North and Latin America

North and Latin America
Data Collection Survey on Marine Plastic Litter in the Caribbean Region

Final Report

October 2020

Japan International Cooperation Agency (JICA)

EX Research Institute Ltd.

5R
JR
20-006

Table of contents

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Official Name
3R	Reduce, Reuse, and Recycle
ABWREC	Antigua & Barbuda Waste Recycling Corporation
ACS	Association of Caribbean States
AFD	Agence Française de Développement
AI	Artificial intelligence
AMA	Agencia de Medio Ambiente (Environment Agency)
APEC	Asia-Pacific Economic Cooperation
BANOBRAS	Banco Nacional de Obras
BEST	Bahamas Environment, Science & Technology
BOOT	Build–Own–Operate–Transfer
BSWaMA	Belize Solid Waste Management Authority
C&D	Construction & Demolition
CARICOM	Caribbean Community
CCI	Clinton Climate Initiative
CIA	Central Intelligence Agency
CIS	Commonwealth of Independent States
CITMA	Ministerio de Ciencia Tecnología y Medio Ambiente (Ministry of Science, Technology and Environment)
CDB	Caribbean Development Bank
CDN	Cadena de Noticias TV S.A.
CDR	Comités de Defensa de la Revolución (Committees for the Defense of the Revolution)
CEP	Caribbean Environment Programme
CRMR	Cooperatives for Recyclable Material Recovery
CRFM	Caribbean Regional Fisheries Mechanism
COP	Conference of Parties
CSM	CARICOM Single Market and Economy
CSR	Corporate Social Responsibility
CTO	Caribbean Tourism Organization
CUC	Cuban convertible peso
CWSA	Central Water and Sewerage Authority
CYEN	Caribbean Youth Environment Network
C&I	Commercial and Institutional
DBJ	Development Bank of Jamaica
DEHS	Department of Environmental Health Services
DMSC	Dirección Municipal de Servicios Comunales
DOE	Department of Environment
DSWMC	Dominica Solid Waste Management Corporation
ECU	Environmental Coordinating Unit
ECSSA	Environmental Cleaning Solutions S.A.
EFF	Extended Fund Facility
EHD	Environmental Health Department
EMA	Environmental Management Authority
EIB	European Investment Bank
EPA (Republic of Guyana)	Environmental Protection Agency
EPA (Belize)	Environmental Protection Act
EPMA	Environmental Protection and Management Act
EPR	Extended Producer Responsibility
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GBPA	Grand Bahama Port Authority

Abbreviation	Official Name
GCFI	Gulf and Caribbean Fisheries Institute
GEF	Global Environment Facility
GDP	Gross Domestic Product
GGGI	Global Ghost Gear Initiative
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation)
GMPP	Global Marine and Polar Programme
GNBS	Guyana National Bureau of Standards
GNI	Gross National Income
GPA	Global Programme of Action
GPAP	The Global Plastic Action Partnership
GPML	Global Partnership on Marine Litter
GRDP	Gross Regional Domestic Product
GSWMA	Grenada Solid Waste Management Authority
G7	Group of Seven
G20	Group of Twenty
HDPE	High-density polyethylene
HF	High frequency (radar)
HIPC	Heavily Indebted Poor Country
HME	Harmful to the marine Environment
HP	Home page
IAST	Institute of Applied Science and Technology
IBRD	International Bank for Reconstruction and Development
IC	Independent Contractors
ICT	Information and Communications Technology
IDB	Inter-American Development Bank
INEGI	Instituto Nacional de Estadística y Geografía
IMF	International Monetary Fund
IMO	International Marine Organization
IUCN	International Union for Conservation of Nature
JEAN	Japan Environment Action Network
JICA	Japan International Cooperation Agency
kcal	kilocalorie
KfW	Kreditanstalt für Wiederaufbau
kJ	kilojoule
LBS	Land-Based Sources
LGEEPA	Ley General del Equilibrio Ecológico y la Protección al Ambiente
LGPGIR	Ley general para la prevención y gestión integral de los residuos
MALITA	Marine Litter Activity
MARPOL	International Convention for the Prevention of Pollution from Ships
MDTF	Multi-Donor Trust Fund
MEGJC	Ministry of Economic Growth & Job Creation
MIS	Management Information System
MLGCD	Ministry of Local Government and Community Development
MLGRD	Ministry of Local Government and Regional Development
MoC	Ministry of Communities
MOHW	Ministry of Health and Wellness
MOU	Memorandum of Understanding
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
N/A	Not Applicable / Not Available
NaDMA	National Disaster Management Agency of Grenada

Abbreviation	Official Name
NaDMAC	National Disaster Management Advisory Council
NAFTA	North American Free Trade Agreement
n.d.	No data
NDCs	Neighbourhood Democratic Councils
NEMO	National Emergency Management Organisation
NEPA	National Environment and Planning Agency
NGO	Non-Governmental Organization
NIMOS	Nationaal Instituut voor Milieu en Ontwikkeling in Suriname (National Institute for Environment and Development in Suriname)
NLA	National Land Agency
NMR	Nationale Milieu Raad (National Environment Council)
NMX	Normas Mexicanas
NOAA	National Oceanic and Atmospheric Administration
NODS	National Office of Disaster Service
NODS-CU	National Office of Disaster Service – Coordinating Unit
NOM	Normas Oficiales Mexicanas
NORAD	Norwegian Agency for Development Cooperation
NOWPAP	Northwest Pacific Action Plan
NPAP	National Plastic Action Partnership
NPO	Non-Profit Organization
NRCA	Natural Resources Conservation Authority
NSWMA	National Solid Waste Management Authority
NSWMA (Saint Christopher and Nevis)	Nevis Solid Waste Management Authority
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
ODPM	Office of Disaster Preparedness and Management
OECD	Organisation for Economic Co-operation and Development
OECS	Organisation of Eastern Caribbean States
OIC	Organisation of Islamic Cooperation
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OWT & C	Ministry of Public Works, Transport & Communications
PAHO	Pan American Health Organization
PE	Polyethylene
PET	Polyethylene terephthalate
PGIRS	Programa de Gestión Integral de los Residuos Sólidos para la Ciudad de México (Integrated Solid Waste Management Program for Mexico City)
PMCU	Project Management Coordination Unit
PP	Polypropylene
PPP	Public-Private Partnership
PPP[1]	Polluter Pays Principle
PRGF	Poverty Reduction and Growth Facility
PS	Polystyrene
PUP	People's United Party
RAC-REMPEITC	Regional Activity Centre/Regional Marine Pollution Emergency Information and Training Centre
RAPMaLi	Regional Action Plan for Marine Litter
RDC	Regional Democratic Council

[1] In the text, the two "PPP" are used in a way that their meaning can be understood.

Abbreviation	Official Name
RME	Residuos de Manejo Especial (Wastes Requiring Special Handling)
RMRE	Recyclable Material Recovery Enterprises
RSU	Residuos Sólidos Urbanos (Municipal Solid Waste)
RUCP	Registro Único de Control de Plásticos
SBCC	Secretaría de Bienestar, Sustentabilidad y Cambio Climático (Secretariat of Welfare, Sustainability and Climate Change)
SBRC	Sustainable Barbados Recycling Centre
SDGs	Sustainable Development Goals
SEDEMA	Secretaria del Medio Ambiente de la Ciudad de México (Ministry of Environment of Mexico City)
SEDUMA	Secretaría de Desarrollo Urbano y Medio Ambiente, SEDUMA（Ministry of Urban Development and Environment）
SEMA	Secretaría de Ecología y Medio Ambiente (Ministry of Ecology and Environment)
SEMABICC	Secretaría de Medio Ambiente, Biodiversidad y Cambio Climático
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales (Secretariat of Environment and Natural Resources)
SGP	Small Grants Program
Sida	Swedish International Development Cooperation Agency
SIDS	Small Island Developing States
SLSWMA	Saint Lucia Solid Waste Management Authority
SMCRS	Service Métropolitain de Collecte des Résidus Solides (Metropolitan Solid Waste Collection Service)
SNGRS	Service National de Gestion des Résidus Solides
SPAW	Specially Protected Areas and Wildlife
SRO	Statutory Rules and Orders
SSA	Sanitation Service Authority
SSB	Surinaams Standaarden Bureau (Suriname Bureau of Standards)
STAP	Scientific and Technical Advisory Panel
SWM	Solid Waste Management
SWMA	Solid Waste Management Authority
SWMC	The Saint Christopher and Nevis Solid Waste Management Corporation
SWMCOL	Trinidad & Tobago Solid Waste Management Company Limited
SWMP	Solid Waste Management Project
SWMU	Solid Waste Management Unit
TEU	Twenty-foot equivalent unit
TF	Tipping fee
THA	Tobago House of Assembly
UN	United Nations
UNAM	Universidad Nacional Autónoma de México
UNASUR	Union of South American Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEA	United Nations Environmental Assembly
UNEP	United Nations Environment Programme
Unicef	United Nations Children's Fund
UNICPOLOS	United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea
UN-OHRLLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
UPPH	Unidad Provincial Presupuestada de Higiene (Provincial Unit of Hygiene)
UPS	Uninterruptible power supply
URMRE	Union of Recyclable Materials Recovery Enterprises

Abbreviation	Official Name
VOV	Vuil Ophaal en –Verwerking (Department of Solid waste Collection and Disposal)
WB	World Bank
WCR	Wider Caribbean Region
WEF	World Economic Forum
WTE	Waste-to-Energy
WTO	World Trade Organization
WTTC	World Travel & Tourism Council
WWF	World Wide Fund for Nature

Chapter 1. Survey Background and Objective

1.1 Survey background

The table below shows the main international discussions related to the marine plastic litter issue.

Table 1-1 International discussions related to the marine plastic litter issue

Year	Outcomes
2015	"G7 Action Plan to Combat Marine Litter" was formulated at the G7 Summit in Elmau.
2016	Ellen MacArthur Foundation published a report advocating for the transition to the New Plastics Economy in collaboration with the World Economic Forum.
2017	China (the largest importer of plastic waste) began regulations on imports of waste. Import ban in 2018.
2018	The EU formulated the "Plastic Strategy".
2018	G7 leaders, besides Japan and the U.S., signed the "Ocean Plastics Charter" at the G7 Summit in Charlevoix.
2019	The resolution "Marine Plastic Litter and Microplastics" was adopted at the 4th session of the UN Environment Assembly (UNEA4).
2019	The Japanese government formulated the "Resource Circulation Strategy for Plastics".
2019	The EU approved the "Single-Use Plastics Directive".
2019	At the G20 Summit in Osaka, it was agreed to establish the "Implementation Framework for Actions on Marine Plastic Litter". "Osaka Blue Ocean Vision" was shared. The Japanese government launched the "MARINE Initiative" and announced its support for capacity building related to waste management and infrastructure improvement in developing countries.

Over the last 50 years, global plastic production has increased from 15 million tons in 1964 to 311 million tons in 2014, and is expected to double further in the next 20 years (Ellen MacArthur Foundation. 2017). These are mainly used for containers and packaging (30%), building/construction materials (17%), transport related components such as vehicle bodies, parts and tires (14%), consumer products (10%) and fibers (9%).

On the other hand, the amount of plastic released into the ocean in 2015 is estimated to be about 8 million tons per year for macroplastics (more than 5 mm) only, of which 7.36 million tons are estimated to leak from land to ocean via rivers due to improper treatment of municipal solid waste. Other major sources are the loss of fishing nets and fishing activities (about 650,000 tons per year) and microplastics (5 mm or less) (about 280,000 tons per year).

In the Caribbean countries, that are surrounded by or facing the ocean, tourism centered on beach resorts and fisheries are important industries, so that marine pollution caused by plastic litter directly affects the economic and social activities of each country.

The Caribbean countries and the United Mexican States (several states, including the Mexico City and the six states on the Caribbean coast) have already started to respond by banning or restricting the use of disposable plastic bags and styrene foam, and introducing civic education programs, however, this response could not keep up with the increasing amount of plastic waste because appropriate waste management and institutions, infrastructure such as disposal sites, and systems for waste collection and

recycling are not sufficiently developed, and the situation has not improved.

Up to now, JICA has been providing assistance to the Caribbean countries and the United Mexican States, including for waste management, but in light of the above-mentioned situation, it is necessary to consider restructuring the efforts with a view to contributing to the marine plastic litter issue.

In this Survey, information from each country on the current situation of marine plastic litter, current status and issues of countermeasures, cooperation needs, relevant Japanese technologies, etc. will be collected and organized, and the information necessary for considering future support policies will be confirmed.

1.2 Survey objective and surveyed countries

This Survey is to be used as a material for considering future support policies and approaches from JICA, collecting and organizing information in the Caribbean (14 Caribbean states – Antigua and Barbuda, Republic of Guyana, Grenada, Jamaica, Republic of Suriname, Saint Vincent and the Grenadines, Saint Christopher and Nevis, Saint Lucia, Commonwealth of Dominica, Republic of Trinidad and Tobago, Republic of Haiti, Commonwealth of The Bahamas, Barbados, Belize – as well as Republic of Cuba, Dominican Republic and United Mexican States) on the current situation of marine plastic litter, the current status and issues of countermeasures, cooperation needs, and related Japanese technologies.

1.3 Survey outline

After analyzing the socio-economic conditions, information on marine plastic litter, and the current state of waste management in the surveyed countries in Stage 1 of the Survey, the issues, needs, soft countermeasures, and hard countermeasures via Japanese technology, supposed for each stage of the plastic life cycle (production → use → discharge → treatment/disposal → leakage into ocean) have been compiled, and the local situation regarding discharge, treatment/disposal, and leakage has been confirmed.

1.4 Survey content and method

1.4.1 Survey content

The content of the Survey is as follows and is compiled as the final report.

1. Socioeconomic status
   - Current demographic trends and projections of future population changes in the surveyed countries
   - Macroeconomic situation, economic policy
2. Information on marine plastic litter in the surveyed countries

- Marine plastic litter emission sources, amount, and causes
- Impacts of marine plastic litter
- Policies and initiatives against marine plastic litter

3. Current status of waste management in the surveyed countries
   - Relevant organizations and institutional system in the waste management sector
   - Policy, legal system and future plans related to waste management
   - System and infrastructure related to waste management
4. International discussions related to marine plastic litter
   - Current status of international framework initiatives
   - Initiatives of other donors, such as international organizations (including in non-surveyed areas)
5. Japanese technologies and Japanese experience
   - Japanese technologies related to waste management that contribute to the reduction of marine plastic litter
   - Japan's initiatives against the marine plastic litter issue

6 Organized information for considering cooperation proposals to countries regarded as particularly high priority (the following applies to each country)
   - Reasons for selecting this country
   - Areas in this country where special assistance is needed, with supporting reasons
   - Scheme and approach methods considered as particularly effective in this country
   - Points to bear in mind when formulating projects in this country
   - Technologies and products of Japanese companies that are expected to be particularly useful in this country

1.4.2 Survey method

In Stage 1, a desk research covering 17 countries has been carried out in Japan. Based on the results, about 6 countries have been selected and an in-depth research has been conducted as Stage 2 of the Survey. Note that Stage 1 of the Survey (Chapter 2) has not been revised based on the detailed information obtained in Stage 2.

1.5 Survey schedule

The Survey started in March 2020 and ended in October of the same year. The survey schedule for this work is shown below.

Table 1-2 Survey schedule

Work Plan

Work Items		Period	2020							
			March	April	May	June	July	August	September	October
A	Preparatory Work in Japan									
A.1	Collection and analysis of relevant materials and information									
A.2	Creation of the Inception Report									
A.3	Explanation, discussion and finalization of the Inception Report (Draft)									
B	Stage 1: Desk Research									
B.1	Survey of the current situation in each country									
B.2	Survey on the international trends related to marine plastic litter									
B.3	Survey on Japanese technology and Japanese experience									
B.4	Selection of the target countries for an In-depth Research									
C	Stage 2: In-depth Research									
C.1	In-depth Research									
C.2	Creation of the Draft Final Report									
C.3	Holding of seminars for countries subject to the In-depth Research									
D	Organization work									
D.2	Reporting seminar for parties inside and outside of JICA									
D.3	Creation of the Final Report									

Legend: ——— Pre-work period Onsite work period Work period in Japan

Chapter 2. Literature Review on the Marine Plastic Litter Issue in the Caribbean

During the literature review on the marine plastic litter issue, information on the survey items listed in the table below were collected, analyzed and organized for 17 Caribbean countries, namely 14 CARICOM Caribbean states – Antigua and Barbuda, the Republic of Guyana, Grenada, Jamaica, the Republic of Suriname, Saint Vincent and the Grenadines, Saint Christopher and Nevis, Saint Lucia, the Commonwealth of Dominica, the Republic of Trinidad and Tobago, the Republic of Haiti, the Commonwealth of The Bahamas, Barbados, Belize – as well as the Republic of Cuba, the Dominican Republic and the United Mexican States. The table below presents the main survey items and their sources of information.

Table 2-1 Information collected and analyzed as well as main sources of information

No.		Survey items (information to be collected and analysed)	Main sources of information
1		Socioeconomic status	
	1)	Current demographic trends and projections of future population changes	・ World Bank Group. World Development Indicators ・ Open StreetMap ・ Basic data for each country provided by the Ministry of Foreign Affairs of Japan
	2)	Macroeconomic situation, economic policy	・ World Bank Group. World Development Indicators ・ Basic data for each country provided by Ministry of Foreign Affairs of Japan ・ Caribbean Regional Fisheries Mechanism (CRFM). 2018 ・ World Travel & Tourism Council (WTTC). 2018
2		Information on marine plastic litter	
	1)	Marine plastic litter emission sources, amount, and causes	・ UNEP. 2018 ・ World Bank Group. n.d. What a Waste 2.0 for the waste amount ・ World Bank Group. 2019 for collecting detailed information on the marine plastic litter issue specifically in the Caribbean ・ Central Intelligence Agency (CIA). n.d. for the length of the coastline of each country.
	2)	Impacts of marine plastic litter	・ World Bank Group. 2019 ・ IDB. 2018 ・ UNEP. 2014. RAPMaLi
	3)	Policies and initiatives against marine plastic litter	・ Ocean Conservancy. 2019 ・ UNEP 2018a. Legal limits on single-use plastics and microplastics.
3		Current status of waste management	
	1)	Relevant organizations and institutional system in the waste management sector	・ World Bank Group. 2019 ・ UNEP. 2014. RAPMaLi ・ RAC-REMPEITC Carib. 2018 for information related to waste from ships in the MARPOL Convention. ・ Website from relevant institutions/organizations, annual reports, and news articles in each country as well as reports from international organizations and donor agencies.
	2)	Policy, legal system and future plans related to waste management	
	3)	System and infrastructure related to waste management	

2.1 Caribbean countries

2.1.1 Socioeconomic status

1) Geographical distribution and geographical features of each country

The map below illustrates the 17 countries surveyed.

