch and French as the four primary languages of the region and determined the basic political system of representative democracy. Cuba represents the only communist country of the region. The shared heritage and languages also lent themselves to the formation of the Caribbean Community and Common Market (CARICOM). CARICOM has fifteen full members, five associate members, all of which are UK overseas territories; and eight countries with observer status (Fig. 1). This review is focused on the English-speaking core members of CARICOM, which excludes Haiti and Suriname.

## 2. Methodology

The impact of plastic pollution on the environment has been studied widely and several global policy documents to reduce plastic marine pollution were reviewed for this study (e.g., Xanthos and Walker, 2017; UNEP, 2017, 2018a,d; Schnurr et al., 2018; Karasik et al., 2020). However, relatively little empirical research has been done within the Caribbean region. There has been a sharp rise in awareness and concern in the Caribbean about impacts of plastic pollution, but this appears to be largely a response to increased global concern about social, economic and environmental impact of SUP, rather than being based on any local assessments. This review was motivated by lack of regional policy studies aimed at assessing the extent and magnitude of the problem, identifying options to reduce SUP use and alleviate its impact. This paper examines current developments in SUP-related policies and/or



Fig. 1. Map of countries with full membership in CARICOM.

legislation in the Caribbean, including bans or levies, as well as the processes used to introduce the respective mechanisms. Most of these have not previously been documented or discussed in the academic literature.

This review started with a systematic approach based on that used by Adam et al. (2020). This involved assessing the level of knowledge in the region of the impact of SUP, compared to other regions and international fora, examining the formal approaches (i.e., those codified in law and/or regulation) taken to address the problem of SUP and the impact on the marine environment, and making recommendations for remediation and implementation measures consistent with the regions commitment to the United Nations Sustainable Development Goals (UN SDGs).

The review involved examining secondary data from news publications, peer-reviewed publications and conference proceedings, and relevant published and website reports from governments and international organizations, industry sectors, companies and NGOs. This required searches for key words and phrases across open sources, as well as searches in academic databases such as Proquest and Science Direct. Words and phrases included 'single-use plastic ban in the Caribbean', 'impact of single-use plastic on the economies of the Caribbean', 'marine pollution in the Caribbean', 'marine pollution and the economies of the Caribbean' and 'Caribbean response to marine pollution'. Key word searches were also applied for each country. For example, 'single-use plastic ban in Trinidad and Tobago'. The small size of each country meant that all policies identified were at the national level. This obviated the need to examine the geographical boundaries of each policy. The review focused on the reasons behind the initiatives, the measures accompanying each policy, and identified the key participants in the initiatives.

Solid waste management is already a major issue in the Caribbean. In Latin America and the Caribbean an estimated 145,000 tons of waste per day are disposed in open dumpsites, including 17,000 tons of plastic. (UNEP, 2018c). Few Caribbean nations have a comprehensive national solid waste management framework resulting in mismanagement of SUP waste (UNEP, 2018c). As a result, only 54% of the regions solid waste is disposed of in sanitary landfills, and much of the remainder ends up in storm drains and so into the ocean (Riquelme et al., 2016; Caribbean Policy Research Institute, 2017; UNEP, 2019a). This includes some 300,000 tons of plastic, which are not collected or processed, and eventually end up being disposed of in illegal dumps or waterways, accounting for approximately 35% of the waste in the regional marine environment (Diez et al., 2019). This is unsustainable, given the regions heavy dependence on beach-based tourism for revenue and employment, and for fish consumption.

The review therefore focused on current discussions, policies and practical activities aimed at reducing SUP usage. Most of these are still in a very early stage, so there was little basis for a comparison or analysis of the actual impact of the outlined policies, and the review did not examine the level of awareness among the general population. There are therefore several opportunities for further research, including an assessment of policy impact, tracking the raising of awareness among the population, and monitoring any changes in behaviour. To ensure validity and reliability, it was necessary to triangulate the data. This required 1) establishing consistency of the data, using at least three documents to support policy development process, announcements, implementation, and penalties, and 2) accessing original policy documents or utilizing information from a combination of at least three government and/or internationally accredited organizations, such as the United Nations and the World Bank.

### 3. Results and discussion

#### 3.1. Plastic in the Caribbean

Most Caribbean countries have open economies, but few have strong manufacturing or agricultural sectors, so most food and manufactured

goods are imported, along with substantial amounts of plastic in the form of packaging (Plastic Packing Facts, 2013). Trinidad, for example, annually imports, at least 49,000 tons of plastic for packaging used to protect imported food and other products (Hull and Williams, 2020). Disposable plastic has become ubiquitous in the region (UNEP, 2018c, 2019a, 2019b; Diez et al., 2019). Until recently, grocery stores gave free plastic bags to all their customers, and take-out meals routinely came with polystyrene containers, plastic bottles, plastic straws and cutlery, all placed in another plastic bag for convenient carrying (Caribbean Policy Research Institute, 2017; UNEP, 2018a, 2018b). All 13 countries have some plastic bottle recycling initiative, which collects a small percentage of the bottles, but apart from that, disposable items are not recovered and go on to cause waste management, environmental and health problems. Plastic bags, bottles, juice boxes and wrapping materials can very effectively block sewers and storm drains, causing flooding (Caribbean Policy Research Institute, 2017; UNEP, 2018a, 2018b; Cross, 2018; UNEP, 2019a; Grant, 2019). Plastic waste is transported into the ocean; and can threaten marine life and coral reefs, with serious implications for fisheries and food security, as well as tourism (Koushal et al., 2014; Thevenon et al., 2014; UNEP, 2018a, 2018b). The combination of factors – lack of capacity, limited fiscal space, wasteful consumption practices, absence of effective policy and weak enforcement – is why the Caribbean is home to ten of the top thirty global polluters per capita (Diez et al., 2019; Ewing-Chow, 2019). Major polluters include Trinidad and Tobago (which produces the largest amount of waste per day per person, in part because it has a manufacturing sector and an oil and gas industry), Antigua and Barbuda, St. Kitts and Nevis, Guyana, Barbados, St. Lucia, Bahamas, Grenada, Anguilla, and Aruba (Ewing-Chow, 2019).

