



PLASTIC WASTE FREE ISLANDS

**IUCN Plastic Waste  
National Level  
Quantification and  
Sectoral Material  
Flow Analysis**

**Caribbean Regional Report**

July 2021





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Published by: IUCN, Gland, Switzerland

Produced by: Ocean team, Centre for Conservation Action

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Citation: Asia Pacific Waste Consultants (2021). *Plastic Waste National Level Quantification and Sectoral Material Flow Analysis: Caribbean Regional Report*. Gland, Switzerland: IUCN.

Copy editor: Deborah Murith

Cover photo: Unsplash

Layout by: Mireia Villalonga

Available from: IUCN (International Union for Conservation of Nature)  
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## IUCN Document Control

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Version: 2 (Final)

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### Citation

Asia Pacific Waste Consultants, 2021. Plastic Waste National Level Quantification and Sectoral Material Flow Analysis: Caribbean Regional Report.

Prepared for IUCN for the Plastic Waste Free Islands Project, July 2021

### About the authors

Asia Pacific Waste Consultants (APWC) is a leading international environmental management consultancy specialising in the solid waste and recycling sectors. Our dedicated team of experts is passionate about improving environmental outcomes in developing and developed economies.

### Disclaimer

This study only considers material flow analysis of plastic material from the household and commercial sector, tourism sector and fisheries sector as outlined below.

- Household and commercial sector – households and commercial businesses (including supermarkets, stores, administration/office, food and retail outlets).
- Tourism sector – land-based tourism accommodation (including hotels, resorts, bed and breakfast), air-based tourism (airlines and airports), water-based tourism (cruise ships and yachts).
- Fisheries sector – domestic and international fishing vessels.

The authors have taken all due care and skill to ensure all material is accurate as of the date of this report. APWC and the authors do not accept responsibility for any loss that may arise by anyone relying upon its contents.

## Limitations to study

The COVID-19 pandemic prevented the ability to undertake and deliver the project methodology as agreed prior to the pandemic commencing. The original methodology was amended to reflect the impact and challenges presented due to public health and global travel restrictions, and the associated increase in hazardous waste material. The adapted methodology is found in Appendix C: Project methodology.

In addition, amendments to the method for data analysis were also undertaken. These include:

- Tourist accommodation samples collected in Grenada, St Lucia, Fiji and Vanuatu were not representative of waste generated by accommodation premises during pre-COVID-19 years. Therefore, data was extrapolated from previous years and similar countries to estimate waste disposal from the tourism sector.
- There was a lack of direct samples for accommodation composition data, therefore composition data from other countries was applied for modelling purposes.
- Antigua and Barbuda was the only country where auditing cruise-ship waste was permitted, therefore estimates of cruise-ship composition are particularly uncertain.
- Airline analysis was not affected, as audit and flight data prior to COVID-19 was applied to all countries.
- Although COVID-19 had a substantial economic impact and potentially changed consumption habits, no substitutions were applied to the household or commercial waste composition.
- There was a lack of direct samples for fishing gear, therefore potential leakage estimates were calculated using two methods: 1) potential leakage of fishing gear based on the type of fishing activity, represented in the number of fishing gear items leaked; and 2) potential leakage of fishing gear based on import data, represented in tonnes.

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## Countries of focus

This report considers waste disposal and plastics movement in the Eastern Caribbean region. These countries include:

- Anguilla
- Antigua and Barbuda
- Barbados
- The British Virgin Islands
- Dominica
- French Guiana
- Grenada
- Guadeloupe
- Martinique
- Montserrat
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines

The [countries of focus mentioned](#) in this report include Antigua and Barbuda, Grenada and Saint Lucia.



## Executive Summary

IUCN Plastic Waste Free Islands				
Reduce	Improve	Repurpose	Create	Develop
plastic leakage in the ocean.	the knowledge of waste generation among three islands in the Caribbean and three in the Pacific.	waste into commercially viable products to generate jobs and income for local communities.	value chains for waste plastic usage.	a Plastic Waste Free Island blueprint to be scaled up and used by any island country or regional body.

### What is the Plastic Waste Free Islands project?

With support from the Norwegian Agency for Development Cooperation (NORAD), IUCN initiated the Plastic Waste Free Islands (PWFI) project in 2019, part of its global ‘Close the Plastic Tap’ programme. The project strives to promote island circular economy and devise effective and quantifiable solutions to address plastic leakage from Small Island Developing States (SIDS). Most SIDS have vulnerable economies that are largely reliant on tourism and fisheries.

### Aims of the project

Asia Pacific Waste Consultants (APWC) was engaged by IUCN in 2020 to undertake a National Level Quantification of Plastic Waste and sectoral Material Flow Analysis in three key sectors – household and commercial, tourism and fisheries – as stage one of the Plastic Waste Free Islands Project. The plastic waste data mapping has tracked seven plastic materials in an island-wide plastic influx and outflux format. This included assessing imports and exports at a national level to identify sources, quantities and pathways of plastic waste generated and leaked. The assessments were conducted per sector across six countries in two regions – Antigua and Barbuda, Grenada and St Lucia in the Caribbean, and Samoa, Fiji and Vanuatu in the Pacific.

Data has also been collected to provide a robust and comprehensive assessment of the plastic flows and leakages, including an overview of the waste management landscape for both regions.





## APWC quantification

Asia Pacific Waste Consultants (APWC) gathered in-country data during 2020 in three representative Caribbean countries: [Antigua and Barbuda](#), [Grenada and Saint Lucia](#). For the purpose of this report, all regional data analysis is based on these countries only. Data collection encompassed three sectors — household and commercial, tourism and fisheries, and included [sampling, auditing, interviews, questionnaires and consultations](#). In order to consistently quantify inputs and outputs of plastic (including imports and exports) across national levels, locally sourced field-level data was supplemented with regionally focused published research and national statistical data sets.

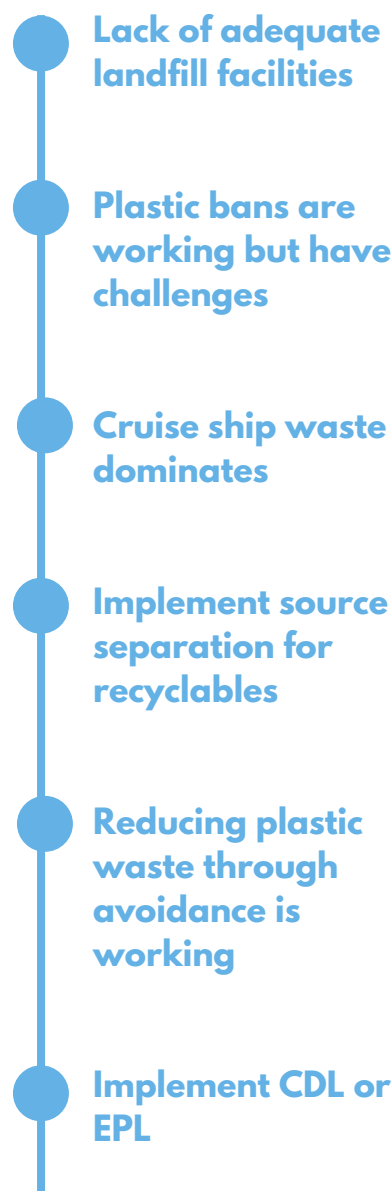
Seven plastic categories were targeted for assessment and qualification: PET; HDPE; PVC; LDPE; PP; PS and other plastics (polycarbonate, polylactide).

# 7

## Plastics assessed

### Activities and assessment

- Waste disposal data from **648 households**, **99 commercial premises**, **93 tourism operators** and **30 fishing vessels**.
- Visual landfill audit of **1,075 trucks** entering the **5 landfills**.
- **29 stockpile assessments**.
- Disposal data is supported by **sectoral interviews** with **939 stakeholders**.
- Extensive data analysis and desktop research was undertaken, culminating in individual reports for each country. The findings of these reports were then collated, analysed, extrapolated and consequently amalgamated into a regional document.



## Caribbean regional snapshot

The Eastern Caribbean Region is bordered by the Atlantic Ocean to the east and by the Caribbean Sea to the west. The Lesser Antilles Chain, a long and partially volcanic island arc in the Caribbean Sea, includes eight sovereign states and 14 dependencies (of the UK, Netherlands, France and USA). Of these 22 states and territories, nine are member states of the Organisation of Eastern Caribbean (OECS), an international, intergovernmental organisation dedicated to regional integration in the Eastern Caribbean ([oecs.org](http://oecs.org)).

The three representative island nations in this study are:

- **Antigua and Barbuda**, which form a twin-island state as part of the Leeward Islands group (FAO 2018);
- **Grenada**, a tri-island state (Grenada, Carriacou and Petite Martinique) and the most southerly of the Windward Islands, located 160 kilometres north of Venezuela; and
- **Saint Lucia**, also part of the Windward Islands, is of volcanic origin and north of Trinidad and Tobago.

The Small Island Developing States (SIDS) in the Caribbean are particularly exposed and vulnerable to increased damage from plastic leakage. Marine plastic pollution is now ubiquitous in SIDS, posing a serious threat to ecosystems highly valued for tourism, fisheries and other valuable commodities. Further challenges for these countries include poorly developed waste management infrastructure, exposure to extreme weather events, small land mass and the majority of their populations living within 10 kilometres of the ocean (Diez et al., 2019).

The accumulation of plastic waste in oceans from domestic, industrial and fishing activities is fast becoming both a regional concern and a pivotal global issue. The increasing popularity of plastic, combined with low recycling rates, is increasing the volume of plastic leakage into the environment, with current global indications placing leakage at 3% or 12 million tonnes per year of all plastic produced (IUCN, 2020).

Studies of the concentration levels of plastics in the Caribbean Sea have been measured at between 20 and 200,000 items per square kilometre (Diez et al., World Bank, 2019). Flexible packaging (such as films, wraps and bags) and multilayer materials (such as sachets, nappies and beverage cartons) represent a disproportionate share of leakage from land-based sources, at 46% and 26% respectively (Diez et al., 2019). Mismanaged waste – including illegal dumping, inadequate disposal, and insufficient and ageing waste management infrastructure – is a primary source of plastic leakage in SIDS.



Figure 1: Location of SIDS for case studies: Antigua and Barbuda, Saint Lucia and Grenada (Source: <https://images.app.goo.gl/czEPmksjTz8LXJ116>)

**The Caribbean is the second most plastic-contaminated sea in the world after the Mediterranean Sea. Estimations of the volume of plastic waste in this area range from 600 to 1,414 plastic items per square kilometre in different locations. (UNEP, 2019)**

Addressing marine pollution is an ecological, economic and social priority, particularly in a region extremely susceptible to the impacts of global marine pollution. Efforts must be directed toward stemming the plastics flow to marine environments and waterways by supporting better waste management and service delivery, implementing broad and effective policy initiatives, encouraging behavioural changes at consumer and industry levels and increasing the investment in government and private sector innovation.

The sustainable use of ocean resources – the so-called ‘blue economy’– is paramount in balancing the demands of the Caribbean’s economic growth, tourism and service logistics and, crucially, the biodiversity of marine ecosystems and the health of its indigenous inhabitants (World Bank, 2016).

**Seventy to 85 per cent of marine litter in the Caribbean Sea comes from land, and most of it consists of PLASTIC. (UNEP)**

### Plastics in Caribbean Region

- Plastic accounts for approximately 20% of total solid waste.
- Plastic litter found in marine and coastal environments average 2,014 items per square kilometre compared with a global average of 573 items per square kilometre.



**Area of three audited countries:**

**Antigua & Barbuda:** 440 km<sup>2</sup>

**Grenada:** 340 km<sup>2</sup>

**St Lucia:** 610 km<sup>2</sup>

**Coastline (combined):** 432 km

**Combined EZZ:** 153,384 km<sup>2</sup>  
(FAO)



**Population:**

394,079  
(Worldometer, 2021)



**UN Country classification:**

Small Island Developing State



# Regional sectoral overview

## Solid waste management in the Caribbean

Increasing population, urbanisation, per-capita incomes and imported goods have altered the nature and complexity of waste composition in the Caribbean, challenging the customary ways of managing household refuse. Traditional practices of reusing waste materials and composting organic waste have been superseded by convenient and free municipal collection programmes, with increasing amounts of plastic, cardboard and other potentially recyclable materials collected and transported to landfill sites for disposal (Kinnaman, 2010).