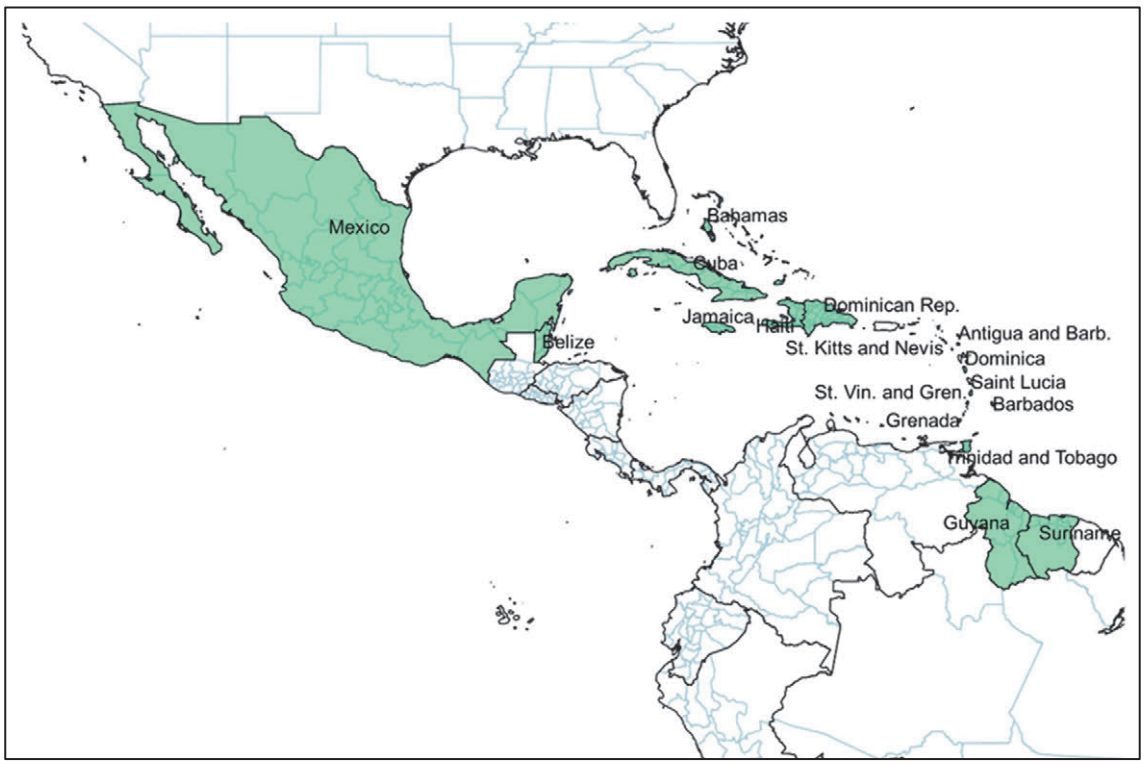


Figure 2-1 Location map of the 17 countries surveyed

Source of the map: Created by JICA Survey Team based on https://www.naturalearthdata.com/

The 17 countries surveyed are classified into North or South American continent, and the West Indies in between, which consists of the Commonwealth of The Bahamas, the Greater Antilles and the Lesser Antilles. The table below shows the geographical classification of the 17 countries surveyed.

Table 2-2 Geographical classification of the 17 countries surveyed

Geographical classification		Country
North America		Belize, United Mexican States
South America		Republic of Guyana, Republic of Suriname
The West Indies	Commonwealth of the Bahamas	Commonwealth of The Bahamas
	The Greater Antilles	Republic of Cuba, Jamaica, Republic of Haiti, Dominican Republic
	The Lesser Antilles	Antigua and Barbuda, Grenada, Saint Vincent and the Grenadines, Saint Christopher and Nevis, Saint Lucia, Commonwealth of Dominica, Republic of Trinidad and Tobago, Barbados

2) Current demographic trends and projections of future population changes

Population in 2018, population projection in 2030 and 2050 in the countries surveyed are shown in the table below. Mexico has a population of more than 126 million, accounting for more than 75% of the 17 countries. Coastal population affects marine pollution particulary (World Bank Group. 2019), and total population in the six Mexican states facing the Caribbean, namely Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan and Quintana Roo in 2015 is 18,492,618 (INEGI. n.d.) which is approximately 10% of the country.

Population in 2030 is expected to increase except in the Republic of Cuba. On the other hand, eight countries will see their population decline in 2050 (Antigua and Barbuda, Republic of Cuba, Jamaica, Saint Vincent and the Grenadines, Saint Lucia, Commonwealth of Dominica, Republic of Trinidad and Tobago and Barbados) and two countries will neither increase nor decrease (Republic of Guyana and Saint Christopher and Nevis). Consumption increase of due to population growth is a major factor that exacerbates marine pollution.

Table 2-3 Current population and projections of future population changes

Country	Population in 2018	Projections in 2030		Projections in 2050	
		Population	Increase or decrease compared to 2018	Population	Increase or decrease compared to 2030
Antigua and Barbuda	96,286	105,000	＋	111,000	－
Republic of Guyana	779,004	822,000	＋	825,000	＋
Republic of Cuba	11,338,138	11,142,000	－	10,162,000	－
Grenada	111,454	116,000	＋	116,000	±
Jamaica	2,934,855	3,048,000	＋	2,960,000	－
Republic of Suriname	575,991	632,000	＋	680,000	＋
Saint Vincent and the Grenadines	110,210	113,000	＋	109,000	－
Saint Christopher and Nevis	52,441	56,000	＋	56,000	±
Saint Lucia	181,889	189,000	＋	182,000	－
Commonwealth of Dominica	71,625	73,000	＋	71,000	－
Dominican Republic	10,627,165	11,770,000	＋	12,796,000	＋
Republic of Trinidad and Tobago	1,389,858	1,413,000	＋	1,344,000	－
Republic of Haiti	11,123,176	12,733,000	＋	14,878,000	＋
Commonwealth of The Bahamas	385,640	427,000	＋	463,000	＋
Barbados	286,641	289,000	＋	277,000	－
Belize	383,071	468,000	＋	571,000	＋
United Mexican States	126,190,788	140,876,000	＋	155,151,000	＋

Country	Population in 2018	Projections in 2030		Projections in 2050	
		Population	Increase or decrease compared to 2018	Population	Increase or decrease compared to 2030
Six Mexican states facing the Caribbean Sea (Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan, and Quintana Roo)	18,492,618	N/A	N/A	N/A	N/A
Total	166,638,232	184,272,000	+	200,752,000	+

Source: World Bank Group. World Development Indicators. Information on the six Mexican states facing the Caribbean Sea is based on population in 2015 available in INEGI.

The table below summarizes current population ratios in capital and major cities, as well as projections of population ratio inmajor cities in each country. According to the report of UNEP, population in major cities in the Caribbean region, including in the countries surveyed, is also increasing, therefore the population ratio of major cities in the region, which was approximately 62% in 2000, was expected to reach 70% in 2015 and 74% in 2020 (UNEP. 2016). Countries expected to have even higher ratios in 2030 are the Republic of Cuba (78.7%), the Dominican Republic (87.8%), the Commonwealth of The Bahamas (84.7%) and the United Mexican States (83.5%). In addition, even if the United Mexican States is excluded, the population living within 30 km from the coast is approximately 45 million, and the population living within 100 km from the coast is 90 million, which is considered to be a major factor of marine pollution, in addition to inappropriate waste management (World Bank Group. 2019).

Table 2-4 Current and projected population ratio of capital and major cities

Country	Capital population ratio (%) in 2018*	Major cities population ratio (%) in 2018	Projection of major cities population ratio (%) in 2030	Projection of major cities population ratio (%) in 2050
Antigua and Barbuda	21.8	24.6	24.8	31.0
Republic of Guyana	14.1	26.6	28.6	36.0
Republic of Cuba	18.9*	77.0	78.7	84.1
Grenada	35.0	36.3	38.9	47.3
Jamaica	20.1*	55.7	60.3	70.4
Republic of Suriname	41.5	66.1	67.6	74.0
Saint Vincent and the Grenadines	24.5	52.2	57.3	65.5
Saint Christopher and Nevis	26.7	30.8	32.4	40.3
Saint Lucia	12.1	18.7	20.4	26.6
Commonwealth of Dominica	20.9	70.5	74.2	80.0
Dominican Republic	31.2*	81.1	87.8	92.0
Republic of Trinidad and Tobago	39.1	53.2	54.8	62.7
Republic of Haiti	24.9	55.3	64.9	74.9

Country	Capital population ratio (%) in 2018*	Major cities population ratio (%) in 2018	Projection of major cities population ratio (%) in 2030	Projection of major cities population ratio (%) in 2050
Commonwealth of The Bahamas	72.6	83.0	84.7	88.4
Barbados	31.0	31.1	32.8	40.8
Belize	6.0*	45.7	48.6	57.1
United Mexican States	17.3*	80.2	83.5	88.2

Source: Capital population ratios are calculated based on population data from World Bank Group. World Development Indicators, and capital population data from CIA. n.d.b. Other items are created by JICA Survey Team based on World Bank Group. World Development Indicators.
* Data 2018 is not available in these countries. The figures for Dominican Republic is from 2009, Belize 2017, and Republic of Cuba, Jamaica and United Mexican States 2020.

3) Macroeconomic situation and economic policy

(1) Macroeconomic situation and economic policy

The Caribbean region is one of the most famous tourist spots in the world. Over 27 million tourists visit the region every year (World Bank Group. 2019). According to the World Travel & Tourism Council (WTTC), tourism in the Caribbean region accounts for about 15% of the region's GDP, and cruise ships arrivals accounted for 34% of the world's total in 2013 (World Bank Group. 2019). Meanwhile, employment in fisheries is about 340,000 (4.3% of the area). In addition, CRFM (Caribbean Regional Fisheries Mechanism) reports that the fishery production of CRFM member countries from 2013 to 2014 exceeded 162,000 tons and generates US$ 460 million per year (World Bank Group. 2019). The macroeconomic indicators of the surveyed countries are summarized below.

Table 2-5 Macro economy in the Caribbean countries

Country	Nominal GDP (US$)	Nominal GDP per person (US$)	GDP growth rate (annual %)	Inflation rate, consumer prices (annual %)	Employment rate (against population)	Exchange rate (vs. US$ 1.0)
Antigua and Barbuda	1,610,574,074.1	16,727.0	7.4	1.2	N/A	2.7
Republic of Guyana	3,878,662,620.8	4,979.0	4.1	1.3	49.5	207.72
Republic of Cuba	100,023,000,000.0	8,821.8	2.2	N/A	52.8	0.82
Grenada	1,185,925,925.9	10,640.5	4.2	0.8	N/A	2.70
Jamaica	15,713,908,816.1	5,354.2	1.9	3.7	59.8	128.87
Republic of Suriname	3,590,753,768.9	6,234.0	1.9	N/A	47.6	7.46
Saint Vincent and the Grenadines	811,300,000.0	7,361.4	2.2	2.3	53.4	2.70
Saint Christopher and Nevis	1,010,822,222.2	19,275.4	2.9	-1.0	N/A	2.70
Saint Lucia	1,921,848,222.2	10,566.0	0.9	1.9	53.0	2.70
Commonwealth of Dominica	550,892,592.6	7,691.3	2.3	1.0	N/A	2.70
Dominican Republic	85,555,390,387.0	8,050.6	7.0	3.6	60.6	29.51
Republic of Trinidad and Tobago	23,808,146,747	17,129.9	-0.2	1.0	58.8	6.77

Country	Nominal GDP (US$)	Nominal GDP per person (US$)	GDP growth rate (annual %)	Inflation rate, consumer prices (annual %)	Employment rate (against population)	Exchange rate (vs. US$ 1.0)
Republic of Haiti	9,658,721,168.9	868.3	1.5	12.5	57.9	68.03
Commonwealth of The Bahamas	12,424,500,000.0	32,217.9	1.6	2.3	67.1	1.00
Barbados	5,145,000,000.0	17,949.3	-0.5	3.7	59.4	2.00
Belize	1,871,203,164.1	4,884.7	3.0	N/A	60.7	2.00
United Mexican States	1,220,699,479,846.0	9,673.4	2.1	4.9	58.7	19.24
Six Mexican states facing the Caribbean Sea	152,207,010,000	8,231	N.A.	N/A.	N/A.	

Source: World Bank Group. World Development Indicators, 2018 data. For the six Mexican states facing the Caribbean Sea: INEGI. n.d., 2018 data.

(2) Diplomacy of the countries

The diplomatic relations of the surveyed countries are summarized in the table below.

The Association of Caribbean States (ACS), an institution established in July 1994, conducts policy dialogue on common areas of interest at the regional level (MOFA. 2019q). The five areas of concern are (1) conservation of the Caribbean Sea, (2) sustainable tourism, (3) trade and economy, (4) natural disasters, and (5) transport (MOFA. 2019q). As for CARICOM – this survey covers 17 countries including 14 countries of the Caribbean Community (CARICOM) as well as the Republic of Cuba, the Dominican Republic and the United Mexican States – it was established for the purpose of free trade in the region, and currently aims to promote functional integration such as economic integration by establishing a joint market system, and coordination on foreign policy, health and education (MOFA. 2019p). Currently, 12 countries except the Republic of Haiti and the Commonwealth of The Bahamas participate in the CARICOM Single Market (CSM) (MOFA. 2019p).

IMF estimates that the regional economy of the Organization of Eastern Caribbean States (OECS) is gaining momentum in the region's economic recovery due to tourism growth, lower oil prices and improved fiscal management (MOFA. 2019f). On the other hand, the medium-term outlook points out that weaknesses in the banking system, high debt, natural disasters, and low competitiveness decelerate growth (MOFA. 2019f).

Table 2-6 Diplomacy of the surveyed countries

Country	Association of the Caribbean (ACS)	Caribbean Community (CARICOM)	British Common-wealth	Organization of Eastern Caribbean States (OECS)	Union of South American Nations (UNASUR)	Organisation of Islamic Cooperation (OIC)	Countries that recognize Taiwan
Antigua and Barbuda	○	○	○	○			
Republic of Guyana	○	○	○		○	○	

Country	Association of the Caribbean (ACS)	Caribbean Community (CARICOM)	British Common -wealth	Organization of Eastern Caribbean States (OECS)	Union of South American Nations (UNASUR)	Organisation of Islamic Cooperation (OIC)	Countries that recognize Taiwan
Republic of Cuba	○						
Grenada	○	○	○	○			
Jamaica	○	○	○				
Republic of Suriname	○	○			○	○	
Saint Vincent and the Grenadines	○	○	○	○			○
Saint Christopher and Nevis	○	○	○	○			○
Saint Lucia	○	○	○	○			○
Commonwealth of Dominica	○	○	○	○			
Dominican Republic	○						
Republic of Trinidad and Tobago	○	○	○				
Republic of Haiti	○	○*					○
Commonwealth of The Bahamas	○	○*	○				
Barbados	○	○	○				
Belize	○	○	○				○
United Mexican States	○						

○: Membership *: Not participating in CARICOM Single Market and Economy
Source: Created by JICA Survey Team based on website of each organization and information available from MOFA

2.1.2 Information on marine plastic litter

1) Marine plastic litter emission sources, amount, and causes

(1) Marine plastic litter emission sources, amount, and causes in the world and regional areas including the surveyed countries

About 80% of marine litter is considered to be released due to improper management of solid waste on land. According to the 2018 UNEP report, 8.28 million tons of plastic waste in total, which consists of 5.27 million tons of macroplastics and 3.01 million tons of microplastics, have been released into the ocean. The release caused by improper waste management and littering accounts for 88.6% of macroplastics and 56.4% of all plastics including microplastics (UNEP. 2018b).

The table below shows the sources of marine plastic litter and emission amount by source for the entire world. The main sources are, in descending order of emission amount, “inappropriate waste

management"[2], "littering"[3], and "Fishing gear such as fishing nets" for macroplastic, "Rubber from tyre abrasion", "City dust"[4] and "Road markings" for microplastic.

Table 2-7 Source and amount of marine plastic litter in the world

Source		Amount		
Type of plastic	Type of Waste	Amount (million tons)	Percentage (%)	Total (million tons)
Macroplastic	Inappropriate waste management*	3.87	46.7	
	Littering*	0.80	9.7	
	Fishing gear such as fishing nets	0.60	7.2	5.27
Microplastic	Rubber from tyre abrasion	1.41	17.1	
	City dust*	0.65	7.9	
	Road markings	0.59	7.1	
	Washing of textiles	0.26	3.2	
	Weathering of marine coatings	0.05	0.5	
	Plastic during upstream plastic production	0.03	0.4	
	Cosmetics and personal care products	0.01	0.2	3.01
Total		8.28	100%	8.28

* "Inappropriate waste management" refers to open dumping and improper landfill of waste observed in developing countries. "Littering" refers to items thrown away by citizens and not properly disposed of. "City dust" refers to weathering of exterior paints, indoor dust, abrasion of protective coatings, and abrasion of shoe soles.
Source: Created by JICA Survey Team based on UNEP. 2018b, p.54 Table 16

The amount of emissions was calculated by emission source for "NAFTA" that includes the United Mexican States, and "Latin America and the Caribbean" that includes the other surveyed countries (refer to Table 2-8). Percentages of total emission caused by improper waste management and littering in Latin America and the Caribbean are 89.2%[5] for macroplastics and 75.2%[6] for plastic in total (including microplastics), both of which are higher than the world (88.6% and 56.4% respectively).

Table 2-8 Emission amount by source in NAFTA and Latin America and the Caribbean

Type of plastic	Type of Waste	NAFTA		Latin America and the Caribbean	
		Emission amount (10,000 tons)	Percentage of total emissions	Emission amount (10,000 tons)	Percentage of total emissions
Macroplastic	Inappropriate waste management	0	0%	89.01	64.7%

[2] Refers to open dumping and improper landfill of waste observed in developing countries.

[3] Refers to items thrown away by citizens and not properly disposed of.

[4] Refers to weathering of exterior paints, indoor dust, abrasion of protective coatings, and abrasion of shoe soles.

[5] (89.01+14.4)/115.94*100=89.19%

[6] (89.01+14.4)/137.53*100=75.19%

Type of plastic	Type of Waste	NAFTA		Latin America and the Caribbean	
		Emission amount (10,000 tons)	Percentage of total emissions	Emission amount (10,000 tons)	Percentage of total emissions
	Littering	8.8	15.0%	14.4	10.5%
	Fishing gear such as fishing nets	No data. 600,000 tons worldwide.			
	Total	10.54	18.0%	115.94	84.3%
Microplastic	Rubber from tyre abrasion	28.2	48.0%	8.46	6.2%
	City dust	1.95	3.2%	5.2	3.8%
	Road markings	12.98	22.1%	5.9	4.3%
	Washing of textiles	3.38	5.8%	1.3	0.9%
	Weathering of marine coatings	1.1	1.9%	0.5	0.4%
	Plastic during upstream plastic production	0.51	0.9%	0.15	0.1%
	Cosmetics and personal care products	0.1	0.2%	0.08	0.1%
	Total	48.16	82.0%	21.59	15.7%
Total		58.70	100%	137.53	100%

Source: Created by JICA Survey Team based on UNEP. 2018b, p.55 Table 18.

(2) Plastic consumption in the world and regional areas including the surveyed countries

The deterioration of the marine environment is attributed primarily to population growth and consumption per capita (World Bank Group. 2019), so plastic consumption was also investigated as shown in the table below. Plastic consumption per capita is above the world average for both NAFTA and Latin America and the Caribbean.

Table 2-9 Plastic consumption per capita by geographical regions

Geographical regions	Plastic consumption per capita (kg/person)
NAFTA	139
Western Europe	136
Japan	108
Oceania	84
Latin America and the Caribbean	56
Central Europe & CIS	48
China	45
Middle East	38
Asia (excl. Japan, India, and China)	22
Africa	13
India	13
World Average	44

Source: Created by JICA Survey Team based on UNEP. 2018b, p.93 Table A2.

UNEP reports that the world plastic consumption is about 323 million tons, of which about half, 160

million tons, will end up as waste. It is estimated that 38.7 million tons, which represents about a quarter of the plastic waste generation, will be improperly treated and 5.27 million tons will be discharged to the marine environment (UNEP. 2018b).