Marine pollution is therefore a particular problem for the Caribbean (Ambrose et al., 2019; Brown, 2020). These states are major contributors to marine pollution but are also more dependent on the environmental quality of the Caribbean Sea, which is the base for the regions 'sand, sun, and sea' tourism package. Tourism directly contributes 15.5% of the regions gross domestic product and employs 14% of the labour force (World Travel and Tourism Council, 2019). The extent of the reliance on the marine environment is evidenced by the impact that the increase in the amount of sargassum algae being deposited on Caribbean beaches, is having on the tourism industry (The Caribbean Council, 2020; Brown, 2020). Sargassum is a natural phenomenon, but since 2011, the piling up of hundreds of tons of rotting, sulphurous weed on the shores has resulted in millions of US dollars being spent to remove the debris (Yong, 2019; Ellsmoor, 2019; The Caribbean Council, 2020). Surprisingly, this failed to raise awareness of the extent of dependency on the quality of the marine environment, and that marine debris can affect not only the marine and coastal environment, and marine biodiversity, but can also directly impact local economies (UNEP, 2018a, 2018b, 2018c).

The health of marine systems in the Caribbean is therefore vital to current and future development (Patil et al., 2016). Clean-up activities provide a snapshot of the level of solid waste pollution stranded on beaches. In 2018, nineteen Caribbean countries participated in the annual Ocean Conservancy International Coastal Cleanup. Debris collected in a single day of beach clean-up around the world, was measured and categorized (by percent composition), volume and weight. Eight participating countries in this review, accounted for 33% of the debris collected, with plastic bottles comprising 26% of all debris items collected in the region (Fig. 2). Collectively, nations of the Caribbean collected 4.2 million foam fragments, plastic and microplastics (Ocean Conservancy, 2017; Diez et al., 2019).

The Caribbean islands generate more waste per capita than average global waste generation waste. As island states with a high dependence on tourism, importation of products and poor waste management exacerbates levels of potential leakage. For example, the UNEP (2018c) report Waste Management Outlook for Latin America and the Caribbean estimate that the number of floating microplastic and macroplastics in the Wider Caribbean Region (WCR) is estimated to be about 82,000 and

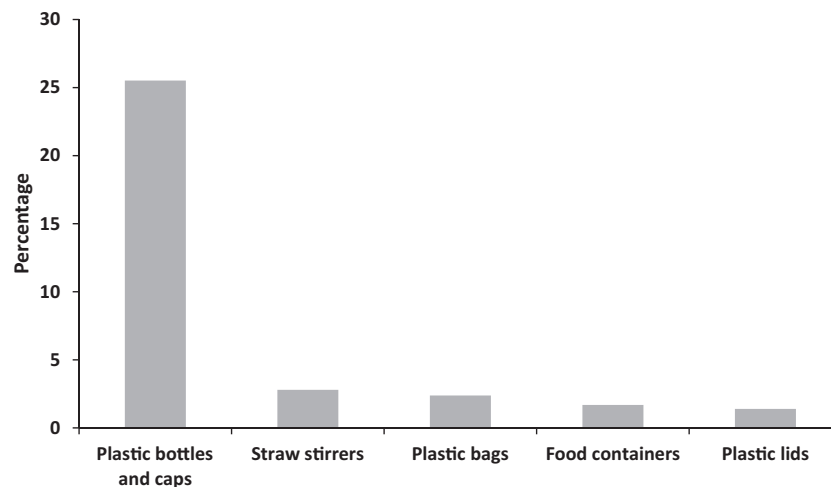


Fig. 2. Single-use waste composition of marine debris collected from 8 of the 13 countries under review in 2017. (Data from the [Ocean Conservancy \(2017\)](#).)

5000 pieces/km<sup>2</sup>, respectively making this region among those with the highest plastic concentrations in the world (UNEP, 2018c). Acosta-Coley et al. (2019a, 2019b) also found that microplastic densities along the Caribbean Coastline of Colombia were a hot spot for microplastic pollution.

In another study, Diez et al. (2019) found that Caribbean litter comprises 2014 items/km<sup>2</sup>, which is three-and a half times the global average (573 items/km<sup>2</sup>), but this debris does not all originate from the region. The Caribbean is part of the circulation in the great Ocean Conveyor current, which moves deep waters from the Atlantic to the Pacific and receives surface waters in exchange (Woods Hole Oceanographic Institution, 2020). This means that some debris items collected on Caribbean coasts originate from transboundary sources. For example, Ambrose et al. (2019) reported that many stranded plastic debris in South Eleuthera, The Bahamas were associated with Atlantic Ocean currents transporting leakage from the North Atlantic sub-tropical gyre. This exposes the region to quantities of marine debris that are higher than domestic patterns of consumption.

In response, the region has committed to addressing solid waste, primarily the anthropogenic causes, with plastic and SUPs being given priority. This has resulted in the adoption of a Regional Solid Waste Action Plan by CARICOM countries (UNEP, 2018c; Diez et al., 2019). This leaves each country to develop its own approach and framework for managing solid waste originated on land (Riquelme et al., 2016). In 1983, the Cartagena Convention was adopted, which is a regional legal agreement for the protection of the Caribbean Sea. Among other things the Convention is designed to reduce land-based sources of marine pollution, including SUPs (UNEP, 2020). Additionally, a Caribbean Regional Node for Marine Litter has been established which is co-hosted by the Cartagena Convention Secretariat and the Gulf and Caribbean Fisheries Institute. This was done within the framework of the Global Partnership on Marine Litter for which the UNEP Global Programme of Action is the Secretariat (UNEP, 2020).