Solid waste management (SWM) is particularly relevant in the Caribbean because most economies in the region are highly dependent on the key, resource-based sectors, including tourism, mining, forestry, agriculture and fisheries (Philipps and Thorne, 2013). Inadequate waste collection and disposal practices, coupled with a lack of or insufficient regulation and enforcement, pose a direct threat to ecosystems and biodiversity, food production and income, as well as livelihoods and health outcomes for millions across the region (Diez et al., 2019). Fortifying and consolidating solid waste management systems and infrastructure is costly and often directly competes with other prominent economic and social issues for adequate funding, such as fiscal and trade matters, poverty and unemployment, and education and health (Riquelme et al., 2016).

Solid waste collections in Caribbean countries range from fully public to fully private services operating under public-sector contract. When the public sector takes full responsibility for collection, the investment and operation costs (fleet maintenance, fuel, etc.) are funded by the public sector either through the municipality or through the national budget. In public-private mix models, the public entity in charge of collection contracts a private company that provides collection services additionally to the services provided by the public fleet. In fully private arrangements, the public sector outsources the services to a private player through a contract agreement (Riquelme et al., 2016).

Approximately 84% of the population across the region benefit from a waste collection service. Households present waste for collection in a number of ways: in communal or individual household steel bins; in bags placed directly on the kerb or hanging from a tree. Collection frequency for households, commercial businesses and tourism operators varies across countries, often along urban, peri-urban or rural lines. The collection vehicles used for households are mostly state-owned and operated compactor trucks.

**The estimated total municipal solid waste is 13.7 million tonnes each year in Caribbean countries.**

Recycling is carried out in a limited and ad hoc fashion. One plastics aggregator operates in Antigua (ABWREC, a non-profit organisation), with all plastics salvaged shipped offshore for recycling. ABWREC also promotes and encourages the separation of recyclables in the community. Waste pickers in Grenada carry out limited recycling of metal, which is then stockpiled and exported for recycling when international prices are favourable (GSWMA, 2020). Chipped green waste is sold as mulch. In Saint Lucia, small-scale recycling is carried out by a number of private operators. As no sustainable markets are available for the material, and there is a lack of institutional support, these operators aggregate recyclable material into stockpiles until fluctuating prices rise or stabilise. Some businesses have segregated disposal stations and segregated collection through Greening the Caribbean.

After collection, waste is disposed of in landfills or in uncontrolled, open dumps lacking adequate pollution control measures, such as soil cover, leachate control or drainage, gas collection or environmental monitoring. Some landfills are equipped with weighbridges, allowing for some quantification of waste generation. In general, no tipping fees are charged at landfills for general household waste, however Commercial & Industrial Waste (C&I), special and hazardous wastes, and ship waste incur fees per tonne and there are some load restrictions in place.

At present, more emphasis is placed on solid waste collection and less on composting, recycling and proper disposal in the Caribbean region. Participants at the Caribbean Solid Waste Management Conference (2016) stressed the need to include separation at source as a clear SWM goal. Separation at source is crucial to promote reuse and recycling and ultimately minimise solid waste going to final disposal sites (Riquelme et al., 2016).

## **No systematic source separation of recyclable materials, including organic waste, takes place prior to household and commercial collection in Antigua and Barbuda, Grenada or Saint Lucia.**

### **Tourism impacts**

The Caribbean region is home to less than 1% of the world's population, yet as a popular international destination receives 6% of the world's tourists each year (Diez et al., 2019), with an estimated 30.2 million international arrivals in 2018<sup>1</sup>. The region's thriving tourism industry attracts visitors from across the globe to enjoy the tropical climate, stunning beaches and reefs, rich biodiversity and unique culture, as well as recreational pursuits such as snorkelling, scuba diving, boating, fishing, hiking and sightseeing. The Caribbean has also emerged as a major hub for the global cruise-liner industry, reaching around one-third of the global passenger capacity, a dominance once held by the Mediterranean region. The vast majority of travellers spend their time on or near coastal areas.

**The travel and tourism sector accounted for 13.9% of the Caribbean's GDP in 2019 (Lopez, 2020). Its contribution to GDP in the region alone brings in more than USD 59 billion a year. (Statista.com)**

<sup>1</sup> <https://www.onecaribbean.org/about-cto/>

**The Caribbean region welcomed approximately 26.3 million foreign visitors in 2019, making it the top international revenue generator in the region for the year.**

High tourist numbers bring multiple economic benefits but also significant pressures on waste management facilities in Caribbean SIDS, mostly owing to their small size and limited infrastructure. Tourism also drives the demand for consumer products, which creates waste that is difficult to manage in terms of volume, composition and recyclable potential (UNEP, 2019). Increasing volumes of marine plastic pollution also affect the aesthetic appeal of coastal locations.

Antigua and Barbuda is one of the Caribbean's most frequented tourism hotspots. During 2019, approximately 1.05 million tourists (air- and sea-based) visited the twin islands, with the majority holidaying during the high season from mid-November to mid-April (Eastern Caribbean Central Bank, 2020a). The country's economic development has shifted from traditional agrarian roots to now being based primarily on tourism, and consequently, the sector is highly dependent on the health of the environment. The tourism sector contributes 42.7% of Antigua and Barbuda's GDP and provides 338,000 jobs, accounting for 90.7% of total employment and more jobs than any other sector in the country (World Travel and Tourism Council, 2020).

Similarly, over the past two decades, the traditionally agrarian-based economy of Saint Lucia has shifted towards a service-based economy, with tourism as the fastest-growing new sector, surpassing that of agriculture in GDP contribution and becoming the main source of foreign exchange earnings (FAO, 2012). Grenada has also seen an increase in tourist numbers, receiving 529,985 air and sea tourists in 2019; Saint Lucia welcomed 609,740 air and sea tourists during the same period.

Compared with the rest of the Caribbean archipelago, both Saint Lucia and Grenada have lower numbers of tourists and tourist spending. In 2014, tourism receipts in Grenada and Saint Lucia were USD 128 million and USD 360 million, respectively and their tourism arrivals were 134,000, and 338,000 (OECS, 2017). From a regional perspective, in 2013, OECS countries received about 273,900 or 17% of the intra-Caribbean tourists out of approximately 1.6 million arrivals to the Caribbean, with the OECS region accounting for less than 0.2% of world tourism arrivals.

During 2019, Grenada received 337,940 passengers by cruise ship; 254 international port calls from cruise liners; 16 parent cruise companies operated 27 cruise ships out of Grenada in 2019. For both cruise ships and yachts operating in the Caribbean, organic waste can be disposed of at sea, 12 nautical miles from shore, and organic waste that is less than 2.5 centimetres in size can be dumped at three or more nautical miles from shore (GPA, 2021). There are facilities onshore at ports operated by the port authorities for dumping non-organic waste and charges may apply.

**In Saint Lucia, yachts generate 1,054 tonnes or 11.9% of the total waste generated by the tourism sector. Rodney Bay marina has established segregated waste disposal and collection to allow for the recycling of plastic bottles, cans, e-waste and other metals, and paper and cardboard.**

In Saint Lucia, hotels and resorts are the largest waste generators and therefore represent the most significant potential for reductions in plastic waste (APWC, 2021). Similar to all private commercial entities, land-based accommodation operators are required to organise waste management collections through private arrangements with licensed waste hauliers, with collection frequency varying from three times per week to weekly. Tourists in accommodation contribute three times more waste than residents contribute per day. In 2020, the tourism sector generated 8,851 tonnes of waste. Of this, 706 tonnes were a plastic waste, contributing 14% of the overall plastics generation for Saint Lucia. Unsurprisingly, organic waste accounted for the largest amount of waste generated, at 45% of the total generated by the tourism sector. Paper and cardboard accounted for 15% of the total waste produced by the sector, generating 1,308 tonnes of waste for the year. Glass contributed 16% towards the total generation rate.

The Ministry of Tourism/NSO reports that 794,604 cruise passengers and 18,855 yacht passengers visited Antigua and Barbuda (Ministry of Tourism, 2020). In Grenada, cruise tourists do not contribute waste.

Expanding cruise-ship tourism in the Wider Caribbean comes at a high environmental cost, according to UNEP. On a one-week voyage, a middle-sized cruise ship (about 3,500 passengers) generates 500 litres of hazardous waste and 8 tonnes of garbage (World Bank, 2019).

**Tourism waste contributes 14% of all plastic waste generated in Saint Lucia, with tourists in accommodation contributing more than three times the waste of residents.**

## **Airline waste in Saint Lucia is composed of 19% plastics.**

### **Fisheries impacts**

The reef fisheries of the Caribbean provide a vital source of protein for millions across the region as well as affording employment, food security and social equity and cohesion (HLPE, 2014). Across the audited SIDS, the fisheries sector makes a considerable contribution to each nation's GDP, generating income and sustaining livelihoods for local people into the future. Commercial, recreational and subsistence (artisanal) fisheries operate in Caribbean SIDS. All are strongly linked to the community and have diverse levels of involvement in the fisheries sector as a whole. The fishing industries in Antigua and Barbuda, Grenada and Saint Lucia have developed from principally artisanal-style fishing to a more commercialised and complex multi-species fishery (MRAG 2021).

**Fisheries are a central component of the Blue Economy — a vision of a vibrant ocean and coastal areas that also fosters economic growth and sustainable livelihoods.**  
(gef.org)

The total number of fishing vessels operating in the commercial capture fisheries of the Caribbean Regional Fisheries Mechanism (CRFM) member states is estimated to be an average of 32,817 per year (2015/2016). The increased commercialisation of the fishery is related to the continuous access to large oceanic pelagic species like tuna, which now constitutes 75% of landings.



**According to a census conducted by the Department of Fisheries in 2012, 30% of people employed in the fisheries sector in Saint Lucia earn up to 50% of their household income from fishing.**

Most of the coastal fishing in the Caribbean is undertaken in open or half-decked vessels with outboard motors. The majority of fishing is for local consumption and provides a significant source of food, employment and income for the local population. The number of active fishing vessels fluctuates annually. On average, there are 250 to 380 domestic vessels operating in Antigua and Barbuda's exclusive economic zone (EEZ). During the 1970s, the domestic fishing fleet was dominated by wooden dories, but today has been replaced with fibreglass lances and pirogue wooden vessels (FOA, 2021).

Abandoned, lost or otherwise discarded fishing gear (ALDFG) is a key component of global marine debris (Macfadyen et al., 2009). It includes nets, lines, traps and other recreational or commercial fishing equipment that has been lost, abandoned or discarded in the marine environment (Matthews and Glazer, 2010). The increased use of plastic and nylon fishing gear leads to the decades-long persistence of plastic debris in the marine environment, often capturing, entangling and killing a broad range of marine animals. The amount of ALDFG in marine debris continues to increase each year (Macfadyen et al., 2009).

**International vessels do not operate and are not permitted to undertake fishing activities within the 7,147 m<sup>2</sup> of Antiguan waters.**

The plastic components of the fishing gear used in the fishing methods above are mostly derived from non-degradable plastic materials (Table 1). Polyethylene (PE), polyamide (PA), polypropylene (PP) and polyester (PES), and other synthetic materials such as polyvinyl chloride (PVC), polyvinyl alcohol (PVAA) and polyvinylidene chloride, are the most commonly used plastics material in fishing gear (Hameed and Boopendranath, 2000; Meenakumari and Radhalakshmi, 2003).

For example, most nets, ropes and lines are comprised of a wide variety of non-biodegradable mono- or multifilament fibre polymer materials, as outlined below:

- The main polymers used to make netting include PE, PA, PES.
- Most ropes and lines are comprised of PP, PE, ultra-high molecular weight polyethylene (UHMWPE) and PA.
- Floats and buoys are commonly comprised of PE, acrylonitrile butadiene styrene (ABS), expanded polystyrene (EPS) and polyurethane (PUR).

For further information and details relating to the household and commercial, tourism and fisheries sectors in Antigua and Barbuda, Grenada and Saint Lucia, please refer to the individual country reports.