In NAFTA including United Mexican States, it is said that solid waste is properly treated, but it would be hard to say that there is no improper treatment. In Latin America and the Caribbean, the amount of plastic waste generated and improper disposal rate for plastic consumption is high, and it is estimated that about 5% of the consumption is discharged to the ocean as macroplastic. In addition, the amount of inappropriate treatment of plastic waste per capita is second highest in the world next to the Middle East, which means that 17.5 kg (Table 2-10) of plastic waste per person in average is treated improperly in Latin America and the Caribbean.

Table 2-10 Overview of the plastic life cycle, from consumption to loss of macro- and microplastics in the marine environment,by geographical regions

Geographical regions	Plastic		Amount of plastic waste generated (10,000 t/y)	Mis-managed share of MSW	Mismanaged plastic MSW		Macroplastic		Microplastic	
	Consumption (10,000 tons/year)	Consumption rate (%)			(10,000 t/y)	Per person (kg/y)	Amount lost to the environment (10,000 tons)	Percentage (%)	Amount lost to the environment (10,000 tons)	Percentage (%)
NAFTA	6,700	21%	1,780	0	N/A	N/A	10.54	2%	48.16	16%
Western Europe	5,800	18%	2,750	0	N/A	N/A	15.81	3%	33.11	11%
Japan	1,400	4%	510	0	N/A	N/A	5.27	1%	6.02	2%
Oceania	300	1%	130	0	N/A	N/A	0	0%	3.01	1%
Latin America and the Caribbean	2,700	8%	2,870	31%	886	17.5	115.94	22%	21.07	7%
Central Europe & CIS	1,900	6%	1,070	1%	12	0.3	5.27	1%	27.09	9%
China	6,300	20%	1,160	32%	375	2.7	47.43	9%	60.2	20%
Middle East	1,600	5%	1,420	53%	753	18.2	94.86	18%	15.05	5%
Asia	2,500	8%	2,940	17%	509	4.4	73.78	14%	42.14	14%
Africa	1,400	4%	1,020	93%	947	8.6	110.67	21%	24.08	8%
India	1,700	5%	430	90%	387	3.0	47.43	9%	24.08	8%
Total	32,300	100%	16,080	N/A	3,870		527	100%	301[7]	100%

Source: Created by JICA Survey Team based on UNEP. 2018b

[7] "Amount of macroplastic lost to the environment" and "Amount of microplastic lost to the environment" in Table 2-10are different from the simple total of emissions in the table because they are calculated from the percentage by emission source obtained from literature.

(3) Estimation of marine plastic litter in the surveyed countries

Literature on marine plastic litter by country include the reports written by Jambeck *et al.*, 2015, and Lebreton *et al.,* 2017, but no information is available for the target countries of this survey. Therefore, in this Survey, the amount of marine plastic litter in the surveyed countries was estimated by using Method I "Calculation based on the population" and Method II "Calculation based on the length of the coastline" (Table 2-11).

In Method I, the amount of marine plastic litter in the surveyed countries was calculated based on the 2017 population[8] in NAFTA, "Latin America and the Caribbean", and the surveyed countries , as well as the total macroplastic and microplastic given in the Table 2-8above. The unit rate of marine plastic litter per person is 1.42 kg/person/year for NAFTA including United Mexican States, and 2.68 kg/person/year for the Caribbean countries. As the figures are calculated based on the population, the values fluctuate depending on the economy and/or consumption, and the capacity of waste management in each country.

In Method II, the amount of marine plastic litter in the surveyed countries was calculated based on the length of the coastline in NAFTA, Latin America and the Caribbean, and the surveyed countries (Attachment 1). The unit rate of marine plastic litter per 1 km of coastline is 2.99 ton/km/year for NAFTA including the United Mexican States and 27.22 ton/km/year for the Caribbean countries. Similar to Method I, as the figures are calculated based on the coastline length, the values fluctuate depending on the economy and/or consumption, and the capacity of waste management in each country.

[8] The population data of UNEP. 2018b uses 2017 data of the World Bank.

Table 2-11 Unit rate for the calculation of marine plastic litter

	Basic Information				Unit Rate I		
Method I	Regions	Macro-plastic (tons/year)	Micro-plastic (tons/year)	Population (person)	Macro-plastic (kg/person/year)	Micro-plastic (kg/person/year)	Total loss of plastic into the marine environment (kg/person/year)
	Latin America and the Caribbean	1,159,400	210,000	510,595,191	2.27	0.44	2.68
	NAFTA	105,400	585,400	486,464,713	0.22	1.20	1.42
	Basic Information				Unit Rate 2		
Method II	Regions	Macro-plastic (tons/year)	Micro-plastic (tons/year)	Length of coastal line (km)	Macro-plastic (tons/km/year)	Micro-plastic (tons/km/year)	Total loss of plastic into the marine environment (tons/km/year)
	Latin America and the Caribbean	1,159,400	210,000	50,301	23.05	4.18	27.22
	NAFTA	105,400	585,400	231,334	0.46	2.53	2.99

Source: Created by JICA Survey Team based on UNEP. 2018b, World Bank Group. World Development Indicators, CIA. n.d.

The amount of marine plastic litter was calculated in the table below based on the two unit rates obtained in Table 2-11.

Table 2-12 Amount of marine plastic litter in the 17 countries surveyed (tons/year)

Country	Method I				Method II			
	Population (2017)	Macro plastic	Micro plastic	Plastic released into the marine environment	Length of coastal line (km)	Macro plastic	Micro plastic	Plastic released into the marine environment
Antigua and Barbuda	95,426	217	39	256	153	3,526	639	4,165
Republic of Guyana	775,221	1,760	319	2,079	459	10,579	1,916	12,496
Republic of Cuba	11,339,259	25,748	4,664	30,412	3,735	86,088	15,594	101,682
Grenada	110,874	252	46	297	121	2,789	505	3,294
Jamaica	2,920,853	6,632	1,201	7,834	1,022	23,556	4,267	27,823
Republic of Suriname	570,496	1,295	235	1,530	386	8,897	1,612	10,508
Saint Vincent and the Grenadines	109,827	249	45	295	84	1,936	351	2,287
Saint Christopher and Nevis	52,045	118	21	140	135	3,112	564	3,675
Saint Lucia	180,955	411	74	485	158	3,642	660	4,301
Commonwealth of Dominica	71,458	162	29	192	148	3,411	618	4,029
Dominican Republic	10,513,131	23,872	4,324	28,196	1,288	29,687	5,377	35,065
Republic of	1,384,027	3,143	569	3,712	362	8,344	1,511	9,855

Country	Method I				Method II			
	Population (2017)	Macro plastic	Micro plastic	Plastic released into the marine environment	Length of coastal line (km)	Macro plastic	Micro plastic	Plastic released into the marine environment
Trinidad and Tobago								
Republic of Haiti	10,982,366	24,937	4,517	29,454	1,771	40,820	7,394	48,218
Commonwealth of The Bahamas	381,761	867	157	1,024	3,542	81,640	14,788	96,427
Barbados	286,233	650	118	768	94	2,167	392	2,559
Belize	375,769	853	155	1,008	386	8,897	1,612	10,508
United Mexican States	124,777,324	27,035	150,154	177,189	9,330	4,254	23,614	27,869
The six Mexican states facing the Caribbean Sea	18,492,618	4,007	22,254	26,260	3,294	1,502	8,337	9,839

Source: Created by JICA Survey Team based on UNEP. 2018b, World Bank Group. World Development Indicators, CIA. n.d.

(4) Actual collection of marine plastic litter in the surveyed countries

In 2018, 13 out of the 17 countries surveyed participated in the activities of Ocean Conservancy, which organizes an International Coastal Cleanup campaign. The table below summarizes the number of participants, the amount collected, the coastal length for cleaning, and the number of items collected in each country. The world average was about 294.9 kg per km, but it was as large as 362.9 kg in the surveyed countries.

Table 2-13 Participation status to ICC 2018 organized by Ocean Conservancy

No.	Country	Number of participants (person)	Amount collected (kg)	Coastal length for cleaning (km)	Number of items collected (N)	Unit rate			
						Amount collected (kg/km)	Number of items collected (N/km)	Amount collected (kg/ person)	Number of items collected (N/ person)
1	Antigua and Barbuda	No participation							
2	Republic of Guyana	323	1,498	3.4	20,246	440.6	5,954.7	4.6	62.7
3	Republic of Cuba	No participation							
4	Grenada	129	496	4.4	12,832	112.7	2,916.4	3.8	99.5
5	Jamaica	9,573	47,566	213.9	774,077	222.4	3,618.9	5.0	80.9
6	Republic of Suriname	96	550	1.3	10,849	423.1	8,345.4	5.7	113.0
7	Saint Vincent and the Grenadines	27	1,025	0.9	5,445	1,138.9	6,050.0	38.0	201.7
8	Saint Christopher	286	691	6.4	10,421	108.0	1,628.3	2.4	36.4

No.	Country	Number of participants (person)	Amount collected (kg)	Coastal length for cleaning (km)	Number of items collected (N)	Unit rate			
						Amount collected (kg/km)	Number of items collected (N/km)	Amount collected (kg/ person)	Number of items collected (N/ person)
	and Nevis								
9	Saint Lucia	223	3,557	6.1	15,361	583.1	2,518.2	16.0	68.9
10	Commonwealth of Dominica	No participation							
11	Dominican Republic	17,277	140,782	100.7	538,281	1,398.0	5,345.4	8.1	31.2
12	Republic of Trinidad and Tobago	3,767	17,277	41.4	174,109	417.3	4,205.5	4.6	46.2
13	Republic of Haiti	No participation							
14	Commonwealth of The Bahamas	902	2,080	63.0	31,538	33.0	500.6	2.3	35.0
15	Barbados	389	886	5.6	58	158.2	10.4	2.3	0.1
16	Belize	1,433	6,002	44.4	72,570	135.2	1,634.5	4.2	50.6
17	United Mexican States	15,257	68,415	310.0	393,450	220.7	1,269.2	4.5	25.8
	Surveyed countries in total	4,9682	290,825	801.5	2,059,237	362.9	2,569.2	5.9	41.4
	Average					411.0	3,326.2	7.7	63.8
	Median					292.6	2,742.8	4.6	48.4
	Worldwide	1,080,358	10,584,041	35,890.3	97,457,984	294.9	2,715.4	9.8	90.2

Source: Created by JICA Survey Team based on Ocean Conservancy. 2019

Beverage containers accounted for about 35% of the collected items, followed by bottle lids (16.3%) and cigarettes (10.6%). Regarding the waste composition of solid waste in the Caribbean region, plastic accounts for only about 12%, but plastic is resistant to deterioration and takes a long time to decompose, and it was also recovered during the coastal cleaning (World Bank Group. 2019).

Table 2-14 Cleaning results from ICC 2018 organized by Ocean Conservancy

No.	Country	Cigarette butts	Food wrappers (candy, chips etc.)	Straws, stirrers	Forks, knives, spoons	Plastic beverage bottles	Plastic bottle caps	Plastic grocery bags	Other plastic bags	Plastic lids	Plastic cups, plates.
1	Antigua and Barbuda	No participation									
2	Republic of Guyana	182	632	731	815	5,521	1,552	425	620	312	1,364
3	Republic of Cuba	No participation									
4	Grenada	240	1,249	90	117	705	211	638	17	369	392
5	Jamaica	8,611	28,937	11,801	15,510	261,945	91,718	18,488	30,740	8,003	27,985
6	Republic of Suriname	-	-	-	-	6,650	-	100	-	-	-
7	Saint Vincent and the Grenadines	-	45	1	54	1,927	361	15	32	220	163
8	Saint Christopher and Nevis	3	56	94	120	1,454	2,409	40	184	263	116
9	Saint Lucia	915	704	170	464	3,050	1,735	334	386	148	625
10	Commonwealth of Dominica	No participation									
11	Dominican Republic	15,264	7,837	14,525	19,708	24,878	26,152	16,077	17,294	43,328	33,890
12	Republic of Trinidad and Tobago	3,708	6,329	1,812	3,770	42,428	11,188	2,557	4,694	1,734	3,542
13	Republic of Haiti	No participation									
14	Commonwealth of The Bahamas	618	1,117	960	877	2,230	2,264	673	1,757	554	1,046
15	Barbados	-	2	-	2	1	3	-	-	1	4
16	Belize	1,330	4,621	3,042	2,131	4,727	7,921	2,134	3,181	1,149	2,335
17	United Mexican States	87,494	12,471	10,493	7,332	31,342	36,166	10,557	10,371	13,472	8,137
	Percentage	10.6%	5.7%	3.9%	4.6%	34.7%	16.3%	4.7%	6.2%	6.2%	7.1%

Source: Created by JICA Survey Team based on Ocean Conservancy. 2019

As shown in Table 2-7, fishing gear such as fishing nets account for about 7.2% of the total released plastics into the ocean, most of which are found underwater due to damages by normal use, anchor rope cutting, stormy weather, fishing boat accidents, etc. (World Bank Group. 2019). The most common item was trap-type fishing gear (41%), followed by nets (14.9%), and recreational hooks and lines (14.0%).

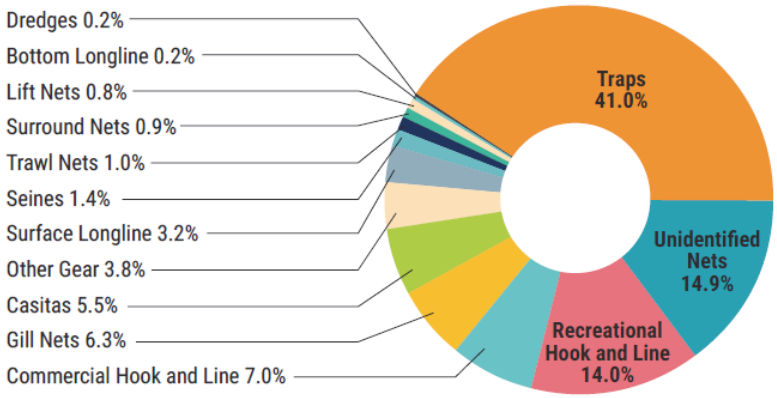


Figure 2-2 Breakdown of reported fishing gear in the Caribbean
Source: World Bank Group. 2019

(5) Main challenges of waste management that directly cause marine plastic litter

In addition to population, improperly managed waste cause marine plastic litter. Regarding the amount of uncollected waste, the situation in 9 of the 17 countries for which information was obtained is shown below, in descending order of the total amount of uncollected waste originating from households.

Table 2-15 Amount of uncollected waste/plastic waste originating from households

No.	Country	Amount ofuncollected waste originating from households		Amount of uncollected plastic waste originating from households	
		tons/year	kg/person/year	tons/year	kg/person/year
1	Republic of Haiti	1,673,750	150.5	93,730	8.4
2	Dominican Republic	1,020,042	96.0	102,004	9.6
3	Republic of Cuba	619,534	54.6	55,758	4.9
4	Jamaica	358,605	122.2	43,750	14.9
5	Republic of Guyana	72,660	93.3	14,387	18.5
6	Republic of Suriname	29,599	51.4	3,848	6.7
7	Republic of Trinidad and Tobago	27,923	20.1	5,353	3.9
8	Belize	8,935	23.3	1,698	4.4
9	Barbados	8,174	28.5	1,398	4.9

Source: Created by JICA Survey Team based on World Bank Group. 2019

The table below shows the waste collection rates of each country in ascending order. Although the Caribbean countries in the Lesser Antilles reach over 90% of collection rate, the Republic of Cuba, the Dominican Republic, Jamaica, the Republic of Haiti, and others that belong to the Greater Antilles still face serious challenges in terms of waste collection rate (World Bank Group. 2019).

Table 2-16 Waste collection rate

No.	Country	Waste collection rate
1	Republic of Haiti	11%
2	Republic of Guyana	40%
3	Republic of Suriname	63%
4	Jamaica	64%
5	Dominican Republic	74-97%
6	Republic of Cuba	77%
7	Belize	85.2%
8	Barbados	90%
9	United Mexican States	93.2%
10	Commonwealth of Dominica	94%
11	Republic of Trinidad and Tobago	94%
12	Saint Christopher and Nevis	95%
13	Saint Lucia	96%
14	Saint Vincent and the Grenadines	96%
15	Grenada	97%
16	Antigua and Barbuda	99%
17	Commonwealth of The Bahamas	100%

Source: Created by JICA Survey Team based on World Bank Group. 2019. The figures for the Dominican Republic and the Commonwealth of The Bahamas are cited from World Bank Group. n.d.

2) Impacts of marine plastic litter

(1) Deterioration of the marine environment including ecosystem

The Caribbean region has a rich marine ecosystem centered on rich flora and fauna, and in developing countries of the Caribbean, this marine ecosystem provides more than 100 million people with food, livelihoods and income through fishing, tourism, coastal protection, and shipping. Total income of sea and coastal tourism alone on the Caribbean islands is estimated to be US$ 57 billion in 2017, with fishing and ocean transport bringing billions of US$ into the area (World Bank Group. 2019).

Marine debris in the Caribbean Sea can adversely affect wildlife that is valuable coastal and marine natural resources and the water quality. Focusing on coral reefs as an example, its degradation is one of the most serious threats to the Caribbean's natural assets, and the current annual revenue loss due to this degradation is estimated to be US$ 350-870 million. If this situation continues, the economic value of coral reefs will decrease by 11-19% by 2050 (World Bank Group. 2019). A survey that analyzes the threats to coral reefs around the world illustrates the threats to coral reefs in the Caribbean Sea as shown in the figure below (Burke, *et al.*, 2011).

Figure 2-3 Threats to Caribbean coral reefs[9]

(2) Obstacles to ship navigation

The impact of marine plastic litter on ships reportedly include the entanglement of plastic debris with the propellers and anchors and the blockage of seawater intake for cooling. There are cases where rescue was needed, and financial loss resulted from repair (Lee. 2015, Hermawan, Damar and Hariyadi. 2017, Mouat, Lozano and Bateson. 2010).

Shipping in the Caribbean Sea includes long-distance shipping that uses the Panama Canal and short-distance shipping that supports logistics within the Caribbean Sea. There are 15 shipping companies in the Caribbean, operating on a total of 168 routes.

Table 2-17 Available routes with shipping companies in the Caribbean

Name of the shipping company		Available routes
1	Geest	21
2	CMA CGM	19
3	Others	19
4	Caribbean Feeder	14
5	Zim	14

[9] Source: Burke, *et al.*, 2011.

Name of the shipping company		Available routes
6	Seabord	14
7	Tropical	13
8	SeaLand	12
9	King Ocean	11
10	Maersk	7
11	Hapag Lloyd	7
12	Europe Caribbean	7
13	Seafreight	4
14	Crowley	3
15	Seatrade Reefer	3
	Total	168

Source: IDB. 2018

The shipping volume (TEU)[10] in these areas is shown in the figure below.

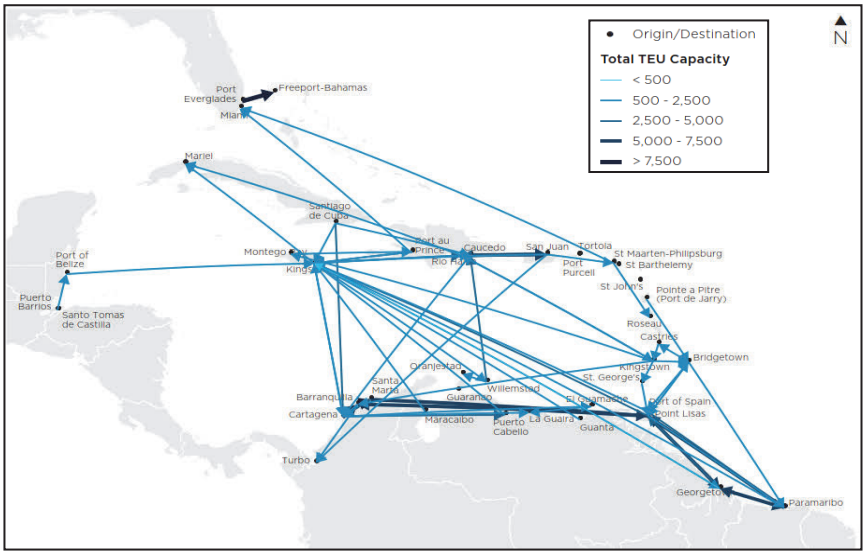


Figure 2-4 Shipping routes for short-distance container by TEU capacity in the Caribbean
Source: IDB. 2018

In that context, logistics in the region is composed of many shipping routes. On the other hand, the table below shows the amount of container cargoes actually transported by these routes.