Nevertheless, even with the Cartagena Convention and the adoption of the regional action plan for marine litter, as well as the commitment made by the UN Environment Caribbean Sub-Regional Office for the Caribbean to be free of SUPs and plastic pollution (UNEP, 2018c, 2019b), progress remains slow in the regional response addressing the extension of the problem in the marine environment.

In Jamaica, 75% of solid waste is collected, while uncollected waste is either buried, burnt or littered, often ending up in drains, rivers, gullies, beaches and ultimately the ocean (Caribbean Policy Research Institute, 2017). Waste that does reach authorized dumpsites is hampered by lack of any comprehensive waste separation or recycling

programs, which allows SUPs to be comingled with all other forms of domestic waste, which contributes to further environmental and social problems. In response, several independent initiatives have been recently introduced to address the use of plastic, with the objective of reducing its impact on the marine environment. Initiatives have been led by the public and private sector, civil society and communities (UNEP, 2019a). However, many of these initiatives are sporadic in nature and are not supported by any specific regulation or national policy. Many activities are uncoordinated or sustained, limiting their overall effectiveness. Given the scale of the problem, a coherent and cohesive policy framework is required for a sustained and effective approach to reduce SUP marine pollution.

### 3.2. Regional strategies to reduce plastic use and marine pollution

There is no universal response to regional SUP pollution (Prata et al., 2019). Various governments and companies have undertaken their own policies or voluntary bans to address their respective problems or areas of interest (Ambrose et al., 2019). The focus for regional governments has been on individual: policies, regulations, and legislation to reduce SUP debris (e.g., imposing bans on plastic bag production and bans on the use of plastic bags); market-based instruments (e.g., levies on SUPs) for minimizing waste; and penalties for non-compliance. Legislative policies have been applied in ten countries that now have national strategies. Guyana was never able to enforce compliance of its 2016 ban and is attempting to reintroduce new measures. These legislative bans set limits for use or access to SUP items, details of which are summarized in Table 1. All jurisdictions began with partial bans on the importation, sale and/or distribution of SUP items and progressed to complete bans, which included the production and importation of the products. As a general rule, implementation of bans is best done with adequate lead time and accompanied by the introduction of alternatives to allow people to change their behaviour (UNEP, 2018a; Adam et al., 2020; Karasik et al., 2020). However, 11 of the thirteen countries with bans announced the bans with little lead time (one to six months), which did not give the industry much time to respond with adequate alternatives. Ideally, the entire supply chain should have been addressed to develop new alternatives to SUP and introduce them to the market.

Currently, 11 countries have instituted national SUP bans: plastic bags, Styrofoam, or both (Fig. 3). St. Kitts and Nevis are at the local government level on the implementation of a national ban and is developing national plans and legislation, while Monserrat is still in the discussion phase (Government of Monserrat, 2018). These initiatives are intended to reduce volumes of mismanaged waste. It is important to

**Table 1**  
CARICOM countries national responses to single-use plastics.

Country and legislation	Date first ban introduced	Name of ban/legislation	Scope	Penalties for breach		Status and impact
				Fines	Imprisonment	
Antigua and Barbuda	January 1, 2016	The External Trade (Shopping Plastic Bags Prohibition) Order, 2017 Litter Control and Prevention Act, 2019	<p>January 1, 2016 – Antigua and Barbuda prohibited the importation, manufacturing and trading of plastic shopping bags. In July of the same year, the distribution of such bags at points of sale was banned. Success of the first year allowed for further phases.</p> <p>July 1st to December 31st, 2017 - Ban on importation and use of food service containers to include: clamshell and hinge containers, hot dog containers, bowls, plates, and hot and cold beverage cups. Depletion of stock on hand to be followed by monitoring and confiscation.</p> <p>January 1st to June 30th, 2018 - Ban on importation and use of plastic utensils (spoons, forks and knives), straws, fruit trays, meat trays, vegetable trays and egg cartons. Depletion of stock on hand to be followed by monitoring and confiscation.</p> <p>July 1st, 2018 to January 1st, 2019 - Ban on importation and use of “naked” Styrofoam coolers. Depletion of stock on hand to be followed by monitoring and confiscation.</p> <p>The ban extends to all businesses within the food service industry to include large and small supermarkets, grocery stores and the catering sector in Antigua and Barbuda. Items include: SUP shopping bags for retail purposes, Expanded polystyrene (Styrofoam) including bowls, plates, hot and cold beverage cups lids and caps, straws, forks, knives, spoons, fruit/vegetable/meat trays and egg cartons for retail purposes.</p>	US\$1110.	6 months.	In effect. In the first year, the ban contributed to a 15.1% decrease in the amount of plastic discarded in landfills in Antigua and Barbuda. The ban on the commercial use of plastic bags has seen major businesses conforming, but compliance among smaller operators remains problematic. To improve this situation, reusable plastic bags were distributed for free in all the smaller businesses. Fines are being discussed for the illegal trade in SUP.
Bahamas	January 1, 2020	Environmental Protection (Control of Plastic Pollution) Bill, 2019	National ban on plastic bags and Styrofoam including: SUP food ware, balloons and non-biodegradable single use plastic bags.	<p>1a) First offence – US\$2000</p> <p>1b) Continuing offence – Additional US\$500 for each day or part thereof during which the offence continue</p> <p>2a) Second Offence – Fine not exceeding US\$3000</p> <p>2b) Continuing offence – Additional B\$700 for each day or part thereof during which the offence continue</p> <p>3a) Corporate body – Fine not exceeding US\$5000.</p>	Not in effect.	In effect. Too early to assess impact.
Barbados	April 1, 2019	Control of Disposable Plastics Act, 2019–11	<p>April 1, 2019 – National ban on the import single use plastic containers and single use plastic cutlery.</p> <p>July 1, 2019 – National ban on distribution, sale or use of single use plastic containers plastic cutlery.</p> <p>April 1, 2020 – National ban on import or manufacture any petro-based plastic bag.</p>	US\$25,000. Continuing offence - US \$500 for each day or part thereof, during which the offence continues after which a conviction is first obtained.	One year.	Too early to assess impact.
Belize	January 15, 2020	Environmental Protection (Pollution from Plastics) Regulation 2020	<p>March 2018 – Belize approved a proposal to reduce plastic and Styrofoam pollution by phasing out of single-use shopping bags and food utensils. Driven by the financial burden of plastic waste clean-up, exposure of shoreline to the enormous floating island of plastic in the Caribbean Sea, and the harm discarded plastic has on marine life.</p> <p>January 14, 2020 – Law officially signed.</p>	Not in effect.		In effect. Too early to assess impact.
Dominica	January 1, 2019	Budget Address 2018–2019: From Survival, to	December 2018–0% duty on the importation authenticated biodegradable products (Lids, Cups,	Not in effect.		Too early to assess impact.