Table 1: Synthetic fibres suitable for different fishing gear

## Material

- Mono- or multifilament polymer nylon
- Polyethylene and polyester (polyethylene terephthalate)
- Polypropylene (PP)
- Polyvinyl chloride (PVC)
- Expanded polystyrene (EPS)
- High-density polyethylene (HDPE)

## Fishing Gear

- Nets and mesh for traps, ropes and floats
- Ropes and bags
- Ropes, bags, tubs, buckets and trays
- Nets, piping, valves, floats, cage and net pen collars and crates
- Floats and buoys
- Flotation, ropes, net webbing, storage tanks; pots, tubs and buckets, and piping for water and air supplies



# Plastics consumption in the Caribbean

## Plastic imports and exports

At present, a limited number of Eastern Caribbean islands collect plastic material for recycling and export. The region as a whole and particularly the countries of interest in this study is known as net importers of plastic products rather than as manufacturers/exporters, as highlighted in Figure 2.

In 2020, 14,595 tonnes of plastic material were imported into the countries in focus. Imports into St Lucia accounted for 40% of the total, Grenada 34% and Antigua and Barbuda 26% of total imports into the countries of focus. Over the same period, 390 tonnes of plastic were exported by the three countries in focus. St Lucia exported 59% of all plastic material exported; Grenada 41% and Antigua and Barbuda did not export any plastic material during 2020.

International cruise ships were responsible for offloading 600 tonnes of plastic waste in Antigua and Barbuda and St Lucia. Grenada does not currently accept waste from cruise ships.

## Fishing gear plastic imports

In 2019, the countries of focus imported approximately 34.21 tonnes of fishing gear containing plastic components, with Grenada responsible for 49% of all imports. It is important to note, however, that import data is missing from Antigua and Barbuda (Table 2).

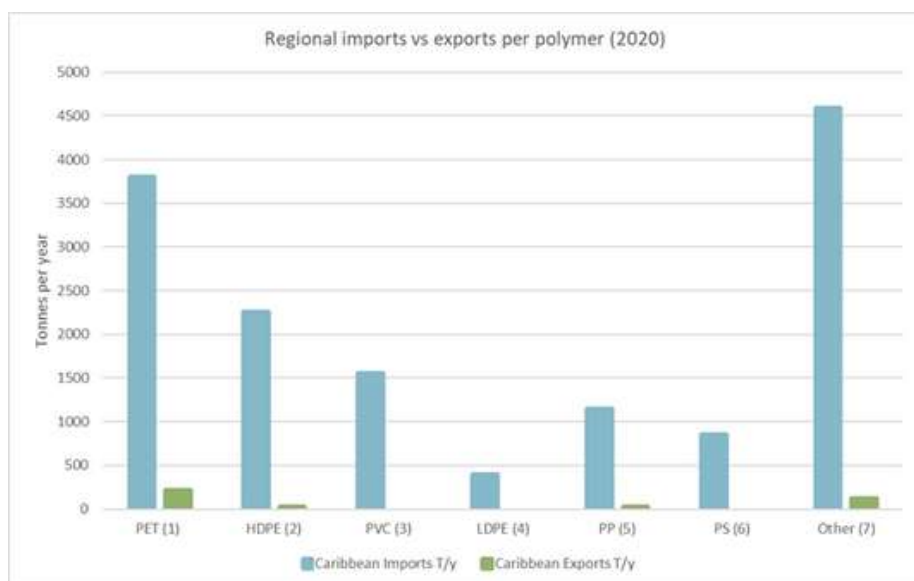


Figure 2: Plastic imports vs. exports by polymer (Antigua and Barbuda, Grenada and St Lucia), 2020

Table 2: Import of fishing gear (2019) (tonnes per year)

HS Code	Definition	Antigua/Barbuda	Grenada	Saint Lucia
56081100	Made up of fishing nets: other	0.30	1.89	0.17
56081900	Other (fish netting)	-	0.01	1.78
950710	Fishing rods	0.87	1.93	1.45
950730	Fishing reels	1.39	2.47	0.98
950790	Other+	4.84	2.90	0.58
9507901	Line-fishing tackle, including fish-landing nets	1.10	7.53	4.00
	<b>Total imports</b>	<b>8.51</b>	<b>16.73</b>	<b>8.97</b>

+ Other fishing rods, fish-hooks, line-fishing tackle, fish-landing nets, butterfly nets and nets decoy 'birds' and similar hunting equipment

\*2018 data provided



# Institutional Framework

## Multilateral environmental agreements (MEAs) and regional agreements in the Caribbean

International agreements are required to regulate the movement of waste in and out of countries to prevent harm to the environment and mitigate adverse effects on human health. A number of waste-related multilateral environmental agreements (MEAs) have been ratified between countries across the Caribbean region. A full list of relevant international and regional agreements and local legislation can be found in the individual country reports.

Enforcement of MEAs and their implementation is a government responsibility, including measures that give effect to obligations under international agreements. For effective recycling of materials, Caribbean SIDS must be able to collect, compact and move material within the region as well as internationally. MEAs help to support these activities.

Two main frameworks have been developed to promote cooperation on pollution reduction, control and prevention in the Caribbean: the protocol on the Control of Land Based Sources of Marine Pollution (LBS Protocol) and the Caribbean Regional Action Plan on Marine Litter Management (RAPMaLi). The latter provides guidance on actions to protect the region's fragile coastal and marine ecosystems from solid waste and marine litter.

Table 3: Multilateral Environmental Agreements in Antigua and Barbuda, Grenada and St Lucia

	Antigua/Barbuda	Grenada	Saint Lucia
Minamata Convention on Mercury, 2013 Stockholm Convention on Persistent Organic Pollutants, 2001	2016		2019
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998	2003		2002
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998	2010		1999*
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994	1997	1997	1997
Convention on Biological Diversity, 1992	1993	1994	1993
Cartagena Protocol on Biosafety, 2000	2003	2004	2005
United Nations Framework Convention on Climate Change, 1992	1993	1994	1993
Kyoto Protocol, 1997	1998	2002	2003
Paris Agreement, 2015	2016	2016	2016
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989	1993		1993
Vienna Convention for the Protection of the Ozone Layer, 1985	1992	1993	1993
Montreal Protocol on Substances that Deplete the Ozone Layer, 1987	1992	1993	1993
MARPOL 73/78, International Convention for the Prevention of Pollution from Ships	1988	2018 (Annex I, II and VI only)	2016 (Annex VI only)
Convention on the Conservation of Migratory Species of Wild Animals, 1979	2007		
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	1997	1999	1982
Convention on Wetlands (Ramsar Convention), 1971	2005	2012	2002

\*Agreement signed by not ratified

+Grenada is not a party to the MARPOL Convention and all policy/regulations regarding the collection and disposal of SGW fall under provisions of municipal solid waste.

## **Amendments to the Basel Convention from 1 January 2021 restrict international trade of plastic scrap material and waste to reduce leakage into the environment.**

**International shipments will require prior written consent from importing and any transit countries. Plastic scrap materials must be a pre-sorted, clean, uncontaminated waste. Plastics consisting of one non-halogenated polymer such as PE, PP and PET will not be subject to the 'prior informed consent procedure prior to export if destined for environmentally sound recycling.**

### **Regional agreements**

The Cartagena Convention is the only agreement that governs marine litter issues specific to the Caribbean region. It does this through the Protocol concerning Pollution from Land-Based Sources and Activities (LBS Protocol). A list of regional bodies and their functions can be found in Appendix 5. For quick reference, the regional bodies are listed below.

- Organisation of Eastern States (OECS)
- Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

- Caribbean Tourism Organisation (CTO)
- Caribbean Alliance for Sustainable Tourism (CAST)
- Caribbean Hotel and Tourism Association (CHTA)
- Cruise Lines International Association, Inc. (CLIA)
- Global Environment Facility (GEF)
- Caribbean Regional Fisheries Mechanism (CRFM), and the Caribbean Fisheries Forum
- Western Central Atlantic Fishery Commission (WECAFC)

### **Plastic bans in the Caribbean**

The importation of single-use plastic and polystyrene (Styrofoam) is banned in 12 Caribbean countries in an effort to stem the flow of plastic pollution. The government of Antigua and Barbuda was the first to implement bans on these products in 2016, with Saint Lucia most recently issuing a ban in August 2019. Grenada became the eighth Caribbean country to introduce plastic bans (UNEP, 2019) in 2018. Some nations have a phased approach, with full bans coming into effect in 2021 (ApaNa, 2019). Figure 3 provides a timeline of plastic bans in the countries of interest for the purpose of this study. Each country has commenced plastic bans to varying degrees.

- The Antigua and Barbuda Declaration aims to encourage all Caribbean countries to eliminate the use of single-use plastics and collaborate to end the pollution of the oceans.
- In order to support the use of plastic alternatives, the government of Saint Lucia is working towards a zero or reduced import duty for biodegradable and compostable food service containers.

Figure 4 presents a comparison of annual plastic disposal per polymer type between the countries of interest. HDPE (2) and PS (6) materials are disposed of in higher quantities across all three countries despite the bans in place.

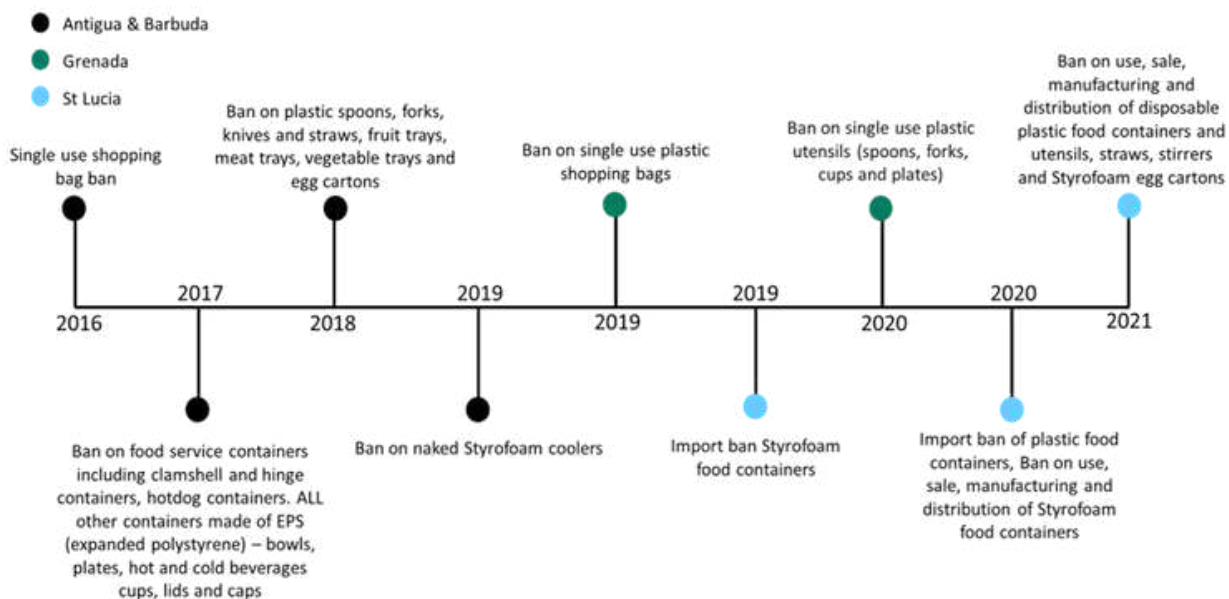


Figure 3: Plastic bans across the Caribbean region (Antigua and Barbuda, Grenada, and St Lucia)

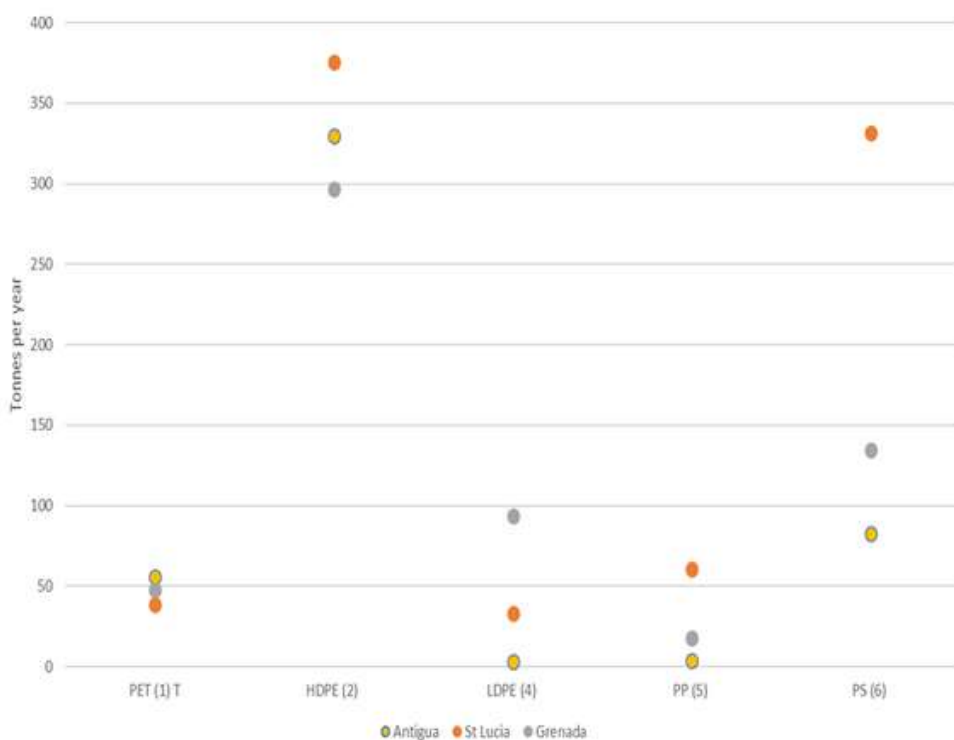


Figure 4: Comparison of plastic disposal per polymer type (tonnes per year)

## Waste management governing bodies, budgets and levies

### Antigua and Barbuda

In 2019, the Ministry of Health, Wellness and Environment allocated 13% of the budget for the Ministry to solid waste management services. Eighty-two per cent (82%) or XCD 12,000,000 was allocated for grants to the National Solid Waste Management Authorities and corporations, 10% (XCD 1,500,000) to waste removal costs, for example collecting derelict cars, and 4% (XCD 500,000) to garbage disposal costs.

