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Contents

Tables

Figures

Glossary of acronyms and abbreviations

AEPW	Alliance to End Plastic Waste
BPA	Bisphenol A
CBCL	A multidisciplinary engineering and environmental consulting firm in Atlantic Canada
CLCPA	Closed Loop Cycle Production in the Americas Program
DSD	Department of Sustainable Development
EPS	Expanded Polystyrene
EPSRC	Engineering and Physical Sciences Research Council
FMCGs	Fast-Moving Consumer Goods
GDP	Gross Domestic Product
HDPE	High-Density Polyethylene
IMF	International Monetary Fund
LDPE	Low-Density Polyethylene
NERC	National Environment Research Council
OAS	Organization of American States
PET	Polyethylene Terephthalate
PP	Polypropylene
PPE	Personal Protection Equipment
PRIF	Plastic Research and Innovation Fund

PS	Polystyrene
PVC	Polyvinyl Chloride
SIDS	Small Island Developing States
TT	Trinidad and Tobago
UKRI	United Kingdom Reserach and Innovations
USA	United States of America
USD	United States Dollars
USDA	U.S. Department of Agriculture
UNEP	United Nations Environment Programme

Abstract

Over the past 50 years, the global annual production of plastics has increased dramatically, from 15 million tonnes in 1964 to roughly 311 million tons by 2014. This spectacular growth has occurred due to its unrivalled physical properties, which allow it to be widely applied in diverse economic production processes, at low cost. One of its main appplications has been in the packaging industry where roughly 26% of the global volume of plastics is used. More importantly, as much as 95% of plastic packaging – estimated at USD 80 – 120 billion annually - is for single-use, either as packaging or as items intended to be used only once before they are discaded as waste or recycled. Of this amount, only 5% is routinely reclycled, and with the bulk ending up either in landfills, water courses or even oceans. Single-use plastics have become a major global threat to public health and the natural environment. On this basis, many countries have implemented various legal and policy sanctions to limit and or control the use of single-use plastics in their economies. Within the Caribbean subregion, as many as twenty-seven countries and territories have legislated or proposed some form of policy controls on reducing the use of plastics over the past decade. The present study examines the economic implications of a ban on single-use plastics proposed for implementation in Trinidad and Tobago in 2020. Applying a cross-section analysis, the potential direct impacts to the economy were assesed at roughly 0.058% of annual GDP, to be borne by six key economic subsectors. A revised incentive framework, enhanced waste management infrastructure, public education and awareness raising intitiatives were identified as important policy elements to be undertaken in the implementation of the ban. Given several limitations of the research, this economic assessment is deemed to be at best a lower bound estimate of the total potential economic impacts.

Introduction

Over the past 50 years, the global annual production of plastics has increased dramatically, from 15 million tonnes in 1964 to roughly 311 million tons by 2014 (Ellen MacArthur Foundation, 2016). This spectacular growth in production and use of plastic reflects its unrivalled physical properties, which allow it to be widely applied in diverse economic production processes, at low cost. Plastics have therefore taken their place as the global 'work horse of the modern economy', and projections are for a doubling of plastic production over the next twenty years. Their use is extensive and includes industries such as food handling, storage, information technology, health care, transportation, energy management, building construction, and packaging, to name a few.

The employment of plastics in the packaging industry is significant, since it represents the largest share of plastic applications, estimated at 26% of the global volume of plastics used. More importantly, as much as 95% of plastic packaging – estimated at USD 80 – 120 billion annually - is for single-use, either as packaging or as items intended to be used only once before they discaded as waste or recycled. These include, among other items, grocery bags, food packaging, bottles, straws, containers, cups and cutlery. It also includes Expanded Polystyrene (EPS) foam (commonly referred to as "Styrofoam") (Ten Brink, 2016).

Of the large volume of single-use plastic applications, only 5% is collected and retained from recycling (Ellen MacArthur Foundation, 2016). Such low rate of reuse implies that plastic disposal constitutes a significant negative externality to global economies, with its impacts now being manifested both in terrestrial and marine ecosystems. According to the United Nations Environment Programme (UNEP) estimates, plastic packaging externalities now amount to USD 40 billion, for which a major share is attributable to impacts on the world's oceans which receive up to 8 million tonnes of plastic leakage annually. Given the magnitude of these impacts, the global community has been seeking to mitigate the effects of plastic pollution through strategies and policies to reduce single-use plastics. Among such strategies is the promulgation of new legislation, or the reshaping of the incentive frameworks in order to stimulate the use of more sustainable alternatives.

Caribbean Small Island Developing States (SIDS) are among several countries that are seeking to better control single-use plastics. To date, as many as twenty-seven (27) countries and territories of the

subregion have implemented, or are in the process of implementing some form of legislative control over the use of single-use plastics (Table 1). Given that most of these countries possess little or no plastic manufacturing capacity, such controls have been mainly through import bans,[1] or other measures calculated to limit their application in production and distribution. But substituting for single-use plastics presents many economic, environmental and social implications which become apparent in the form of higher costs of doing business for several production and service entities. Moreover, opportunities for applying alternatives, and their related cost elements remain largely unknown in the context of Caribbean small economies.

Towards this end, this study presents an economic analysis of the possible impacts of policy to limit the use of single-use plastics in selected economies of the Caribbean. By approximating the cost to the economy related to the implementation of thelegislative controls , governments could be better guided in providing the appropriate incentive framework that would allow the economy to successfully transition to alternative replacements to single used plastic products over the medium to long term. The study focuses on the economy of Trinidad and Tobago as a case analysis. It examines the role of single-use plastics in production and distribution in selected value chains and estimates related cost margins in order to assess the potential for substitution of alternatives to single-use plastics. The paper is presented in 5 sections. After the introduction, the nature of the plastics problem from a global, regional and local perspective is discussed in Section 1. Section 2 then elaborates on the methodological approach to the study, while data analysis and results are presented in section 3. In Section 4 policy recommendations and conclusions from the study are presented, and key limitations from the research are outlined in Section 5.

Table 1
Status of styrofoam and plastic bag bans in the wider Caribbean Region, 2019

Country	Date of implementation
Anguilla	March 31st, 2019
Antigua and Barbuda	January 1st, 2016
Aruba	January 1st, 2017
The Bahamas	June 1st, 2020
Barbados	April 1st, 2019
Belize	April 22nd, 2019
British Virgin Islands	In Discussion
Cayman Islands	In Discussion
Curacao	In Discussion
Dominica	January 1st, 2019
Dominican Republic	In Discussion
Guyana	January 1st, 2016
Grenada	February 1st, 2019
Haiti	August 1st, 2013
Jamaica	January 1st, 2019
Montserrat	In Discussion
Puerto Rica	December 1st, 2016
Saint Barthelemy	In Discussion
Saint Kitts and Nevis	In Discussion
Saint Lucia	December 1st, 2018
Saint Martin	In Discussion
Saint Vincent and the Grenadines	January 31st, 2018
Sint Maarten	In Discussion
Suriname	In Discussion
Trinidad and Tobago[2]	Draft legislation
Turks and Caicos Islands	January 1st, 2017
United States Virgin Islands	January 1st, 2017

Source: UNEP 2019c.

[1] In this study the use of the word ban implies any legislative control on the import of materials considered as single-use plastics. Note that this classification can vary depending on member country legal definitions.

[2] For Trinidad and Tobago, the ban is proposed for Polystyrene (Styrofoam) only.

I. Nature of the plastics problem

In its broadest context, the problem of plastics is situated in the global challenge of waste management which now confronts humanity. According to Graves (2019), this has become an enduring problem globally, and the impact of poor waste management strategies reverberates through all sectors, affecting public health, economies, industries, and the environment. Poor waste management also contributes to climate change and disasters (UNEP, 2019b).