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Table 1 (continued)

Country and legislation	Date first ban introduced	Name of ban/legislation	Scope	Penalties for breach		Status and impact
				Fines	Imprisonment	
		Sustainability and Success: A Resilient Dominica	Single Use Containers, Cutlery, and Drinking Straws) as well as no duty on the importation of reusable shopping bags. January 1, 2019 - Ban on the importation of the non-biodegradable single use plastics from all ports of entry.			
Grenada	February 1, 2019	Non-Biodegradable Waste Control (Plastic Bags) Order	February 1, 2019 - National ban on importation and local manufacture of single-use plastic shopping bags with handles. December 1, 2019 - Ban on the sale or offer for sale of single-use plastic shopping bags with handles. February 1, 2020: No person shall offer for sale any food item in or with a single-use plastic shopping bag with handle. Additionally, there shall be no importation, manufacture, sale or offer for sale of SUP cutlery, plates, straws and cups.	Not in effect.		In effect. Too early to assess impact.
Guyana	January 1, 2016	Litter Regulations	National ban on the use, importation or manufacturing possessing and selling food in the Styrofoam.	No less than \$50,000 (US\$240). Businesses - issued written warning prohibiting the use of expanded polystyrene; or a fine of no less than \$100,000 (US\$480).	None included in legislation.	Initial legislation failed. New initiative being developed.
Jamaica	January 1, 2019	The Trade Act The Trade (Plastic Packaging Materials Prohibition) Order, 2018 The Natural Resources Conservation Authority (Plastic Packaging Materials Prohibition) Order, 2018	As of January 1, 2019 the Government will impose a ban on single use plastic bags, cutlery, straws and polystyrene. The ban covers the importation, manufacture and distribution of the materials. The plastic bags to be banned are those that are commonly referred to a 'scandal bags' or other bags with dimensions of 24 in. by 24 in. or less.	Not exceeding J\$2m (US\$14,040).	Not exceeding two years.	2015 estimates state that each person used 500 'scandal' bags per year, an estimated 75% increase from 2011.  In effect. Too early to assess impact.
Montserrat	December 31, 2018 Go Green Initiative		The <a href="#">Government of Montserrat</a> , through the Cabinet banned the use of plastic products, such as plastic cups, plates and Styrofoam dishes in all Government Ministries and Departments.	Not in effect.		No ban in effect.
St. Kitts and Nevis	No legislation in place. In 2018 the Plastic Free July, initiative began to educate citizens on the personal, natural and economic effects of plastic pollution.		December 2019: During the Budget 2020 debate, Minister Eugene Hamilton stressed the importance of establishing a national position on plastic waste. The subject continues to be discussed at a national level.	Not in effect.		No ban in effect.
St. Lucia	August 1, 2019	The Styrofoam and Plastics (Prohibition) Act No. 22 of 2019	In March 2018, the Cabinet of Ministers were requested to consider and endorse the following recommendations: A phase-out of Polystyrene (Styrofoam) food service containers. An imposition of a 0% Import Duty on all biodegradable and compostable food service containers. A total ban on plastic shopping bags, in order to encourage the use of reusable shopping bags, along with total ban on single use plastics and personal care products containing microplastics thereby reducing the impact of plastics on the environment, both marine and terrestrial.  In 2019 the ban was introduced which made illegal the importation, manufacture, sale, use and/or distribution of Styrofoam and plastic food service containers.	Seizure – Individual required to pay for storage, the export of the illegal items, or, the disposal of the illegal item. Importation, manufacture, use, and distribution - not exceeding \$15,000 (US\$5550).	Not in effect.	In effect. Too early to assess impact.
	May 1, 2017		May 1st, 2017 – National ban on Styrofoam containers. March 1st, 2020 – National ban on the importation of	Not in effect.		In effect. Too early to assess impact.

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Table 1 (continued)

Country and legislation	Date first ban introduced	Name of ban/legislation	Scope	Penalties for breach		Status and impact
				Fines	Imprisonment	
St. Vincent and the Grenadines		The Environmental Health Control of Disposable Plastics Regulations 2019	disposable plastic shopping bags. August 1st, 2020 – National ban on the importation of disposable plastic food service containers. August 1st, 2020 – National ban on the distribution, sale or use of disposable plastic shopping bags. January 1st, 2021 – National ban on disposable plastic food containers from.			
Trinidad and Tobago			July 2018 – Government announces ban on the importation of polystyrene foam products effective 2019. January 1, 2020 – National ban on the use and importation of single-use plastic and polystyrene Remove customs duties on eco-friendly alternatives.	Not in effect.		In effect. Too early to assess impact.

recognize that while some countries, such as Trinidad and Tobago, St. Vincent and the Grenadines and Jamaica, have the capacity to produce some SUP,s all of them import a significant amount of the plastic they use (UNEP, 2018a, 2018b, 2018c), which is why the national bans make the importation of most SUPs illegal.

