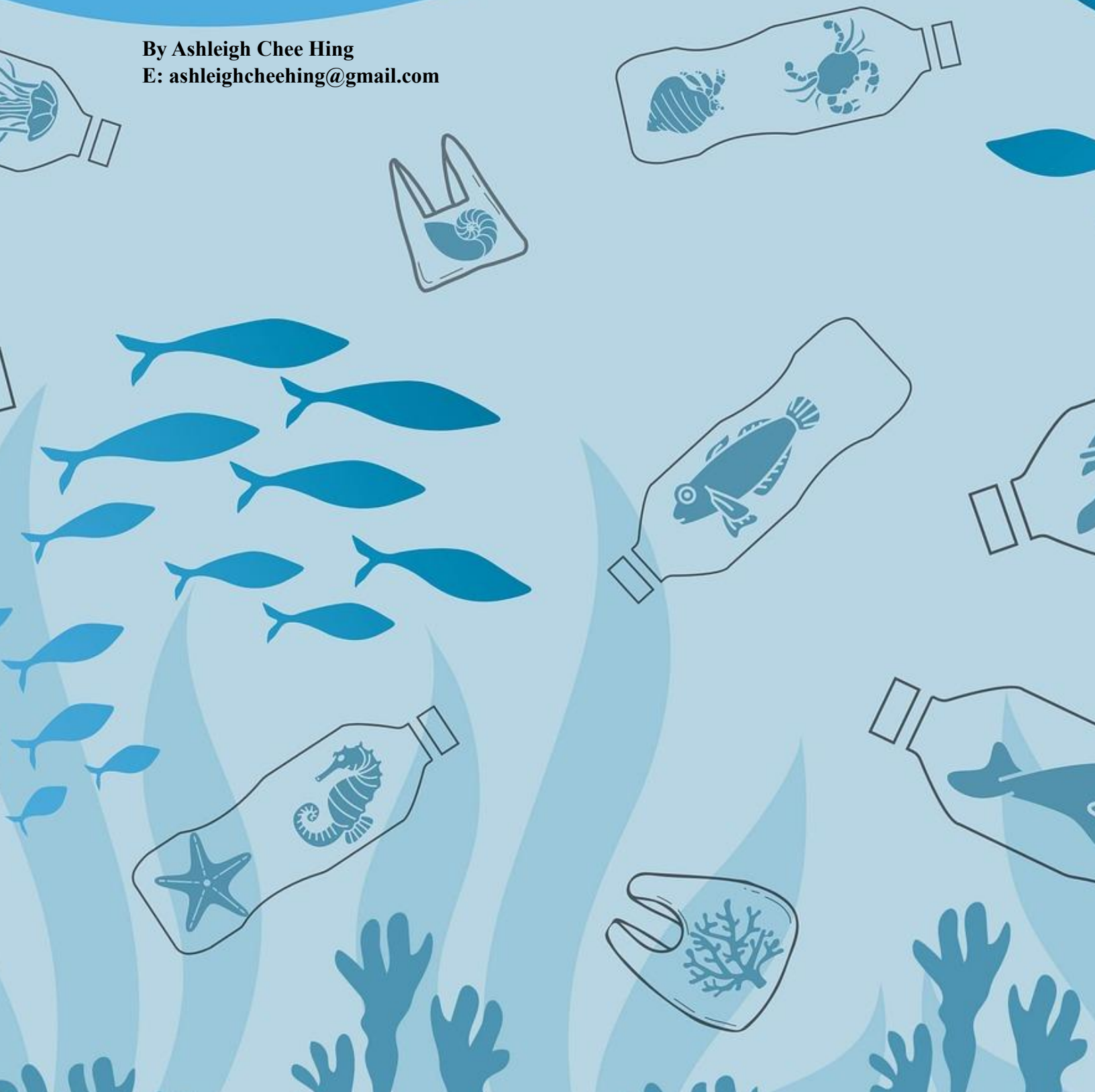


# Plastics as Pollutants: Plastic pollution across Caribbean Small Island Developing States

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## Small Products, **Big** Problems

The Antarctic blue whale (*Balaenoptera musculus spp.*) is the largest animal in the world, weighing about 400,000 pounds. That is estimated to be around the weight of thirty-three elephants. (WWF 2018). *Two-thousand* blue whales weigh about 322,000 tonnes – and that is the amount of plastic waste that remains uncollected and littered across the Caribbean every year. (Diez et. al. 2019) (Table 1). Plastic pollution is a significant problem everywhere on Earth, but especially in the Small Island Developing States (SIDS) of the Caribbean because it damages the sensitive ecosystems that exist in the Caribbean and negatively impacts the health of Caribbean SIDS citizens.

