

July 2023

INTRODUCTION

In 2019, IUCN launched the Plastic Waste-Free Islands (PWFI) project, aiming to reduce plastic waste generation and leakage into the ocean in island nations in the Pacific and Caribbean regions. An economic assessment was conducted as part of the project in Antigua and Barbuda. The study examined the impacts of marine plastics on the fisheries and tourism sectors and the costs and benefits of implementing a national recycling system from a national and from a regional cooperation perspective.

Plastic waste is a global problem!

9% of plastics are recycled

22% is mismanaged

80% of marine plastics can be attributed to land-based sources

20% of marine plastic pollution originates from the fishery sector



Plastic pollution leads to contamination of the marine environment

Harms biodiversity and ecosystems

Reduces the provision of ecosystem services

Has negative impacts on the economy, such as for:

- fisheries
- tourism sectors

To address the issue, efficient policy responses and legal instruments are required at various levels. These can include waste reduction at the source, extended producer responsibility, consumer behaviour changes through bans and taxes, educational campaigns, and improvements in waste management infrastructure.

The Caribbean Region heavily relies on a healthy marine ecosystem for its economy, specifically tourism and fisheries, which faces significant challenges due to plastic pollution, driven by poor waste management systems and limited recycling. Governments in the region have started implementing measures such as bans on single-use plastics, but more analysis of policy responses is needed.

IMPACT OF MARINE PLASTICS IN ANTIGUA & BARBUDA (2019)

The impact of marine plastics in Antigua and Barbuda in 2019 was assessed through data collection and analysis. Two different plastic accumulation scenarios were considered to estimate the stock and flow of marine plastics in the region, specifically on the shoreline and the Exclusive Economic Zone of Antigua and Barbuda. The study focused on the impact of marine plastics on the fisheries and tourism sectors.

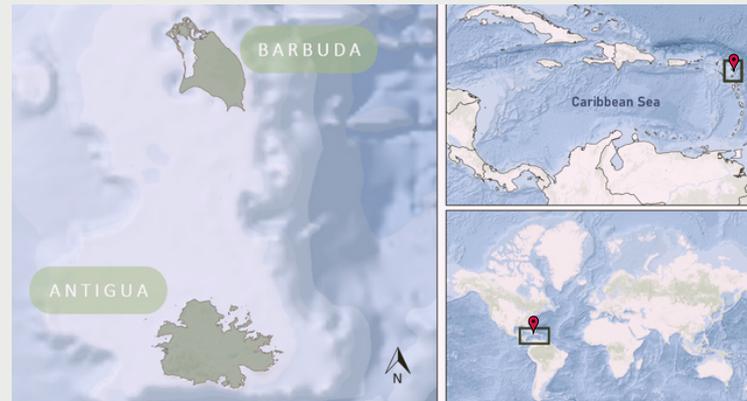
For the fisheries sector, the impact on revenue caused by marine plastics was estimated. Factors such as repair costs, lost productive time, and reduced catches were considered. The estimated impact on fisheries revenue in 2019 was 9.2% of the total revenue, equivalent to 3,861,103 East Caribbean Dollars (XCD) or 1,428,980 US Dollars (USD).

The study also calculated the costs of completely cleaning up all plastics ending up on the coastline to prevent further accumulation of plastics and potentially impacting the tourism sector through a reduction in visitors in the future. The estimated costs for coastal clean-ups in 2019 ranged from XCD 12,868,519 (USD 4,762,590) to XCD 37,657,395 (USD 13,936,860) depending on the plastic accumulation scenario.

CASE STUDY INTRODUCTION

Antigua and Barbuda is a dual island country in the northeastern heart of the Caribbean archipelago, see Map 1 below.

Map 1

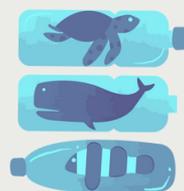


In this country > 3,200 tonnes of plastic waste were disposed, mainly single-use plastics.

Around 21% of all plastics disposed end up leaking into the marine environment annually.

The government has implemented measures to address the issue, including fees on imported cans and bottles and the prohibition of plastic shopping bags and styrofoam. However, challenges remain in waste management and recycling.

To combat plastic pollution, efforts are needed to:



- Encourage producer responsibility,
- support the recycling sector,
- and improve waste disposal practices.