[10] TEU ("Twenty-foot Equivalent Unit") is a unit used to indicate the loading capacity of container ships and the number of cargoes handled at container terminals. Among the ISO containers, which are metal boxes of standardized sizes that can be loaded on different transportation modes such as container ships, trailers, and freight trains, one 20-foot container is referred to as "1 TEU".

Table 2-18　Performance of TEU in the Caribbean in 2014

Country	Performance of TEU in 2014
Antigua and Barbuda	**24,014**
Aruba	29,419
Bahamas	**1,400,000**
Barbados	**78,432**
British Virgin Islands	11,217
Cayman	46,720
Cuba	**300,836**
Curacao	89,193
Dominican Republic	**1,306,809**
Guadeloupe	183,922
Haiti	**175,307**
Jamaica	**1,638,113**
Martinique	171,889
Puerto Rico	1,319,961
Sint Maarten	82,643
St. Vincent & The Grenadines	**14,646**
St. Lucia	**40,521**
Trinidad & Tobago	**594,364**
Total	7,508,006

Surveyed countries are indicated in bold.
Source: IDB. 2018

In 2014, the total world shipping fleet[11] was 5,103 vessels, the total cargo volume was 18,141,014 TEU, and the world average cargo volume per vessel including large vessels was about 3,500 TEU/vessel. Based on this value, the number of container vessels operating in the Caribbean region is estimated at about 2,100 vessels/year. The average size of container vessels in the Caribbean region is unknown, but it is considered to be smaller than 3,500 TEU/vessel, so that the number of vessels actually operating is propably higher than 2,100 per year.

In addition to these regional shipping services, the number of vessels navigating the Panama Canal was 13,795 in 2018, which means that at least about 16,000 vessels are sailing annually in the Caribbean region (Canal de Panama. 2020). In addition, large cruise ships and fishing boats are operating, and marine plastic litter have an even greater negative impact on these ships.

[11] Nippon Yusen FACT BOOK I 2015 p.10

(3) Negative impacts on tourism and fisheries

The following table shows the contribution rate of the tourism industry to GDP in the surveyed countries.

Table 2-19 Contribution rate of the tourism industry to GDP in the surveyed countries

Country	Contribution rate of the tourism industry to GDP[12]	GDP in 2018 (World Bank value/present value/US$ million)	Contribution of the tourism industry to GDP (1,000 US$)
Antigua and Barbuda	44.1%	1,611	710,263
Republic of Guyana	7.8%	3,879	302,536
Republic of Cuba	10.6%	100,023	10,602,438
Grenada	56.6%	1,186	670,048
Jamaica	34.0%	15,714	5,342,729
Republic of Suriname	3.7%	3,591	132,858
Saint Vincent and theGrenadines	45.5%	811	369,142
Saint Christopher and Nevis	62.4%	1,011	630,753
Saint Lucia	41.8%	1,922	803,333
Commonwealth of Dominica	33.4%	551	183,998
Dominican Republic	17.2%	85,555	14,715,527
Republic of Trinidad and Tobago	7.6%	23,808	1,809,419
Republic of Haiti	7.9%	9,659	763,039
Commonwealth of The Bahamas	40.4%	12,425	5,019,498
Barbados	34.9%	5,145	1,795,605
Belize	44.9%	1,871	840,170
United Mexican States[13]	17.2%	152,207	26,179,606
Total	-	420,968	70,870,961

[12] Source: WTTC. 2018

[13] The value for the contribution rate is for the whole country. Contribution of the tourism industry to GDP corresponds to the total GRDP of the 6 Mexican states facing the the Caribbean Sea.

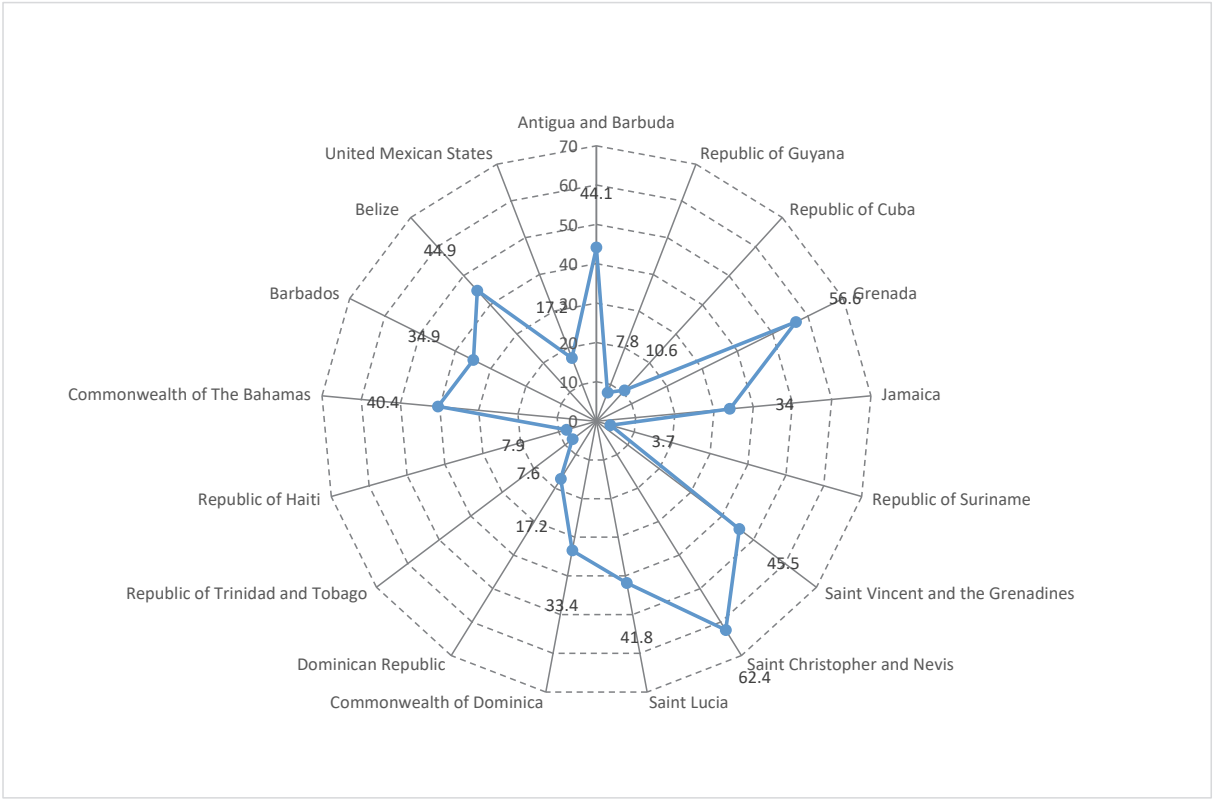


Figure 2-5 Contribution rate of the tourism industry to GDP in the surveyed countries[14]

Although the contribution rate of the tourism industry to GDP varies from country to country, it accounts for about 17% of the total GDP of the surveyed countries as a whole, and the tourism industry centered on beach resorts is one of the major sources of income in the area. In the Caribbean, marine debris can adversely affect wildlife that is valuable coastal and marine natural resources and the water quality. If the amount of waste released to the ocean continues without being reduced, it may destroy the lives of people who are heavily dependent on the marine economy, such as fishing and tourism, and may affect the national economy.

[14] Source: Created by JICA Survey Team from WTTC. 2018

Figure 2-6 Kingston harbour in Jamaica[15]

On the other hand, the contribution of fisheries to GDP is not higher than a few percent, and it does not have the same impact as the tourism industry in terms of economy, but as mentioned above, the impact of marine plastic litter on ships has been reported to include entanglement of plastic debris with the propellers and anchors and the blockage of seawater intake for cooling, which is a big loss to fishing operations.

Table 2-20 Contribution rate of fisheries of CRFM member countries to GDP (unit: %)

Year / Country	2010	2011	2012	2013	2014	2015	2016
Anguilla	1.7	2.2	2.28	2.02	1.96	1.91	2.62
Antigua and Barbuda	**0.91**	**1.11**	**1.17**	**1.25**	**0.8**	**0.98**	**0.96**
Bahamas	**1.4**	**1.3**	**1.3**	**1**	**1**	**0.9**	**N/A**
Barbados	**0.14**	**0.1**	**0.12**	**0.21**	**0.14**	**0.13**	**0.15**
Belize	**2.6**	**2.1**	**2.4**	**3.6**	**3.5**	**2.7**	**1.4**
Dominica	**0.3**	**0.37**	**0.37**	**0.34**	**0.48**	**0.55**	**0.49**
Grenada	**1.45**	**1.33**	**1.61**	**1.52**	**1.39**	**1.4**	**1.4**
Guyana	**2.6**	**2.2**	**2.4**	**2.2**	**1.7**	**1.7**	**1.8**
Haiti	**-**	**1.5**	**1.5**	**N/A**	**N/A**	**N/A**	**N/A**
Jamaica	**0.33**	**0.36**	**0.36**	**0.41**	**0.5**	**0.5**	**N/A**
Montserrat	0.26	0.31	0.35	0.37	0.38	0.31	0.29
St. Kitts and Nevis	**0.47**	**0.56**	**0.54**	**0.42**	**0.4**	**0.39**	**0.32**
St. Lucia	**0.59**	**0.57**	**0.57**	**0.59**	**0.55**	**0.52**	**0.54**
St. Vincent and the Grenadines	**0.5**	**0.47**	**0.44**	**0.48**	**0.48**	**0.53**	**0.5**
Suriname	**2.4**	**2.1**	**1.9**	**2.4**	**2.9**	**3.8**	**N/A**
Trinidad and Tobago	**0.046**	**0.038**	**0.035**	**0.034**	**0.037**	**0.051**	**N/A**

[15] Source: UNEP. 2014

Year / Country	2010	2011	2012	2013	2014	2015	2016
Turks and Caicos Islands	0.6	0.6	0.4	0.5	0.5	0.5	N/A

N/A - Not Available
Surveyed countries are indicated in bold.
Source: CRFM. 2016

(4) Deterioration of the living environment in coastal regions

Waste that eventually reaches the ocean (beach) through drainage channels may carry pathogens that are harmful to humans (World Bank. 2019). According to reports, marine debris including marine plastic litter include not only plastic containers and packaging, but also medical waste, sanitary items, disposable diapers, and alike, hence, there are risks that pathogens may diffuse from the waste into the environment and pose a danger to humans (UNEP. 2014). In addition, there is a risk that mosquitoes and flies may spread from the water accumulated in the waste plastic containers, causing dengue fever, malaria, and chikungunya fever among others (World Bank. 2019). In order to avoid these risks, proper coastal management is important, but this is not sufficient in the Wider Caribbean Region (WCR) (UNEP. 2014). As a result, living environment in coastal areas of WCR countries may deteriorate. In addition, the health and safety of those who use beaches and the ocean for recreational activities are potentially at high risk in areas where marine debris accumulates (UNEP. 2014).

(5) Financial burden for removal

The Japanese "Act on Promoting the Treatment of Marine Debris Affecting the Conservation of Good Coastal Landscapes and Environments to Protect Natural Beauty and Variety (Act No. 82, 2009)" states that coastal managers[16] stipulated by the "Coast Act (Act No. 101, 1956)" must take necessary measures to dispose of beach debris. In addition, municipalities must, as part of their duty, cooperate with the coastal managers or land occupants of the coast (if there is no occupant, it is the coastal manager) regarding the treatment of beach debris. It is stipulated that the municipalities collect coastal debris and alike in cooperation with coastal managers, and that the collected coastal debris are accepted and disposed of at municipal waste treatment facilities.

The action plan of UNEP for marine debris management in WCR recognizes that the state of solid waste management in WCR countries remain at a low international standard (UNEP. 2014). There are various situations such as lack of collection equipment, treatment and/or disposal facilities in some countries, collection and/or disposal conducted only in large cities in other countries, and waste reduction activities are apparently not effective. In many cases, the solid waste management strategy does not include

[16] Coastal managers: River departments, Port departments, Fisheries departments, etc. of prefectures or municipalities

activities for managing the marine debris, and it is recommended that solid waste management also include the management of marine debris.

Although the management of marine plastic litter should be included in the in-land solid waste management system, if the appropriate budgets for managing marine waste are not added to that of solid waste management on land, proper solid waste management on land will be neglected, resulting in the release of solid waste to the ocean and the increase of marine waste.

3) Policies and initiatives related to marine plastic litter

The Cartagena Convention, the most comprehensive environmental agreement in the Caribbean, provides the legal framework for the governance of most maritime activities and requires appropriate measures for marine pollution prevention and control, as well as ecosystem protection (World Bank Group. 2019).

The three protocols are the Oil Spill Protocol, the Specially Protected Areas and Wildlife (SPAW) Protocol, and the Land-Based Sources (LBS) Protocol. The LBS Protocol was adopted in October 1999 and became effective in August 2010 (UNEP. n.d.b).

The LBS Protocol is the only convention that applies to the marine litter issue in the Caribbean and is a crucial tool for addressing land-based pollution (UNEP. 2014, World Bank. 2019). Ratifying the LBS Protocol implies the establishment of policies, plans and legal systems for the prevention of waste that release to the marine environment, but does not guarantee its compliance, and it is required to establish an appropriate institutional mechanism for enforcing domestic laws (UNEP. 2014).

The LBS Protocol stipulates that the largest point pollution source is domestic wastewater, and non-point pollution sources are the scattering and releases from land, and the establishment of pollution standards and implementation schedules is encouraged as a framework for dealing with pollution sources (UNEP. n.d.b).

- Annex I: Establishes a list of land-based sources and activities and their associated contaminants of greatest concern to the marine environment
- Annex II: Outlines and establishes the process for developing regional standards and practices for the prevention, reduction, and control of the sources and activities identified in Annex I
- Annex III: Establishes specific regional effluent limitations for domestic sewage
- Annex IV: Requires each Contracting Party to develop plans, programmes and other measures for the prevention, reduction, and control of agricultural non-point sources of pollution

The table below shows the LBS Protocol ratification status in the surveyed countries.

Table 2-21 Ratification status of LBS Protocol of the Cartagena Convention

No.	Country	Year ratified	Year of ratification or accession
1	Antigua and Barbuda		2010
2	Republic of Guyana		2010
3	Republic of Cuba		
4	Grenada		2012
5	Jamaica		2015
6	Republic of Suriname		
7	Saint Vincent and the Grenadines		
8	Saint Christopher and Nevis		
9	Saint Lucia		2008
10	Commonwealth of Dominica		
11	Dominican Republic	2000	2012
12	Republic of Trinidad and Tobago		2003
13	Republic of Haiti		
14	Commonwealth of The Bahamas		2010
15	Barbados		
16	Belize		2008
17	United Mexican States		

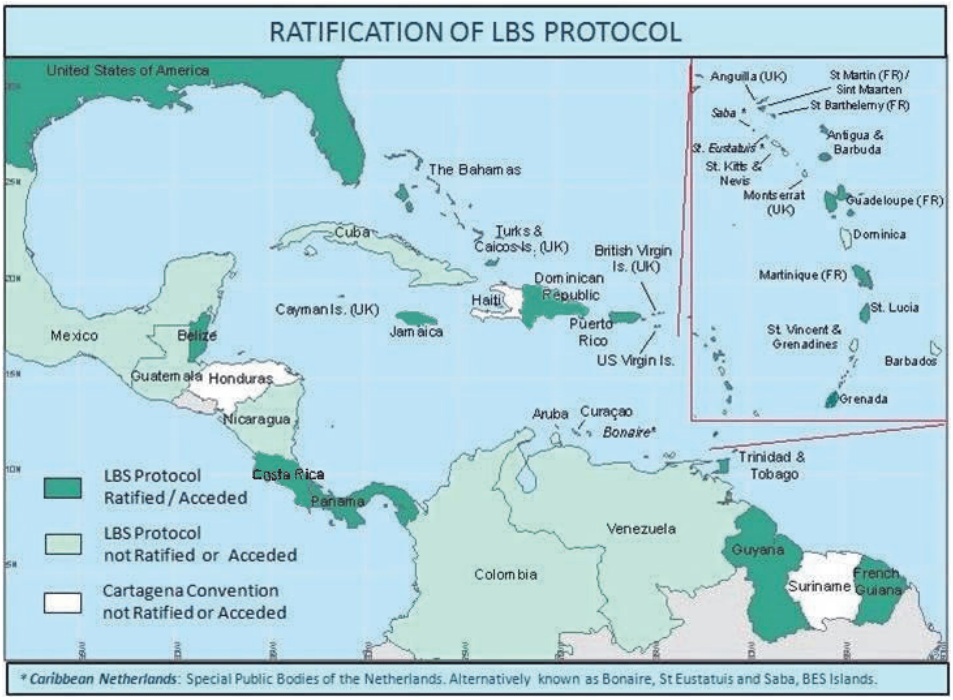


Figure 2-7 Ratification status of LBS Protocol of the Cartagena Convention
Source: UNEP

Policies for marine plastic litter include measures on the upstream side in the plastic life cycle, such as prohibiting the use of plastic bags, and measures on the downstream side, such as promoting the recycling of valuable materials including plastic. Here, macroplastic's life cycle is divided into three

stages as shown in the table below, and the policies related to marine plastic litter are also classified into three types accordingly: “Reduction of plastic use”, “Reduction of plastic waste released to the ocean” and “Recovery of plastic waste from ocean”. The policy was investigated, including the legal systems and regulations, and the prospect of them in each country.

Table 2-22 Examples of policies and initiatives of plastic

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the Ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ Ban on import or production of plastic bags	・ Mandatory recycling ・ Cleaning of riverbeds and streets	・ Coastal cleanup ・ Budgeting for recovery of plastic waste from the ocean
Initiatives of local governments, companies, NGOs, etc.	・ Import of alternative materials ・ Development of alternative materials	・ Introduction of recycling systems and technologies ・ Proper waste management	・ Introduction of technologies for the collection of floating debris ・ Introduction of technologies for the collection of beach litter

Policies for the reduction of plastic use generally includes prohibitions of plastic bags and/or single-use plastics such as food containers and more rarely cutlery.

The following table summarizes the status of introduction of policies related to plastic bags and single-use plastics, the enactment status of Extended Producer Responsibility (EPR) schemes and the obligation of recycling in the 17 countries surveyed. A characteristic policy in the surveyed countries is that many countries have established or are considering restrictions on the import and use of foamed styrene. Regulations regarding microplastics have been confirmed only in Saint Lucia, where it has been announced that personal care products containing microplastics will be completely prohibited.

Table 2-23 Summary of policies related to marine plastic litter in the countries surveyed[17]

Country	Plastic bags		Single-use plastics (including foamed styrene)		EPR	Mandatory recycling
	Restriction or prohibition	Taxation	Restriction or prohibition	Taxation		
Antigua and Barbuda	○		○	○	○	
Republic of Guyana			○*[18]	○		
Republic of Cuba						○
Grenada	○		○			○*

[17] Refer to each country’s section for detailed information and references.

[18] Regulations on foamed styrene have already been implemented. Regulations on single-use plastics are expected to be implemented by 2021.