By way of examples, plastic packaging made up 47% of plastic waste globally in 2015, and many governments have identified it as the "most problematic" to manage(UNEP, 2018a). At the same time, single-use plastics also account for approximately 8-9% of the global waste stream (UNEP 2019b). It is a product of the petrochemical industry (Degnan, 2019; OAS, 2016) and has found widespread application globally due to its durability, versatility, low cost of production, high quality, and resistance to decay (OAS, 2016). It is useful to noted that these same application advantages which have lend to the generation of massive waste and pollution issues at the global level (Graves, 2019).

There are seven different types of plastics, these being: (i) Polyethylene Terephthalate (PET); (ii) High-Density Polyethylene (HDPE); (iii) Polyvinyl Chloride (PVC); (iv) Low-Density Polyethylene (LDPE); (v) Polypropylene (PP); (vi) Polystyrene (PS); and (vii) Others (BPA, Polycarbonate and LEXAN). Most of the polymers used in the production of single use plastics are non-biodegradable and on average, only begin breaking down after 500 years. Therefore these material take up a considerable amount of space in the environment, landfills and waterways (OAS, 2016). It has also been deemed to be the second most harmful material disposed into the natural environment (TheWaytogo, 2008, cited by OAS, 2016).

Additionally, PS can contain benzene and styrene compounds and which have the potential to leach from the packaging materials into hot foods and drinks that are fatty, acidic or alcoholic. These compounds are suspect to be carcinogenic. This health risk associated with the leaching of these harmful chemicals into foods is one of the driving forces behind the global trend of banning this material in over 100 cities in Europe, Asia and North America (TheWaytogo, 2008, cited by OAS, 2016), with new

legislative controls being implemented on a regular basis. Apart from the health concerns posed by PS and Expanded Polystyrene (EPS), it is lightweight, bulky and difficult to separate from other waste, further complicating its management (OAS, 2016).

In the United States of America (USA) , many petrochemical companies have also invested in the production of ethylene and propylene for over ten years and as this country focused on shale gas and natural gas production. The USA domestic market absorbs much of its produced polyethylene, mainly in high-density and low-density forms for the manufacture of virgin plastic.[3] The production of virgin plastics is projected to rise globally by a compound margin of 4%. Taking into consideration the prevailing challenge of plastic waste management, the USA Environmental Protection Agency has been engaged in several waste reclamation and recycling research initiatives. The evidence suggests that these undertakings have already begun to bear fruit as new research has made inroads into the possibility of reconverting waste plastics to monomers[4] via a depolymerization process (Degnan, 2019).

With respect to the global players in the management of plastic wastes, China has been the main importer of the world's plastics waste for over 25 years. However, this came to an end in 2018 when the government of China implemented its "National Sword" policy, effectively reducing its plastic importation by 99%, thus plunging the world into a waste management dilemma (Degnan 2019). This development has since motivated greater global efforts into examining and exploring new technologies and innovative solutions to the problem. Renewed research efforts, supported by several international corporations such as Ikea in the United Kingdom, and McDonald's in the United States of America, have been oriented towards discouraging the use of single-use-plastics (Kenward 2018). In the United Kingdom (UK), the UK Plastic Research and Innovation Fund (PRIF) was established, and further afield, in early 2019, thirty companies formed the Alliance to End Plastics Waste (AEPW), with a commitment to invest USD 1.5 billion to developing opportunities to remove plastics from the general waste stream. (Degnan, 2019). With respect to research and development, agencies such as the UK Research and Innovation (UKRI), in collaboration with the Engineering and Physical Sciences Research Council (EPSRC), Innovate UK, and the National Environment Research Council (NERC), have forged ahead in developing "new technology and also new plastics that can have lower levels of environmental impact" (Kenward, 2018).

Given the widespread evidence of the impacts of plastics on the global economy, the environment and society, efforts have also been made at the multilateral level towards the management of plastic wastes. Among the most recent initiatives is the 2019 ammendment of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, to create a legally binding framework for more transparency in the global trade in plastic wastes, whilst ensuring safer management for human health and the environment. A new Partnership on Plastic Waste was also established among business, government, academic and civil society resources, interests and expertise to assist in implementing the newly proposed measures (Basel Convention, 2019).

A. The regional context

The global trends observed in of waste management of are similar among the Small Island Developing States (SIDS). However the geographical locations, consumption patterns and environmental sensitivities amplify the negative impacts of waste in Caribbean countries. For instance, several islands surpassed the

[3] Virgin plastics: This type of plastic resin is produced and derived from "mechanical resources" such as natural gases, petroleum resources, and crude oils. The important differentiating factor is that these sources have never been processed before. It's newly made plastics. Available at: http://www.planetcleanrecycle.com/defining-plastics-virgin-vs-recycled/, cited September 14, 2020.

[4] A molecule that can be bonded to other identical molecules to form a polymer.

global daily average of 0.74 kilogrammes per capita[5] in 2016 (Kaza et al, 2018). Among them, the United States Virgin Islands (4.46), the British Virgin Islands (3.75), Puerto Rico (3.28) and Aruba (2.91) were some of the highest waste generators. In keeping with the Caribbean SIDS country considered in this study, while Trinidad and Tobago is not among the highest waste producers in the Caribbean, its daily per capita generation is still signficant at 1.47 kilograms of waste per capita per day (Kaza et al, 2018).

With respect to plastic wastes, the Caribbean Sea is regarded as the second most plastic-contaminated space after the Mediterranean Sea, and estimations of plastic waste ranged from 600 to 1,414 plastic items per square kilometre. The Caribbean region is also one of the main contributors to plastic pollution with the dubious distinction of having 10 of the 30 largest per capita polluters of single-use plastics in the world (UNEP 2019, cited by IWEco 2019).

Despite these metrics, the Caribbean has responded reasonably against the use of single-use plastics. For example, Barbados began advocating against plastics since 2006, while the U.S.A- Virgin Islands encouraged groceries to substitute these products for eco-friendly options since 2011. In 2013, Haiti implemented a plastics ban, and several other subregional economies have implemented, or at least proposed a ban on single-use plastics and Styrofoam as at January 2020. Other Caribbean SIDS having other policy and or legislative controls are: Antigua and Barbuda, the Bahamas, Barbados, Belize, the Dominican Republic, Grenada, Jamaica and Trinidad and Tobago. These developments demostrate the subregion's commitment to addressing the high levels of single-use plastics found in its waste stream as reflected in the the implementation and management of the importation ban of these items. While is is still too early to assess the success of these initiatives, it is expected that significant welfare benefits would be achieved over time through the reduction of the negative externalities associated with single-use plastics.

B. The situation in Trinidad and Tobago

Trinidad and Tobago faces the particular challenge of managing wastes in general, and plastic wastes in particular due to its relatively high Gross Domestic Product (GDP) per capita which supports a high level of consumption (and concomittant waste generation), and a fairly well-developed manufacturing sector all operating alongside weak waste management institutions. The country's waste production indicator – one of the environmental indicators of the industrial sector – shows over 1,300 tons of waste ending up in the landfills of Trinidad and Tobago each day. This amounted to an overall waste generation of 700,000 tons in 2010, or roughly 1.50 Kg per person per day (CBCL, 2010)[6]. Moreover, on average 0.19 kilogram of plastic waste per capita, per day, is deposited into the oceans and seas around Trinidad and Tobago as a result of weak waste management systems (Ewing-Chow, 2019). Of particular concern is the high volume of waste emanating from the food and beverage industry related to the disposal of food containers. Furthermore, when waste is partitioned according to type, plastics emerge as an especially difficult problem. According to the OAS (2016), plastics contributed 19.17%[7] to the overall waste stream in Trinidad and Tobago in 2010, representing a significant share among solid waste categories. The subcategorization of this share by types of plastic is shown in Table 2.

Considering manufacturing, Trinidad and Tobago also distinguishes itself among Carribbean SIDS as a significant manufacturer of final products, based on imports of primary plastic raw materials. According the the Central Statistiscal Office (CSO), (2020), the country imported TTD 551.4 millions in plastic raw materials in 2018, which represent an increase of 25.8% over the previous year. Primary

[5] Based on country data adjusted to 2016.