Overall, the impact of marine plastics in Antigua and Barbuda in 2019 amounted to XCD 16,729,622 (USD 6,191,569) to XCD 41,518,498 (USD 15,365,839) in direct costs (impact on fisheries and total estimated costs of coastal clean-up).

These findings highlight the significant economic implications of marine plastics on Antigua and Barbuda's key economic sectors, emphasizing the need for effective measures to mitigate plastic pollution and protect the environment and economy of the region.

PROPOSED SOLUTIONS

The recommendations for improving waste management in Antigua and Barbuda include, among others, strengthening the recycling system by:

- improving waste collection and
- segregation at the source.

Through the PWFJ project, establishing a Regional Recycling Hub in the Caribbean has been proposed as a potential solution for Antigua and Barbuda and other Caribbean islands to improve waste management.

Currently, recycling in Antigua and Barbuda is limited, with only one waste recycling company operating in the country. There is no separation at the source of recyclable materials or organic waste prior to collection from households or commercial businesses.

This study considered the costs and benefits of a recycling system when Antigua and Barbuda implements it alone, as well as from a regional cooperation perspective with all countries bordering the Caribbean Sea also reducing plastic leakage into the sea.

OVERALL DIRECT COST MISMANAGED PLASTICS (2023-2040)

After estimating the impact of marine plastics in 2019, the study estimated the future impact of plastics continuing to leak into the marine environment, without measures to reduce this leakage.

The future and present values for the period 2023-2040 of the overall impact, direct cost to the fisheries sector, and clean-up costs are displayed in Table 1 and they depend on which plastic scenario is chosen; thus, four different values are presented.

Table 1		
Future and present values of the overall direct costs to fisheries and coastal clean-ups (2023-2040) (discount rate: 6.35%)		
Plastic Accumulation Scenarios		
	Scenario 1 (XCD)	Scenario 2 (XCD)
Future Value	389,568,230	938,245,714
Present Value	214,660,490	517,614,074

COST OF IMPLEMENTING THE RECYCLING SCHEME

To understand the costs and benefits of reducing mismanaged waste and plastic leakage into the Caribbean Sea, the study estimated the costs of improving the recycling system in Antigua and Barbuda, considering improved collection and sorting, and transport to existing large-scale recycling infrastructure.¹

Currently, the operating cost of the general waste management system is estimated to amount to XCD 110.3 per tonne of waste. The estimated cost per tonne of recycling plastics is presented in Table 2.

Table 2			
Estimated costs of recycling per tonne of plastics (2019) ²			
	Types of cost	XCD per tonne	USD per tonne
Collecting cost	Labour cost	272.9	101.0
	Investment cost	13.3	4.9
	Fixed cost	7.9	2.9
Sorting cost		201.5	74.6
Shipping cost		68.8	25.5
Total		564.4	208.9

The following figure compares the Waste Management Budget (WMB) under the BaU scenario with the WMB under the recycling scenario, which is combined with the cost of recycling. The difference between the two waste management scenarios is equal to the additional cost of the proposed solution, i.e. the recycling system as shown in Figure 1.

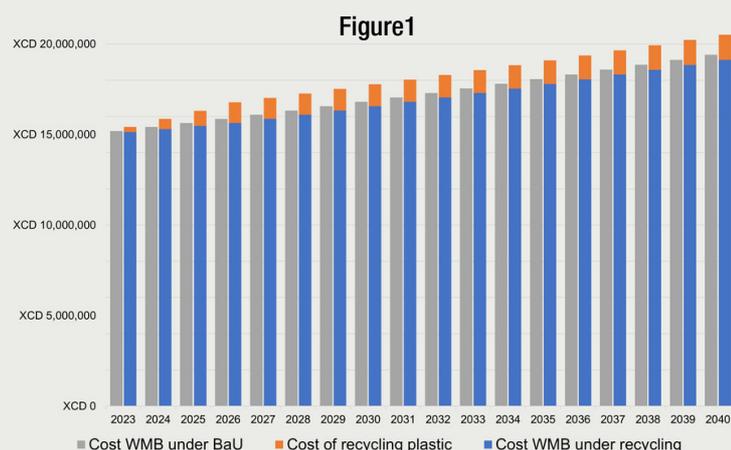


Figure 1 – Estimated costs of recycling, and the waste management budget under BaU scenario and the national recycling scenario (XCD/year)

The future value of the overall cost is estimated to be XCD 25,473,259 (USD 9,427,556). Applying the discount rate of 6.35% results in an estimated present value of XCD 13,495,094 (USD 4,994,483).