Country	Plastic bags		Single-use plastics (including foamed styrene)		EPR	Mandatory recycling
	Restriction or prohibition	Taxation	Restriction or prohibition	Taxation		
Jamaica	○	○	○	○		
Republic of Suriname	○*		○			
Saint Vincent and the Grenadines	○*		○	○	○	
Saint Christopher and Nevis			○*	○	○	○*
Saint Lucia	○*		○			○*[19]
Commonwealth of Dominica	○*		○			
Dominican Republic	○*		○*			
Republic of Trinidad and Tobago			○*	○*[20]		
Republic of Haiti	○[21]		○			
Commonwealth of The Bahamas	○		○			
Barbados	○		○		○	○
Belize	○		○	○	○	
United Mexican States	Situation is different in each of the 6 Mexican states, but the trend is towards the restriction or prohibition of plastic bags and/or single-use plastics (as of 2020). Refer to section 2.19 for details.					

*: Expected, includes countries where a bill has been submitted and a phase-out schedule has been decided, as well as countries where discussions have started at the government level.

The MARPOL Convention is the Convention on the Prevention of Marine Pollution and consists of six Annexes for the prevention of marine pollution from ships (World Bank Group. 2019). Annex I (Regulations for the Prevention of Pollution by Oil) and Annex II (Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk) are mandatory items for Parties, while Annexes III-VI are voluntary items for each country (World Bank Group. 2019). Annex V (Prevention of Pollution by Garbage from Ships) is relevant regarding the problem of marine plastic litter, as its content regulates the disposal of waste including plastics from ships (World Bank Group. 2019). As of 2017, more than 150 countries have signed Annex V of the Convention (Gard Insight. 2017). Annex V also requires ships to bring waste including plastics to land-based facilities, which must be prepared by the states that have signed the Convention (World Bank Group. 2019). In addition, the Caribbean area including the Gulf of Mexico is considered as a special area, but the development of the above-mentioned land-based facilities is challenging (World Bank Group. 2019).

[19] In Saint Lucia, recycling is not mandatory but promoted.

[20] The Beverage Containers Bill that regulates the beverage container deposit system was confirmed by data from more than 5 years ago, butthe implementation status is unknown.

[21] Black plastic bags have been banned since 2013, but no enforcement.

In addition to the MARPOL Convention, other international conventions/treaties related to marine plastic litter include the London Convention, the London Protocol, the Basel Convention, and the Convention on Biological Diversity. The following table shows the ratification status of each convention in the countries surveyed.

Table 2-24 Ratification status of international conventions related to marine plastic litter

Country	MARPOL Convention	London Convention	London Protocol	Basel Convention	Convention on Biological Diversity
Antigua and Barbuda	○	○	○	○	○
Republic of Guyana	○		○	○	○
Republic of Cuba	○	○		○	○
Grenada					○
Jamaica	○	○		○	○
Republic of Suriname	○	○	○	○	○
Saint Vincent and the Grenadines	○	○		○	○
Saint Christopher and Nevis	○		○	○	○
Saint Lucia	○	○		○	○
Commonwealth of Dominica	○			○	○
Dominican Republic	○	○		○	○
Republic of Trinidad and Tobago	○		○	○	○
Republic of Haiti		○			○
Commonwealth of The Bahamas	○			○	○
Barbados	○	○	○	○	○
Belize	○			○	○
United Mexican States	○	○	○	○	○

2.1.3 Current status of waste management

1) Relevant organizations and institutional system in the waste management sector

Refer to each country's section as it varies from country to country.

2) Waste management policies, legal system and future plans

Refer to each country's section as it varies from country to country.

3) Status of infrastructure development related to waste management

(1) Status and challenges of waste management

The amount of waste generated, collection rate and disposal rate in the 17 countries surveyed are summarized in the table below.

Table 2-25 Waste management indicators in the 17 countries surveyed

Country	Generation		Collection	Disposal	
	Amount generated (tons/day)	Proportion of plastic (%)	Collection rate (%)	Disposal rate in controlled landfill (%)	Disposal rate in open dump (%)
Antigua and Barbuda	83	13	99	100	Unknown
Republic of Guyana	510	14	40	Disposal rate in final disposal sites: 61.37%	
Republic of Cuba	7,400	10	77	30.68	Unknown
Grenada	85	16	97	98.3	Unknown
Jamaica	2,921	12	64	64.0	Unknown
Republic of Suriname	234	11	63-79.5	Unknown	63.0
Saint Vincent and the Grenadines	87	8	96	Disposal rate in final disposal sites: 99.91%	
Saint Christopher and Nevis	86	23	95	100.0	0
Saint Lucia	217	11	96-100	Unknown	96.8
Commonwealth of Dominica	36	16	94	Unknown	94.0
Dominican Republic	11,118	10	74.9-97	Unknown	72.6
Republic of Trinidad and Tobago	2,078	19	94.3-100	12.0	84.0
Republic of Haiti	6,407	13	11	9.94	Unknown
Commonwealth of The Bahamas	714	13	100	100.0	0
Barbados	489	17	90	90.0	Unknown
Belize	290	19	85.2	Unknown	66.0
United Mexican States	144,193	11	93.4	Unknown	21.0
The six Mexican States facing the Caribbean Sea	Unknown	10.09	72.8 (2010)	Unknown	Unknown

Source: Created by JICA Survey Team based on World Bank Group. n.d.. The data of the six Mexican states facing the Caribbean Sea are based on the population in 2015 from INEGI. 2015.

For household waste that does not receive collection services, open burning represents the main treatment method (62% in average), followed by dumping (onshore and rivers) from 5% to 35% depending on the country. Composting is also a common treatment method in the Republic of Trinidad and Tobago (20%) and Grenada (12%).

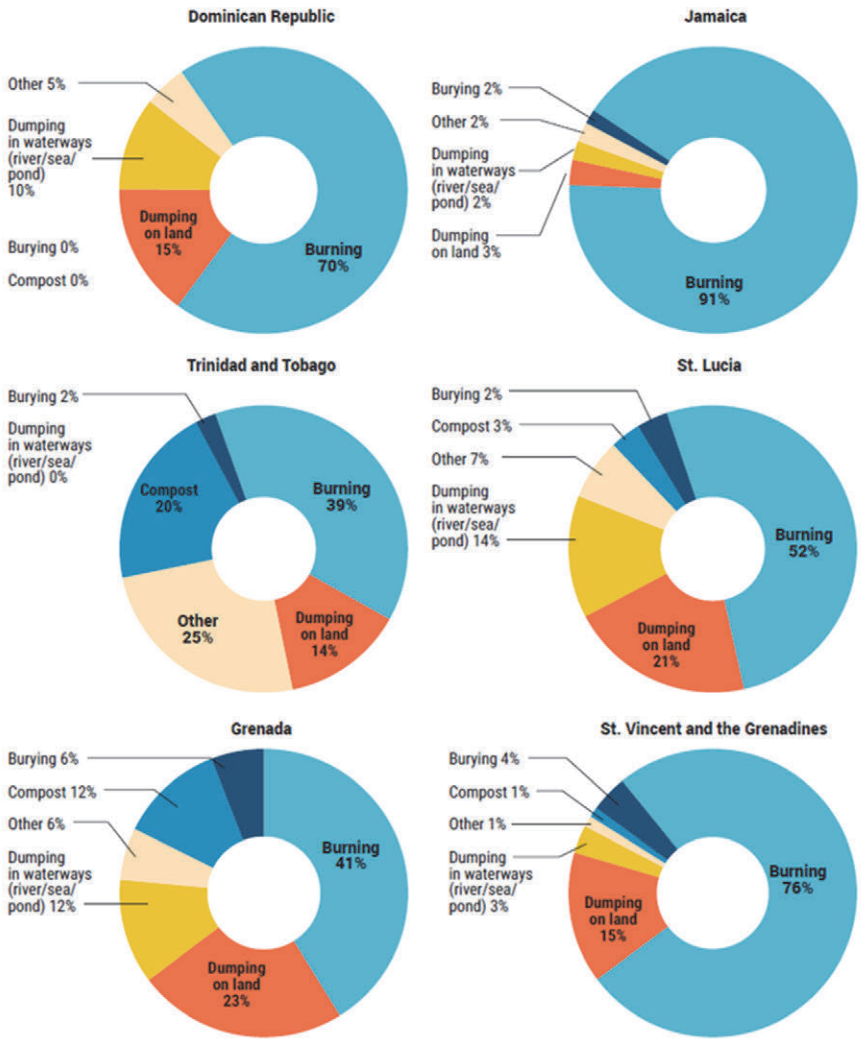


Figure 2-8 Waste management practices of households without collection service
Source: World Bank Group. 2019

(2) Management of waste from ships

This section summarizes the status of acceptance and disposal of waste from ships.

As mentioned in 3) Macroeconomic situation and economic policy and 2) Impacts of marine plastic littertourism in the Caribbean is of particular importance to the region's economy, and cruise ships are flourishing. Although not limited to the Caribbean, the United Mexican States had the largest number of visitors from cruise ships in ten years in 2018 with approximately 7.48 million people (Mexico News Daily. 2019). The number of tourists on cruise ships in the other surveyed countries is small compared to the United Mexican States (see the table below), but the four countries of Jamaica, Saint Christopher and Nevis, the Dominican Republic, and Belize have reportedly more than one million visitors a year.

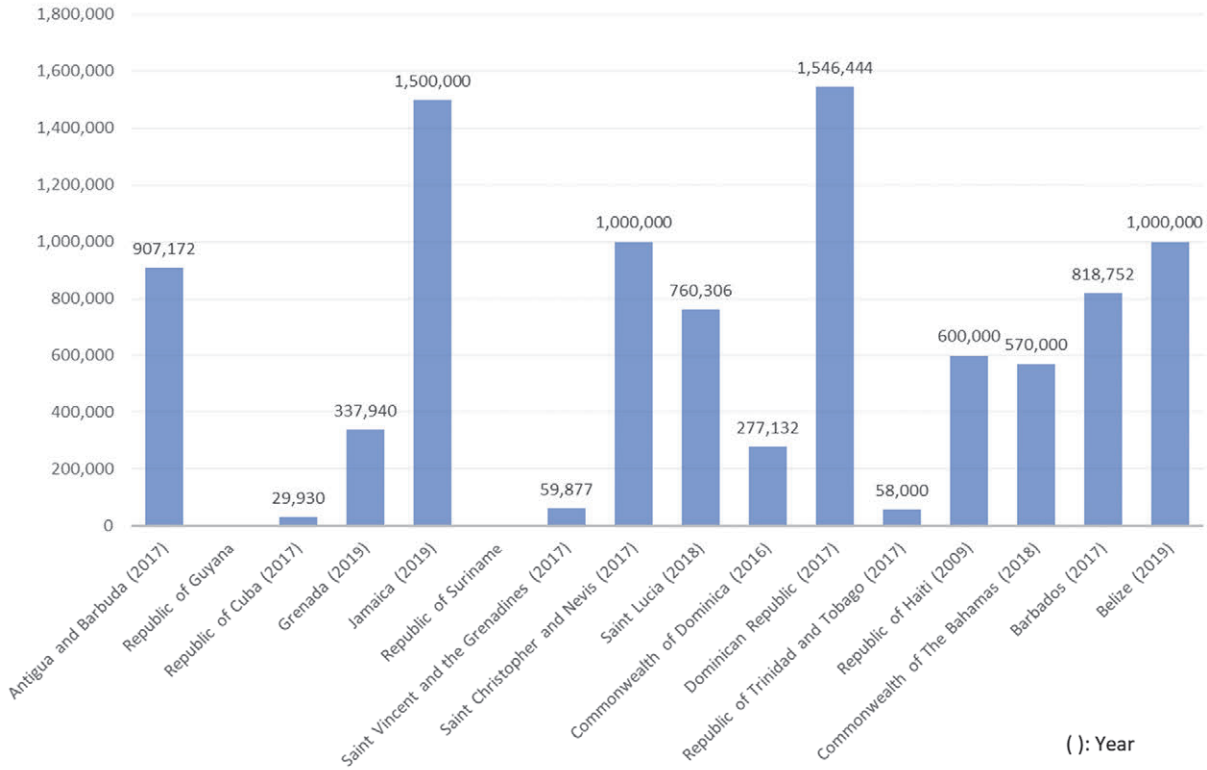


Figure 2-9 Annual number of visitors from cruise ships in the surveyed countries

Source: Created by JICA Survey Team from The daily Observer. 2017, Statista. n.d., Caribbean & American News. 2020, Jamaica Information Service. 2020, Travel Agent Central. 2018, Travel Agent Central. 2019, Dominica News Online. 2018, Dominican Today. 2018, Gov.tt. n.d., Reuters. 2009, Learning English. 2019, Verdict Media Limited. 2018., Belize Tourism Board. 2020.

The amount of waste received from ships in each surveyed country and the status of acceptance, treatment, and disposal is shown in the table below. The total amount of waste received was calculated as 0.2 ton/m^3. Even when the MARPOL Convention is ratified, its provisions are not always enforced by national law, and in addition, there are many countries that do not have guidelines on the acceptance, treatment and disposal of waste from ships.

Table 2-26 Amount of waste stipulated in Annex V of the MARPOL Conventionthat are accepted by the surveyed countries

Country	(m^3/year)	(tons/day)
Antigua and Barbuda	9,953	5.5
Republic of Guyana	30,258	16.6
Republic of Cuba	21,661	11.9
Grenada	6,527	3.6
Jamaica	140,327	76.9
Republic of Suriname	8,074	4.4
Saint Vincent and the Grenadines	2,168	1.2
Saint Christopher and Nevis	21,221	11.6

Country	(m^3/year)	(tons/day)
Saint Lucia	17,274	9.5
Commonwealth of Dominica	5,942	3.3
Dominican Republic	628,813	344.6
Republic of Trinidad and Tobago	1,312,839	719.4
Republic of Haiti	24,656	13.5
Commonwealth of The Bahamas	47,701	26.1
Barbados	35,763	19.6
Belize	14,153	7.8

Source: Created by JICA Survey Team based on RAC-REMPEITC Carib. 2018

Table 2-27 Acceptance, treatment and disposal of waste from ships in the surveyed countries

Country	Reception facilities and type of waste	Disposal method
Antigua and Barbuda	・ Reception facilities: Compactor trucks and/or barges. ・ The reception of food waste is prohibited by the government due to the lack of incineration capacity and concerns about health risk of international waste. ・ Service providers such as Bryson's Shipping, NSWMA and Island Sanitation, hired by the ships, collect and transport waste.	・ Disposal at the only landfill on the island. ・ Waste from cruise ships should be disposed of at a different final disposal site than the waste generated in the country. Collection of disposal fee based on weight. There is tipping fee for international waste.
Republic of Guyana	・ Reception facilities: Trucks and dredging vessels. ・ Waste is received by a service provider.	・ Disposal at open dump site or final disposal site operated by the local government. Waste from cruise ships are required to be buried deep in an ordinary landfill. ・ Certification issued by Port Health Officials is required.
Republic of Cuba	・ No data	
Grenada	・ Reception facilities: Trucks. ・ Food waste is collected by GSWMA. ・ Local companies may receive waste oil.	・ Disposal at Perseverance disposal site on Grenada island or Dumfries disposal site on Carriacou island, both of which are managed by GSWMA. ・ No tipping fee.
Jamaica	・ Reception facilities: Compactor trucks. ・ NSWMA is also a service provider.	・ Part of the food waste is treated by a small incinerator of CEAC Outsourcing (CEAC Outsourcing. 2019). ・ Some plastics are recycled and some ends in the landfill. Aim is to have all of it recycled. ・ Disposal in dedicated cells in the landfill site.
Republic of Suriname	・ Reception facilities: Trucks.	・ The government does not supervise the collection and disposal of waste from ships. ・ Waste received at Parama Boli port

Country	Reception facilities and type of waste	Disposal method
		are sent to a material recovery facility (MRF). • Landfill disposal without collecting fees and without separating domestic and foreign waste.
Saint Vincent and the Grenadines	• Reception facilities: Trucks. • Solid waste only. No meat or food is allowed. • Service provider is SWMU.	• Disposal at Diamond and Belle Isle sanitary landfills. • There is no tipping fee nor transport fee payment to SWMU.
Saint Christopher and Nevis	• Reception facilities: Trucks. • There is an acceptance confirmation process by each government agency. • There is no fixed charge for the reception of waste.	• Disposal at a landfill site on the island. • Immediate landfilling of organic waste.
Saint Lucia	• Reception facilities: Trucks. • Upon acceptance, prior notice using a declaration 72 hours in advance, and SLSWMA approval are required. • Accepts a wide range of waste types. • Service provider is SLSWMA.	• Recyclables are classified and tariffs are levied based on the value of the recyclables (recycling is mandatory in the country). • Disposal at the municipal dump site or final disposal site.
Commonwealth of Dominica	• No data	
Dominican Republic	• Reception facilities: Closed trucks. • Service providers (26 commercial enterprises) have a license. • There is an acceptance confirmation process by each government agency. • The service provider pays a customs fee of US$ 40 per ton based on the weighbridge at the port entrance.	• Treatment by incineration (or sterilization) by a private facility operator.
Republic of Trinidad and Tobago	• Reception facilities: Trucks. • Each government agency responds by prior notice of acceptance. • Service provider include Kizen, SWMCOL, etc. • Collected by the local government (SWMCOL) as regular waste collection.	• Isolation at ordinary final disposal sites or landfilled in cells designated for international waste.
Republic of Haiti	• No data	
Commonwealth of The Bahamas	• Reception facilities: Trucks and containers. • Government supervision has not been implemented for waste from ships.	• Waste from ships is disposed of without separation or inspection at regular landfill sites owned by the local government in Nassau, and by the private sector in other cities.
Barbados	• Reception facilities: Containers. • It is often the departure and arrival	• Processing in the incinerator installed in Bridgeport (capacity is

Country	Reception facilities and type of waste	Disposal method
	point of cruise ships, therefore, most of the waste is domestic. ・ Accept only combustible waste as a policy. ・ There exists various documents, from acceptance of waste to disposal of ash.	not enough during the high season, and there is a smoke problem). Ash is disposed of at the final disposal site. ・ It is prohibited to dispose of waste from ships directly at the final disposal site.
Belize	・ There is an informal policy of not accepting waste from ships.	・ Prohibition of disposal of waste from ships at the final disposal site.

Source: Created by JICA Survey Team from RAC-REMPEITC Carib. 2018

(3) Natural disasters in the Caribbean countries and their impact on waste management

Caribbean countries are heavily affected by natural disasters, and annual hurricanes are sometimes catastrophic. The table below summarizes the major large-scale natural disasters. Between 2016 and 2018,Category 5 and Category 4 hurricanes have been experienced four times and twice respectively, and six were Category 3 or higher out of a total of 10 hurricanes in 2017 (Unicef. 2019).

In particular, the 2017 Hurricane Irma was the most powerful hurricane in the Atlantic Ocean in history, and the second longest-running Category 5 hurricane ever (World Bank Group. 2019).

In terms of waste management operations in areas where many natural disasters such as hurricanes occur, it is first important to collect waste, and secondly cover waste with soil in final disposal sites (if compaction and covering are not carried out sufficiently, waste will flow out during storms). Additionally, the location of the final disposal site is also related to the effects of storm surges, and it is therefore an important factor when considering support for the marine plastic litter issue.