*Table 1 showing the amount of uncollected household waste and household plastic waste in tonnes/year*

Country	Uncollected household waste (tons/year)	Uncollected household plastic (tons/year)
Haiti	1,673,750	93,730
Dominican Republic	1,020,042	102,004
Cuba	619,534	55,758
Jamaica	358,605	43,750
Guyana	72,660	14,387
Suriname	29,599	3,848
Trinidad and Tobago	27,923	5,353
Belize	8,935	1,698
Barbados	8,174	1,398
St. Lucia	1,408	310
St. Kitts and Nevis	1,026	238
Grenada	622	102
St. Vincent and the Grenadines	580	49
Dominica	530	85
Antigua and Barbuda	295	35
<b>TOTAL</b>	<b>3,823,683</b>	<b>322,745</b>

Sources: Dominican Republic 2010 National Census (Dominican Republic National Statistics Office, 2011); Jamaica 2011 National Census Statistical Institute of Jamaica, 2011); Trinidad and Tobago 2011 National Census; St. Lucia 2010 National Census (Saint Lucia Central Statistics Office, 2011); Grenada 2011 National Census (Grenada Central Statistics Office, 2011); St. Vincent and the Grenadines 2012 National Census (SVG Ministry of Finance and Economic Planning, 2012). The waste characterization studies were also used (see annex 6).

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In general, the issue of plastic pollution advances in Caribbean SIDS because many countries lack funds to purchase and maintain waste management systems, there is limited land for construction of machinery that can contribute to the circular economy of plastic products, citizens are either unaware of, indifferent to or detached from the crisis of plastic pollution in the Caribbean, and

ultimately, while there exists the narrative of protecting the environment, the availability of actionable steps to the general public is unsubstantial.

Furthermore, what exacerbates this problem within the Caribbean SIDS is the advent of online shopping, the ease of access to cheap fast-fashion retailers, and the marketed reduction of patience and the desire to fulfil wants as quickly as possible. This is overconsumption. With overconsumption, pollution closely follows since pollutants quickly and easily enter unregulated landfills, and into ecosystems. The overconsumption of plastic products around the world is truly evident in that plastic products is in such high demand on markets, that there are *430 million metric tonnes of new plastic* produced every year. (Serumaga 2025). Furthermore, the popularity of single-use plastics continues to grow with “the main drivers being convenience, low-cost, necessity, and low perceived behavioural control.” (Kanhai, Keller, and Richter 2024). The economic success of single-use plastic is also very low since an insignificant 14% of it is recycled, accounting for 64% of economic losses. (Barne and Pirlea 2019).

### **Sun, sea and... trash?**

Additionally, Caribbean SIDS are highly dependent on tourism and the marketing of the popular Caribbean narrative known as “the Sun, sea and sand”. Unfortunately, a large portion of this tourism depends on tourist cruise lines. The popularity of holidaying on cruise trips is increasing and, even though cruise ships follow international rules on waste and recycling, there is such a significant capacity of passengers, that there is more rubbish being deployed at Caribbean ports that exceed the carrying capacity of the country. In 2024 alone, there was about 33.7 million people who enjoyed travelling the region via cruise ships. (Handy 2025). More than two-thirds of tourists are cruise ship passengers (Fernandez-Stark and Daly 2017), and this industry creates about 78,954 jobs from reports in 2018 (CANARI n.d.). This therefore creates traction for the marketability of cruise line tourism. Therefore, even though there is significant pollution attached to the cruise ship industry in the Caribbean, the continuation of the cruise line tourism activity is favoured since it greatly boosts the economy and quality of life of Caribbean citizens and hence the effect of plastic pollution continues. However, this issue of marine plastic pollution is a great threat to the USD \$57 billion coastal tourism industry. (Barne and Pirlea 2019).

Based on an article published by the BBC, written by Gemma Handy in 2025, there was a case study done on the landfills in Antigua and Barbuda which are SIDS. From cruise ships, there has been more than 1200 tonnes of litter from the cruise ships in 2025. Since the landfill’s establishment in 2005, there has been no updates to its carrying capacity at the facility and the new litter just gets piled higher over the years. (Handy 2025).

### **Water only flows in one direction and the law of conservation of energy – The Movement of Plastic Pollution**

Water is ubiquitous. The hydrological cycle ensures this – water exists in the form of fluids (liquids and gas), and solids and are all around the environment. When plastic pollutants enter the environment through littering, it ends up in waterways as rain falls and carries the buoyant plastics to rivers, and into mangroves and estuaries, it ends up in the ocean. Oceans are all connected; there

are no natural boundaries blocking any ocean from each other, and therefore any plastic pollutants can merge and travel all over the world. Plastics make up roughly 80% of the pollution found in oceans (Barne and Pirlea 2019) and using Trinidad and Tobago as an example, there is great evidence of plastic pollutants' journey from land pollution to the ocean. From an article written by authors from the United Nations in the Caribbean, a case study was discussed of the Maraval River in Port of Spain, Trinidad. Plastic pollutants were found to travel from the Maraval River to Invader's Bay and out to the sea (United Nations in the Caribbean 2024) (Figure 1).