### Grenada

In 2019, the annual budget for solid waste management was 1.25% of the government's national budget. Spending included XCD 12,610,069 for all collection and disposal services, landfill operations, and maintenance works; public cleaning represents 59% of Grenada's Solid Waste Management Authorities annual budget.

As no tipping fees at the landfill are currently charged, the only user-pays revenue comes from household levies, which cover just 75% of the cost of waste collection.

### St Lucia

Saint Lucia's Solid Waste Management Authority's (SLSWMA) annual budget is XCD 14,226,904. The cost of waste management in Saint Lucia represents 95% of the SLSWMA's annual budget and 4.2% of the government's national budget in 2019 (SLSWMA, 2020c; Government of Saint Lucia, 2018b). Table 4 details the waste management budget and levies across the audited countries.

Table 4: Waste management budget and levies

Country	Governing body	Landfill fees/levies	% government budget
Antigua and Barbuda	NSWMA	<ul style="list-style-type: none"> <li>No tipping fees at Cook's Landfill for households</li> <li>Commercial, industrial, institution, and businesses charged USD 20 per tonne at the weighbridge (lost to the system)</li> <li>Environmental levy on cruise ship passengers (USD 1.50) (lost to the system).</li> <li>No tax on air passengers</li> </ul>	13% of the total budget for the Ministry (2019)
Grenada	GSWMA	<ul style="list-style-type: none"> <li>No tipping fees at Perseverance or Carriacou landfills for households</li> <li>Commercial sector fees are defined in the National Waste Management Act but not enforced for fear of illegal dumping</li> </ul>	1.25% (2019)
Saint Lucia	SLSWMA	<ul style="list-style-type: none"> <li>No tipping fees at Deglos Sanitary Landfill (except for special waste)</li> <li>Environmental levy on every visitor through air and seaports for land and ship waste</li> <li>XCD 4.08 per visitor = XCD 5 million (2019)</li> <li>Levy covers 36% of the total annual budget of SLSWMA</li> </ul>	4.2% (2019)



# Waste service provision and infrastructure

## Collection services and waste management responsibilities

Across the Caribbean region, 84% of the population has a waste collection service. Most commercial businesses and tourism ventures are responsible for organising their own waste collections. Common themes across the countries of interest in the region include:

- At present households, commercial businesses, tourism operators and fishers are not required to segregate waste.
- Any recycling that is undertaken is done so by the choice of the individual.
- Commercial businesses and tourism operators are generally responsible for organising their own waste collection.
- In Grenada and Saint Lucia, waste collection services are provided by private companies.
- Collection frequency differs between countries.

**Caribbean countries that produce more waste have larger gaps in household waste collection services. (Diez et al., 2019)**

## Landfill

The World Bank recently reported that the Caribbean region has the highest landfill rate in the world. Some landfills are sanitary (although some are over capacity and are no longer adequate to function as sanitary landfills), some are controlled and some unspecified (World Bank, 2018). The recycling rate is very low across the region. The following provides a short current situational analysis of landfills in the countries of interest for this study.

### Antigua and Barbuda – Cook’s Landfill

- The landfill is over capacity, the old dumpsite is now in use and onsite infrastructure is not sufficient.
- Large amounts of green waste are deposited, causing deep air pockets and continuously smouldering fires.
- Space is available to construct two new sanitary cells at the current site.
- Recycling infrastructure is limited, private and not being used at its full capacity.
- Each vehicle load type and weight are recorded on entry at the weighbridge and there are now load restrictions in place.
- There is no tipping fee for households, however commercial, industrial and institutional businesses are charged USD 20 per tonne at the weighbridge (note: This does not include waste from the fisheries sector as this is collected by NSWMA. It would, however, include land- and sea-based tourism waste).

Table 5: Solid waste collection in Antigua and Barbuda, Grenada and St Lucia

	Antigua/Barbuda	Grenada	Saint Lucia
Waste service provided (%)	More than 95%	56–98% (GSWMA, 2020[1]).	100% of all households and institutions
Waste collection frequency	Once a week	Daily	Twice a week
Collection	Solid Waste Management Authority through its own trucks.	9 private contractors	Private companies are contracted by SLSWMA to collect waste in 11 waste collection zones who use their own equipment, facilities and staff
Disposal site	Cook's landfill	Perseverance and Carriacou landfills	Deglos Sanitary Landfill and Vieux Fort Waste Transfer Station
Weighbridge	Weighbridge is operational	Weighbridge at Perseverance by not operational	Both Deglos and Vieux Fort have weighbridges
Recycling	Limited infrastructure	No infrastructure	Limited infrastructure
Plastic recycling	ABWREC plastics aggregator	No infrastructure	Greening the Caribbean, D & D Recycling, Recyclene Solutions and JUA KALI Ltd aggregate plastics as part of their businesses

### Grenada – Perseverance, on Grenada island and Dumfries on Carriacou island

- Perseverance is an engineered sanitary landfill. Only the dumpsite is used after a land slippage in 2001.
  - It is located within 200 metres of the ocean, making leakage unavoidable directly into the sea.
  - It has been on fire since March 2021.
  - A new cell is being built, with a life expectancy of five years.
  - There are no ongoing plans for waste disposal beyond this.
  - There is a perimeter fence and secure access via a gate, and no access after hours.
- There is no daily covering of waste. Waste is compacted and light earth cover applied.
- No tipping fees are charged for waste disposal.
- Tipping fees at the landfill for the commercial sector are defined in the National Waste Management Act, however, are not enforced for fear of promoting increased illegal waste dumping and littering (GIZ, 2015).
- No systematic source separation of plastic or glass recyclables takes place.
- Dumfries was built as a sanitary landfill but is currently being used as a dump site.
  - There is no fence or gate to prevent waste leakage or stop scavenging animals from entering
  - No monitoring of waste disposal after hours.

### Saint Lucia – Deglos engineered sanitary landfill and Vieux Fort waste transfer facility

- Both facilities are equipped with weighbridges and accept waste from households, institutions, commercial, however and industrial, construction and demolition, certain hazardous waste (including asbestos, fibreglass, certain pharmaceuticals and biomedical waste), end-of-life vehicles, scrap metal, e-waste, used oil and quarantine waste from ships and aircraft.
- There are no tipping fees at the Deglos site for solid waste, except for special waste such as ship waste, biomedical ship waste, tyres, hazardous waste (asbestos, used oil), e-waste, biomedical waste and derelict cars.
- Waste is currently transported from Vieux Fort to Deglos. Twenty pyrolysis machines were purchased in 2020 to process waste from the island's southern areas but these are not yet operational.

## Regional waste initiatives

### ReMLit Project

The Building Resilience in the Eastern Caribbean through Reduction in Marine Litter project (ReMLIT) is a USD 3 million project implemented under the OECS Ocean Governance and Fisheries Programme. The project is funded by the Government of Norway. ReMLIT aims to reduce and control marine pollution in the Eastern Caribbean through strengthening legal frameworks (OECS.org).

### RePLAST

RePLAST-OECS Pilot Plastic Recycling Project was launched in May 2019 as a two-year, public-private initiative, implemented by UNITE Caribbean. It aims to establish an incentivised plastic waste collection and recycling scheme. The plastic collected will be exported to a recycling plant in the Caribbean, promoting a circular economy model. The first pilot country is Saint Lucia with subsequent replication in the other OECS countries.



# Waste generation and disposal

According to a recent study by Brooks et al. (2020), on average Eastern Caribbean countries generate 1.43 kilograms of waste per person per day (Figure 6). It is worth noting that this data is based heavily on What is Waste 2.0: A Global Snapshot of Solid Waste Management to 2050 report (Kaza et al., 2018) and the methods for calculating waste generation and disposal differ from APWC methodology.

Analysis of APWC audit data derived from in-country audits found that waste disposal rates in the Caribbean countries of interest differ from the findings of Brooks et al. (2020). Antigua and Barbuda has the largest discrepancy (2.47 kg/person/day) as shown in (Figure 6). St Lucia data is the most comparable and was the only country where APWC disposal rates fell under Brooks et al. (2020) figures.

## Waste disposal per sector

APWC's analysis suggests the tourism sector is responsible for the largest disposal intensity across the three countries of interest and is nearly double the daily disposal rate of the whole of Antigua and Barbuda.

- Household – 1.77 kilograms per person per day
- Commercial – 5.96 kilograms per person per day
- Tourism – 6.22 kilograms per tourist per day
- Fisheries – 2.13 kilograms per vessel per day

## Comparison of total waste disposal between regions

Figure 7 outlines the total waste disposal per capita versus GDP per capita (based on GDP per capita USD, 2019). It clearly indicates that countries in the Caribbean dispose of greater amounts of waste per person per day. At a country level, there appears to be a correlation between the classification of the country's economy and the amount of waste<sup>1</sup> disposal. The World Bank (World Bank, 2021) classifies the countries in the following way:

- Lower middle-income economies – Vanuatu
- Upper middle economies – Fiji, Grenada, Samoa, Saint Lucia, Tuvalu
- High-income economies – Antigua and Barbuda, Palau

This may lead to the assumption that countries with higher GDP per capita dispose of greater amounts of waste per day.

<sup>1</sup> World Bank (2021) Data: World Bank Country and Lending Groups. Country Classification. Available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

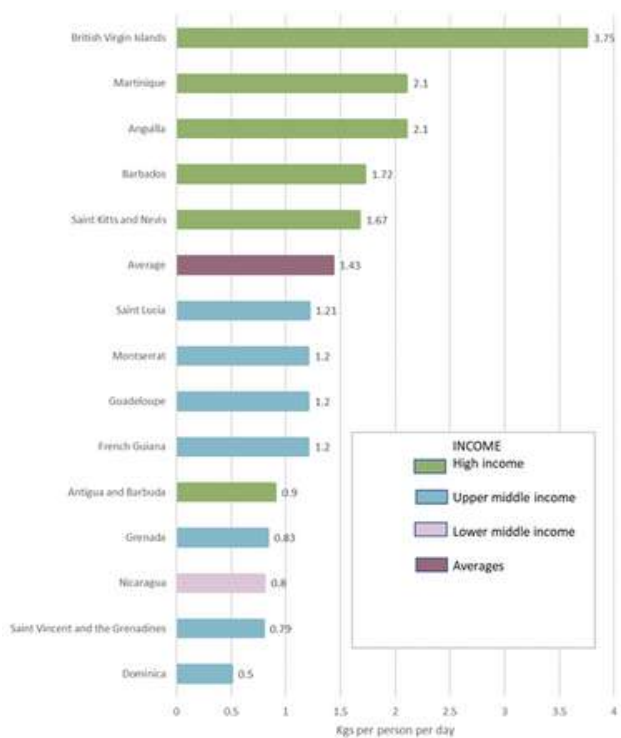


Figure 5: Eastern Caribbean Regional waste generation (kilograms per person per day) Source: Brooks et al. (2020).