Table 2-28 Large-scale natural disasters in the Caribbean region

Month/Year	Type of Natural Disaster
1998	Hurricane George
1999	Hurricane Jose
	Hurricane Lenny
September 2004	Hurricane Ivan
July 2005	Hurricane Emily
September 2008	Hurricanes pass continuously near the Republic of Haiti
January 2010	Earthquake in the Republic of Haiti
August 2015	Tropical Storm Erica
October 2016	Hurricane Matthew
August 2017	Hurricane Irma
	Hurricane Harvey
September 2017	Hurricane Maria
September 2019	Hurricane Dorian

The figure below shows the routes of the hurricanes from 2000 to 2019. In particular, among the 17 countries, 13 island countries are highly vulnerable to washout of plastic waste.

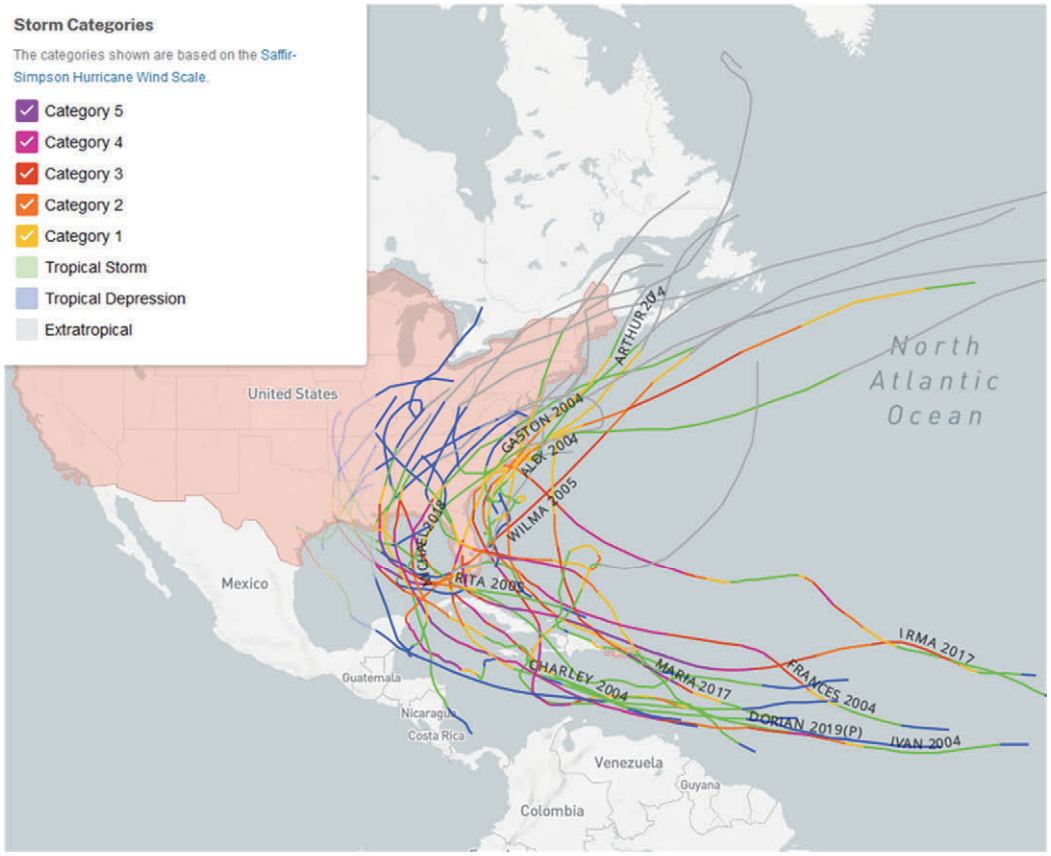


Figure 2-10 Hurricane routes in the Caribbean since 2000 [22]

[22] Source: NOAA. Historical Hurricane Tracks (https://coast.noaa.gov/hurricanes/#map)

2.2 Antigua and Barbuda

2.2.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Antigua and Barbuda is an island country consisting of Antigua, Barbuda and several remote islands located in the Caribbean Sea with a population of 96,286 (2018) and an area of 440 km^2 (similar to Tanegashima) (MOFA. 2019a).

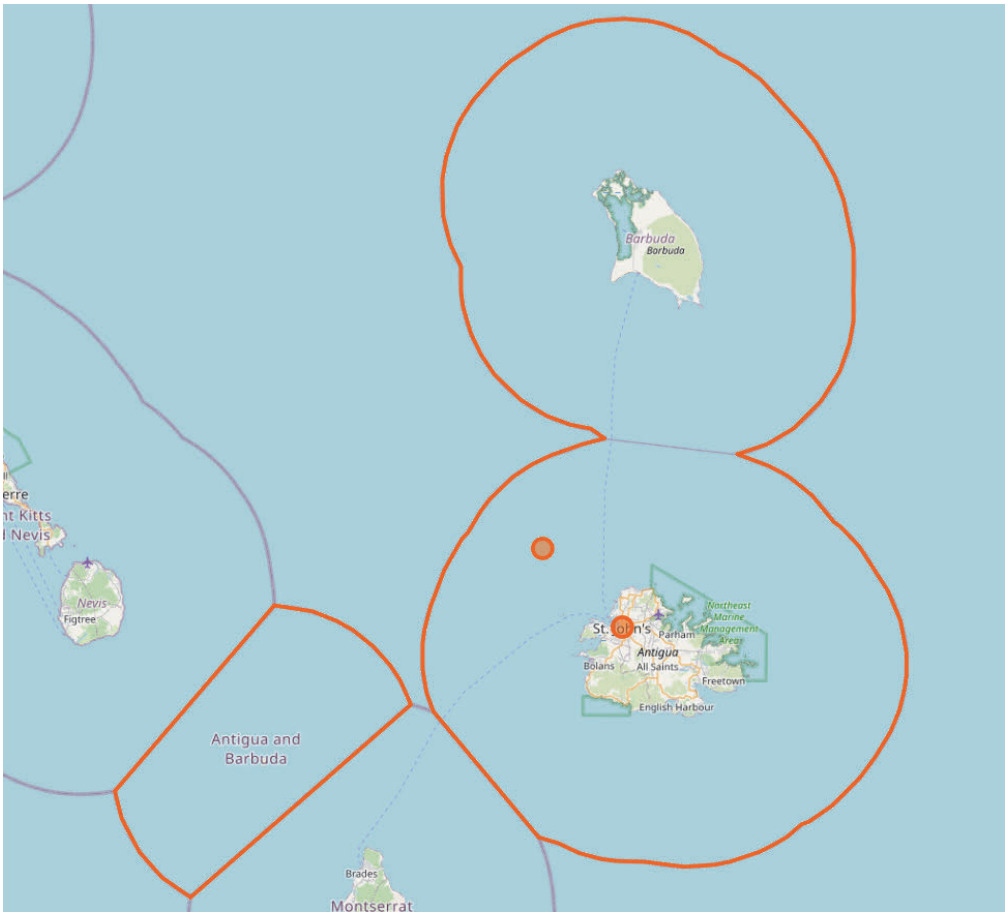


Figure 2-11 Map of Antigua and Barbuda[23]

The capital is St. John's, located in the northwest of Antigua, and the capital's population accounts for more than 20% of the total population. Of the two main islands, most of the population live on Antigua, and only about 1,600 live on the coral reef of Barbuda. The main ethnic group is African (87.3%), and others include mixed race (4.7%), Hispanic (2.7%), and White (1.6%). The official language is English, but Antiguan Creole is also used. The main religion is Christianity (Anglican Church, Protestant, Catholic, etc.). The table below summarizes information on demographic trends and projections of

[23] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

future population changes in the country. The population in 2050 is projected to increase by about 15% compared to 2018, with approximately one in three people living in a major urban area.

Table 2-29 Demographic trends and population projections in Antigua and Barbuda

Item (Unit)	Data	
Population (person)	96,286	
Population growth (annual %)	0.9	
Population density (person/km^2)	218.8	
Urban population (person)	23,685	
Urban population (% of total population)	24.6	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	11.8	
Population ages 0-14 (% of total population)	22.1	
Population ages 15-64 (% of total population)	69.1	
Population ages 65 and above (% of total population)	8.8	
Population, male (% of total population)	48.2	
Population, female (% of total population)	51.8	
Population projections	2030	2050
Projection of population, total (person)	105,000	111,000
Projection of urban population (person)	26,000	34,000
Projection of urban population (% of total population)	24.8	31.0

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[24]

Tourism accounts for more than 44% of the country's GDP and constitutes the backbone of the economy. Since it relied heavily on tourists from the United States in particular, it was hit hard by the multiple hurricane damages in the 1990s and the simultaneous terrorist attacks on the United States in 2001. The tourism industry has been positioned as the most important industry and has been used as a means to acquire foreign currency and create jobs, but due to public safety issues and the economic crisis in 2008, an IMF financial assistance was approved in 2010. GDP grew in 2014 due to the increase in tourists and construction, and in 2016 it recovered due to the resumption of tourism and investments including a new cruise ship pier. Besides, Antigua and Barbuda joined the CARICOM Single Market (CSM) in November 2007. Below is a summary of the economic situation of Antigua and Barbuda.

Table 2-30 Economic situation of Antigua and Barbuda

Item (Unit)	Data
GDP (current US$)	1,610,574,074.1
GDP per capita (current US$)	16,727.0
GNI per capita, PPP (current international $)	25,490.0
GDP growth (annual %)	7.4

[24] Source: MOFA. 2019a

Item (Unit)	Data
GDP per capita growth (annual %)	6.4
Inflation, consumer prices (annual %)	1.2
Imports of goods and services (% of GDP)	N/A
Exports of goods and services (% of GDP)	N/A
Main industries (MOFA. 2019a)	Tourism, construction, light industry (clothing, alcohol, home appliances, etc.)
Contribution of Fisheries to GDP (% of GDP) (2016 Preliminary) (CRFM. 2016)	0.96
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	44.1
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	1.7

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data

2.2.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Antigua and Barbuda. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 256 to 4,265 tons/year. Since the waste collection rate and the disposal rate in sanitary landfill are both high, the amount of plastic litter released into the ocean is not expected to be large.

Table 2-31 Waste management status and emissions of marine plastic litter in Antigua and Barbuda

Main item		Sub-item	Data	Unit
Generation		Amount generated	83	ton/day
		Proportion of plastic	13	%
		Amount of plastic litter generated	11	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	99.0	%
		Uncollected waste from households	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	100.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	256	ton/year
		Amount released per day	0.70	ton/day
		Length of the coastline	153	km
		Amount released per km of coastline	1.67	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	4,165	ton/year
		Amount released per person	43.65	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. In June 2019, the

Government of Antigua and Barbuda signed and launched “The Antigua and Barbuda Declaration”, which aims to encourage all Caribbean countries to eliminate single-use plastics and collaborate to end marine pollution.

As measures to reduce the amount of plastic used, the import of plastic bags has been banned from January 2016, and their use prohibited from July 2016, while alternative products are tax-free (WB. 2019). The use of plastic bags for storing and disposing of waste is not concerned by the ban. The ban on the importation and use of Styrofoam has been implemented in the following three stages and applies to all companies in the food service industry. Together with the ban on plastic bags, alternative products become tax-free (WB. 2019).

- Stage 1 (January 2017): Styrofoam for food service containers
- Stage 2 (January 2018): Plastic cutlery, Styrofoam trays, egg cartons
- Stage 3 (January 2019): Styrofoam coolers

Table 2-32 Policies and initiatives related to marine plastic litter in Antigua and Barbuda

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・Ban on the importation, retail distribution, sale and use of plastic bags (UNEP. 2018a). ・Environmental levy on the manufacture, import and use of plastic beverage containers (UNEP. 2018a). ・Ban on the importation and free distribution of expanded polystyrene products in the	・Littering prevention (Litter Control and Prevention Act No. 3 of 2019). ・EPR as part of the regulation on plastic bags (UNEP. 2018a).	・In September 2019, the Prime Minister announced the adoption of the Parley Air strategy in partnership with Parley for the Oceans [25]. Commitment to construct a recycling facility, Parley Air Base, by 2030.

[25] Organization that contributes to the protection of the ocean and the prevention of marine destruction. Parley Ocean Plastic is created by recycling plastic waste collected in coastal areas.

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	food service industry (UNEP. 2018a).		
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・Joined UNEP's #CleanSeas Campaign (The Planetary Press. 2019). ・ABWREC collects recyclable materials including plastics and raises public awareness (UNEP. 2014) ・Recycling business of collected plastics by Abinco Plastics. Cooperation with ABWREC starts in 2020 (Abinco Plastics. n.d.)	・Participate in ICC yearly cleanup (did not participate in 2018). Volunteers from community groups, schools, and private sector pick up litter at beaches, waterways, and the ocean, and record the data on the quantity and type. (UNEP. 2014). ・National Cleanup in 2018: Ministry of Health and the Environment launched "#Clean Up 268", a national awareness campaign to carry out a coastal marine and terrestrial inland cleanup on June 2 and 3, 2018.

2.2.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Antigua and Barbuda

Table 2-33 Waste-related organizations in Antigua and Barbuda

Organization name	Responsibilities and/or Initiatives
Department of Environment (DOE) of the Ministry of Health, Wellness and The Environment	Policy and regulatory body for solid waste.
National Solid Waste Management Authority (NSWMA)	・ Government agency involved in public waste management operations. Provide storage facilities for solid waste, collection, and transport, implementation of disposal, cleaning of road gutters, and mowing. The total number of employees is about 70, including technical and clerical staff. ・ Do not cover the island of Barbuda (waste management carried out by the town hall of the island). ・ Cooperation with NODS-CU, which is the management agency for dealing with emergency/disaster situations such as hurricanes (NODS. n.d.). Involved in the urban disaster risk reduction exercises undertaken just before each hurricane season (NODS. n.d.).
Antigua & Barbuda Waste Recycling Corporation (ABWREC)	・ Non-profit organization. Cooperate with DOE and National Solid Waste Management Authority. Efforts to support the reduction of bulk waste by collecting non-biodegradable resources through recycling. Activities also include public education and awareness raising on recycling. ・ Established in 2006. There are 3 full-time staff and 7 part-time staff.

Organization name	Responsibilities and/or Initiatives
	・ Export sales revenue of recycled resources in 2014 was about US$ 30,000. ・ Installed dedicated collection containers in 45 elementary, middle and high schools thoughout the country (there are 65-70 schools nationwide), 5 communities (there are 52 communities in the country, with an average population of 2,000-3,000 people each), and 4 supermarkets. Collect PET bottles, cans, and cardboard (only from supermarkets). Also collect car batteries from specified businesses. ・ Responsibility for the facility construction: Antigua and Barbuda Government, Owner of the land and facility: Government, Electric power company: bear the electric utility expenses.
Antigua & Barbuda E-Waste Centre (GEF. 2018)	Non-profit organization specialized in E-waste. Established by UNDP's GEF SGP (Global Environment Fund, Small Grant Program). Accept ICT (Information and Communication Technology) devices such as mobile phones and computers, UPS batteries, transformers, computer cables, photocopiers, ink jet cartridges, small household electrical appliances, and export after sorting.

Source: UNEP. 2014, JICA.2015, Website of each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. A technical study was scheduled to be completed by 2020 to build and operate a waste-to-energy facility (WTE) by 2025 (Antigua & Barbuda. 2015), but the current situation is unknown.

Table 2-34 Legal system related to waste management in Antigua and Barbuda

Name of the legislation	Content
National Solid Waste Management Authority Act	Enacted in 1995, amended in 2005. Act to establish the NSWMA. There is no policy on solid waste management.
Litter Control and Prevention Act No. 3 of 2019	An act aimed at preventing littering.
External Trade (Shopping Plastic Bags Prohibition) Order, 2017	Act on the prohibition of shopping plastic bags.
The Environmental Protection and Management Act 2019 (EPMA)	Serves as the main guiding policy for the DOE. Extensive and comprehensive consideration of all aspects of the environment.

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. In addition to resource recovery at the waste recycling center, the 3Rs such as food waste composting and environmental education are being implemented. However, ABWREC exists through the support of the government, the electric power company, and the Rotary Club, and it is recognised that there is a need to create a system in which profits are returned to recycling companies (JICA. 2015).

On the other hand, a survey conducted in 2015 showed the need to renew equipment such as compactors and heavy machinery to improve operational efficiency in collection and disposal, and the lack of

technical knowledge for the construction of the second cell at the final disposal site was also recognized as a problem. Due to the high electricity utility expenses, there is an intention to adopt WTE (JICA. 2015).

Table 2-35　System and infrastructure related to waste management in Antigua and Barbuda

Waste management stage	Content
Collection/Transport	・ Industrial waste is handled by private companies. ・ For the collection of municipal solid waste, NSWMA accounts for 30-40%, and the private sector 60-70%. ・ Door-to-door collection in most cases. ・ NSWMA owns 5 collection vehicles that it purchased. ・ NSWMA's income from the waste collection fee is expected to total about US$ 2 million. The shortfall is government subsidies. ・ No collection fee is charged to the general population. The collection fee includes some of the taxes such as Head Tax, Vacation Tax, and levy on PET bottles and cans (0.25 EC cents/container). ・ Collection fee of US$ 20/ton is collected from business operators (companies). ・ Collection fee of US$ 40/ton is collected from cruise ships.
Treatment	・ There is a waste recycling facility located in Powells, Antigua, and owned by ABWREC. There is no collection service, and residents bring in recyclable resources directly (UNEP. 2014). ・ In the ABWREC facility, the resource sorting machine that was delivered under the Japanese Grant Aid for Grassroots Human Security "Project for Promotion of Recycling in Antigua" (2012), is in operation. ・ There is interest in compost as treatment of garden waste. ・ Recyclable resources such as paper, plastic, and metal are removed from the final disposal site by about 20 waste pickers. There is a facility of a recycling company (Will's Recycling Ltd.) that handles metal products near the final disposal site. Collected items are brought there and paid cash.
Disposal	・ The Cooks Sanitary Landfill and Civic Amenities Site in western Antigua is the island's only final disposal site for mixed waste (Resources & Waste Advisory Group. 2020). It is a sanitary landfill with leachate treatment facilities owned and operated by NSWMA (UNEP. 2014). Constructed with a World Bank loan, completed in 2003, and operated since 2006.Waste tires, garden waste, medical waste, waste oil, sewage (by vacuum car). Recyclable resources such as paper, plastic, and metal are also brought in without segregation. ・ Over 1 million scrap tires. Only piling up. ・ No sanitary treatment of medical waste, they are landfilled in a specific cell after crushing.

Source: JICA. 2015

Situation of resource recovery work at ABWREC

E-waste brought to the E-Waste Centre

Figure 2-12 Situation of waste treatment in Antigua and Barbuda (Photographs)[26]

[26] Source: Antigua nice. com. 2014

2.3 Republic of Guyana

2.3.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Republic of Guyana has a population of 779,004 (2018), an area of 215,000 km^2 (slightly smaller than Honshu) (MOFA. 2019b) and is located in the northeastern part of South America. There are the Wakenaan islands at the mouth of the river, but there are few residents and tourists, and it is as if there were no remote islands. It has a border with Suriname on the east, Venezuela on the west, Brazil on the south, and faces the Caribbean Sea and the Atlantic Ocean on the north.