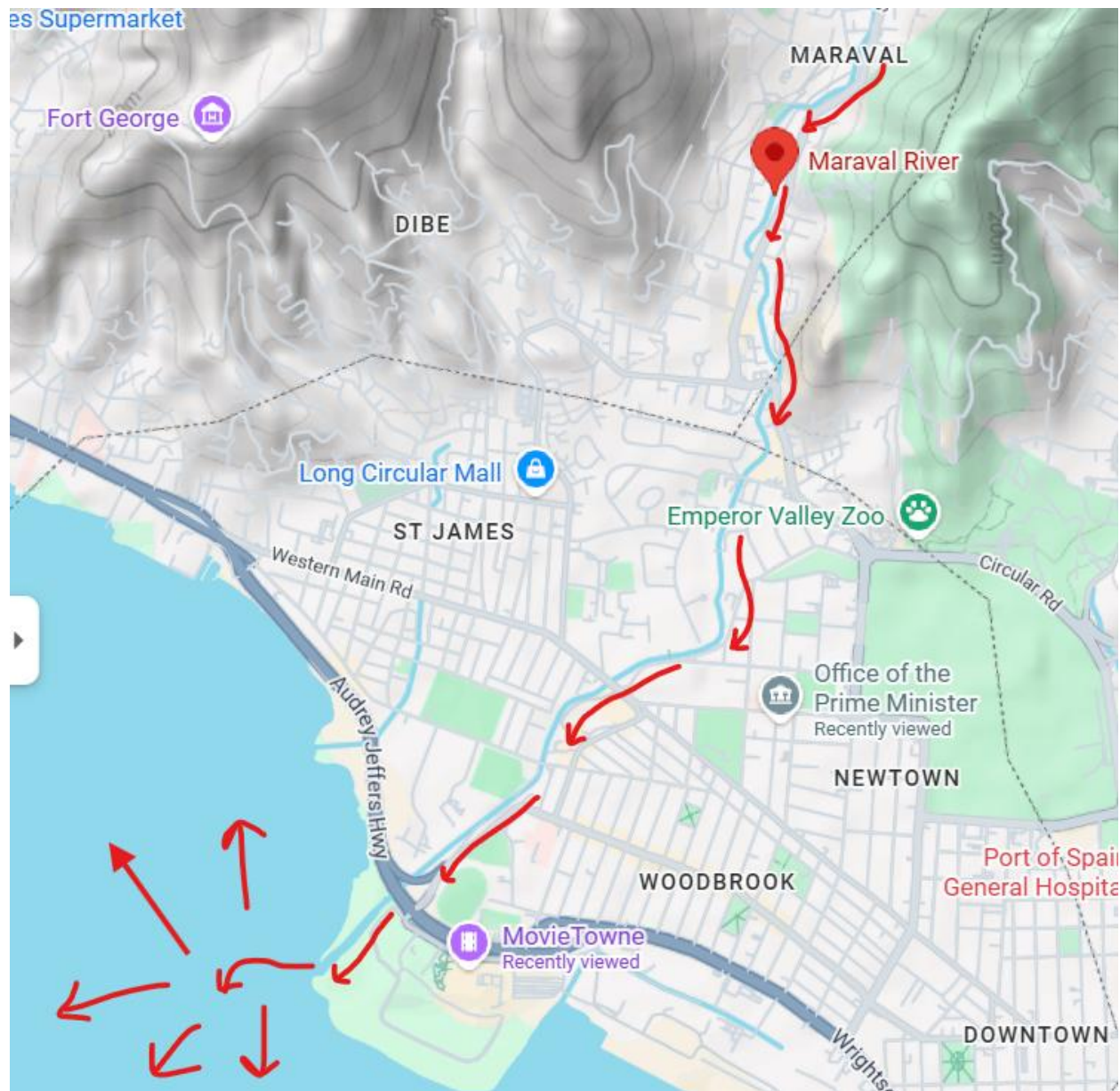


Figure 1. Map showing the movement of plastic pollution from Maraval River to Invader's Bay to the Ocean. Source: Google Maps

Since it has been established that water is ubiquitous, it is also equally acceptable to say that plastic pollution is as ubiquitous as water. To emphasise the far-reaching effect of plastic pollution,

microplastics have been found at the deepest trench of the ocean, known as the Mariana Trench (Gibbens 2018), and to the highest point on Earth: Mount Everest (Wilkinson 2020). Nonetheless, from a Caribbean context, there are grave impacts of the prevalence of plastic pollution. Even before the litter ends up in the ocean, there are environmental impacts and human health concerns along the way.

The law of conservation of energy states that energy cannot be created nor destroyed but can be transferred from one form to another. Energy in the forms of wind, rain and water flow acts as transport means for plastics to pollute the built environment such as urban areas and roads, and the natural environment such as waterways and beaches. (Diez et. al. 2019). This litter causes flooding that worsens with heavy rainfall, due to clogged drainage (*Figure 2*).