## Composition of waste disposed of

Figure 8 overleaf provides a visual overview of the waste composition for waste disposal by household and commercial, tourism and fisheries sectors in the countries of interest during 2020. **Organic material accounted for 35.% of all waste disposed of** across the three countries. **Plastic material accounted for 5.2% overall.**

## Waste disposal methods

According to APWC audits in 2020, the most common waste disposal method across all sectors in the countries of interest for this project is to use the collection services provided by the government.

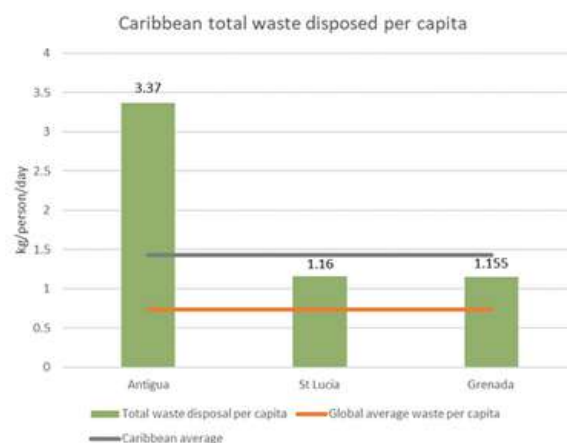


Figure 6: Total waste disposal per capita based on APWC audit data (kilograms per person per day).

## Waste disposal intensity

Figure 10 outlines the total waste disposal intensity versus the plastic disposal intensity for each sector in the countries of interest for this study. It outlines that the largest amount of waste disposal per person per day is in the tourism sector, followed by the commercial sector. The tourism sector is also responsible for the largest disposal of plastic material, followed by the fisheries sector.

## Movement of plastic material

Table 6 provides an outline of the amount of plastic material entering the Caribbean regions countries of focus via imports, the total plastic exported, disposed of, recycled and leaked.

## Plastics disposal contribution per sector

In 2020, 19,329 tonnes of plastic were disposed of in the Caribbean region (Antigua and Barbuda, Grenada and Saint Lucia). Figure 11 below outlines the disposal rate in tonnes and disposal percentage share by polymer type per sector.

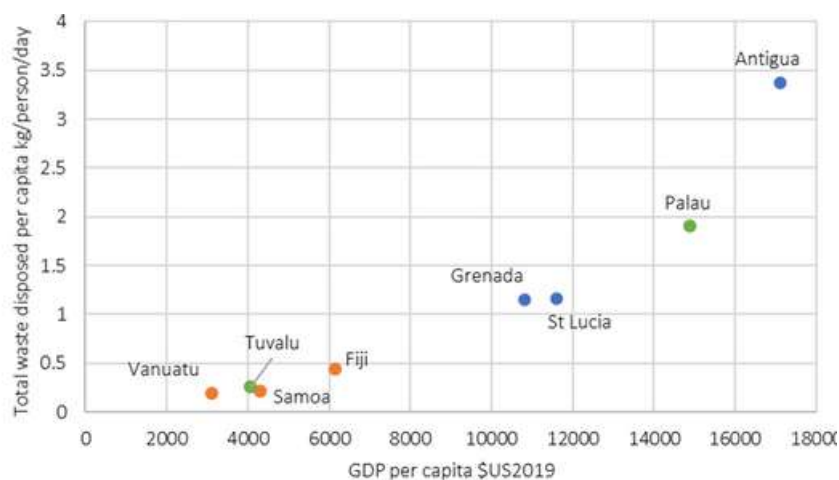


Figure 7: Comparison of total waste disposal per capita vs. GDP per capita in 2019 between the Caribbean and Pacific regions (Source: APWC data, 2019–2020)

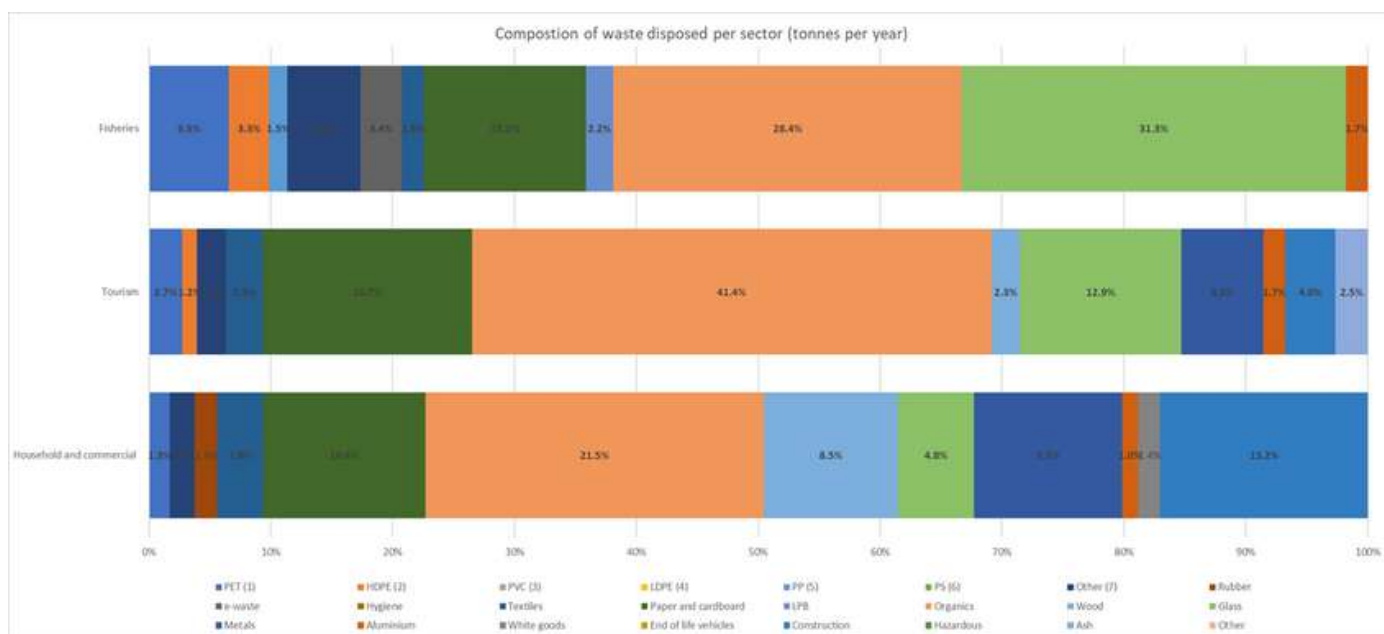


Figure 8: Composition of waste disposal by the household and commercial, tourism and fisheries sectors in the Caribbean (tonnes per year)

Table 6: Plastic material flow (tonnes per year)

	Imports	Exports	Disposal	Recycling	Leakage
PET	3,806	216	3,257	41	644
HDPE	2,253	27	1,899	18	386
LDPE	1,554	0	1,318	0.2	307
PP	396	0	184	0	212
PVC	1141	26	817	0	351
PS/EPS	852	0	574	0	281
Other Plastic	4,593	120	3,730	0	908
<b>Total</b>	<b>14,595</b>	<b>390</b>	<b>11,779</b>	<b>59</b>	<b>3,088</b>

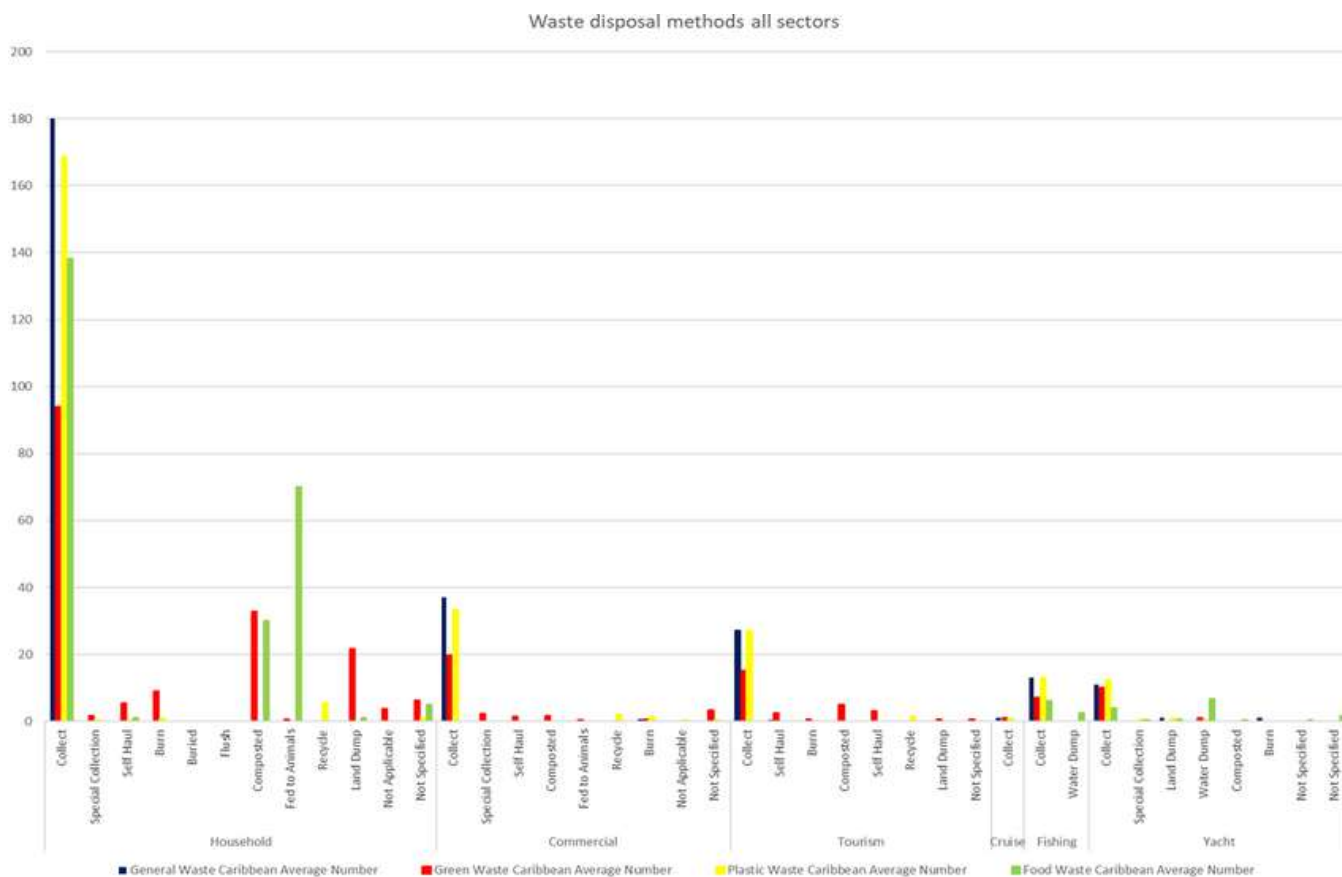


Figure 9: Waste disposal methods across all sectors in Antigua and Barbuda, Grenada and St Lucia

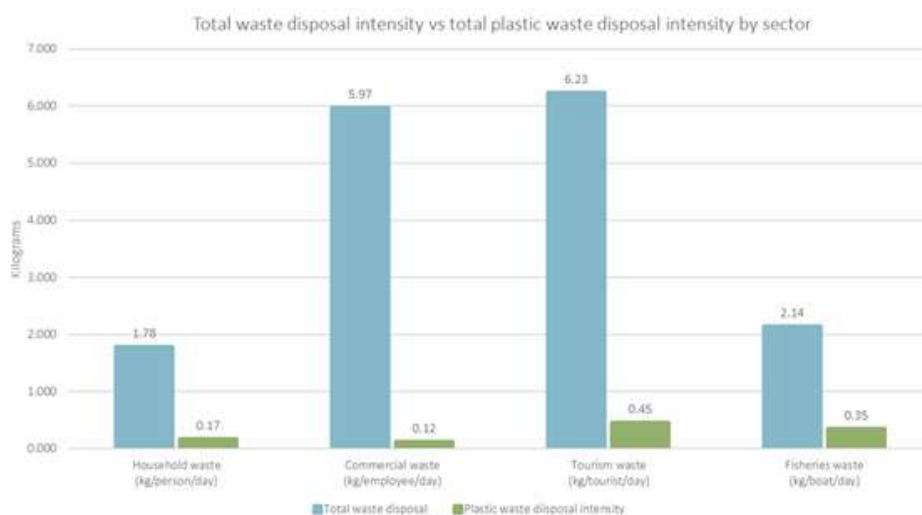


Figure 10: Waste disposal vs. total plastic waste disposal intensity (kilograms) by sector in Antigua and Barbuda, Grenada and Saint Lucia (2020)