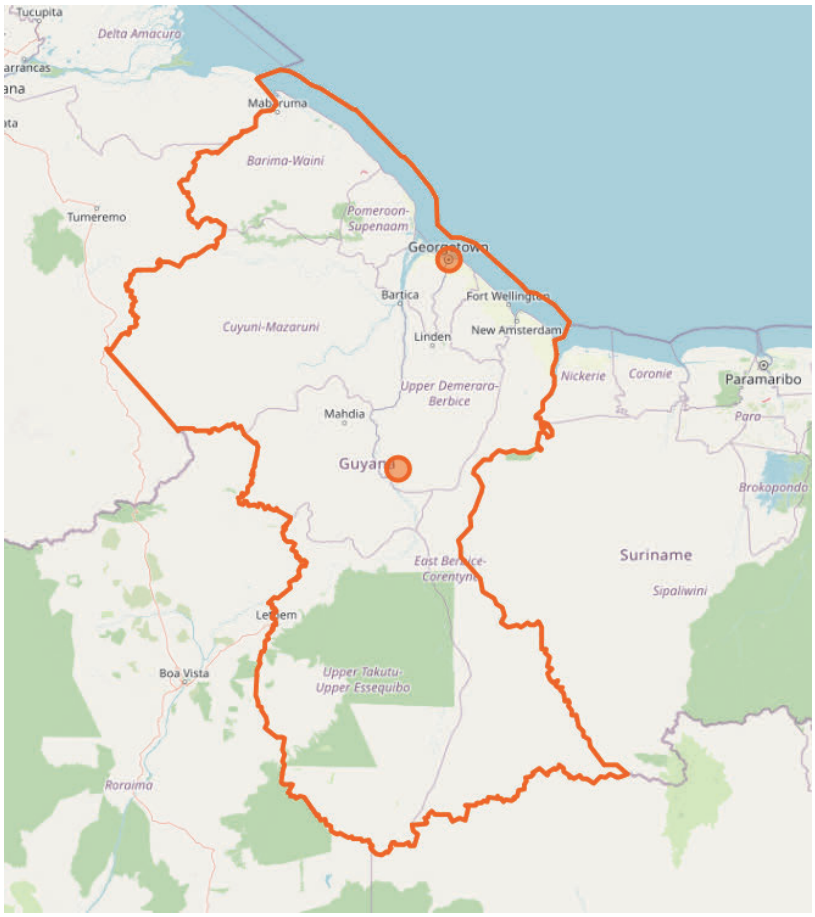


Figure 2-13 Map of the Republic of Guyana[27]

The capital is Georgetown, which is located in the north, and whose population accounts for about 14.1% of the total population. The ethnic groups consist of East Indians (39.8%), Africans (29.3%), mixed races (19.9%), indigenous peoples (10.5%), etc. The official language is English, but Guyanese Creole is also used. The main religions are Christianity, Hinduism, and Islam. The table below summarizes information

[27] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

on demographic trends and projections of future population changes in the country. The population living in areas where elevation is below 5 meters above sea level accounts for nearly 30% of the total population. The population in 2050 is projected to increase by about 6% compared to 2018, with more than one in three people living in a major urban area.

Table 2-36 Demographic trends and population projections in the Republic of Guyana

Item (Unit)	Data	
Population (person)	779,004	
Population growth (annual %)	0.5	
Population density (person/km^2)	4.0	
Urban population (person)	207,262	
Urban population (% of total population)	26.6	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	27.9	
Population ages 0-14 (% of total population)	28.2	
Population ages 15-64 (% of total population)	65.3	
Population ages 65 and above (% of total population)	6.5	
Population, male (% of total population)	50.2	
Population, female (% of total population)	49.8	
Population projections	2030	2050
Projection of population, total (person)	822,000	825,000
Projection of urban population (person)	235,000	297,000
Projection of urban population (% of total population)	28.6	36.0

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[28]

Agriculture and mining are the main industries and fishing is also thriving. In addition, sugar, rice and bauxite account for about 50% of the export revenue. In the 1980s, the international prices of sugar, rice, bauxite, etc., which are the main export products, fell and the economy was sluggish. Although it achieved high growth in the 1990s, the economy deteriorated in 1999 and comprehensive debt relief measures were applied as a Heavily Indebted Poor Country (HPIC). Driven by the growth of the agriculture, manufacturing, and service industries, it has maintained positive growth since the global financial crisis of October 2008. Besides, it has discovered oil fields and started oil production.

Below is a summary of the economic situation of the Republic of Guyana.

Table 2-37 Economic situation of the Republic of Guyana

Item (Unit)	Data
GDP (current US$)	3,878,662,620.8

[28] Source: MOFA. 2019b

Item (Unit)	Data
GDP per capita (current US$)	4,979.0
GNI per capita, PPP (current international $)	8,420.0
GDP growth (annual %)	4.1
GDP per capita growth (annual %)	3.6
Inflation, consumer prices (annual %)	1.3
Imports of goods and services (% of GDP)	47.1
Exports of goods and services (% of GDP)	35.5
Main industries (MOFA. 2019b)	Agriculture (sugar, rice, rum), mining (bauxite, gold), fishing (shrimps), textile
Contribution of Fisheries to GDP (% of GDP) (2016 Preliminary) (CRFM. 2016)	1.8
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	7.8
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	12.7

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data

2.3.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Republic of Guyana. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 2,079 to 12,496 tons/year. In addition, the amount of uncollected plastic litter from households per capita is also the largest among the surveyed countries, and it is considered that the total loss of plastic into the marine environment is close to the maximum estimated value.

Table 2-38 Waste management status and emissions of marine plastic litter in the Republic of Guyana

Main item		Sub-item	Data	Unit
Generation		Amount generated	510	ton/day
		Proportion of plastic	14	%
		Amount of plastic litter generated	72	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	40.0	%
		Uncollected waste from households (World Bank Group. 2019)	72,660	ton/year
		Uncollected waste from households per person (World Bank Group. 2019)	93.3	kg/person/year
Treatment/Disposal		Recycling rate	0.54	%
		Landfill disposal rate	61.37	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	2,079	ton/year
		Amount released per day	5.70	ton/day
		Length of the coastline	459	km
		Amount released per km of coastline	4.53	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	12,496	ton/year
		Amount released per person	16.12	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d., UNEP. 2018b

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-39 Policies and initiatives related to marine plastic litter in the Republic of Guyana

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	・ An environmental tax is levied on non-returnable beverage containers (Customs Act). ・ Ban on the importation, manufacture and sale of expanded polysterene products and, subject to exceptions, the use of expanded polysterene containers for food (Regulation 8 of 2015 under Environmental Protection Act). Violators will be fined over US$ 50,000. ・ Disposable plastics are expected to be banned by 2021. As of April 2020, EPA is in discussion with manufacturers, importers, the tourism sector, etc. EPA launched an online public survey on April 25, 2020 (EPA Guyana).	・ Guyana Advisory Solid Waste Management Association is responsible for keeping the seawall clean in Georgetown. ・ There is a regulation concerning littering (Environmental Protection (Litter Enforcement) Regulations 2013 (No. 7 of 2013)).	・ In RAPMaLi's pilot project "Improving Marine Litter Management in the Caribbean (2008)", a cleanup campaign, Pick It Up Guyana, was held with the aim of raising public awareness regarding waste and promoting cleanup activities (UNEP. 2014).
Initiatives of local governments, companies, NGOs, etc.	・ EPA collaborates with supermarkets to reduce the use of plastic bags.	・ Joined UNEP's #CleanSeas Campaign (The Planetary Press. 2019). ・ The city of Georgetown carries out cleanup and awareness raising campaigns (litterers are subject to high fines).	・ Participation in the ICC coordinated by Ocean Conservancy. ・ NGOs carry out related activities such as beach cleanups and awareness raising.

2.3.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste

management sector

The table below describes the organizations related to waste in the Republic of Guyana. The Draft Solid Waste Management Bill is currently under deliberation, and it has been proposed to establish a Solid Waste Management Authority (SWMA) as a corporate body to supervise all policy, operation and licensing aspects related to solid waste management in the country (Ministry of Communities. n.d.a).

Other agencies, such as the Ministry of Public Infrastructure, the Guyana National Bureau of Standards (GNBS), and the Institute of Applied Science and Technology are also involved to some extent in waste management (Ministry of Communities. n.d.b). In addition, the Guyana Advisory Solid Waste Management Association is an organization responsible for seawall cleaning and preservation in the capital Georgetown (UNEP. 2014).

Table 2-40 Waste-related organizations in the Republic of Guyana

Organization name	Responsibilities and/or Initiatives
Ministry of Communities (MoC)	Responsible for formulating waste management policies and overseeing waste management of local governments (municipalities).
Department of Environment, Ministry of the Presidency	Responsible for forestry, mining, environmental management, wildlife, protected areas, land use planning, and climate change as environment-related missions. Mandate was transferred from the Ministry of Natural Resources in 2016.
Environmental Protection Agency (EPA)	Legally established in 1996 by the Environmental Protection Act. Responsible for taking the necessary steps to manage, protect and improve the environment. The EPA is under the Environment Bureau, Ministry of the Presidency. Lead Agency for the Convention on Biological Diversity, the Basel Convention and the Cartagena Convention in the country.
Regional Democratic Councils (RDCs)	Operate as decentralised offices of the central government. Oversees the waste management activities of the Neighbourhood Democratic Councils (NDCs).
Neighbourhood Democratic Councils (NDCs)	Responsible for smaller divisions within each area, providing waste management, street sweeping, and drain cleaning services to residents.
City/Town Councils	Provide waste management, street sweeping, and drain cleaning services to residents within their jurisdiction.

Source: Ministry of Communities. n.d.b, Website of each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-41 Legal system related to waste management in the Republic of Guyana

Name of the legislation	Content
Environmental Protection (Water Quality) Regulations 2000	・ Establish rules related to sewerage, and water quality standards.
Environmental Protection (Hazardous Wastes Management) Regulations 2000	・ Regulations on the generation, storage, treatment, disposal and transport of hazardous waste, and the use of imported chemicals. These activities require an environmental permit from the Environmental Protection Agency (EPA).

Name of the legislation	Content
Environmental Protection Act. 11, 1996 amended in 2005	・ Established in 1996, revised in 2005.Act governing the management, conservation, protection, improvement of the environment, the prevention or control of pollution, the assessment of the impact of economic development on the environment, the sustainable use of resources and related matters.
Environmental Protection (Litter Enforcement) Regulations 2013 (No. 7 of 2013)	・ Prescribes penalty for littering.
Draft Solid Waste Management Bill 2014	・ Bill on solid waste management that proposes the establishment of the Solid Waste Management Authority (SWMA). Also establishes a licensing and permit system for waste management facilities.
Environmental Protection (Expanded Polystyrene Ban) Regulations, 2015 (No. 8 of 2015)	・ Regulations prohibiting the import, manufacture, sale of expanded polystyrene products and the use of expanded polystyrene containers for food, with exceptions. It aims at promoting the use of biodegradable, recyclable and environmentally friendly containers.
Municipal and District Councils Act	・ Law that empowers councils to establish, maintain and implement sanitary services, including waste management.
Customs Act	・ Law introducing an Environmental Levy on imported alcoholic and non-alcoholic beverages in disposable metal, plastic, glass and cardboard containers.
Putting Waste in its Place: A National Integrated Solid Waste Management Strategy for the Cooperative Republic of Guyana 2017-2030	・ National Integrated Solid Waste Management Strategy from 2017 to 2030. Consider whether it is possible to reduce the costs associated with sorting, recycling, transport, and disposal by controlling or minimizing waste generation. Introduce 3R promotion programs by resource (kitchen waste, scrap, cardboard), recycling facilities, etc.

Source: IDB. 2016

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. In addition to resource recovery at the waste recycling center, the 3Rs such as food waste composting and environmental education are being implemented.

Table 2-42 System and infrastructure related to waste management in the Republic of Guyana

Waste management stage	Content
Collection/Transport	・ NDCs and town/city councils are responsible for waste collection, however, due to limited financing and equipment, the collection system is irregular, and the collection area is not fully covered (Ministry of Communities. n.d.b.). ・ Through the Regional Solid Waste Management Program, MLGRD has contracted with several private contractors since 2013 to support waste collection (Ministry of Communities. n.d.b.).
Treatment	・ Reuse and recycling initiatives are as follows (Ministry of Communities. n.d.b.):

<table>
<tr><th>Waste management stage</th><th>Content</th></tr>
<tr><td></td><td>

Banks DIH operates a beverage bottle return program.
Caribbean Container Incorporated carries out a cardboard recycling program.
Guyana Metal Recycler's Association coordinates scrap metal recycling.
The sugar industry reuses or recycles much of its waste. The Institute of Applied Science and Technology (IAST) has successfully operated pilot programs on solid waste recycling (Ministry of Communities. n.d.b.).
A community composting pilot was completed in 2 NDCs (Ministry of Communities. n.d.b.).

</td></tr>
<tr><td>Disposal</td><td>

There are about 20 final disposal sites (open dumps or controlled landfill sites) (details below).

<table>
<tr><th>Region</th><th>Designated Waste Disposal Sites</th><th>Type of Facility</th></tr>
<tr><td>Region 1</td><td>Khan's Hill</td><td>Controlled dump</td></tr>
<tr><td>Region 2</td><td>Lima Dump</td><td>Controlled dump</td></tr>
<tr><td></td><td>Charity Dump</td><td>Controlled dump</td></tr>
<tr><td>Region 3</td><td>Nil (waste currently sent to Haags Bosch, until construction of landfill in Windsor Forest is complete)</td><td>n/a</td></tr>
<tr><td>Region 4</td><td>Le Repentir Dump (now closed to the public permanently and soon to be rehabilitated</td><td>Open dump</td></tr>
<tr><td></td><td>Haags Bosch Sanitary Landfill</td><td>Controlled dump</td></tr>
<tr><td></td><td>Lusignan Landfill (design of rehabilitation is in progress)</td><td>Controlled dump</td></tr>
<tr><td></td><td>Diamond Grove (design of closure is in progress)</td><td>Open dump</td></tr>
<tr><td>Region 5</td><td>Zorgenhoop</td><td>Controlled dump</td></tr>
<tr><td></td><td>Naarsteghied</td><td>Controlled dump</td></tr>
<tr><td></td><td>West of Burma Road</td><td>Controlled dump</td></tr>
<tr><td>Region 6</td><td>New Amsterdam-Belle Vieu</td><td>Controlled dump</td></tr>
<tr><td></td><td>Kilcoy/Chesney</td><td>Controlled dump</td></tr>
<tr><td></td><td>Number 0 Village</td><td>Controlled dump</td></tr>
<tr><td>Region 7</td><td>Byderabo dump</td><td>Open dump</td></tr>
<tr><td>Region 8</td><td>Nil (site identification in progress)</td><td></td></tr>
<tr><td>Region 9</td><td>Bonn Success</td><td>Controlled dump</td></tr>
<tr><td>Region 10</td><td>Caracara dump</td><td>Open dump</td></tr>
<tr><td></td><td>Dokara dump</td><td>Open dump</td></tr>
</table>
Source: Ministry of Communities. n.d.b

Haags Bosch Landfill at Eccles began operation in 2011 and receives approximately 110,000 tons of waste per year (Ministry of Communities. n.d.a). The site covers an area of 50 ha, a waste fill area of 26 ha, and an expected lifetime of 25 years (Ministry of Communities. n.d.a). Although it was designed as a sanitary landfill, some functions such as the leachate treatment system are not in operation (Ministry of Communities. n.d.a).
MLGRD collaborates with RDCs and NDCs to identify final disposal sites in other regions, and contracted with the private sector for the development, operation and maintenance of EPA-approved disposal sites (Ministry of Communities. n.d.a).

</td></tr>
</table>
Source: IDB. 2016

Figure 2-14 State of Haags Bosch final disposal site in the Republic of Guyana (Photograph)[29]

[29] Source: Department of Public Information. 2018

2.4 Republic of Cuba

2.4.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Republic of Cuba has a population of 11,338,138 (2018), an area of 109,884 km^2 (about half of Honshu) (MOFA. 2020a), is located in the Caribbean Sea, and consists of the main island of Cuba and its surrounding islands. There are many islands such as Isla de la Juventud, which is a large remote island located to the southwest of the main island, and Cayo Romano, which is connected to the land.

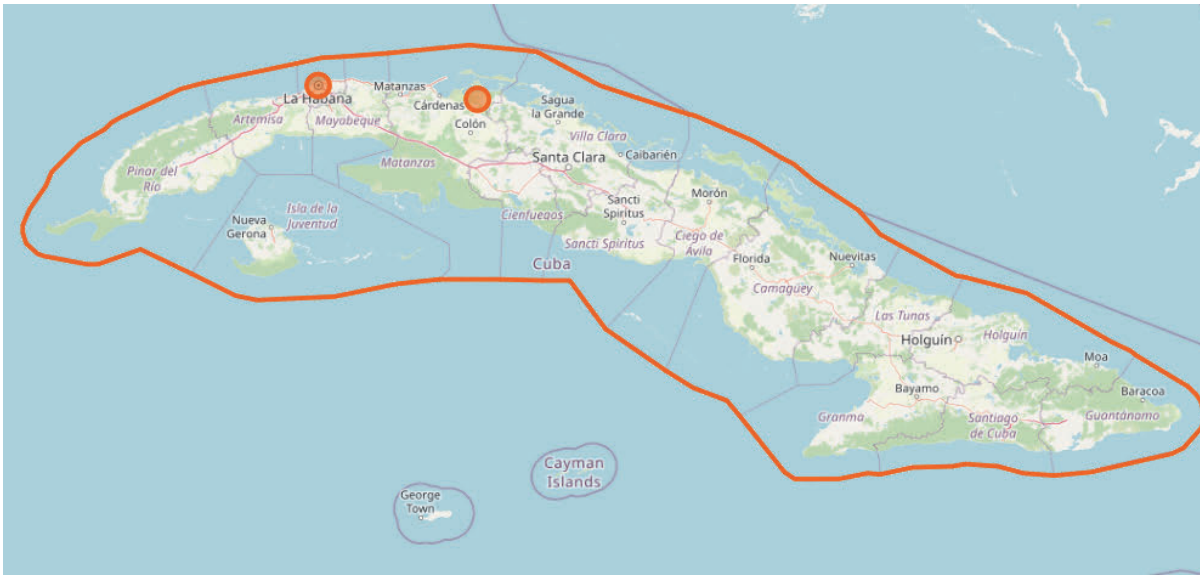


Figure 2-15 Map of the Republic of Cuba[30]

The capital is Havana, whose population accounts for about 20% of the total population. According to estimates, ethnic groups consist of mixed race (50%) and Europeans and Africans (about 25% each). The official language is Spanish, and in principle there is a freedom of religion. The table below summarizes information on demographic trends and projections of future population changes in the country. The current population growth rate is zero, and the population is expected to decline in the future. On the other hand, population concentration in major urban areas is increasing and is expected to reach 84% by 2050.

Table 2-43 Demographic trends and population projections in the Republic of Cuba

Item (Unit)	Data
Population (person)	11,338,138
Population growth (annual %)	0.0
Population density (person/km^2)	109.0
Urban population (person)	8,734,561

[30] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

Item (Unit)	Data	
Urban population (% of total population)		77.0
Population in urban agglomerations of more than 1 million (% of total population)		18.8
Population living in areas where elevation is below 5 meters (% of total population)		2.9
Population ages 0-14 (% of total population)		16.2
Population ages 15-64 (% of total population)		68.6
Population ages 65 and above (% of total population)		15.2
Population, male (% of total population)		49.7
Population, female (% of total population)		50.3
Population projections	2030	2050
Projection of population, total (person)	11,142,000	10,162,000
Projection of urban population (person)	8,769,000	8,546,000
Projection of urban population (% of total population)	78.7	84.1

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[31]

The collapse of the Soviet Union caused a significant negative growth in the Cuban economy in the early 1990s. In response to the economic crisis, the government partially introduced market-based economic reforms, and it has been on a recovery trend since 1995, with an average growth rate of 4.6% in the latter half of the 1990s. From 2006 to 2007, it recorded high growth against the background of close economic relations with Venezuela and China, but the growth rate slowed rapidly due to the global economic crisis and hurricane damages, and since 2009 the growth rate has remained at around 2-3%.