### 3.3. First adopter advantage - a multi-pronged approach – educate, engage and alternatives - the case of Antigua and Barbuda

In 2016, Antigua and Barbuda became the first Caribbean country to successfully implement a ban on the importation and use of SUP bags commonly used for grocery and retail shopping. This was first introduced in major supermarkets (and later extended to smaller retailers) as SUP bags accounted for 90% of plastic debris in the environment. The process began in July 2015 and included six months of lead time prior to the introduction of the ban in 2016 (Diez et al., 2019). It included consultation and involvement of various key stakeholders at all levels which helped to reduce the burden on consumers and ensured that alternatives to SUPs were available for all products (UNEP, 2018a, 2018b). It also included regular progress updates by the government and a public education campaign, with messages on reusable bags to encourage widespread acceptance of the ban. The awareness-raising campaign was used to educate the population of the reasons behind the switch, and to give them a sense of commitment, with the slogan “I’m making a difference one bag at a time”. Additionally, after the ban was introduced, the public was given several incentives to switch to reusable and biodegradable alternatives. Shoppers were provided with tax-exempt reusable bags, and supermarkets provided single-use recycled paper bags. Biodegradable alternatives were also made locally from sugar cane, bamboo, paper, and potato starch (Diez et al., 2019).

However, despite the success there were still challenges two years after the introduction of the ban (The Daily Observer, 2018), and this led to public discussions and introduction of fines and penalties for breaching the ban. This combination led to a 15.1% decline in the amount of plastic waste going to landfills in the first year after the ban was introduced (Seucharan, 2019). It is likely that this made way for the subsequent expansion of the ban to include Styrofoam and polystyrene receptacles including coolers, food service containers, plastic utensils, straws, fruit trays, meat trays, vegetable trays and egg cartons (Government of Antigua and Barbuda, 2017; UNEP, 2018a, 2018b; Diez et al., 2019).

### 3.4. A consultative phased approach

Some countries such as Dominica, Grenada, St. Lucia and St. Vincent and the Grenadines, have recently implemented their bans, based on a systematic engagement framework. For example, St. Lucia took initial steps in March 2018 towards phasing out polystyrene food service containers (Karasik et al., 2020). The process included imposition of a 0% import duty on all biodegradable and compostable food service containers, a total ban on plastic shopping bags, to encourage the use of reusable shopping bags, along with total ban on single use plastics and personal care products containing microplastics, thereby reducing the impact of plastics on the environment, both marine and terrestrial. This was done simultaneously with: i) the establishment of a collaborative framework between the Saint Lucia Solid Waste Management Authority, and the relevant agencies to implement waste diversion and minimization strategies that encourage recycling, reuse and composting; and ii) public education campaigns aimed at promoting environmentally friendly products such as biodegradable products and the economic/environmental impacts of SUPs, in contrast to their alternatives; and to encourage positive behaviours such as community recycling and composting (Government of St. Lucia, 2019).

The St. Lucian government aims to increase the lifespan of the landfills, provide employment/economic opportunities and improve environmental stewardship. This collaborative approach was also used