The impact in terms of the amount of plastics accumulating in Antigua and Barbuda's waters and coastline under the two recycling scenarios (national recycling and regional cooperation) is displayed below in Figure 2.

¹ The study considered transport to Miami as a proxy for costs, while an exact location for the Regional Hub is not yet decided.

² Source: Searious Business, 2021; PEW, 2020.

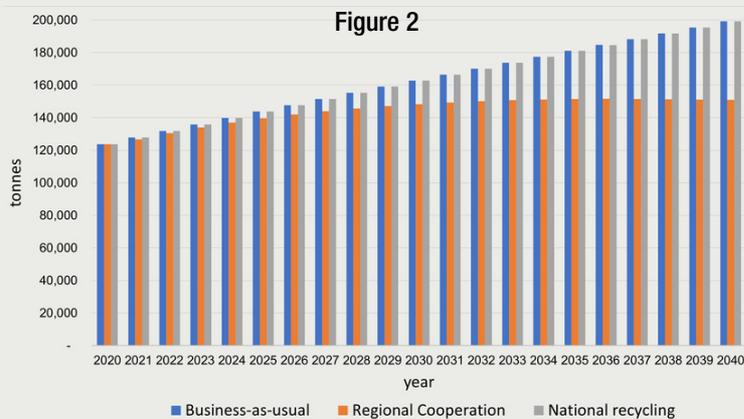


Figure 2 – Estimated tonnes of plastics in Antigua and Barbuda's waters under the three future plastic management scenarios

OVERALL RESULTS NATIONAL AND REGIONAL RECYCLING SCENARIOS

The next figures show the annual benefits of both recycling scenarios (national and regional cooperation) as well as the annual costs of implementing the proposed national recycling system. Figure 3 shows the results under the first plastic accumulation scenario, while Figure 4 shows the results under a second plastic accumulation scenario. Results are displayed both in discounted and non-discounted values. Table 3 shows the net future and present values of the regional cooperation and national recycling scenario.

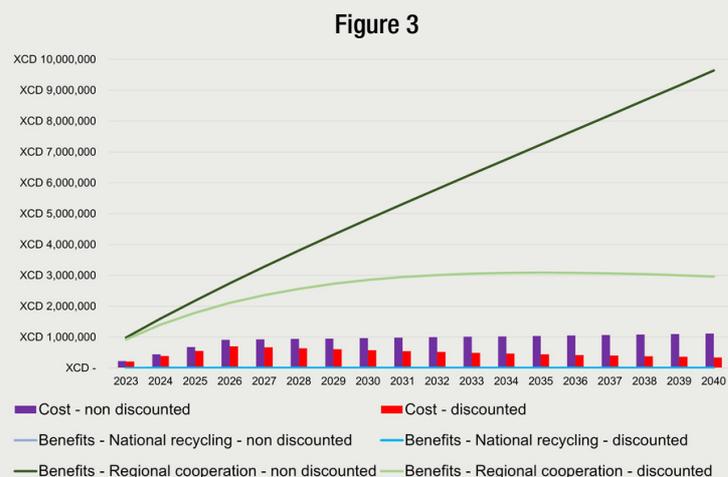


Figure 3 – Cost of recycling plastics for Antigua and Barbuda; benefits of the national recycling and regional cooperation scenario under plastic accumulation scenario 1 (future and present values, discount rate: 6.35%)