[6] CBCL is a multidisciplinary enginerring and environmental consulting firm in Atlantic Canada that was commissioned to conduct a study for the Govrnment of Trinidad and Tobago.

[7] This figure does not include beverage containers.

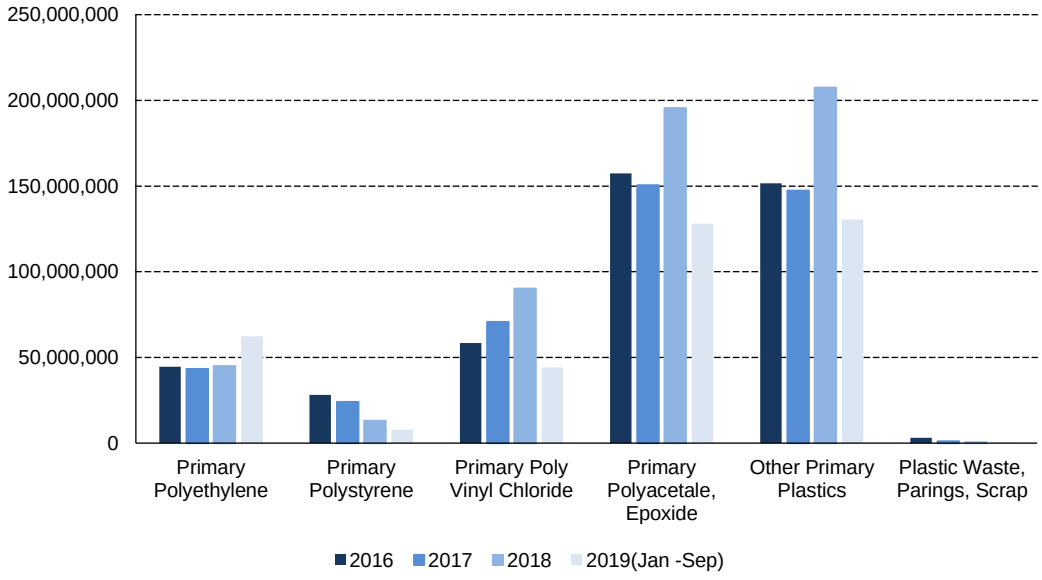
Polyacetale/Epoxides (35.4%), and Other Primary Plastics (37.6%), constitute the larger shares of imports, although import of primary polyvinylchlorides (16.4%) is also substantial (Figure 1). The majority of these imports (90%) is shunted into domestic manufactures, of which the food and beverage sector is the largest, accounting for roughly 53% of total manufacturing output (Organization of American States and Ministry of Planning and Development, Government of the Republic of Trinidad and Tobago, 2016). Hence, policy adjustments in relation to the use of single-use plastics are likely to also affect the country's manufacturing sector with implications for indirect economic losses. These impacts, while recognized, are not taken into account explicitly in this study.

Table 2
Distribution of discarded plastics by type in Trinidad and Tobago, 2010
(Percentages)

Type of plastics	Total waste
Miscellaneous/unrecognizable plastics	6.68
PS containers (Foam)	8.89
Clean LDPE film	47.86
Clear PET containers	24.84
Coloured PET containers	2.35
Clear HDPE Containers	4.59
Opaque HDPE Diary Product containers	0.05
Tubs and lids (HDPE, PP, LDPEPS)	1.10
Nylon stacks	2.87

Source: OAS 2016.

Figure 1
Primary plastic imports into Trinidad and Tobago, 2016-2019
(TT Dollars)



Source: Based on Data from CSO, 2020.

In responding to the problem of plastic waste disposal, several actions have been undertaken by Trinidad and Tobago. Among them is the country's engagement with the Closed Loop Cycle Production in the Americas (CLCPA), an initiative spearheaded by the Department of Sustainable Development (DSD) of the Executive Secretariat for Integral Development of the Organization of American States (OAS) in 2013. Its aim is to engender a stronger regimen of recycling within the country's manufacturing sector, and to bolster productivity, competitiveness and sustainability of small and medium-sized businesses.

The government has also sought to further strengthen the legal framework to give effect to the ban on the importation of finished EPS products for the Food and Beverage Sector into Trinidad and Tobago. Additionally, a cabinet decision was made to remove customs duty on plastic alternatives, and in its 2020 National Budget Statement the govenemnt also propose to terminate the use of plastic water bottles in public offices by Januarry 2020 (Ministry of Finance, 2019). It is important to note that the success of a ban is hinged on the availability of alternative products, enforcable standards and as well as the necessary infrastructure to manage the waste generated by these alternatives. Hence, it is necessary to understand the nature of economic incentives which drive the production, distribution and consumption of single-use plastic products and the ultimate generation of plastic wastes. This understanding is critical to the crafting of efficient waste management policy, to which the present study seeks to contribute.

II. Methodological approach to the study

A suitable methodological approach to this type of study would be to estimate an appropriate cost function, with relevant cost shares which could be used to determine the marginal costs of inputs, including single-use plastics, in the economy of Trinidad and Tobago. Indeed, there is an extensive literature which discusses this application to several industries. The typical model estimated is the translog cost function[8] which is specified as a logarithmic expression of total costs in relation to a vector of input prices and output quantities. As noted by Salgado Banda and Bernal Verdugo (2007), this function in its generality imposes no prior restrictions on cost structure and allows for ex-post testing of key model specification characteristics such as homotheticity, homogeneity, returns to scale and elasticities of substitution. Translog cost functions have been estimated to measure banking efficiency by Daglish et al (2015), while Carlos-Martin J. and Voltes Dorta A. (2011) have attempted the same for airports. Recognizing the often real difficulty of obtaining relevant cost data for specific industries, Kim W., Kang K., and Kook W., (2010) also estimated a cost function for the trucking industry in South Korea, using institutional data[9] as a proxy for specific sector data. Gronberg et al (2005) also confronted similar data issues in their estimation of educational cost functions in the state of Texas.

Given this recognized drawback, Rosse (1970) proposed an approach to estimating cost function parameters without using cost data by undertaking a cross-sectional analysis. This methodology is premised fundamentally on two critical assumptions these being that firms are minimizing costs, and that they are operating in a monopolistically competitive market. On this basis, Rosse argues that the potential long-run average costs of firms can be more confidently observed given that all firms are unlikely to face the same level of product demand. Alternative approaches to cost estimation as identified by JBON (2020) include engineering analysis, in which technical data supplied by firm engineers or operations managers are utilized as a proxy for costs.

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[8] This is a contraction of Transcendental Logarithmic and is used to model how a combination of input costs result in total costs.

[9] Data from a national "Report on Transportation in Korea" prepared by the Korea National Statistical Office. These data represent a total summary of firm specific costs, and not individual trucking company data.

For the specific instance of this research, data limitations, both in terms of quantity and quality, constrained the application of a translog approach to estimating costs for single-use plastics in Trinidad and Tobago.[10] Hence the core methodology used for this study involved a cross sectional analysis supplemented by elements of an engineering analysis. Primary data for the study were gathered through a field survey implemented among main single-use plastics users in Trinidad and Tobago. These data were then used to estimate sub-sector plastic input costs which were then aggregated to obtain a broad measure of the *baseline* cost of single-use plastics in Trinidad and Tobago. Subsequently, these input costs were re-estimated using substituted prices for *alternatives* to single-use plastic inputs to obtain a new aggregate cost. The difference between the alternative and baseline costs were then assessed as the economic cost for substituting single-use plastics in Trinidad and Tobago. Survey data were also used to estimate the relative cost-shares for single-use plastics among the main sub-sector users in Trinidad and Tobago.