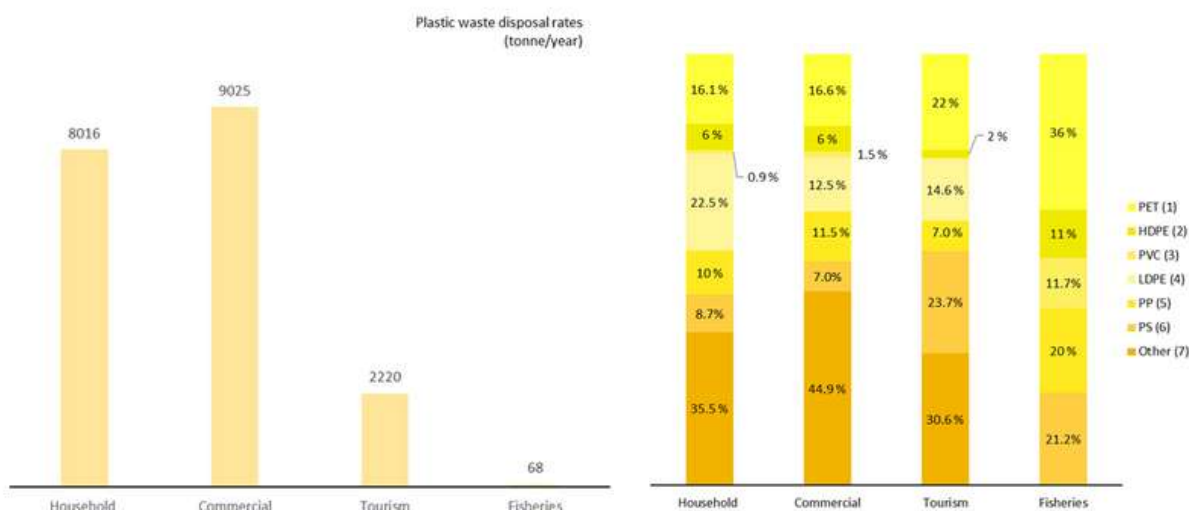


Figure 11: (Left) Plastic waste disposal rates (tonnes/year) in sectors of interest in Antigua and Barbuda, Grenada, and Saint. Lucia; (right) Percentage of plastic polymer disposal per sector

## Top 10 plastic items disposed

Table 7 provides a list of the top 10 plastic items most frequently disposed of in the Caribbean region.

- The top 10 plastic items account for 51% of all plastic waste disposal during 2020 (6,607 tonnes).
- Single-use plastics account for 50% of the top 10 plastics by polymer type. These items account for 26.2% of plastic waste disposal (3,393 tonnes).

- PET containers account for 30% of the top 10 plastics by polymer type. These items account for 18.4% of all plastic waste disposal (2,377 tonnes).
- Plastic shopping bags and garbage bags found in the top 10 plastic items disposed of account for 6.6% of all plastic waste disposal (855 tonnes).

Table 7: Top 10 plastic items disposed of by the household and commercial, tourism and fisheries sectors in the Caribbean region

% of all plastics	Polymer	Item
9.2	PET 1	• Water bottles PET
9.2	PET 1	• Beverage containers (not water) PET
7.7	LDPE 4	• Soft plastic packaging, single-use plastics
7.0	OTHER 7	• Soft plastic packaging, single-use plastics
4.9	OTHER 7	• Other single-use
3.6	HDPE 2	• Light shopping plastic bags single-use
3.0	HDPE 2	• Garbage bags single-use
2.5	PP 5	• Container lids PP
2.4	OTHER 7	• Multi-layered containers
1.5	HDPE	• Other HDPE



# Quantifying plastic leakage

APWC's approach to quantifying plastic leakage included capturing data on everyday consumption and generation of plastic products using household and commercial premises waste audits carried out by the waste management sector. Furthermore, to get a clearer picture on plastic use and disposal pathways, audits were undertaken on stockpiles and landfills to capture data on materials that are not usually disposed of in household bins (for example, bulky commercial and construction waste).

## Plastic leakage per sector

Overall, it is estimated that 3,087 tonnes of plastic waste were leaked in 2020 (Table 8). The largest contributor to plastic leakage was the household (1,984 tonnes per year) and commercial sector (794 tonnes per year). Plastic leakage for the tourism (287 tonnes per year) and fisheries (22.7 tonnes per year) sectors is significantly smaller than for the household and commercial sectors.

- Grenada's household and commercial sector was responsible for 40% of all plastic leakage in the region (1,241 tonnes), with households contributing 876 tonnes to the total leakage amount.
- Saint Lucia was responsible for the largest leakage rate in the tourism sector, 4.7% (287 tonnes).
- Audit data indicates that the fisheries sector leaked 0.73 tonnes of plastic, with Grenada responsible for 0.5% of all plastic leaked in the region.

Figure 12 compares plastic leakage per polymer by region and sector. It indicates that the household and the commercial sector contributes the largest amount of plastic leakage, followed by tourism and fisheries. It also shows that the Pacific region was responsible for the largest amount of plastic leakage in 2020.

Table 8: Plastics leakage rate per sector (tonnes per year)

	Household leakage (T/y)	Commercial leakage (T/y)	Tourism leakage (T/y)	Fishing leakage (T/y)
PET (1)	403	138	99	5.1
HDPE (2)	243	98	41	2.9
PVC (3)	122	85	4	0.1
LDPE (4)	189	93	24	0.1
PP (5)	217	110	21	2.6
PS (6)	192	77	10	2.1
Other (7)	618	193	87	9.8
Total	1,984	794	287	22.7

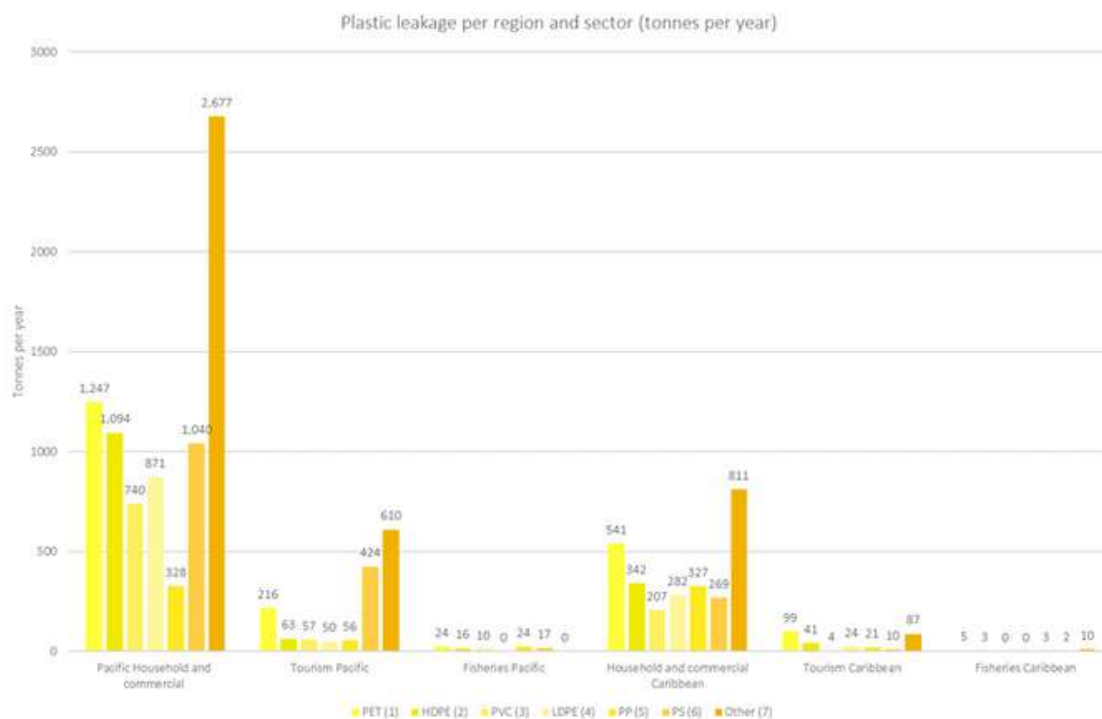


Figure 12: Plastic leakage per region and sector (2020) shown in tonnes per year

## Plastic recovery options

Based on an average compliance rate of 80%, a container deposit levy (CDL) could prevent approximately 451 tonnes of PET and HDPE plastic leakage within the countries of interest. A successful CDL has the potential to be financially sustainable, providing income that can be earmarked for solid waste programmes such as landfill and dumpsite remediation, improved collection and sorting processes, education programmes and environmental clean-ups.

Materials captured through a CDL scheme could increase market opportunities by coordinating regional-level collections and have the potential to support economies of scale and bargaining power to increase sale values. The concept of a regional recycling hub is currently being explored in the Pacific region and a similar model could be investigated for the Caribbean region.

A CDL with an 80% compliance rate within the countries of focus could potentially capture and prevent 68% (206.55 tonnes) of PET beverage bottle leakage or 76% of all PET containers (156.04 tonnes) leakage annually. CDL schemes across the Eastern Caribbean region could incentivise region-wide reverse logistics and create recycling markets for countries without such availability.

A CDL with an 80% compliance rate within the countries of focus could potentially capture and prevent 1% (380.67 tonnes) of HDPE beverage bottle leakage or 23% of all HDPE container (295.35 tonnes) leakage.