*Figure 2. showing plastic pollution and flooding.* Photo Credits: Szabolcs Molnar on Pixabay

Jamaica 43,750 tonnes per year of household plastic that remains uncollected (Table 1), and this acts as an aggressor to flooding whereby extensive flooding caused infrastructural damage, loss of household items, high economic costs for repairs and restoration, spread of diseases and death. (de Meira and Phillips 2019). To make matters worse, marine plastic pollution also bears its destructive head via the Northern waters brought by ocean currents. (Barne and Pirlea 2019), therefore the source of plastic pollution comes from both inland and from external sources due to the interconnectedness of the ocean.

As plastic pollution destroys as it moves along the once pristine land of SIDS in the Caribbean, over 600 species of wildlife has been entangled by or ingested plastic marine litter. (Figure 3). Of these species, about 15% are considered endangered or threatened based on the IUCN. (Lusher et. al. 2017). This affects the entire food web of these delicate ecosystems, as well as impacts the ability of humans to use and enjoy the available ecosystem services and resources withing legitimate means.

Additionally, the Beetham dump in Trinidad is the largest disposal site but is unfortunately situated within the Caroni Swamp which is an ecologically sensitive site. (“Government of the Republic of Trinidad and Tobago NATIONAL WASTE RECYCLING POLICY” 2015). This, therefore, poses a great threat to the wildlife of the Caroni Swamp as toxins, carcinogens, and contaminants leach into the water, curious animals eat contaminated waste and cause ecological harm to the entire mangrove ecosystem.

Moreover, when the plastic eventually ends up in the ocean, the precious coral reefs of the Caribbean become an undesirable statistic in that plastic-polluted coral reefs are twenty times more likely to succumb to diseases and death, therefore resulting in ecological collapse. (Meiffren-Swango and Lamp 2025). According to a publication to a UWI Today issue written by La Daana Kada Kanhai in 2022, coastal and marine ecosystems provide crucial habitats for resident and migratory organisms, and she outlined that plastic pollution is a stressor that puts pressure on marine and coastal ecosystems, especially since oceans are all interconnected. (Kanhai 2022).



*Figure 3. showing a bird with plastic bag in its beak. Photo Credit: Ilie Barna on Pexels*

## **The Dangers of Plastics and Microplastics to the Environment and Human Health**

Even though plastics take hundreds or thousands of years to decompose (National Geographic Society 2022), with the physical and chemical degradation of plastics occurring via wave action, sun damage and wind, the ocean becomes full of microplastics – plastics that are less than 5mm. (GASCO News 2024). Microplastics can appear as coloured plastic pieces in the ocean and as ocean deposits mixed in the sand. (*Figure 4.*).



*Figure 4. showing microplastics in sand.* Photo Credit: Soren Funk on Unsplash

Microplastics may seem harmless but that could not be further than the truth – microplastics are detrimental to the health of wildlife and the health of humans.

Researchers from Germany postulate that microplastics pollution may be higher in terrestrial areas, rather than marine ecosystems. (United Nations Environment Programme 2021). Terrestrial microplastics have been found to reduce the productivity of soil invertebrates, thereby decreasing the amount of soil fauna. (Lin et. al. 2020). This can have a snowball effect where the soil becomes heavily dense, and infertile due to both lack of air spaces that soil fauna provides (especially macrofauna like earthworms) and lack of detritivores for nutrient cycling to the soil thus creating conditions that are difficult for permeation of water and plant roots. Hence, in a directly

proportional relationship, as the productivity of soil fauna decreases, so does the viability of soil to grow plants also decreases. This is detrimental to the environment since plants being the producers and the starting point for all food chains, the entire food chain collapses and therefore the ecosystem suffers and ceases to exist.