A. Data description

In order to capture some sense of the total costs which firms utilizing single-use plastics face in Trinidad and Tobago, survey data were collected for four broad areas. These were fixed costs, variable or operational costs, outputs of the firms, and basic demographics relating to the type of business, and geographic location. In the context of the prevailing COVID-19 pandemic, firms were also canvassed about the general impact of the disease on the cost of their operations.

With respect to the targeted sectors, businesses which consume large quantities of single-use plastics such as food processing, drink manufacturers, bakeries, caterers, restaurants, supermarkets and fruit and vegetable distributors were chosen for the analysis. As noted above, food and drink, including bakeries, accounted for 53% of total manufacturing output, and 21.4% of the total number of manufacturing establishments in Trinidad and Tobago in 2010 (Organization of American States and Ministry of Planning and Development, Government of the Republic of Trinidad and Tobago, 2016). Additionally, the country is served by an elaborate food catering and restaurant sub-sector, which supports the country's national school feeding programme, as well as a well-entrenched and diverse dine-out and street-food culture. Finally, supermarkets, and in the case of Trinidad and Tobago, a ubiquitous network of small fruit and vegetable retailers, are also well-recognized large single-use plastic users (typically in the form of plastic bags). Table 3 summarizes the range of single-use plastics employed in these various sub-sectors.

Table 3
Range of single-use plastics in use in Trinidad and Tobago

Product	Material
Burger containers	Styrofoam
Straws (long)	Plastic
Spoons	Plastic
Forks	Plastic
Plates (large)	Plastic
Plates (small)	Plastic
Plates (small)	Styrofoam
Plates (large)	Styrofoam
Bowls (small)	Plastic
Food Containers (medium)	Styrofoam
Food Containers (large)	Styrofoam
Food Containers (small)	Plastic
Food Containers (large)	Plastic
Plastic bags (various sizes)	Plastic

Source: Field Consultant, ECLAC 2020.

[10] Note that although industry data were gathered using a field survey, the data manifested strong collinearity most likely related to the bundling of the plastics categories among different industry players. This ultimately mitigated against the application of a model estimation approach.

In light of this wide array of single-use plastic users, total cost estimation is expected to yield a proxy for long-run total costs across these industries, since such diversity reflects variability of all fixed costs. Towards this end, the specific variables for the survey included data on the estimated physical size of plant, estimated total value of building and equipment used in the business, monthly[11] rental or mortgage, and monthly loan payments. Together, these variables were intended to capture an index of fixed cost per period over all firms surveyed. Considering variable costs, the survey also gathered monthly estimates of labour costs; energy (electricity and fuel); other utility costs (water and telecommunications); maintenance and repairs; marketing and promotion; and other general operating costs. Firms were also asked to provide an *overall estimate* of their monthly total costs for the operation of the business. Importantly, monthly expenses on *all* categories of single-use plastics were specified as a separate variable in order to facilitate the achievement of the study objectives.

For any total cost estimation, the level of output produced per period is also a key variable given the direct relationship between total cost and quantity of goods produced. Several studies (Abrate et al, 2014; Gronberg et al, 2005; Kim et al, 2010; Banda et al, 2007) routinely point to the difficulty in selecting and measuring output for this purpose. This is because a firm's outputs are often many and diverse, reflecting different stages of production, or may be intermediate inputs to other products, even within the same firm or elsewhere. Moreover, specifying the output price could be difficult depending on the market structure in which the product is sold.

This difficulty is exacerbated when considering non-tangible outputs for service providers, where additional imponderables may impact service delivery.[12] These concerns were also confronted in this study, particularly with respect to specifying the level of outputs for supermarkets. Further, outputs were defined differently across single-use plastic user categories. In the case of supermarkets, the study adopted the approach of selecting sales of three Fast-Moving Consumer Goods (FMCGs)[13], as the measure of supermarket output. These were units of bread, potatoes, and/or frozen chicken sold per month. Outputs for the various sub-sectors analysed in the study are presented in Table 4.

Table 4
Measures of outputs for various types of business

Type of business	Units of output
Bakery	Number of Loaves of Bread Sold Per Month
Food Manufacturer	Number of Cases of Bottled Product Sold per Month
Restaurant	Number of Take-out Meals Sold per Month
Supermarket	- Number of Packaged Loaves of Bread Sold Per Month; - Number of Packs of Frozen Chicken Sold Per Month; - Kilograms of Potatoes Sold Per Month;
Vegetable Market	Kilograms of Vegetables Sold Per Month

Source: Authors' Estimation, 2020.

The detailed survey instrument is presented in the Annex.

[11] Since the survey targeted a wide scope of businesses, *monthly* data were sought from respondents in order to enhance recall particularly by respondents from smaller firms which might not have formalized data collection and recording resources.

[12] For example, many services (e.g. legal services) are initiated in one time period and completed in another or might be completed through collaboration with several service providing firms.

[13] Fast-moving consumer goods are products with a short shelf life and high consumer demand that sell quickly at relatively low cost. They typically include products such as dairy, soft-drinks, baked goods and meats. They are also widely sold across many types of food distribution outlets.

B. Field survey

Sampling for the survey was done using a stakeholder listing previously engaged by the Ministry of Planning and Development of the Government of Trinidad and Tobago. This list comprised 14 main stakeholder groups including Chambers of Commerce, Business Associations and Stakeholder Listings from previous consultations undertaken by the Ministry. Given the applied sampling method and online data gathering approach as explained below, it was deemed to be adequate in terms of target population, completeness, accuracy, and currency.[14] With respect to currency, the survey implementation took into account the prevailing disruptive dynamics of the Covid-19 pandemic, and respondents were asked to provide answers in relation to their business operations for the 2019 business year only.

Although for the purposes of the study a probability sampling method was ideal, public health requirements in response to Covid-19 limited social interaction and constrained the availability of, and access to survey respondents. Two types of non-probability sampling techniques[15] - Snowball Sampling and Purposeful Sampling - were therefore utilized. According to Ghaleji, (2017), snowball sampling is a convenient sampling method applied when it is difficult to access subjects with the targeted characteristics. In this method, the existing study subjects recruit future subjects among their acquaintances, and Bhutta, (2009) observes that the emergence of social networking sites has transformed the internet into an efficient tool for snowball sampling. Purposeful sampling involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about, or experienced with the phenomenon of interest (Cresswell, Plano and Clark, 2011). In addition to knowledge and experience, Bernard (2002) and Spradley (1979) also note the importance of availability and willingness or respondents to participate, and their ability to communicate experiences and opinions in an articulate, expressive, and reflective manner. Ultimately, all the above factors informed the sampling approach for the study. It should be noted however that non-probability sampling does not allow for an unbiased estimation of sampling statistics, so that estimates cannot be generalized to be statistically representative of the wider population. This is an important caveat to be taken into account in the interpretation of the study results.

With respect to sample size, Delice (2010) points out that the researcher's decision depends on the research topic, population, aim of the research, analysis techniques, sample size in similar research, the number of subgroups in the sample population, variability, and research design. Although a sample size between 30 and 500 at 5% confidence level is generally sufficient for many researchers, the decision on the size should reflect the quality of the sample in this wide interval. On that basis, the survey targeted 250 businesses.

The Covid-19 public health requirements also mandated the use of an online platform for deploying the survey. Google Forms was used to develop and administer the survey form, and the resulting hyper-link was e-mailed to various stakeholders. The survey was also posted on the UN-ECLAC website and Facebook page, and shared with several business chambers.

The types of businesses targeted include: Restaurants, Supermarkets, Vegetable Markets, Caterers, Food manufacturers, Bakeries, and Soft drinks and Bottled Water producers. The online survey remained available to respondents for a period of six weeks, from early June to mid-July, 2020.

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[14] Target population- all businesses that use single -use plastics; Completeness - coverage-all businesses in the country regardless of size location, profitability, visibility etc; Accuracy - the unit is included once and only once; Currency - the unit exists in the current time period.