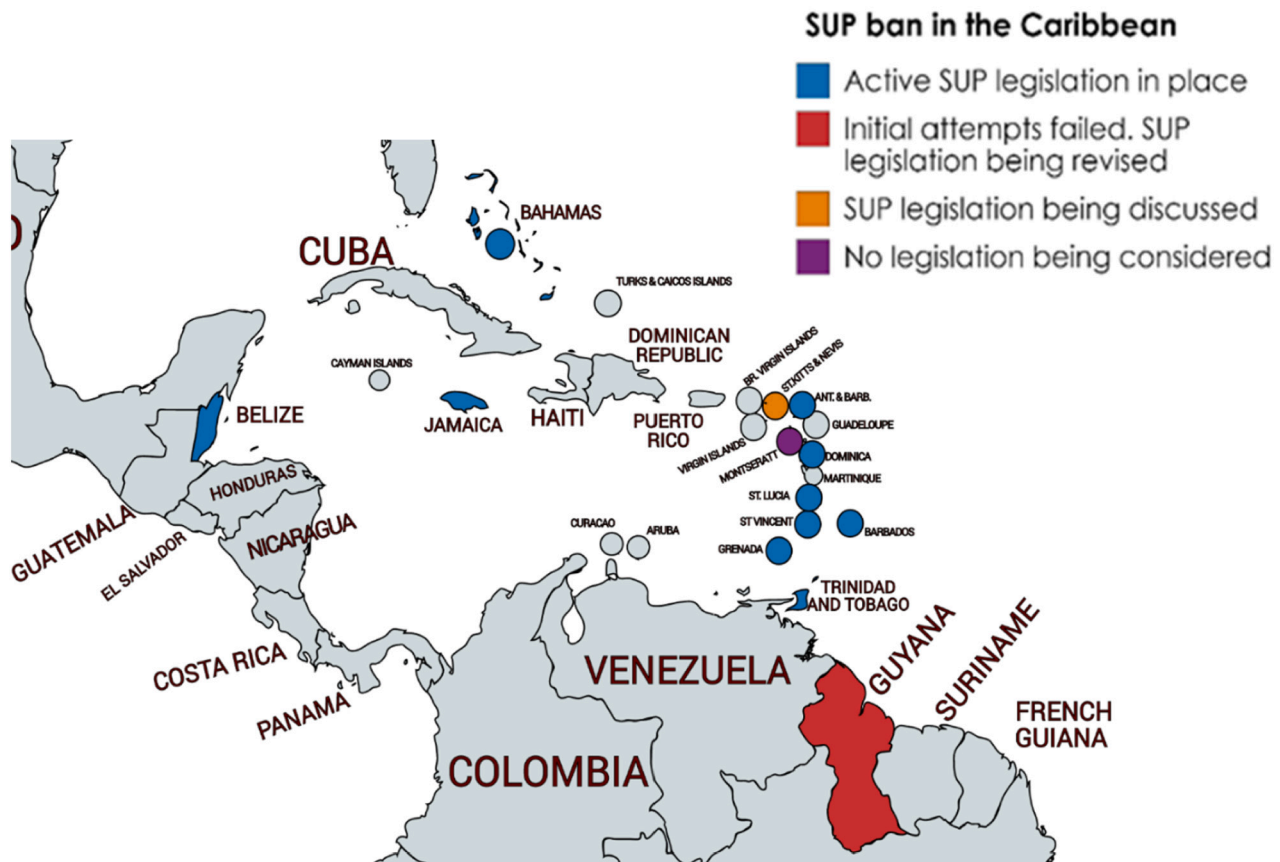


Fig. 3. Plastic bans in the Caribbean as of April 2020.

in the Bahamas which introduced a phased implementation ban on SUPs and polystyrene which went into effect on January 1, 2020, with a transition period of six months (Government of the Bahamas, 2019). As with Jamaica, fines were to be introduced in June 2020. Their collaborative process involved key stakeholders, including the Ministry of Environment and Housing, Ministry of Tourism, Ministry of Health, Ministry of Finance, Customs Department, University of The Bahamas, the Bahamas Chamber of Commerce and Employers Federation, The Bahamas Plastic Movement, The Nature Conservancy, Atlantis Paradise Island and Baha Mar Ltd. Their goal was to develop an inclusive national campaign to phase out SUPs by the end of 2020 (Government of the Bahamas, 2011; Ambrose et al., 2019).

Barbados also introduced a phased approach to eliminating SUPs and polystyrene. Barbados introduced the longest lead time. The plan was initially announced in 2018, with a projected two-year lead time. Beginning in April 2019, Barbados introduced a phased approach beginning with a ban on the importation of SUP and polystyrene items. In July 2019, a ban on the trading of these items came into effect, and on April 1, 2020, the full ban took effect. Stakeholders, including industry leaders and the newly created Ministry of Marine Affairs and the Blue Economy continue to collaborate to create sustainable alternatives to SUPs (Simpson, 2019; The Barbados Advocate, 2019).

A consultative, phased approach was also used in Dominica, which also plans to become the world's first climate-resilient country (Gibbens, 2018). In December 2018, the government established a 0% import duty on authenticated biodegradable products and reusable shopping bags. This was followed by a comprehensive ban on all SUPs and polystyrene which took effect in January 2019 as a part of the 'Go Green Dominica initiative'. The government has continued to engage with businesses and residents towards their goal and in February 2020, another phase of

their strategy was introduced; to provide reusable jute and cotton bags free to all households on the island (Skerrit, 2019; Government of Dominica, 2020). As these are very recent initiatives, the results of these efforts cannot yet be determined.

### 3.5. Non-compliance - fines and enforcement

Legislation addressing SUPs across the region has been primarily aimed at mitigating the effects of poor waste management systems, under the umbrella of environmental stewardship. Many of the legislative measures were enacted with accompanying penalties for non-compliance. In Antigua and Barbuda, fines were applied for delinquency; in other countries, such as Jamaica, Belize and Barbados, fines were a part of the original legislation (Government of Jamaica, 2018a, 2018b; Government of Barbados, 2019; Government of Antigua and Barbuda, 2019). Details of current penalties for non-compliance are summarized in Table 1.

Barbados has proposed fines for offenders who breach the established bans. Under the Control of Disposable Plastic Bill, anyone found guilty of importing, selling or using SUPs could be fined up to US \$25,000 and/or one-year imprisonment (Government of Barbados, 2019). The Government of the Bahamas stated in 2019 that they would implement a law to take effect on January 1, 2020, introducing fines up to US\$2000 for businesses that break the law after the six-month transition period (Mckenzie, 2019). While fines in Belize are based on the amount of plastic a person possesses, with a minimum figure based on the threshold for the amount of plastic.

In countries where bans have been introduced, there is often weak enforcement, which affects their effectiveness. For example, Trinidad and Tobago introduced bans, but with a lack of clarity on its reach and



enforcement. In 2019, the Minister of Finance, Colm Imbert, indicated in his presentation of the national budget that there was never a complete ban on SUP items since, for example, 60% of the polystyrene used in Trinidad is manufactured locally. This meant that the polystyrene ban was only relevant to the 40% being imported. Additionally, to circumvent the ban, producers of plastic and Styrofoam were conducting trials to try to make plastic more rapidly degradable with various additives. This attempt to beat the system frustrated environmentalists, who were irate that the government did not appear to accept that reducing the use of plastics could help to improve the environment and create new business opportunities (GlobalVoices, 2020). Barbados also faced some setbacks with implementing the ban on plastics. Barbados made preparations to develop a bill, specifying fines for people who broke the law regarding the use of plastics. Barbados had envisioned implementing a ban on the importation and sale of SUPs on April 1, 2019. However, business owners requested an extension to get rid of their old stocks. As a result, the date was pushed back to January 1, 2020, and then to April 1, 2020 so that citizens could make the necessary adjustments (Loop, 2019).