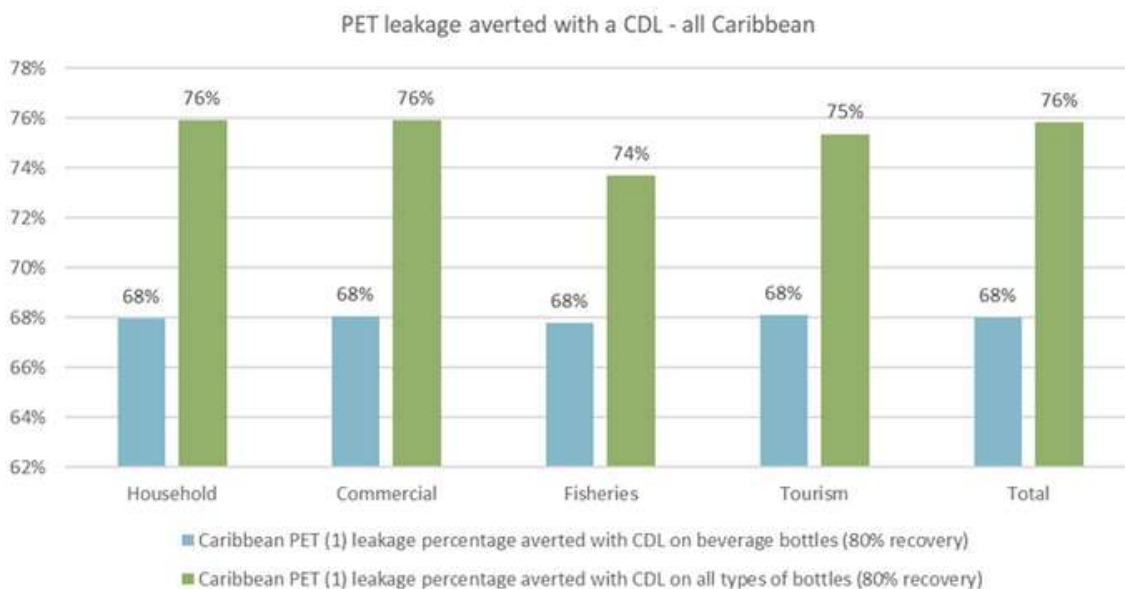


Figure 13: Potential PET leakage averted with a CDL in the Caribbean region

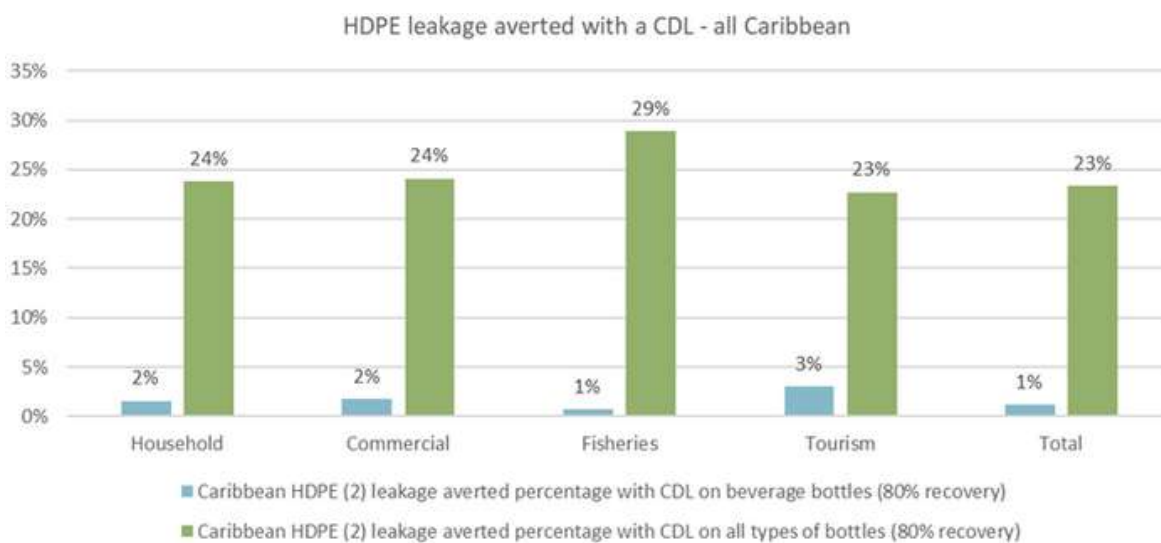


Figure 14: Potential HDPE leakage averted with a CDL in the Caribbean region

Extending a CDL to include PET and HDPE bottles and containers, e-waste and white goods in addition to other recovery programs for nappies, and organics could **redirect 93,044 tonnes of recyclable waste from landfill or unmanaged waste disposal annually** at an 80% capture rate (Figure 15). The model found that removing 80% of organic (green and food) waste materials (71,897 tonnes) would prevent 77% of recyclable material from entering landfill annually.

OECS countries could adopt the capture of traditional CDL materials such as plastic and glass bottles and apply learnings from other SIDS, such as Tuvalu in the Pacific region, to implement a self-sustaining CDL system. Bans or incentivising alternatives to single-use nappies could divert another problematic plastic waste from landfill.

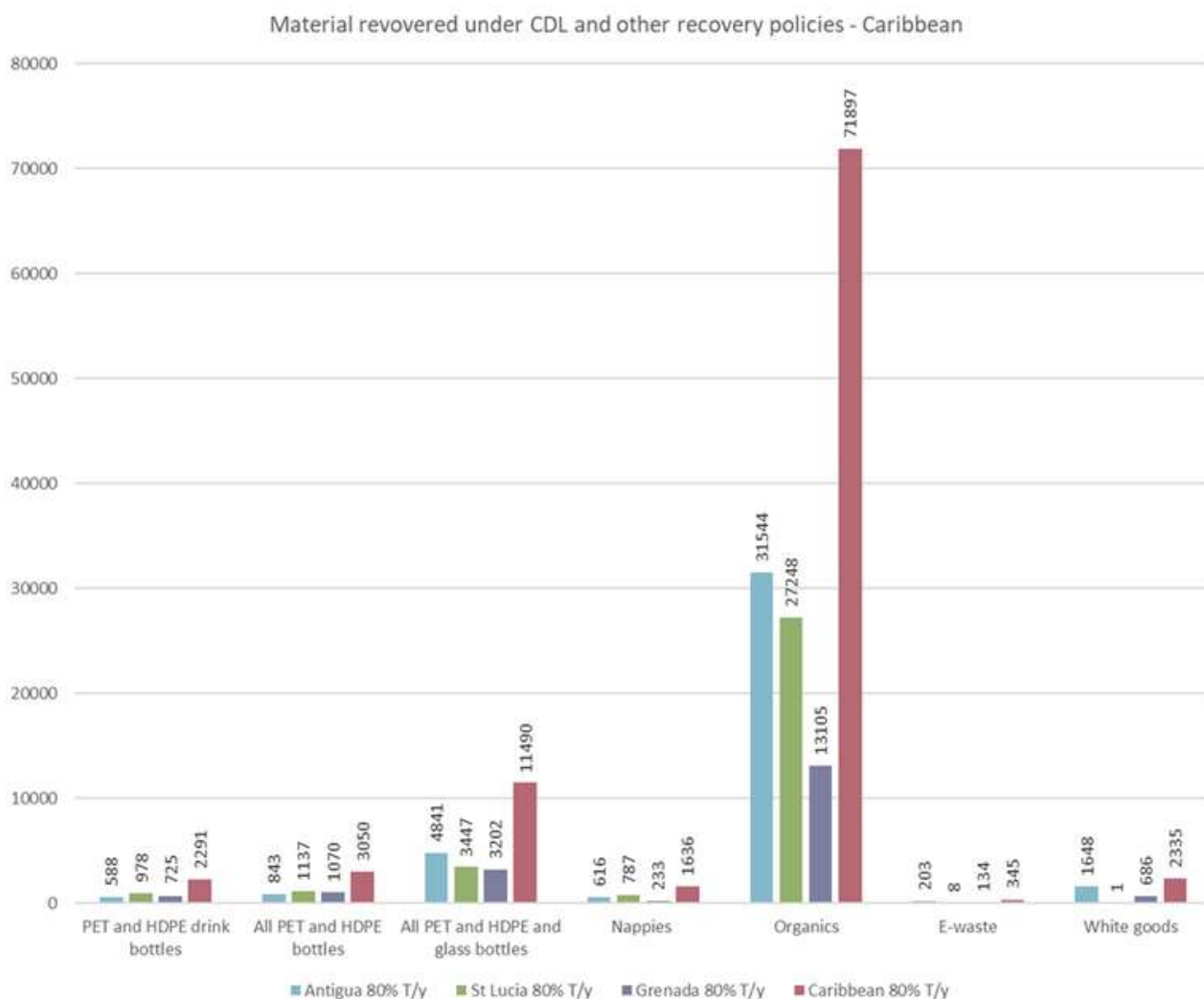


Figure 15: Potential materials available for capture under CDL legislation in Antigua and Barbuda, Grenada and Saint Lucia (tonnes/year)

# Recommendations for Caribbean region

## Landfills:

- In order to increase the limited space in landfills and prevent fires, implement segregated collection of waste and industrial composting facilities.

## Recycling:

- Installing mechanisms to support recycling programmes through levies may divert recyclable material from landfills. Collections of recyclable waste should only be conducted by approved contractors to avoid illegal dumping if set tipping fees are charged.
- Support the feasibility of an OECS regional hub for receiving recyclable material from islands in the Eastern Caribbean region. Ensure each country is ready with finance mechanisms when the hub is ready for operation.

## Tourism:

- Centrally manage cruise ship waste through the OECS so that waste recovery can be enhanced and cruise ship waste monitoring can be improved.
- Create educational material (such as video) to be presented to tourists prior to arrival (prior to descent/on the landing of aircraft/docking of cruise vessel/at customs for yacht and pleasure craft visitors) to showcase the natural beauty of the island and guide tourists on how to preserve the environment during their visit. Such material could be applied across all OECS countries.

- Implement source separation at high-traffic tourist locations such as air and seaports, tourist attractions and accommodation venues, as segregation of waste currently does not exist in most tourism facilities.

## Households and commercial:

- The plastic bag and Styrofoam (polystyrene) bans have sought to introduce alternative materials but many are still single-use items. Future legislation should employ the waste hierarchy and encourage 'reduce' and 'reuse' first, encouraging households to reuse rather than use single-use items (e.g. reusable water bottles, reusable food containers and cups). Plastic water bottles smaller than 1.5 litres should also be banned. Single-use alternatives carry environmental risks when decomposing. Proper management of single-use alternatives is recommended through dry-wet segregation at the household waste collection and an industrial composting facility. This will help prevent the adverse effects of single-use alternatives.
- Dry-wet waste segregation, accompanied by an industrial composting facility, a container deposit scheme (CDS) and recyclable plastic exports should be implemented with urgency to significantly reduce waste going to landfills.
- Lack of education on littering is a major problem. GSWMA solid waste management associations should continue their education and awareness campaigns, requesting support from the Ministry of Tourism.

- Nappies represented a high percentage of household plastics in Grenada and Saint Lucia. A programme to reduce single-use nappies (diapers) should start as soon as possible. Promote and encourage reusable nappies.

#### **Fisheries:**

- Mandate gear ID and recovery as a requirement for a fishing licence for all fisher folk.
- Develop fishing-gear recapture schemes to incentivise fishers to retain and surrender damaged and/or lost fishing gear for recovery. The systems to recover gear should copy what happens in the north of Grenada, where fishers sell their gear to farmers who reuse them.
- As a high percentage of fishers reported throwing plastics overboard, implement an intensive and extensive educational programme for fishers on the impacts of ghost gear, plastic pollution, resource recovery and the value of recyclable materials and fishing best practices, demonstrating to the industry how dependent it is on maintaining healthy oceans.
- There is a lack of monitoring and enforcement of regulations. Legislation regarding fishing gear should be enforced. Since fishing vessels have the opportunity to provide monitoring services, promote the reporting of abandoned fishing gear in accordance with IMO's mandatory reporting requirements under MARPOL Annex V, including discharge or accidental loss of fishing gear.

## **Learning opportunities for each region**

A number of opportunities exist for both the Caribbean and Pacific regions to adopt and advance mechanisms for controlling plastic material flow, particularly in capturing mismanaged plastic waste. Some examples of this include:

- Tourism sector – Rodney Bay Marina in Saint Lucia is an example of a segregated collection system. Similar collection systems could be established at all ports where cruise and yachting tourists are received.
- The Caribbean region could consider adopting a fisheries observer programme similar to the Pacific model, which includes monitoring of waste dumped overboard.
- The Pacific region is currently exploring the concept of a regional recycling hub to improve the marketability of recyclable plastic material. This concept may also be transferable to the Caribbean region.
- Palau (in the Pacific region) has introduced the Palau Pledge. Visitors sign a pledge upon entry to the country recognising a commitment to respect and protect the natural environment. An educational video explains the importance of the pledge and why it is necessary. Other Pacific and Caribbean islands could introduce a similar pledge to highlight the importance of the natural environment and encourage visitors to commit to a range of environmental responsibilities.

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## Appendix 1: Plastic comparison between regions

### Top 10 plastics

Table 9 outlines the top 10 plastic items disposed of in the Caribbean and Pacific regions using data from our countries of interest (2020).

#### In the Caribbean

- The top 10 plastic items account for 60.8% of all plastic waste disposed of during 2020 (7,877 tonnes)
- Single-use plastic (SUP) accounts for 50% of the top 10 plastics by polymer type. These items account for 26.2% of plastic waste disposal (3,393 tonnes).
- PET containers account for 30% of the top 10 plastics by polymer type. These items account for 18.4% of all plastic waste disposal. (2,377.13 tonnes).
- Plastic shopping bags and garbage bags found in the top 10 plastic items disposed of account for 6.6% of all plastic waste disposed of (855 tonnes).

#### In the Pacific

- The top 10 plastic items account for 48.8% of all plastic waste disposed of during 2020 (13,863 tonnes).
- Single-use plastic (SUP) accounts for 50% of the top 10 plastics by polymer type. These items account for 30.5% of plastic waste disposal (8,671 tonnes).
- PET water containers in Table 9 account for 23% of all plastic waste disposal (3,209 tonnes).
- PS food containers account for 18% of the top 10 plastic items by polymer type. These items account for 9.2% of all plastic waste disposed of (2,631 tonnes).
- Hygiene waste (nappies and sanitary items) accounts for 33.7% of all plastic waste disposed of (9,568 tonnes).