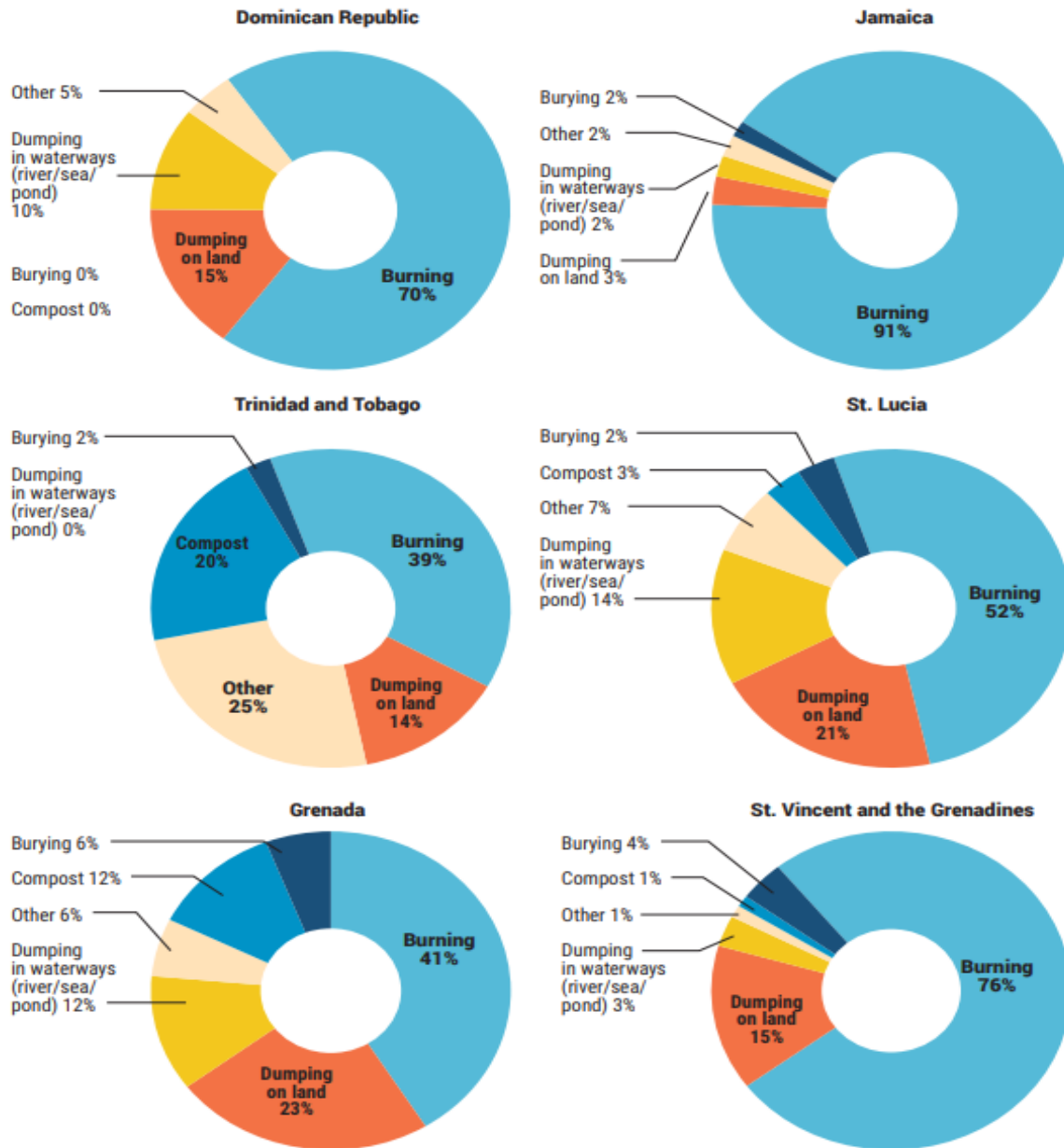
Besides that, chlorinated plastics such as polyvinyl chloride (PVCs) and Chlorinated Polyethelene and other plastics release toxic chemicals when broken down into microplastics therefore increasing risks on wildlife, as well as increasing the amount of toxic chemicals such as Bisphenol A (BPA) and phthalates that leach into groundwater reservoirs, thus posing risks to human health and wildlife that depend on groundwater resources. These two examples of toxic chemicals are known to cause hormonal disruptions to animals and humans. (UNEP 2021).

In addition to that, authors on the UNEP 2021 report on “Plastic planet: How tiny plastic particles are polluting our soil” outline that microplastics can reach a particle size of the nano-level, which is small enough to pass across membranes, alarmingly easily through highly selective membranes like the placenta or blood-brain barriers, which can therefore cause changes in gene expression and biochemical reactions in animals and humans. (UNEP 2021).

An even more concerning notion is that much of the Caribbean SIDS depend on the fisheries industry and Caribbean citizens consume significant amounts of seafood with a growing reliance on imported seafood. Bioaccumulation of microplastics occurs within fishes and thus bioaccumulates in humans as seafood is consumed. Furthermore, research shows that people who live within 10km of affected coastal communities are especially vulnerable to gastrointestinal diseases due to uncollected waste and viruses via mosquito borne diseases. (World Bank Group 2019). This is especially worrisome since approximately 70% of Caribbean people live in coastal communities and most major infrastructure is in the coastal built environment. (UWI STACIE 2021).

### ***I love* the smell of... plastic pollution in the morning**

Plastic pollution can also manifest in the air. A significant percentage of household waste is burnt within several Caribbean SIDS (*Figure 5*), and this is detrimental to human health since thermoplastics break down and release carcinogenic and toxic gases into the atmosphere, which humans breathe. Some toxins released are dioxins, chlorinated furans or styrene gas. (Pathak et. al. 2024).



Sources: Dominican Republic 2010 National Census (Dominican Republic National Statistics Office, 2011); Jamaica 2011 National Census Statistical Institute of Jamaica, 2011); Trinidad and Tobago 2011 National Census; St. Lucia 2010 National Census (Saint Lucia Central Statistics Office, 2011); Grenada 2011 National Census (Grenada Central Statistics Office, 2011); St. Vincent and the Grenadines 2012 National Census (SVG Ministry of Finance and Economic Planning, 2012).