[15] This is a sampling technique where the odds of any member being selected for a sample cannot be calculated. It relies on the subjective judgement of the researcher.

While survey researchers have been using various modes and methods, such as mail, telephone, and e-mail, to collect data, over the past decade, web surveys as a new mode of conducting surveys via websites have gained significant popularity (Couper, Traugott, & Lamias, 2001). Compared with traditional modes of surveys, web surveys have several advantages, including shorter transmitting time, lower delivery cost, more design options, and less data entry time. However, web surveys often face specific challenges, such as losing participants who do not have Internet access and having low response rates that could lead to biased results Baruch (1999).

Response rate is generally defined as the number of completed units divided by the number of eligible units in the sample, according to American Association for Public Opinion Research. It is the most widely used and commonly computed statistics to indicate the quality of surveys. Based on a recent meta-analysis (Manfreda, Bosnjak, Berzelak, Haas, and Vehovar, 2008) of 45 studies examining differences in the response rate between web surveys and other survey modes, it is estimated that the response rate in the web survey on average is approximately 11% lower than that of other survey modes. Given these factors, this survey was expected to have a 25% response rate.

III. Data analysis and results

Two broad areas of analysis were undertaken in order to arrive at the study results. The first involved frequency, breakdowns and summary statistics of survey variables in order to obtain overall perspectives about the sample. This stage of the analysis also estimated relative cost shares for inputs, including single-use plastics, which were used in the second stage of the analysis to estimate *baseline* and *alternative* costs to the various business categories as a result of adopting alternatives to single-use plastics.

A. Summary of survey results

By the end of the survey period, a total of 54 useable questionnaires were completed online. This amounted to a response rate of 21.6%, which, while lower than the expected rate, is deemed to be reasonable in light of the challenges of the Covid 19 pandemic.[16]

In terms of business categories, most of the respondents were from restaurants (37%), caterers (22.2%) and supermarkets (14.8%). Only 5.6% of respondents were food manufacturers, with the remainder being vegetable market operators. The majority of the businesses surveyed were from the Central region of the island of Trinidad (42.6%), with 18.5% and 14.8% coming from the South-West and North-West regions respectively. Roughly 11% of respondents were from each of the North-East and South East regions, and 2% were sampled from Tobago.

Among all businesses surveyed, the mean Total Monthly Cost of operation was TTD 161,469. This estimate however bore a high standard deviation across all business categories (TTD 294,518). Given this large dispersion about the mean, the median (TTD 45,000) and the mode[17] (TTD 20,000) provide a more meaningful indicator of the spread of total monthly costs of operation for the sample. Mean total monthly costs for each business catgory are however shown in Table 5.

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[16] Given the threat of Covid-19, it is possible that businesses were focussed on re-opening and dealing with other public health issues. Furthermore, many businesses remained closed during the survey period so that it was not possible to access them for follow-up in order to complete the survey form.

[17] Median is the middle number in a list of numbers arranged in ascending order; mode is the highest occurring frequency of a single number among a range of numbers.

Table 5
Mean total monthly operating costs by business category
(TT Dollars)

Business category	Mean total monthly operating costs
Bakery	152 286
Caterer	28 042
Food Manufacturer	109 000
Restaurant	145 320
Supermarket	508 500
Vegetable Market	3 850

Source: Authors' estimation, 2020.

With respect to the variable of interest, monthly expenditure on single-use plastic inputs, this was estimated at TTD 8,814 across all business categories. Supermarkets (TTD 31,169) faced the highest average monthly costs followed by Food Manufacturers (TTD 8,333), Bakeries (TTD 7,371), Restaurants (TTD 6,230.00), Caterers (TTD 2,041.66), and Vegetable Markets (TTD 225.00). Table 6 summarizes these figures and cost shares for the various business sectors. A summary of estimates for all other survey variables is presented in the Annex.

Table 6
Average monthly expenditure on single-use plastics by category

Category	Expenditure *(TT Dollars)*	Share of Total Costs *(percentages)*
Bakery	7 371	4.8
Caterer	2 042	7.3
Food manufacturer	8 333	7.7
Restaurant	6 230	4.3
Supermarket	31 169	6.1
Vegetable market	225	5.8

Source: Authors' estimation, 2020.

B. Estimation of annual baseline and alternative costs – single-use plastics

As outlined in the methodology, the assessment of the overall cost of replacing single-use plastics in Trinidad and Tobago was achieved by estimating the difference between the current input costs for single-use plastics (the *baseline* position), and a proposed *alternative* state where replacements for single-use plastics are employed. This difference was aggregated across all single-use plastic users over a one-year period.[18]

Three important additional data sets were necessary in order to undertake the above estimations. These are 1) the average quantity of each category of single-use plastics used by different business entities per period (Table 7); 2) prices of single-use plastic inputs as well as alternatives (Table 8 and 3) the overall number of business entities utilizing single-use plastics in Trinidad and Tobago (Table 9). The first of these was obtained using product prices, outputs, expenditure estimates,

[18] For this analysis all estimates are for the 2019 business year.

and guidance from industry stakeholders. Prices of current inputs and alternatives were sourced from local suppliers, while the number of registered businesses by sector was assembled based on information from chambers of commerce, industry associations and public sector registries. In the specific instance of vegetable markets, this number was sourced from the USDA (2016) Report on the Trinidad and Tobago Retail Food Sector.

The quantity of single-use plastics used by different business entities provided some indication of the number to be replaced with alternatives per period. It should be noted that this approach assumes a one-to-one replacement of inputs. However, economic cost theory suggests that a profit maximizing firm will likely adjust the input mix in order to achieve technical efficiency. This is an important consideration for policy implementation aimed at the substitution of single-use plastics in any economy.

Table 7
Average number of plastic units used by business sector per month

Product	Material	Bakery	Caterer	Food manufacturer	Restaurant	Supermarket	Vegetable market
Burger containers	Styrofoam	500	200	50	600	600	50
Straws (long)	Plastic	500	200	50	1 000	300	50
Spoons	Plastic	500	200	50	1 000	300	50
Forks	Plastic	500	200	50	1 000	300	50
Plates (large)	Plastic	450	200	50	600	200	30
Plates (small)	Plastic	450	200	50	600	200	30
Plates (small)	Styrofoam	600	350	50	800	2 400	50
Plates (large)	Styrofoam	600	350	50	800	2 400	50
Bowls (small)	Plastic	600	100	50	600	1 000	-
Food Containers (medium)	Styrofoam	500	350	50	800	4 000	50
Food Containers (large)	Styrofoam	600	350	50	800	4 000	50
Food Containers (small)	Plastic	500	200	1 500	400	4 000	-
Food Containers (large)	Plastic	800	200	1 500	400	4 000	-
White bags (medium)	Plastic	6 000	500	1 000	800	15 000	300

Source: Authors' estimation based on survey data, 2020.

Table 8
Wholesale prices of single-use plastics and alternatives, 2020

Product	Material	Price *(TT Dollars per pack)*	Unit Price *(TT Dollars)*	Material *(Plastic alternative)*	Price *(TT Dollars per pack)*	Unit Price *(TT Dollars)*
Burger containers	Styrofoam	27.55/50	0.55	Bagasse	425/500	0.85
Straws (long)	Plastic	12.97/250	0.052	Plant based plastic (PLA)	1152/4800	0.24
Spoons	Plastic	5.24/12	0.44	Recycled PLA (made from corn)	400/1000	0.4
Forks	Plastic	5.55/25	0.22	Recycled PLA (made from corn)	400/1000	0.4
Plates (large)	Plastic	16.43/12	1.37	Bagasse	360/500	0.72
Plates (small)	Plastic	7.99/12	0.67	Bagasse	280/1000	0.28
Plates (small)	Styrofoam	4.44/25	0.18			0.67
Plates (large)	Styrofoam	5.32/20	0.27			0.85
Bowls (small)	Plastic	9.77/12	0.81	PLA	550/1000	0.55

Product	Material	Price *(TT Dollars per pack)*	Unit Price *(TT Dollars)*	Material *(Plastic alternative)*	Price *(TT Dollars per pack)*	Unit Price *(TT Dollars)*
Food Containers (medium)	Styrofoam	29.59/50	0.59	Bagasse	236/200	0.55
Food Containers (large)	Styrofoam	7.37/10	0.74	Bagasse	370/200	1.85
Food Containers (small)	Plastic	16.34/8	2.04			2.24
Food Containers (large)	Plastic	27.55/8	3.44			3.60
White bags (medium)	Plastic	182.89/2000	0.09	Recycled paper	275/250	1.1

Source: Field Consultant, ECLAC, 2020.