### 3.6. Lessons learned

#### 3.6.1. Need for effective communication and provision of alternatives

Other countries have adopted various hybrid approaches. In 2013 Guyana unsuccessfully attempted to enact a ban on Styrofoam. The attempt failed to garner support from the business community and was subsequently rejected. In December 2015, its government announced the ban without consultation, with an implementation date of January 1, 2016 (Stabroek News, 2015). This top-down approach left little room for discussion, with businesses unprepared and no time to find suitable alternatives. This model was closely followed by the Jamaican government who made its announcement in September 2018 for implementation on January 1, 2019. In Jamaica, the ban was applied to the importation and manufacture of all SUPs, included plastic bags, straws and Styrofoam. It was implemented through a Ministerial Order under the Trade Act of Jamaica. This makes it easier for governments to reinforce the bans with businesses instead of targeting individuals. In fact, Jamaica recently conducted a Regulatory Impact Assessment, the results of which were intended to inform or support the policy response (NEPA, 2020). Upon implementation, both governments immediately refused the entry of Styrofoam items into the country and banned the manufacturing of the product (Environmental Protection Agency - Guyana, 2015). However, the governments differed in some of the measures adopted subsequently. For example, the government of Guyana conducted an audit to access the volume of Styrofoam which was in stock in the country (Ministry of Natural Resources, 2016). This allowed for an inventory of stored Styrofoam to be identified and used with no business suffering losses due to redundant stock. In Jamaica, no formal audit was done. Instead, a three-month moratorium was given to allow for use of existing stock.

Negative outcomes in both Guyana and Jamaica have been apparent. Neither country provided standard alternatives for the consumers. In Jamaica where there are local manufacturers of plastic and polystyrene products there should have been consultations with business related to alternatives compared to those countries who rely heavily on imported SUPs. In Guyana, in particular, there is still a clear need for suitable alternatives (Staff Reporter, 2019). The creativity of the Jamaican people, however, has resulted in a number of spontaneous alternatives, as many businesses developed branded reusable bags to substitute for the SUPs. Unfortunately, in both cases, the public has had to pay the price; where alternatives have been provided, they have been more expensive (starting at US\$2) than the previously issued single use item which was not an immediate additional cost to the consumer. Additionally, Jamaica has seen the continuation of the use of SUPs and Styrofoam products beyond the three-month moratorium initially established (Bennett, 2019), as local manufacturers can apply for an

exemption until 2021. This seems to contradict the position taken by the government, when it proceeded to implement the ban on the manufacture, distribution and use of Styrofoam products on January 1, 2020 (Linton, 2019). There have been some positive effects as a result of the bans; there has been a reduction in SUPs in debris and in the waste management systems in both countries (Ministry of Communities, 2017; Buzz Contributor, 2019). It has also stimulated the development of new business ideas as companies work to find alternatives. Guyana is now moving to introduce a comprehensive ban on SUPs by 2021 (Khan, 2019). The lack of effective communication with the key stakeholders at various levels, primarily local businesses such as supermarkets and restaurants, could have avoided many of the current pitfalls. Local businesses in both countries continue to find creative ways to respond. The Guyanese government has been forced to re-examine its approach, while Jamaica has seen the emergence of a black market for SUP, which presents an opportunity for further research.

#### 3.6.2. Importance of lead-time

The Caribbean lifestyle has included SUPs for more than three decades. This means that any proposed reform will require enough time between announcing a change and completing the process. Inadequate lead time can create problems, if it affects a country's ability to develop and implement the plans necessary to effect change, as well as the time allotted to residents to respond to the need for change (UNEP, 2018c, 2019a, 2019b). Jamaica and Guyana both introduced legislation with very short notice (three months). The lack of prior consultation and warning by the Governments was seen as a lack of sufficient lead time by the private sector, which pushed back forcibly in the case of Guyana. Short lead time might look like decisive government action but does not allow for planned phase-out or the development and roll-out of satisfactory alternatives. The result in both countries has been the long-term use of the banned product, so rapid, forced compliance was actually counter-productive. This approach typically leads to a scarcity of the SUP item and emergence of an illegal trade.

After the initial introduction of the bans in both countries, there were reports of significant support for the ban (Department of Environment, 2018; Morris, 2019; Guyana Times, 2019), but there are still problems with standardized available alternatives to SUP bags. Many organizations are still without a steady supply of biodegradable single-use options, as paper bags are not manufactured domestically and have to be imported (Charles, 2019; Guyana Times, 2019). This lack of alternatives could have been addressed if the stakeholders had been engaged and given more warning before the bans took effect. Programs with a short lead time are therefore less likely to succeed. Programs with more consultation and effective information campaigns are more likely to work in practice. The Government of Jamaica has done little, one year after the ban, to investigate these issues or to explore these adjustment problems and other short-term effects, and there is a lack of reliable data on the effects of the plastic ban on debris, waste collection and sales (Government of Jamaica, 2018a, 2018b).

### 3.7. Policy recommendations to reduce SUP marine pollution in CARICOM countries

Numerous policy instruments exist for governments of CARICOM countries to reduce SUP marine pollution (UNEP, 2018a, 2018b, 2018c; Diez et al., 2019). Policy instruments include legislative bans on certain types of SUPs (Xanthos and Walker, 2017). These historically focused on plastic shopping bags, but recently legislative bans have been expanded to include bans on other SUPs (e.g., food packaging and utensils). Other policy instruments to reduce SUPs includes economic instruments, such as taxes and levies and are designed to change human behaviour and dissuade use of certain types of plastics (i.e., problem or harmful plastics found in the environment) (Schnurr et al., 2018). Revenues from taxes or levies have been used in other jurisdictions to fund green initiatives, such as education, fund recycling schemes, among others. Another

policy instruments for governments of CARICOM countries to consider implementing is extended producer responsibility (EPR). EPR strategies leverage corporate resources to reduce SUP waste generated by consumers. Implementation of EPR strategies allows local jurisdictions to gain greater control over their waste streams (Diggle and Walker, 2020). Finally, best practices based on UNEP (2018a) and Karasik et al. (2020) reports that can also guide governments of CARICOM countries to implement effective policy approaches and best practices to reduce SUP pollution are summarized below:

**Foundation:** This includes activities designed to:

- **Assess baseline conditions** - Assessment of baseline conditions provide policymakers with evidence of categories of SUPs most commonly found in the environment.
- **Evaluate appropriateness of possible policy actions** – It is important to evaluate the most appropriate instruments that will be beneficial in addressing specific issues identified in baseline surveys.
- **Assess sustainable development impacts of preferred options** - Once appropriateness of possible actions has been assessed, governments of CARICOM countries may consider a short list of suitable instruments.