Figure 5. highlighting the amount of household waste that is burnt per year without collection services.

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This is especially dangerous to persons who live near under-regulated dumps such as the Beetham dump in Trinidad. Communities that are situated around the dump which burns waste, are in direct contact with the toxic chemicals from the burnt plastics and are substantially susceptible to

negative health effects, as outlined in Table 2. A similar issue happens in Turks and Caicos where smog from dump fires have affected communities in the area for years. (Handy 2025).

Table 2. showing the types of plastics that release toxic chemicals upon burning

Retrieved from

<https://pmc.ncbi.nlm.nih.gov/articles/PMC10786097/#:~:text=Some%20plastics%20release%20particularly%20carcinogenic,%5B7%2C%2011%2C%2013%2C%2016%5D.%20Our>

<b>TYPE OF PLASTIC</b>	<b>COMMON FORMS</b>	<b>TOXICANTS RELEASED UPON BURNING</b>	<b>HEALTH EFFECTS</b>
Polyvinyl Chloride	Drainpipes, blister packs, children’s toys, bottles and jugs, etc.	Carbon monoxide, dioxins, chlorinated furans	Carcinogenic, birth defects, respiratory disorders, etc.
Polystyrene, styrene	Foam cups, meat trays, egg cartons, plastic forks and spoons, etc.	Styrene gas, acrolein, hydrogen cyanide	Carcinogenic, eye and mucous membrane damage, narcosis, death in high doses
Polyurethane	Wood finishes, sealants, adhesives, curtains, etc.	Carbon monoxide, hydrogen cyanide, phosgene	Death in high doses

### Are Plastics Useful?

Plastics are very useful because they are convenient, they are widely available and are lightweight materials that can be used in many human infrastructures, the medical industry, and building vehicles. Plastics are, again, ubiquitous, and a reason for that is that there are innumerable applications of plastic in everyday life. Some plastics are necessary for use, because there may be no other substitute for it based on what it may be used for. However, single-use plastics, while they are convenient, the risk definitely outweighs the advantages. Hence, there must be changes made to stop the havoc that single-use plastic pollution wreaks upon the citizens of Caribbean SIDS.

## #BeatPlasticPollution: Circular Economy in the Caribbean

Circular Economy is the process of transforming our one-time use economy, into one that is sustainable and waste is eliminated, resources circulated. Figure 6 is an apt descriptor of circular economy as it applies to environmental science, and it is a best practice to remedying the issue of plastic pollution. The following are some ways in which some Caribbean SIDS reduce plastics waste.