Table 9
Number and scope of single-use plastics users in Trinidad and Tobago

Category	Estimated number
Bakeries	66
Caterers	125
Food Manufacturers	60
Restaurants	650
Supermarkets	191
Vegetable Markets (Vendors)	2 400[19]

Source: Authors' estimation, 2020.

1. Estimation of annual baseline single-use plastic costs

With respect to baseline costs, total annual cost of Single-use plastics for each business sector was estimated as the product of Number of Units used per month; Unit Price; Number of Businesses per sector and Number of Months per Year. This yielded an overall estimated annual cost of **TTD 144,973,231**, or **0.091%** of 2018 GDP, for single-use plastics in the economy of Trinidad and Tobago in 2019. Among business sectors, supermarkets absorbed the highest share of annual costs, followed by restaurants and vegetable markets. Caterers however bore the smallest share of current annual costs (Table 10).

Table 10
Annual baseline input cost by sector - Single-use plastic, 2019

Category	Amount *(TT dollars)*
Bakery	5 825 952
Caterer	3 758 100
Food Manufacturer	6 195 312
Restaurant	50 232 000
Supermarket	72 041 227
Vegetable Market	6 920 640

[19] Source: United States Department of Agriculture (USDA), 2016.

Category	Amount *(TT dollars)*
Total Current Estimated Costs (TTD)	144 973 231
Total Current Estimated Costs (TTD-M)	145
Annual GDP - 2018 (TTD -M)[20]	159 527
Total Cost -Single-Use Plastics as % of GDP (2018)	0.091

Source: Authors' estimation, 2020.

2. Estimation of annual alternative costs

By substituting the prices of single-use plastics with those of alternatives, a projected annual cost of **TTD 237,479,844** for the replacement of single-use plastics in the Trinidad and Tobago economy was obtained (Table 11). This represented a new share of 2018 GDP of **0.149%**. Among the business sectors, Vegetable Markets were projected to have the highest marginal increase in plastic-replacement input costs of 171%, followed by Bakeries (99%), and Supermarkets (74%). Increases in plastic-replacement input cost for Caterers and Restaurants were estimated at 49% and 37% respectively, while for Food Manufacturers, this increased by 19% (Figure 2).

Hence, the transition of the Trinidad and Tobago economy from single-use plastics to non-plastic alternatives is projected to cost **TTD 92,506,613**, or a *net* of **0.058%**[21] of annual (2018) GDP based on business operations costs in 2019.

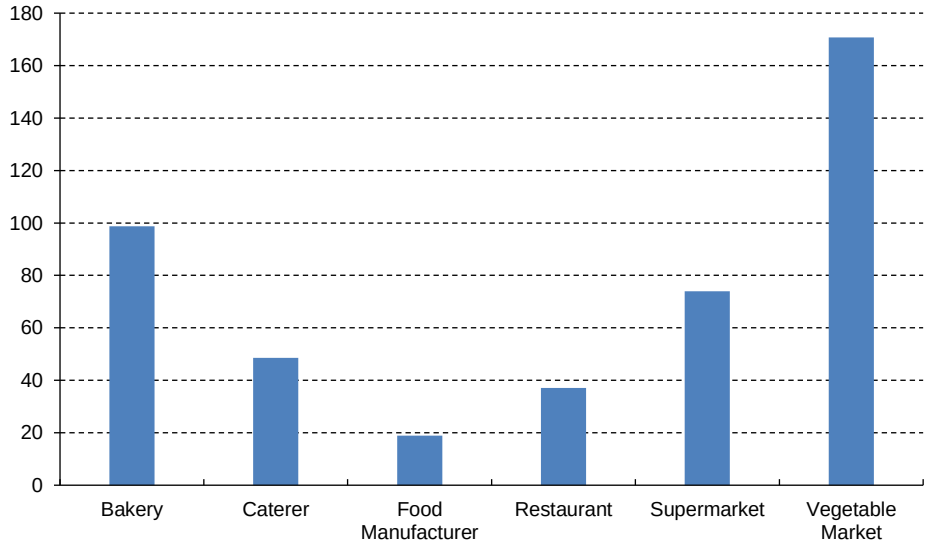
Table 11
Annual alternative input to single-use plastic cost by sector, 2019

Category	Amount *(TT Dollars)*
Bakery	11 580 624
Caterer	5 584 500
Food Manufacturer	7 364 160
Restaurant	68 889 600
Supermarket	125 326 560
Vegetable Market	18 734 400
Total Estimated Alternative Costs (TTD)	237 479 844
Total Estimated Alternative Costs (TTD-M)	237.5
Annual GDP – 2018 (TTD -M)	159 527
Total Cost -Plastic Alternatives as % of GDP (2018)	0.149

Source: Authors' estimation, 2020.

[20] GDP Source: IMF, 2018.
[21] 0.149 – 0.091 = 0.058.

Figure 2
Percentage change of annual plastic input cost by sector for transition to single-use plastic alternatives



Source: Authors' estimation, 2020.

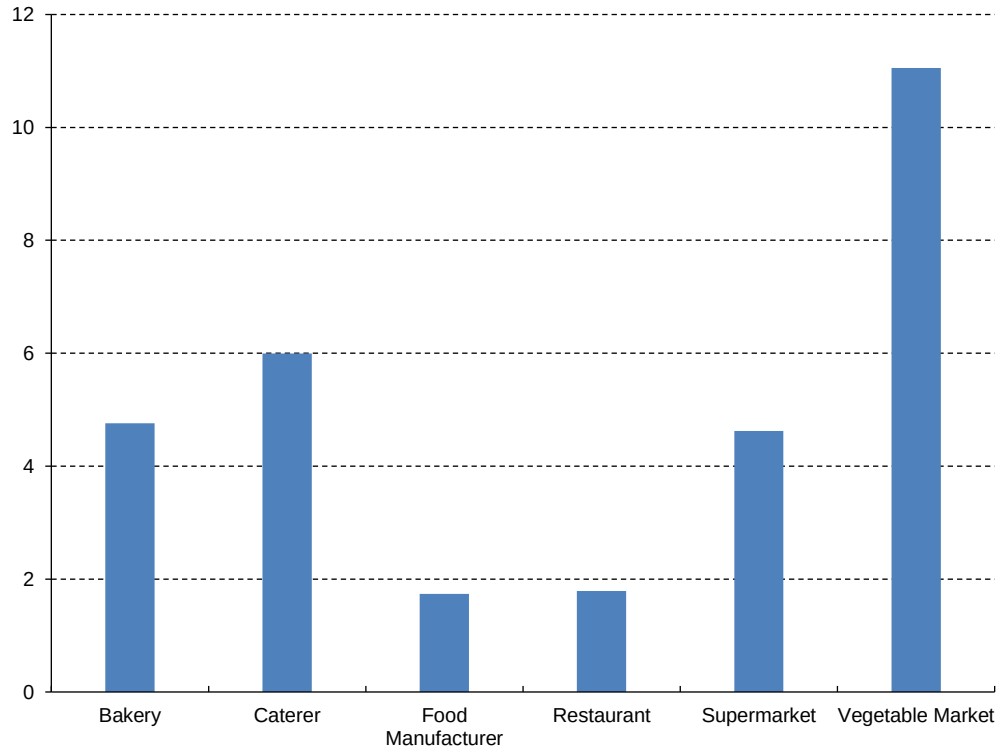
An important question at this stage of the analysis is how the transition to alternatives would affect overall total costs for businesses in Trinidad and Tobago. Given an increase in the cost of a single input (plastic replacements), and assuming no technical substitution effects, total costs were projected to increase by between 9.6% and 16.9% across all business sectors (Table 12 and Figure 3). Further details of costs for single-use plastics and alternatives are presented in the Annex.