Table 9: Caribbean vs. Pacific top 10 plastic items disposed in 2020

Caribbean %	Polymer	Item	Polymer	Pacific %	
9.2	PET 1	Water containers PET	beverage containers water PET	PET 1	11.3
9.2	PET 1	Other beverage containers PET	other SUP	OTHER 7	7.8
7.7	LDPE 4	Soft plastic packaging SUP	soft plastic packaging SUP	OTHER 7	7.2
7.0	OTHER 7	Soft plastic packaging SUP	soft plastic packaging SUP	LDPE 4	6.2
4.9	OTHER 7	other single use	styrofoam takeaway food containers SUP	PS 6	5.8
3.6	HDPE 2	light shopping plastic bags SUP	garbage bags SUP	HDPE 2	3.5
3.0	HDPE 2	garbage bags SUP	food containers ps	PS 6	1.9
2.5	PP 5	container lids pp	other other	OTHER 7	1.9
2.4	OTHER 7	Multi layered containers	food semi rigid containers e.g trays PP	PS 6	1.9
1.5	HDPE 2	Other HDPE	food containers EPS PS	OTHER 7	1.9

## Appendix 2: Additional comparison

Table 10: Additional comparison between Caribbean and Pacific regions

	Caribbean	Pacific
Plastic imports vs. exports	<ul style="list-style-type: none"> <li>Imports 14,595 tonnes</li> <li>Exports 390 tonnes</li> </ul>	<ul style="list-style-type: none"> <li>Imports 43,316</li> <li>Exports 14,670</li> </ul>
Waste disposal per sector	<ul style="list-style-type: none"> <li>Households 1.78 kg/person/day</li> <li>Commercial 5.97 kg/employee/day</li> <li>Tourism 6.23 kg/visitor/day</li> <li>Fisheries 2.14 kg/vessel/day</li> <li>The Caribbean tourism sector is nearly 22 times more likely to dispose of waste than the Pacific.</li> </ul>	<ul style="list-style-type: none"> <li>Households 0.14 kg/person/day</li> <li>Commercial 0.23 kg/employee/day</li> <li>Tourism 1.74 kg/visitor/day</li> <li>Fisheries 0.93 kg/vessel/day</li> </ul>
Composition of waste disposed	<ul style="list-style-type: none"> <li>Organics accounted for 35% of waste.</li> <li>Plastics 5.2%</li> </ul>	<ul style="list-style-type: none"> <li>Organics accounted for 53%</li> <li>Plastics 11%</li> </ul>
Plastic disposal	<ul style="list-style-type: none"> <li>Households 0.17 kg/person/day</li> <li>Commercial 0.12 kg/employee/day</li> <li>Tourism 0.45 kg/visitor/day</li> <li>Fisheries 0.35 kg/vessel/day</li> </ul>	<ul style="list-style-type: none"> <li>Households 0.01 kg/person/day</li> <li>Commercial 0.04 kg/employee/day</li> <li>Tourism 0.17 kg/visitor/day</li> <li>Fisheries 0.24 kg/vessel/day</li> </ul>
Plastics Leakage	<ul style="list-style-type: none"> <li>9,566 tonnes</li> </ul>	<ul style="list-style-type: none"> <li>3,087 tonnes</li> </ul>

## Appendix 3: Key regional reports

- Diez, S.M., Patil, P.G., Morton, J., Rodriguez, D.J., Vanzella, A., Robin, D.V., Maes, T., Corbin, C. (2019). Marine Pollution in the Caribbean: Not a Minute to Waste. Washington, D.C. : World Bank Group.
- United Nations Environment Program (2014) Regional Action Plan on Marine Litter Management (rapmali) for the Wider Caribbean Region 2014
- UN Environment The Caribbean Environment Programme – Status of Styrofoam and Plastic Bag Bans in the Wider Caribbean Region
- World Bank (2020). Preventing Marine Plastics – A Circularity Approach.
- World Bank (2020). PROBLUE 2020 Annual Report.
- World Bank (2020). What a Waste 2.0. A global snapshot of Solid Waste Management to 2050.

## Appendix 4: Regional bodies and function

Table 11: Regional bodies and functions (Source: UNEP, 2014)

	Regional body	Function
Waste	Organisation of Eastern Caribbean States (OECS)	Founded in 1981 OECS is a regional institution which has a mission to contribute to the sustainable development of the Member States by assisting them with policy and programme formulation and execution in terms of regional and international issues, and by the facilitation of bilateral and multilateral cooperation. Objectives include: to improve the coverage and effectiveness of domestic solid waste collection and disposal facilities; reduce pollution of international and territorial waters caused by ship-generated solid waste; improve the collection, treatment and disposal of ship-generated solid wastes; assist the beneficiary countries in the establishment of appropriate legal and institutional frameworks to enable effective management and disposal of shore and ship-generated waste; assist in the preparation of plans and programs to address the problems of collection, treatment and disposal of liquid waste; and identify regional opportunities for reduction, recovery and recycling of solid waste.
	Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)	The GPA is a sector of UNEP which was established in 1995 and addresses the impacts of land-based sources and activities on coastal and marine environments and human well-being. Its goal is to prevent, reduce, control or eliminate and/or recover from the impacts of the degradation of the marine environment from land-based activities by facilitating the duty of States to preserve and protect the marine environment. In the Wider Caribbean, the Protocol on the Prevention, Reduction and Control of Land-based Sources and Activities adopted in 1999 in Oranjestad, Aruba, was the first agreement of its kind to be established following the development of the GPA. This protocol, which falls within the legal framework of the Cartagena Convention, establishes the platform for the development of a regional strategy for addressing marine litter sources, impacts and interventions. ( <a href="http://www.gpa.unep.org/">http://www.gpa.unep.org/</a> )
Tourism	Caribbean Tourism Organisation (CTO)	Established in 1989, as a merger of the Caribbean Tourism Association and the Caribbean Tourism Research and Development Center. The CTO's main objective 'is the development of sustainable tourism for the economic and social benefit of Caribbean people'. The environmental issues associated with marine litter and solid waste management play a substantial role in the foundation of the tourism economies of the region. ( <a href="http://www.onecaribbean.org/">http://www.onecaribbean.org/</a> )
	Caribbean Alliance for Sustainable Tourism (CAST)	CAST is a non-profit organisation formed by members of the Caribbean Hotel Association in 1997 to promote responsible environmental and social management of natural and heritage resources within the hotel and tourism sector. The strategic focus of CAST includes sustainable tourism certification and standards development and access to environmental management tools for best practice resources – guides, manuals, videos and DVDs. ( <a href="http://www.caribbeanhotelandtourism.com/CAST.php">http://www.caribbeanhotelandtourism.com/CAST.php</a> )
	Caribbean Hotel & Tourism Association (CHTA)	Formed in 1962 and brings together members of the Caribbean hospitality industry 'to optimise the full potential of the Caribbean hotel and tourism industry by serving member needs and building partnerships. The impacts of marine litter on the health and aesthetics of the region's beaches and ocean resources are critical to the economic sustainability of this industry. ( <a href="https://www.caribbeanhotelandtourism.com/">https://www.caribbeanhotelandtourism.com/</a> )
	Cruise Lines International Association, Inc. (CLIA)	CLIA is the world's largest cruise industry trade association. Two of its primary roles are to 'actively protect the marine environment with minimal impact on the ocean, marine life and destinations' and 'monitor and participate actively in the development of domestic and international maritime policies and regulations. To minimise environmental impact, they have wastewater treatment systems that can rival land-based ones. Environmental programmes are implemented and these ensure compliance with international regulations. They also encourage passengers to partake in onboard resource conservation programmes, which include recycling trash. ( <a href="http://cruising.org/">http://cruising.org/</a> )
Fisheries	Global Environment Facility (GEF)	Climate Change Adaptation in the Eastern Caribbean Fisheries Sector, focused on increasing the resilience and reducing the vulnerability to climate change impacts in the Eastern Caribbean fisheries sector through the introduction of adaptation measures in fisheries management and capacity-building of fisherfolk and aquaculturists.

## Appendix 5: Fisheries policies and responsibilities

Table 12: Fisheries policies and responsible parties (Antigua and Barbuda, Grenada and Saint Lucia)

Country	Fishing Policies	Government entity responsible
Antigua & Barbuda	The Fisheries Act, 2006 (Act No. 22 of 2006) involved in the management and conservation of marine fisheries resources of implemented on 1 February 2013	Department of Fisheries
Grenada	<p>The Grenada Fisheries Act (1986) and Regulations (1987), based on the Organisation of Eastern Caribbean States (OECS) harmonised legislation, governs the activities of the Grenada Fisheries Division.</p> <p>1995 UN Fish Stocks Agreement (UNFSA) requires states to minimise pollution and catches by lost or abandoned gear specifically.</p> <p>Grenada has an Integrated Coastal Zone Management Policy (ICZM Policy), formally defining Grenada's coastal zone and addresses the impact of climate change on its coast. It has also begun establishing a system of marine and terrestrial protected areas.</p>	Department of Fisheries
Saint Lucia	<p>No comprehensive fisheries policy. The government has just received a grant from the FAO for policy creation (World Bank 2019).</p> <p>The Fisheries Act, No. 10 of 1984 and the Fisheries Regulations, SI No. 9 of 1994 form the basis of law related to fisheries development and management.</p> <p>Saint Lucia actively supports regional fisheries management initiatives at the level of the OECS, CARICOM and the Western Central Atlantic Fisheries Commission (WECAFC).</p> <p>Appropriate representation at the International Convention for the Conservation of Atlantic Tunas (ICCAT) and the International Whaling Commission (IWC)</p>	The Fisheries Department under the Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives is the government entity responsible for fisheries in Saint Lucia.

## Appendix 6: Plastic waste disposal by polymer in the tourism sector

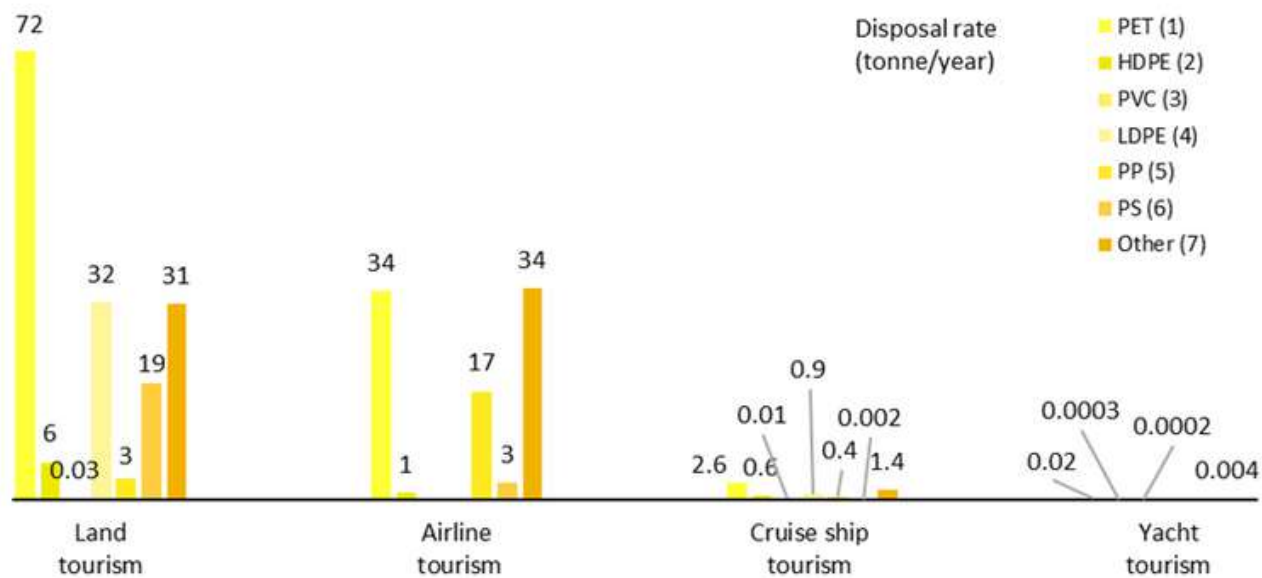


Figure 16: Plastic waste disposal comparison and contribution by polymer type across the three subsectors





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