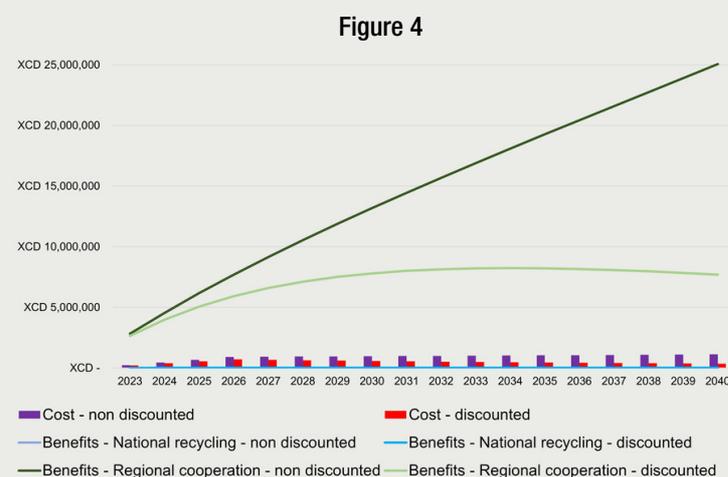


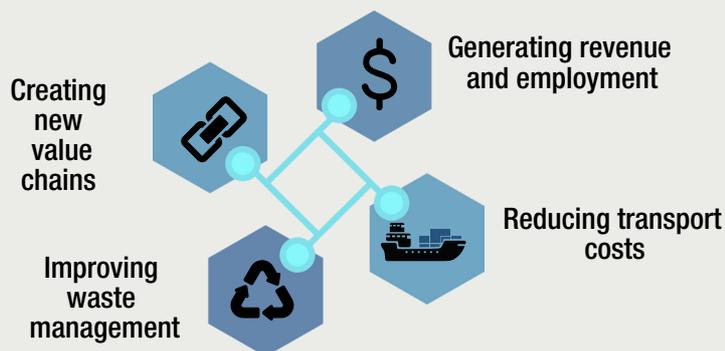
Figure 4 – Cost of recycling plastics for Antigua and Barbuda; benefits of the national recycling and regional cooperation scenario under plastic accumulation scenario 2 (future and present values, discount rate: 6.35%)

Table 3 shows that none of the national recycling scenarios are profitable based on the benefits and costs considered in this study, and without or with applying the discount rate used. However, under the regional cooperation scenario, for both plastic accumulation scenarios, the benefits of a regional reduction in MPW greatly overcome the costs of implementing recycling in Antigua and Barbuda.

Recycling Scenario	Plastic Accumulation Scenarios	Net Future Value		Net Present Value	
		XCD	USD	XCD	USD
National recycling	1	-16,466,210	-6,094,082	-8,667,780	-3,207,913
	2	-16,408,969	-6,072,898	-8,637,216	-3,196,601
Regional Cooperation	1	81,975,409	30,338,789	38,351,629	14,193,793
	2	247,607,709	91,638,679	118,490,732	43,852,973
Net future and present values of the national and regional cooperation scenario under both plastic accumulation scenarios (discount rate used: 6.35%)					

The study highlighted the potential benefits of selling recycled plastics. To breakeven in net present value over the 18-year period considered, Antigua and Barbuda would need to resell the plastics at least at a constant price of XCD 436.14 (USD 161.41) per tonne under the least profitable scenario (national recycling under plastic accumulation scenario 1) and XCD 434.6 (USD 160.84) per tonne under the best case (national recycling under plastic accumulation scenario 2).

Additionally, there are other potential benefits of increased recycling of plastics in Antigua and Barbuda.



OTHER ASPECTS OF THE IMPACT OF MARINE PLASTIC POLLUTION AND INSTRUMENTS TO REDUCE IT

Marine plastic pollution not only has potential adverse effects on tourism and fisheries revenue, but it also can negatively impact employment in these sectors. The tourism sector employs a significant portion of the workforce in Antigua and Barbuda, whereas the fisheries sector serves as a crucial safety net for the population, particularly during periods of income loss.

Antigua and Barbuda has a high per capita fish consumption of around 50 kilograms, which is among the highest in the world. Marine plastics pose a threat to food security in Antigua and Barbuda, by diminishing fish stocks and contaminating fish with macro- and microplastics.

Although this study focuses on the direct cost of marine plastics on the fisheries and tourism sectors in Antigua and Barbuda, it's important to note that other factors such as natural disasters like Hurricane Irma in 2017 and the global travel restrictions due to the COVID-19 pandemic have had significant impacts on the tourism sector and the overall economy.