Before selecting the most appropriate option that would address the issues and needs identified in the baseline assessment, a key step would be to study sustainable development impacts of short-listed choices, taking into consideration all sectors (including food and/or other retail) and all segments of the population. For example, although the environmental benefits of introducing a ban might be highly positive, the social impacts on a large part of the population might be unsustainable, making bans not the most desirable option (UNEP, 2018a).

**Preparation:** The preparatory stage is designed to engender population support which helps in producing sustainable results. It may be necessary to:

- **Engage stakeholders** - Acceptance from the broadest range of stakeholders is important, and can be ensured through calls for early inputs, policy discussion meetings, and wide-reaching awareness campaigns. Special attention should be paid to mapping the main stakeholder groups that will be affected by the new policy and their relative power. Being able to present evidence-based options (informed by thorough baseline studies) can help support selected policies and ensure effectiveness.
- **Raise awareness** - Resistance is likely to decrease if consumers are aware of the social, environmental and economic impacts of mis-managed SUPs. These can be communicated through a variety of methods, ranging from: educational programmes, workshops in schools, extensive multi-media awareness-raising campaigns, distribution of information material and demonstrating alternative options to SUPs (reusable bags, reusable bottles). Campaigns should have a clear and simple message, relevant for all stakeholders.
- **Make provision for sustainable alternatives** - Before banning any SUPs, governments may wish to verify presence of appropriate sustainable alternatives (UNEP, 2018a).
- **Provide incentives to industry** - When regulating production and consumption of SUPs, governments may face resistance from plastic producers and from packaging importers and distributors. To limit resistance and gain support, governments may consider providing incentives to industry. Incentives should be introduced long before new legislation is implemented to guarantee enough time for plastic manufacturers, distributors and retailers to adapt to new regulations. Measures may include provisions to allow time to adapt. For example, provide enough time for retailers to deplete existing plastic bags stocks, begin alerting consumers of the upcoming change and purchase new alternatives. Tax rebates and financial incentives to stimulate production of cost-effective alternatives to SUPs can also be considered (UNEP, 2018a).

- **Use revenues to support environmental programs and promote international cooperation and innovation** - When introducing levies on SUPs, consideration should be given to how revenues from that economic instrument will be used. To maximize public benefits, revenues from levies could be used to: support specific environmental projects, boost local recycling industry, create job opportunities in plastic recycling. Finance awareness initiatives which promote for instance waste minimization. **Enforce policies** - To guarantee good governance, enforcement and monitoring of policies it is important to clearly distribute and define roles and responsibilities between local, national and sub-national authorities and organizations. For example, in the case of a levy on retailers, it should be made clear to the retailers how and when the levy should be collected or deposited. In the case of levies on consumers, the public should be made aware of the costs they have to pay. **Continue to monitor SUP pollution and adjust policies as necessary** - It is important to monitor progress and effectiveness of introduced policies and adjust accordingly (UNEP, 2018a).

#### 4. Conclusions

As each Caribbean country has unilaterally sought to address SUPs, there needs to be a greater consensus among the countries, and more sharing of best practices as to the policy approach (e.g., legislative or economic approaches or a combination of both) that would be most effective. The consultative and engagement model adopted by most have yielded some success, highlighting the weaknesses in the top-down systems of Jamaica and Guyana. The Jamaica-Guyana approach would actually be more effective if they were less abrupt and coercive, and included support for substitutes and the use of legislative and other tools to nudge consumers towards these more environmentally friendly options.

Further, regulatory (e.g., bans) or economic (e.g., levies) instruments should be introduced in stages, and move forward in phases, with education campaigns and good marketing of alternatives. Countries should work more closely with all stakeholders and the public, ensuring that they are aware of the direction of travel and the timetable. Adequate lead times (i.e., more than a year) would help, especially if supported by research and development. This is closer to the model used in Antigua and Barbuda. Penalties are usually necessary to deal with recalcitrant operators, but in many cases a system of phased substitution, with adequate alternatives available, would make the process far easier. Once the public is persuaded of the case for switching, the battle is largely won.

Economic instruments, such as SUP levies or taxes can also be used to contribute to development of more sustainable alternatives. Antigua and Barbuda, for example, promoted cloth bags that local tailors and seamstresses were taught to make, and ensured that there were several alternatives for Styrofoam (including paper and a cardboard made from starch). These alternatives were developed in partnership between the government and private sector. Therefore, it is important to examine both the SUP products currently in use and any proposed alternatives to ensure that the transition from the status quo is a substantial net gain for society and for the environment.

#### CRedit authorship contribution statement

**C. Andrea Clayton:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft, Funding acquisition. **Tony R. Walker:** Conceptualization, Validation, Writing - review & editing, Resources, Supervision, Project administration. **Joana Carlos Bezerra:** Data curation, Writing - review & editing, Funding acquisition. **Issahaku Adam:** Writing - review & editing, Visualization, Funding acquisition.

## Declaration of competing interest

The authors declare that they have no known competing interests or personal relationships that could have appeared to influence the work reported in this paper.

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