Table 12
Mean total monthly operating costs by business category
(TT Dollars)

Business category	Mean total monthly operating costs
Bakery	159 536
Caterer	29 723
Food Manufacturer	110 895
Restaurant	147 922
Supermarket	532 011
Vegetable market	4 276

Source: Authors' estimation, 2020.

Figure 3
Percentage increase in total monthly costs with alternatives
(TT Dollars)



Source: Authors' estimation, 2020.

3. A note about Covid-19 in the context of single-use plastics

Many environmental policy researchers have pointed to the implications for single-use plastics use in light of the pervasive impacts of Covid 19 (Vaughan, 2020). Hence for the field study, respondents were asked about how they were affected by the pandemic in relation to this issue in Trinidad and Tobago. 26% of respondents indicated that their business increased the use of single-use plastics due to Covid-19. Four percent could not say, while the remainder were unaffected in this manner. The businesses affected were restaurants which increased the use of plastic bags for increased take-out meals. At supermarkets, customers also requested or purchased more single-use bags reflecting their concerns about catching the virus by using possibly contaminated older plastic bags.

Among all other businesses affected, increased single-use plastics use also arose due to higher frequency of sanitization and garbage disposal. Finally, the use of single-use plastics also increased in health care facilities, as workers and clients used larger quantities of personal protection equipment (PPE) such as gloves, plastic gowns and shields.

IV. Policy implications and conclusions

In absolute terms, the cost of transitioning the Trinidad and Tobago economy from single-use plastics to more environmentally friendly alternatives may be considered to be small. These figures however do not fully represent the true cost of single-use plastics to the economy and society and might best be regarded as lower-bound estimates. What then are the possible policy implications of these findings?

Firstly, efficient policy management typically requires strategies for responding to unintended consequences of policy, through some form of compensating variation. This in turn must anticipate the adjustment strategies of firms, as they seek to minimise costs, while sustaining market share. By way of example, some supermarkets in Trinidad and Tobago have already initiated adjustments through initiatives to replace single-use plastic bags with reusable shopping bags sold instore. Many restaurants have also begun adjustments to the use of more biodegradable food service materials. Further, the State has also proposed fiscal adjustments to encourage private sector investment in the domestic production of alternatives to single-use plastics and has adopted a phased approach to implementation. This notwithstanding, consideration should be given to strategies for rewarding potential losses, for businesses who might not be able to fully adjust to the new policy requirements over the short term. This is important since revised policy could force some firms to radically alter operations strategy where this is possible, or to ultimately cease operations.

Secondly, it is clear that all sectors are not likely to be affected to the same degree by policy implementation. For instance, while in absolute terms, the vegetable market segment's share of the total economic cost is small, the adjustment cost to single-use plastic *within* vegetable market firms is significant. Additionally, transitioning to other types of packaging can also result in other concomitant costs, which could result in even more substancial costs to some business entities. One such possibility is with respect to increased post-harvest losses to vegetable market operators if single-use plastic replacements do not provide the same shelf-life longevity as currently utilized plastic products. A similar dynamic could emerge particularly in the case of caterers, restaurants and supermarkets, which may face added costs to meet new or different food-safety and/or public health requirements consequent upon the adoption alternatives to single-use plastic packaging. These subsectors apart, another

important implication relates to the potential impact of the policy on the existing printing and packaging sector of Trinidad and Tobago. This subsector, while not assessed in the study, is likely to face a signifcant short term reduction in current output demand, with potential for substancial financial losses, as they will be required to phase out current production. Additional social ramifications in the form of job losses, imply the need for transition support of this subsector so that it could possibly become a viable player in the production of environmentally friendly altenatives to single-use plastics in the future.

As a third consideration, it is important to note that while all of the above give focus to the possible cost adjustments within the firm, other policy implications relate to unaccounted costs of single-use plastics which may accrue outside of the firm. These externality costs alluded to above, include environmental impacts such as flooding due to the accumulations of single-use plastics in water courses; public health impacts related to the bio-accumulation of micro-plastics in the food chain and related threats to wildlife and marine fauna; and the despoiling of beaches and other recreational areas. The mitigtion of at least some of these additional costs should also be taken into account in a benefits-cost analysis, in order to fully assess the full impact of the proposed policies.

Fourthly, the application of an enhanced single-use plastics strategy is likely to be maximally efficient if it is accompanied by a more comprehensive and robust national waste management programme, which builds more efficient institutions, strenghthens the waste management regulatory framework, and improves waste management incentives. This is important since in the absence a more rigorous waste management regime, even the disposal of altenatives could in turn become the source of additional externality costs to the economy. Further, the current proposal to ban only polystyrene (PS) imports should be expanded in due course to other types of single-use plastics, if the policy benefits to the society are to be maintained over the medium to long term.

A fifth implication realtes to the role of public education and awareness raising in driving the implentation of the policy to replace single-use plastics. It is apparent that various businesses and consumers have different understandings about what is truly a single-use plastic alternative, and what are the parameters, such as biodegradeability that specify it as a genuine replacement. Related to the above is the issue of technical standards for alternatives to single-use plastics and the regulatory measures to define, implement and monitor such standards. Clarity in this regard is necessary for regulators, consumers, and business investors in order to ensure the achievment of policy objectives.

Finally, the overall study results also suggest the need for a more finely attuned fiscal incentive framework which could stimulate the strenthening of the overall circular economy. Such framework will support the monetization of most forms of wastes, reduce waste production, enhance recycling, and penalize indiscriminate disposal. Trinidad and Tobago currently implements a pigouvian environmental tax in the form of a green fund levy (Government of Trinidad and Tobago, 2016). Consideration should be given to exploring how a portion of this fund could be utilized to promote circular economy investments in research and development so as to contribute to the efficient management of, and innovative utilization, and commercialization of plastic wastes. Ultimately, fiscal policy must also align with national trade policy, in order that the long run social, economic and environmental goals can be achieved.

V. Limitations of the research

Several important assumptions were necessary in order to arrive at the estimates. Firstly, in practice, there is no single input factor known as 'single-use plastics', as this represents a diverse range of supplies, which are utilized in the delivery of myriad business services. The need to apply averages with respect to the level of utilization of these goods in the economy must of necessity underestimate this measure in any estimation.

Secondly, many firms use plastics in several enterprises, for which specific accounting of their use might be difficult, and therefore under-estimated.

A third factor relates to the wide range of businesses, which individually also utilize single-use plastics, but not on a large enough scale to warrant analysis. Such firms may include pharmacies, cleaning companies, and even events-planning businesses, which at the aggregate level could consume considerable quantities of single-use plastic.

Another key assumption in assessing the cost of replacing single-use plastics is its one-to-one replacement with alternatives. This is not strictly inconsistent with economic theory, as the marginal rate of substitution for any replacement of technology will favour an increase of the cheaper input. We should therefore expect that a transition to more expensive inputs should result in some level of technical transformation of the production process in order to maximize efficiency and minimize costs. This however could not be taken into account in this study given the inability to estimate cost function coefficients.

Finally, while the study gives focus to the accounting costs of single-use plastics at the level of the firm, it does not consider the likely important measure of externality costs of single-use plastics in Trinidad and Tobago. As alluded to above, this is expected to be significant given the country's high level of waste generation. Externality costs are those expenses related to the handling and disposal of wastes, and the concomitant public health, and environmental costs, which are borne by economic agents external to the firm.