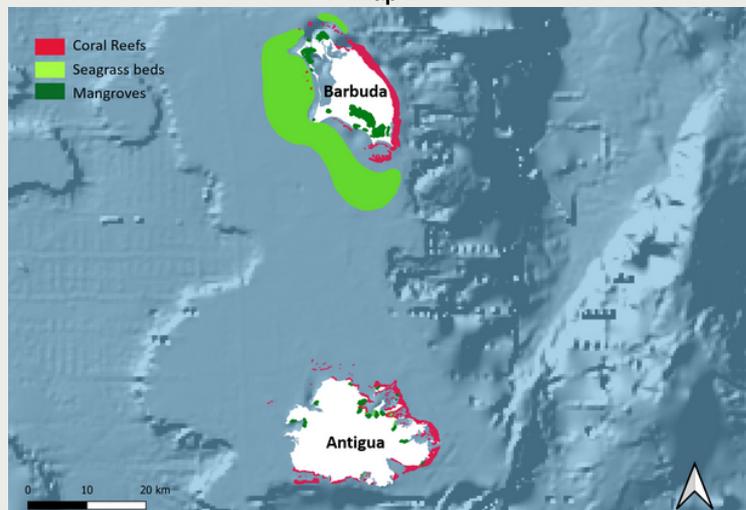
The tourism sector is also vulnerable to the effects of climate change, including sea level rise, increased storm frequency, and coastal erosion. Additionally, this study does not fully consider the future impacts of climate change on fisheries, such as shifting fish migration patterns, changes in reproduction, and altered habitats. It's worth mentioning that Caribbean fishery resources are already overexploited, with declining regional production and a high percentage of species considered overfished.

IMPACT ON MARINE AND COASTAL ECOSYSTEMS

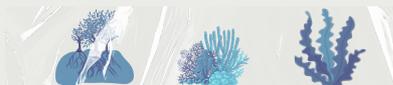
Marine ecosystems in Antigua and Barbuda, including coral reefs, mangroves, and seagrass beds, are crucial for tourism, natural coastal defense, livelihoods in the fisheries sector, and various ecosystem services such as shoreline protection, breeding grounds, water purification, and carbon sequestration.

The conservation and restoration of these ecosystems are essential due to their significant contribution to the island's economy, employment, and vulnerable conservation status of certain species. Map 2 below displays the locations of these ecosystems.

Map 2



Marine plastics have detrimental effects on coral reefs, seagrass beds, and mangrove forests, interfering with their ecological functions and causing population declines and increased disease.



These impacts are exacerbated by other stressors such as climate change, pollution, overfishing, and invasive species, leading to the degradation of marine and coastal ecosystems, affecting tourism, fish stocks, and marine biodiversity including seabirds and marine mammals.

IMPACT ON MARINE WILDLIFE

Antigua and Barbuda's waters are home to six marine mammal species, with three considered vulnerable; four species of sea turtles, two of which nest and forage in nearshore waters; and a diverse range of bird species, including migratory and resident species, with 33 seabird species listed as "least concerned" and two listed as "vulnerable" and one as endangered."

Marine plastics pose various dangers to marine fauna including:

- entanglement,
- ingestion,
- colonisation by invasive species and
- contact or coverage with plastics and exposure to harmful chemicals.



Seabirds, sea turtles, marine mammals, sharks, rays, and sponges are among the species affected with:

- ingestion of plastics leading to potential mortality,
- entanglement causing suffocation or drowning, and
- plastic debris serving as vectors for the spread of pathogens and pollutants.

Plastic pollution should be considered in conjunction with other stressors when assessing its impact on the marine environment, as it may contribute to the decline of individuals, populations, or ecosystems, but not necessarily cause critical population decreases on its own. In addition to macroplastics, the presence of microplastics is a concern as small organisms can ingest them, bioaccumulate contaminants, and elicit toxicological effects, posing risks to marine animals throughout the food chain.

FINAL REMARKS

This study primarily focused on estimating direct costs for the fisheries and tourism sectors in Antigua and Barbuda, but it acknowledges that some costs and benefits were not included, such as the impact of ghost fishing, or the full costs of establishing a Regional Recycling Hub and the demand for recycled plastics under the current and future market.

The study emphasizes the need to consider the broader impacts of mismanaged plastics on blue natural capital assets, marine biodiversity, and the overall economy, recognizing the complexity of quantifying the impact on marine ecosystems. It suggests the implementation of a national recycling system and shows the positive impact of regional efforts to address the plastic waste problem while highlighting the importance of reducing plastic use, improving waste management infrastructure, and integrating local waste pickers into the system.

Further research is needed to gather data on mismanaged plastics, understand the real costs including microplastics, and develop comprehensive accounting frameworks like Ocean Accounting to assess the economic impacts of marine plastics and multiple stressors.