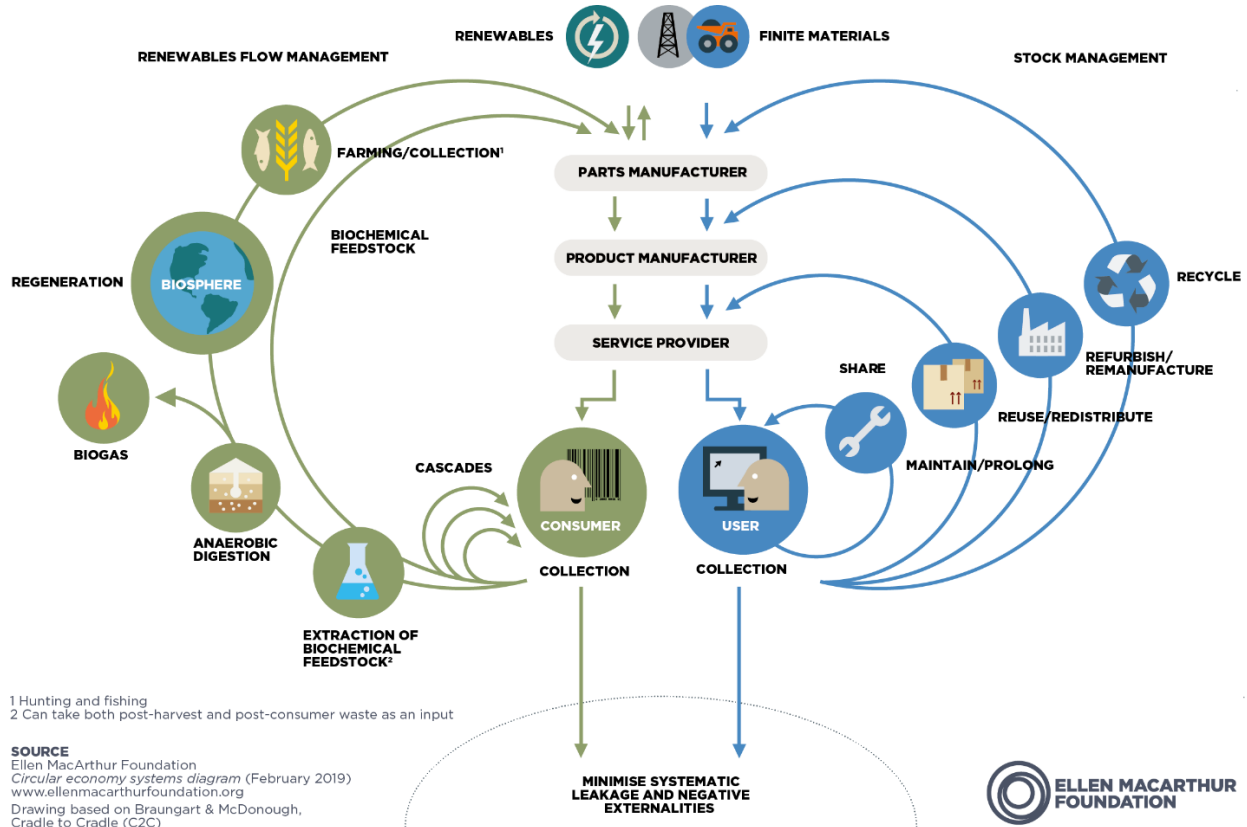
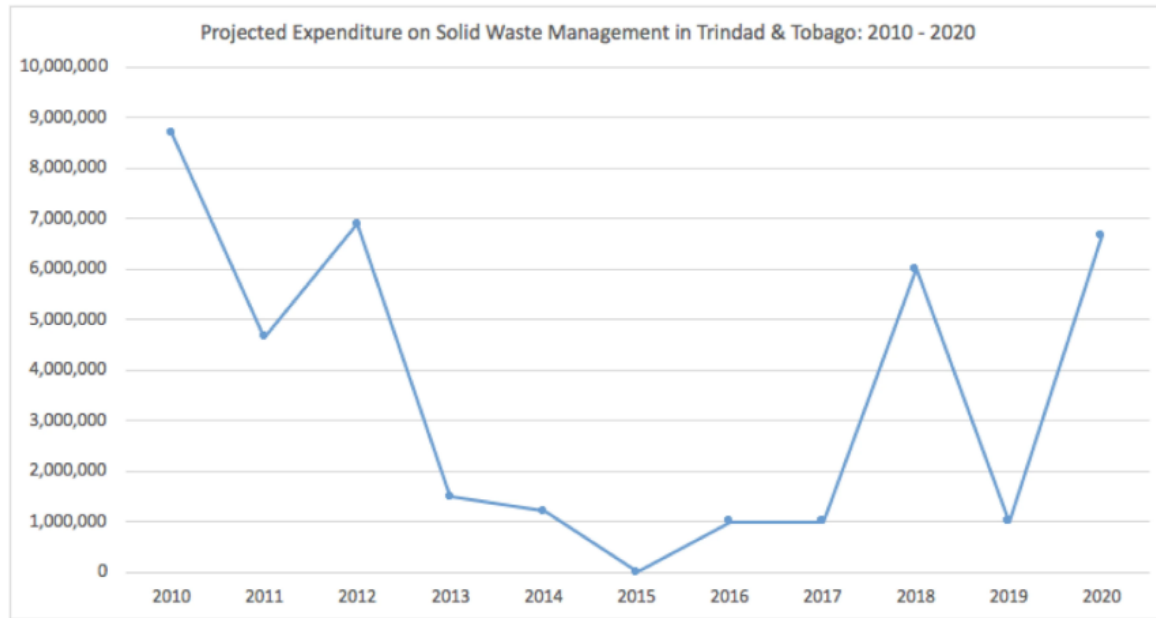


Figure 6. Showing a butterfly diagram of circular economy.

Source <https://www.ellenmacarthurfoundation.org/circular-economy-diagram>.

To ensure the circular economy of plastics in Trinidad and Tobago, funding allocations have been made available, for example in 2019, TTD \$1 million was allocated to the Public Sector Recycling Program, and in 2020, TTD \$5 million was allocated to upgrade and maintain the recycling facilities. From Figure 7 below, there shows a positive upwards trend of expenditure on solid waste management in Trinidad and Tobago.

Legislative arrangements as outlined by the Waste Recycling Policy of 2015 in Trinidad and Tobago are governed primarily by the Litter Act of 1973.



*Figure 7 showing the amount of projected expenditure on solid waste management in Trinidad and Tobago from 2010 to 2020.*

Source: <https://www.mdpi.com/2071-1050/11/23/6580>

Other than legislation, there are many citizens and NGOs that are contributing to the solutions to plastic pollution in Caribbean SIDS. The ABWREC (Antigua and Barbuda Waste Recycling Corporation) is a project of the Rotary Club of Antigua Sundown. This is a team that collects, crushes, and exports PET bottles to manufacture new bottles as a recycling and reusing scheme. (Elesha 2023). This is a perfect example of circular economy (Figure 6).