Given the key limitations outlined above, it is important to note that while this approach provides some insights into the cost of substitution, it does not afford a robust interpretation of the results as an economy-wide measure of the cost of replacing single-uzse plastics in Trinidad and Tobago.

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Annexes

Annex 1
Cover letter

Economic Commission for Latin America and the Caribbean
Subregional Headquarters for the Caribbean

18 May 2020

TO WHOM IT MAY CONCERN

Study on the Economic Implications of the Ban of Single-Use Plastics in Trinidad and Tobago

The United Nations Economic Commission for Latin America and the Caribbean (ECLAC) is currently undertaking economic analysis of the likely impact of policy to limit single use plastics in Trinidad and Tobago. Single-use plastics, often also referred to as disposable plastics, are commonly used for packaging or in the production of items for use only once before they are thrown away or recycled. These would include grocery bags, food packaging, bottles, straws, containers, disposable cups, plastic covers and cutlery. This research will also include expanded polystyrene foam, commonly referred to as "Styrofoam".

I invite you to support our research by completing the attached survey. Please note that specific company details need not accompany your response. Furthermore, all data will be aggregated according to business category. The information you provide will facilitate the conduct of economic analysis to inform relevant sustainable development policy in Trinidad and Tobago. Unless otherwise indicated, please use **2019** as the base year for the average costs requested.

It is my hope that you will find the time to complete the survey instrument which can be accessed via the link indicated below. Please note that if your organization has multiple branches, a separate survey should be completed for each location. Should you have any queries, do not hesitate to contact our Environmental Consultant, Ms Camille Roopnarine at croopnarine@gmail.com or 868-495-3866, or Mr. Willard Phillips of ECLAC at willard.phillips@un.org or by telephone at 868-224-8027.

Many thanks in advance for your kind assistance in completing this study.

Yours Sincerely,

Diane Quarless
Director

1 Chancery Lane, P.O. Box 1113, Port of Spain, Trinidad and Tobago
Tel: 868 224-8000; Fax: 868 623-8485; e-mail: registry-pos@eclac.org . www.eclacpos.org

What is the average monthly wage per full-time employee (non director) in yourbusiness? *

How much do you spend on average on plastic inputs (bags, containers, styrofoam, cutlery, straws, cups etc) per month? *

How much on average do you pay per month for electricity to run your business? *

What is the average monthly fuel cost (gas, cooking gas, diesel) for your business? *

What is the average water utility monthly cost for your business? *

What are your monthly maintenance/repair costs?

What is the estimated total cost per month of other supplies (ingredients, supplies for sale etc) used in your business? *

On average, how much do you spend per month on marketing and promotion of your business? *

Overall, how much do you spend per month to operate your business?

Have you replaced single-use plastics with other materials in anticipation of the proposed ban on single-use plastics? *

- Yes
- No
- Don't know

If yes to #18, please describe what you did.

If yes to #18, please estimate the percentage increase in cost to your business (in %)

Has your use of single-use plastics in your business increased due to Covid-19? *

- Yes
- No
- Don't know

If yes to #21, please describe how the use was increased.

Are you completing this survey for a branch of the main business or the head office? *

- Branch
- Head office

Annex 3
Frequency summary: all survey variables

Variable	Mean	Valid responses
Main Type of Business	-	54
Business Location	-	54
Ave. Number of Outputs per Month	2 758.31	54
Size of Business Operation (Sq. Ft.)	2 514.50	54
Estimated Value of Buildings and Equipment	3 247 259.26	54
Monthly Rental/Mortgage	14 054.63	54
Monthly Loan Payments	10 912.96	54
Total Number of Employees	13.87	54
Ave. Wage per Fulltime Employee	3 705.56	54
Ave. Monthly Expense on Plastic Inputs	8 813.95	54
Ave. Monthly Expense on Electricity	7 066.43	54
Ave. Monthly Expense on Fuel	2 494.50	54
Ave. Monthly Expense on Other Utilities	641.59	54
Ave. Monthly Expense on Repairs and Maintenance	6 027.35	54
Ave. Monthly Expense on Other Supplies	174 305.56	54
Ave. Monthly Expense on Marketing	2 377.78	54
Ave. Total Monthly Expense to Operate Business	161 468.52	54
Have You Replaced Single-Use Plastics in your Business?	-	54
If Yes, By How Much Has This Increased Monthly Costs?	0.28	18
Has Covid 19 Caused an Increase in the use of Single-Use Plastics?	-	54
Survey Completed for Head / Branch Office?	-	54

Annex 4
Average value of product usage by industrial sector per month (TT Dollars)

Product	Material	Bakery	Caterer	Food manufacturer	Restaurant	Supermarket	Vegetable market
Burger containers	Styrofoam	275.00	110.00	27.50	330.00	330.00	27.50
Straws (long)	Plastic	26.00	10.40	2.60	52.00	15.60	2.60
Spoons	Plastic	220.00	88.00	22.00	440.00	132.00	22.00
Forks	Plastic	110.00	44.00	11.00	220.00	66.00	11.00
Plates (large)	Plastic	616.50	274.00	68.50	822.00	274.00	41.10
Plates (small)	Plastic	301.50	134.00	33.50	402.00	134.00	20.10
Plates (small)	Styrofoam	108.00	63.00	9.00	144.00	432.00	9.00
Plates (large)	Styrofoam	162.00	94.50	13.50	216.00	648.00	13.50
Bowls (small)	Plastic	486.00	81.00	40.50	486.00	810.00	-
Food Containers (medium)	Styrofoam	295.00	206.00	29.50	472.00	2 360.00	29.50
Food Containers (large)	Styrofoam	444.00	259.00	37.00	592.00	2 960.00	37.00
Food Containers (small)	Plastic	1 020.00	408.00	3 060.00	816.00	8 160.00	-
Food Containers (large)	Plastic	2 752.00	688.00	5 160.00	1 376.00	13 760.00	-
White Bags (medium)	Plastic	540.00	45.00	90.00	72.00	1 350.00	27.00
TOTAL		**7 356.00**	**2 505.40**	**8 604.60**	**6 440.00**	**31 431.60**	**240.30**

Annex 5
Average cost of products used by sector per month (TT Dollars)

Product	Material	Bakery	Caterer	Food manufacturer	Restaurant	Supermarket	Vegetable market
Burger containers	Styrofoam	425.00	170.00	42.50	510.00	510.00	42.50
Straws (long)	Plastic	120.00	48.00	12.00	240.00	72.00	12.00
Spoons	Plastic	200.00	80.00	20.00	400.00	120.00	20.00
Forks	Plastic	200.00	80.00	20.00	400.00	120.00	20.00
Plates (large)	Plastic	324.00	144.00	36.00	432.00	144.00	21.60
Plates (small)	Plastic	126.00	56.00	14.00	168.00	56.00	8.40
Plates (small)	Styrofoam	402.00	234.50	33.50	536.00	1 608.00	33.50
Plates (large)	Styrofoam	510.00	297.50	42.50	680.00	2 040.00	42.50
Bowls (small)	Plastic	330.00	55.00	27.50	330.00	550.00	-
Food Containers (medium)	Styrofoam	275.00	192.00	27.50	440.00	2 200.00	27.50
Food Containers (large)	Styrofoam	1 110.00	647.00	92.50	1 480.00	7 400.00	92.50
Food Containers (small)	Plastic	1 120.00	448.00	3 360.00	896.00	8 960.00	-
Food Containers (large)	Plastic	2 880.00	720.00	5 400.00	1 440.00	14 400.00	-
White Bags (medium)	Plastic	6 660.00	550.00	1 100.00	880.00	16 500.00	330.00
TOTAL		**14 622.00**	**3 723.00**	**10 228.00**	**8 832.00**	**54 680.00**	**650.50**

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