Furthermore, the 6R's, Reduce, Reuse, Refuse, Rethink, Repair, and Recycle is well implemented since, from a domestic perspective, any plastics that are not recycled end up in the built environment of Jamaica or stagnant waters block drains and cause increases mosquito breeding sites. From 2018 to 2021, an initiative to reducing and eliminating plastics in Jamaica was called the Medium-Term Socio-Economic Policy Framework which involved more sustainable activities and promoted businesses to start using monetary incentives like a deposit refund scheme for plastic bottles. This aims to reduce the presence of waste in the country and limit the levels of toxicity in the environment from plastic pollutants. (“The Vision 2030 Jamaica ‘Beating Plastic Pollution Campaign,’” n.d.).

As a case study, in Kernaham, Trinidad, there is an agricultural community at the East coast of Trinidad where they combine different PET plastics and heavy plastics and create a new product which is a “wood-like material” that can be used for construction. This therefore removes the advent of plastic waste, increases the commercial value of plastic products, and creates jobs for rural communities. This was done by a group of women in Kernaham who added shredded plastics

to gravel to create “sequestered concrete” therefore trapping plastics and removing it from the environment. The women of this area recognized that there was a serious plastic pollution problem and came up with an extremely innovative way to reduce the plastic pollution they encountered in their community while simultaneously creating revenue for themselves. (UNEP 2024).

Besides that, there is the Environmental Management Authority’s (EMA) iCARE initiative which increases public participation in recycling, and encourages more citizens to be proactive in protecting the environment that they live in. (Hamilton-Davis 2025).

## **The Ongoing Fight Against Plastic Pollution – Problems Encountered**

These are excellent practices and campaigns moving forward to reduce the impact of plastic pollution in Caribbean SIDS, however, the legislation needs to be updated, and it is recommended that better management of the waste in the Beetham dump be reviewed. It is detrimental that the dump is allowed to continue to exist in an ecologically sensitive area.

As a RAMSAR site, the Caroni Swamp is protected but unfortunately organizations or individuals cannot sue on the basis of RAMSAR because the protection of the Caroni Swamp is “based on RAMSAR” and was therefore amended or otherwise tailored and incorporated into local laws to the needs of Trinidad’s context. Instead of suing under the convention, individuals or organizations can engage in legal action based on the National Wetlands Policies from failure of regulatory bodies like the EMA or based on the Common Law Act on negligence or nuisance underpinned by the Certificate of Environmental Management (CEC) Rules. (RAMSAR 2001).

Unfortunately, the law system traditionally takes years to settle issues and frankly, in the context of Trinidad and Tobago, there are more pressing issues at hand when it comes to the attention of the judicial system, such as high crime rates, and the increasing need for access to justice as gang-based violence, domestic violence, and human trafficking. Unfortunately, this issue is only propelled by brain drain and a lot of young lawyers and judicial staff leaving the country and overloading the inadequate human resources in the judicial system.

Moreover, for a political party to address the needs of the citizens, it needs to assess mental attitudes to certain aspects, and even though there is a greater narrative of environmental awareness in the Caribbean SIDS, many citizens do not see the importance of protecting the environment. Therefore, it may be so that political parties may not put emphasis on environmental protection as it should be, and citizens may be more inclined to vote for the party that ensures their physical safety away from crime.

Besides that, if an initiative was implemented that households across the Caribbean would have to sort their trash into types of plastics, glass, tin, and cardboard, it most likely would not be received well since this initiative requires a level of understanding of how to sort trash, people could not be bothered to sort their trash, no time to sort trash, costly to buy sorting bins, and there is not enough skilled workers who would be able to manage the waste once it is sorted.

## **Conclusion**

Worldwide plastic pollution leaves a grave mark on the Anthropocene due to the sheer magnitude of it. The Caribbean, with its great branding as a tourism destination, is no stranger to this plastic pollution, and its prevalence is due to the lack of capital, land space, skilled human resources and overconsumption. So, as plastic usage increases, plastic pollution also increases, and therefore the environmental impacts and human health issues become apparent. Plastics cause environmental pollution in the land, water and air, via different pathways into the natural and built environment that affect both humans and wildlife. While these issues are prevalent in Caribbean SIDS, there are many communities, institutions and organizations that are battling the effects of plastic pollution in their countries effectively, innovatively, and sustainably. However, the issue of laws in countries, for example, in Trinidad and Tobago, it is impacted by the lack of resources in the judicial system causing a lack of urgency placed onto environmental problems.

## **Recommendations for handling plastic waste**

- Reducing the use of single-use plastic by switching to purchasing items made of more durable and long-lasting materials like glass and metals.
- Use paper straws instead of plastic straws
- Repurpose plastics by using reusable plastic containers like butter containers or ice cream tubs
- Engage in recycling schemes, for example Trinidad and Tobago's EMA iCARE initiative
- Ensure that the product you are buying is safely biodegradable and does not just mean that it biodegrades into microplastics in the end
- Educate yourself on the lifecycle of plastics

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