The main industries are tourism, agriculture (sugar and tobacco), nickel mining, etc. In recent years, it has been focusing on the medical field (including overseas dispatch of doctors), but the problems of widening disparities and corruption are becoming more serious in the country.

Venezuela is the largest trading partner, importing from there about 100,000 barrels of crude oil per day on favourable conditions. Income is also increasing due to the provision of medical services to Venezuela. In recent years, the deterioration of the Venezuelan economy due to lower crude oil prices has caused a decrease in crude oil exports from Venezuela to Cuba, affecting the economy.

As part of the process of de-dollarization, the currency of transactions between state-owned companies was changed to convertible pesos (CUC) in July 2003, the use of dollars for secondary services and products provided by state-owned companies was banned in March 2004, and the US dollar was banned from being distributed domestically in November 2004.

[31] Source: MOFA. 2020a

Since the installation of President of the Council Raul Castro, there have been signs of liberalization such as possession of prepaid mobile phones, sale of electrical products such as DVDs, and lifting of the ban on hotel accommodation. In the agricultural sector, there is also a movement of decentralization to give local governments the right to make policy decisions and take responsibilities.

Below is a summary of the economic situation of the Republic of Cuba.

Table 2-44 Economic situation of the Republic of Cuba

Item (Unit)	Data
GDP (US$)	100,023,000,000.0
GDP per capita (current US$)	8,821.8
GNI per capita, PPP (current international $)	N/A
GDP growth (annual %)	2.2
GDP per capita growth (annual %)	2.3
Inflation, consumer prices (annual %)	N/A
Imports of goods and services (% of GDP)	12.6
Exports of goods and services (% of GDP)	14.5
Main industries (MOFA. 2020a)	Tourism, agriculture, forestry and fisheries (sugar, tobacco, seafood), mining (oil, nickel, etc.), medical and bio industry
Contribution of Fisheries to GDP (% of GDP) (2016 Preliminary) (CRFM. 2016)	N/A
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	10.6
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	3.8

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data

2.4.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Republic of Cuba. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 30,412 to 101,682 tons/year, which is estimated to be the largest value among the surveyed countries for both methods. There is a problem with the waste collection rate of 70% in the country, and there is also a considerable amount of uncollected household waste (619,534 tons/year).

Table 2-45 Waste management status and emissions of marine plastic litter in the Republic of Cuba

Main item	Sub-item	Data	Unit
Generation	Amount generated	7,400	ton/day
	Proportion of plastic	10	%
	Amount of plastic litter generated	710	ton/day
Collection/Transport	Collection rate (World Bank Group. 2019)	77.0	%
	Uncollected waste from households (World Bank Group. 2019)	619,534	ton/year
	Uncollected waste from households per	54.6	kg/person/year

Main item		Sub-item	Data	Unit
		person (World Bank Group. 2019)		
Treatment/Disposal		Recycling rate	9.49	%
		Landfill disposal rate	30.68	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	30,412	ton/year
		Amount released per day	83.32	ton/day
		Length of the coastline	3,735	km
		Amount released per km of coastline	8.14	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	101,682	ton/year
		Amount released per person	8.97	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d., UNEP. 2018b

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-46 Policies and initiatives related to marine plastic litter in the Republic of Cuba

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ N/A	・ Recycling obligation (UNEP. 2018a) ・ Act on Environmental Protection and Prohibition of Waste Disposal (Environmental Law No. 81 (1997)).	・ N/A
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ Recycling Programs conducted in the city ofSantiago de Cuba (UNEP. 2014). ・ According to the Recycling Increase Strategy of the Recycling Corporation, the amount of plastic recycled will gradually increase as follows, and the production of recycled products is planned (Grupo Empresarial de Reciclaje. 2020). ➢ 2013-2017: 4,544 recycled per year ➢ 2018-2022: 8,800 tons ➢ 2023-2028: 16,000 tons ・ Atres, a non-agricultural cooperative, reuses about 50 tons a month of waste plastic purchased mainly from recyclers (also use plastic self-collected on the coast of the national park) to produce a building material called Ecomadera and use it to manufacture furniture (Cubahora. 2019).	・ Implementation of international programs such as Sandwatch. ・ NPO BirdsCaribbean carries out beach cleanup.

2.4.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in the Republic of Cuba

Table 2-47 Waste-related organizations in the Republic of Cuba

Organization name	Responsibilities and/or Initiatives
CITMA: Ministerio de Ciencia Tecnología y Medio Ambiente (Ministry of Science, Technology and Environment) and AMA: Agencia de Medio Ambiente (Environment Agency)	Responsible for environmental protection and overall environmental management.
Ministry of Economic Planning	Administrative agency that controls public services, including waste management.
Havana City Public Service Bureau: Dirección Provincial de Servicios Comunales (Provincial Direction of Communal Services)	Department of Public Services in Havana. Havana City consists of all 15 local governments, which are equivalents to prefectures.
Sanitation Unit, Havana City Public Service BureauUPPH: Unidad Provincial Presupuestada de Higiene (Provincial Unit of Hygiene)	Manage and guide municipal waste collection and final disposal, as well as related activities. It is an organization of local governments, and its financial resources come from the national government. Transformation into a public corporation is being considered.

Source: JICA. 2018, Website of each organization

The organization chart of CITMA is shown in the figure below.

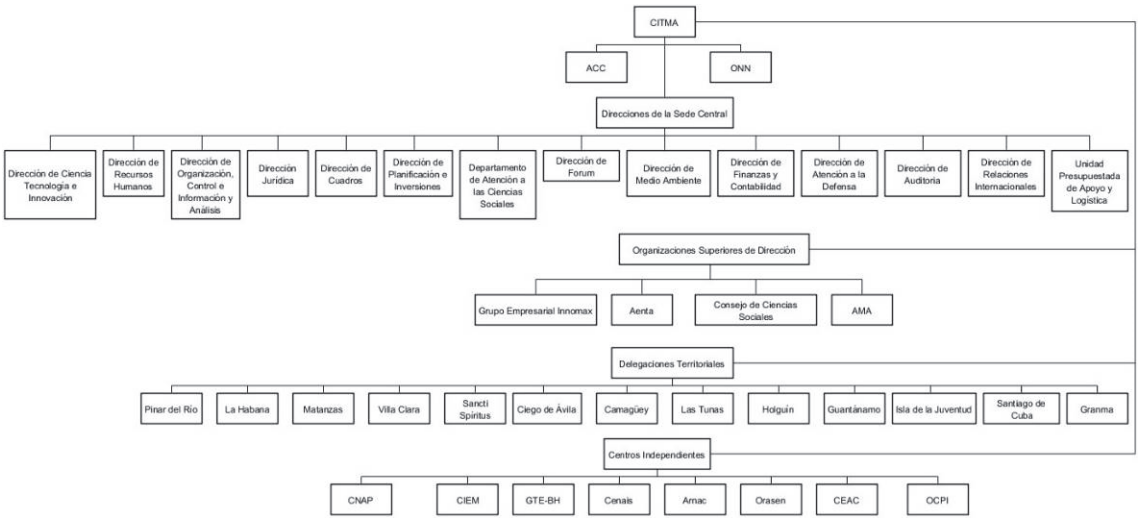


Figure 2-16 Organization chart of CITMA, Republic of Cuba[32]

[32] Source: CITMA. n.d.

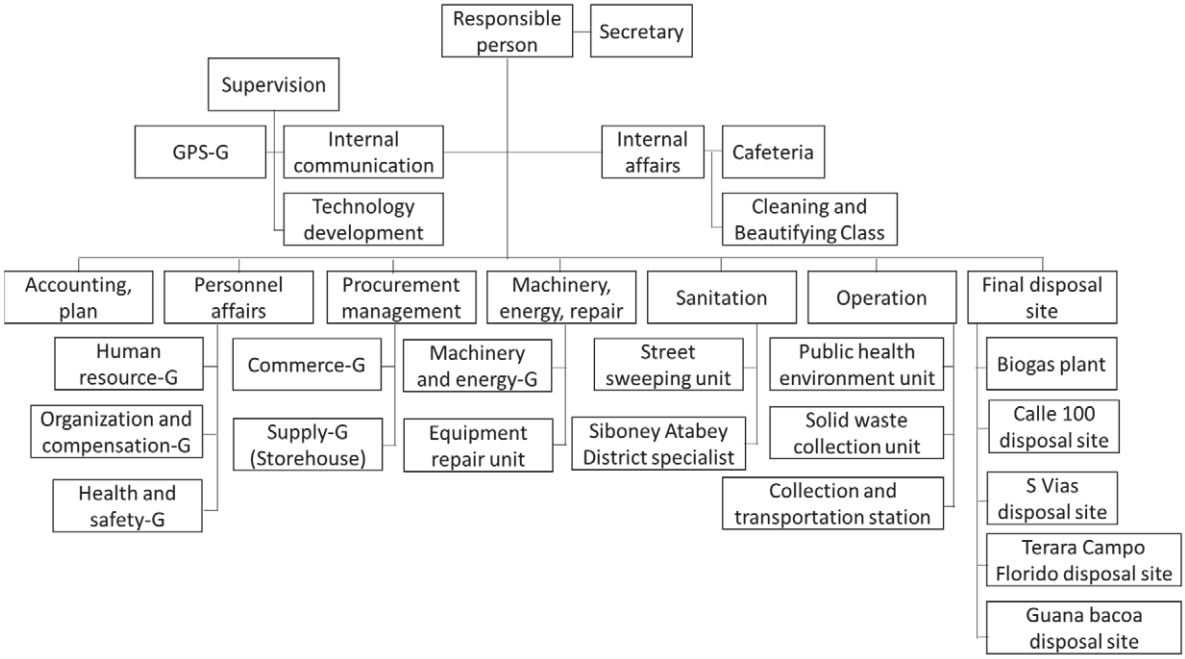


Figure 2-17 Organization chart of UPPH in Havana[33]

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-48 Legal system related to waste management in the Republic of Cuba

Name of the legislation	Content
Promulgación de la Ley 1288 del reciclaje y su reglamento para la recuperación de materias primas, Desreto Ley No.3800 que la implememta.	Act of 1975 on Recycling and Reuse.
Decreto No.123 Infracciones contra el Ornato Público, la Higiene y otras para La Habana	Decree of 1984 on Infractions against Public Ornaments and Hygiene for Havana.
Decreto No.99 Delitos contra la limpieza de la Ciudad.	Decree of 1987 on the Cleanliness of the City.
Resolución No.16 de las Regulaciones sobre la higiene y el ornato de la Ciudad de La Habana.	Regulations on Hygiene and Ornaments in Havana. Revised in 1994.
Decreto Ley No. 201: Contra el ornato público y la higiene comunal. La Habana	Decree of 1995 on Public Ornaments and Public Health in Havana.
Law of the Environment (No. 81 of 1997)	Provide environmental policy principles and basic rules for environmental management in the country to protect the environment and contribute to sustainable development. Chapter 2 is about solid waste. Article 147 prohibits the dumping of waste that may affect human health and impair the quality of life of residents.
Norma Cubana 133 RSU Almacenamiento,	Norms on storage, collection and transport from

[33] Source: JICA. 2018

Name of the legislation	Content
recolección y transportación y requisitos higiénicos sanitarios y ambientales	hygienic and environmental perspective (2002).
Norma Cubana 134 RSU Tratamiento y requisitos higiénicos sanitarios y ambientales	Norms on intermediate treatment from hygienic and environmental perspective (2002).
Norma Cubana 135 RSU Disposición final y requisitos higiénicos sanitarios y ambientales.	Norms on final disposal from hygienic and environmental perspective (2002).
Política para el incremento del Reciclaje de Materias Primas (Recycling promotion policy)	Approved by the Council of Ministers in 2012 and revised in 2014. Promotion of recycling, increase of the added value of recycled products in domestic and overseas markets, introduction of new technology and development of recycling industry through encouragement of foreign capital (Ministerio de Industrias. 2019, Global Recycling. 2016).
Estrategia Ambiental Nacional 2016/2020	National Environmental Strategy. Appropriate solid waste management will be strengthened by 2020.
Lineamiento de la Política Económica y Social del Partido y la Revolución 2016-2021 (Guidelines of the Economic and Social Policy of the Party and the Revolution 2016-2021)	There is a related description in Section 193: "Strengthen recycling and foster the increase of added value of recovered products. Priority is given to the use of municipal solid waste."

Source: UNEP. 2014, JICA.2018

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. In the Republic of Cuba, comprehensive efforts for waste management are not sufficient. There are issues in the initiatives to reduce the amount of municipal waste, in the collection and transport plans, in the vehicle maintenance and repair shop capabilities, in the technology related to final disposal site design and operation management, and in addition, the planning department lacks basic capabilities such as planning and management to carry out these initiatives.

Table 2-49 System and infrastructure related to waste management in the Republic of Cuba

Waste management stage	Content
Discharge	・ In the case of Havana, municipal waste can be discharged at any time in containers installed at collection stations (picture below). Approximately 20,000 containers are maintained, and the amount collected through the containers is about half of the solid waste of Havana. Waste in the containers is collected daily. ・ The containers are managed by each local government and have a capacity of 770L with a lid and casters. ・ In areas without containers, collection is carried out door-to-door using trucks, tractors, hand carts, etc. ・ Although sorting is not implemented, some households bring their recyclables to the buyback center and get a small amount of money (A. Michael, *et al.*, 2018).
Collection/Transport	・ Waste collection is carried out by the Municipal Service Management Bureau (DMSC: Dirección Municipal de Servicios Comunales) (A.

Waste management stage	Content
	Michael, *et al.*, 2018). ・ Collection and transport in Havana is as follows: ➢ Municipal waste collection is conducted 24 hours a day, 7 days a week. ➢ One driver and three workers board the garbage truck (the photograph below shows the collection) and perform on average 3 collection trips per shift. The average transport volume is 10 tons/time. The final disposal site is mainly Calle 100. ・ Five of the 15 local governments own their own collection vehicles, but they need additional garbage trucks from UPPH. ・ The 15 local governments accept complaints from residents regarding non-collection, and UPPH responds. ・ Construction waste is collected using heavy machinery in consideration of the impact on traffic. Large containers are installed in areas where the amount of generation is high. When it is full, it is replaced with an empty container by a hoist truck. ・ There is no dedicated collection vehicle for infectious waste. It is disposed of in a dedicated section of the Calle 100 final disposal site.
Treatment	・ There is a biogas facility (JICA. 2018). ・ Regarding resources, it is as follows (see Figure 2-18) (A. Michael, *et al.*, 2018). ➢ Some of the recyclable materials such as iron/non-ferrous metal scrap, paper/cardboard, and plastic are collected by IC (Independent Contractors for Recyclable Material Collection, Travajadores por cuenta propia) and CRMR (Cooperatives for Recyclable Material Recovery, Cooperativas de Recuperación de Materias Primas). These are often spin-offs of public enterprises. ICs and CRMRs pay for recyclable materials to individual households and businesses, and receive payment by bringing them to the buyback centers. The buyback centers belong to the state-level Recyclable Material Recovery Enterprises (RMRE), where materials are recycled and sold to domestic and foreign industries. ➢ There is a collection activity of recycled materials organized by the Pioneers (Pioneros) and the Revolutionary Defense Commission (CDR: Comités de Defensa de la Revolución). Unlike IC, there is no payment. The collected recycled materials are supplied directly to RMRE (no payment). ➢ Public enterprises are required to separate waste (recyclable materials and residual waste). Each state's RMREs send recyclable materials to the national level URMRE (Union of Recyclable Materials Recovery Enterprises). URMRE sells iron parts of metal and non-metal waste to national industries. Non-ferrous metal scrap is sold domestically and abroad. Substituting exports and imports of non-ferrous metal scrap save more than US$ 200 million to the national economy.
Disposal	・ In Havana, there are the final disposal sites of Calle 100 (picture below), 8 Vias (Ochobias), Tarara Campo Florido (Tarara), and Guanabacoa (JICA. 2018). ・ The paved road of Calle 100 becomes a dirt road from the middle of the disposal site, and since there are no gutters, it becomes muddy and difficult to access after a few days of rain (JICA. 2018).

Waste management stage	Content
	• Due to lack of equipment, there are problems with soil coverage, compaction, traffic congestion at the approach road and entrance, and waste picker control (JICA. 2014). 

Source: JICA. 2018

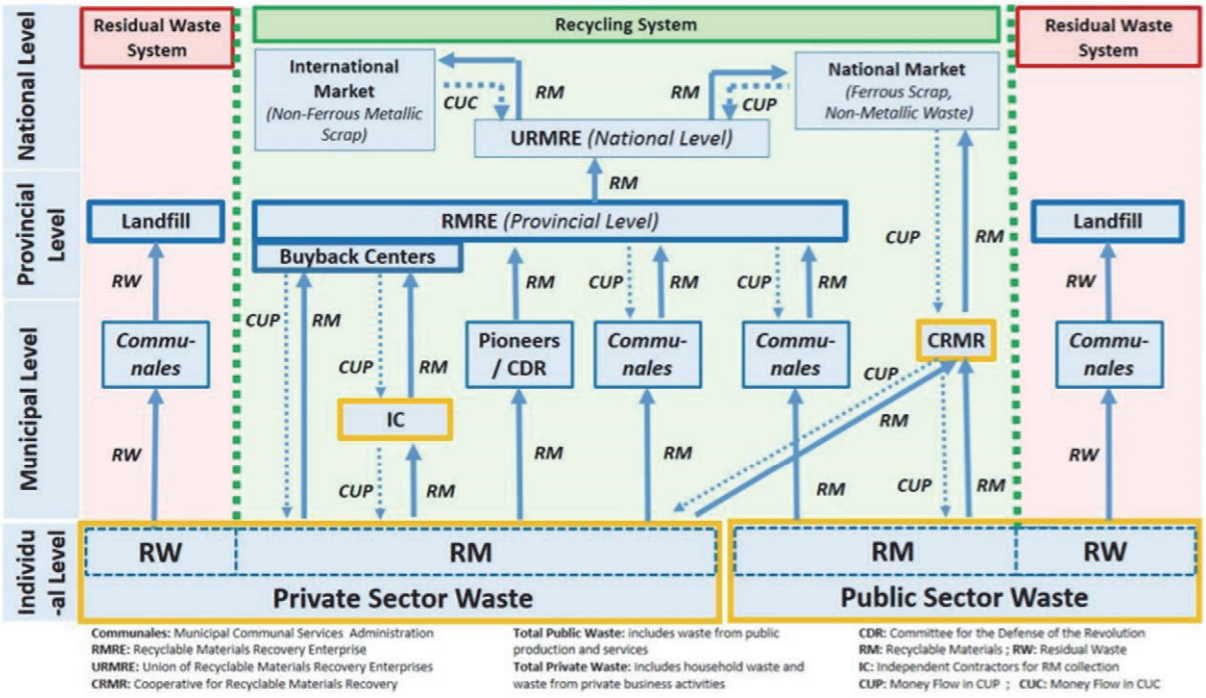


Figure 2-18 Flow of resources in the Republic of Cuba[34]

[34] Source: A. Michael, *et al.*, 2018

Waste discharge container in Havana

Waste collection in Havana

Figure 2-19 Discharge and collection of waste in Havana (Photographs)[35]

[35] Source: JICA. 2018

2.5 Grenada

2.5.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Grenada is an island country located in the Caribbean Sea with a population of 111,454 (2018) and an area of 340 km^2 (almost the same as Fukue Island in the Gotō Islands) (MOFA. 2019c). The main island is Grenada, and to the north lie the remote islands of Carriacou, Petite Martinique, Ronde Island, and Caille Island. Neighboring countries separated by the sea are St. Vincent and the Grenadines on the north, Barbados on the northeast, and Trinidad and Tobago and Venezuela on the south.

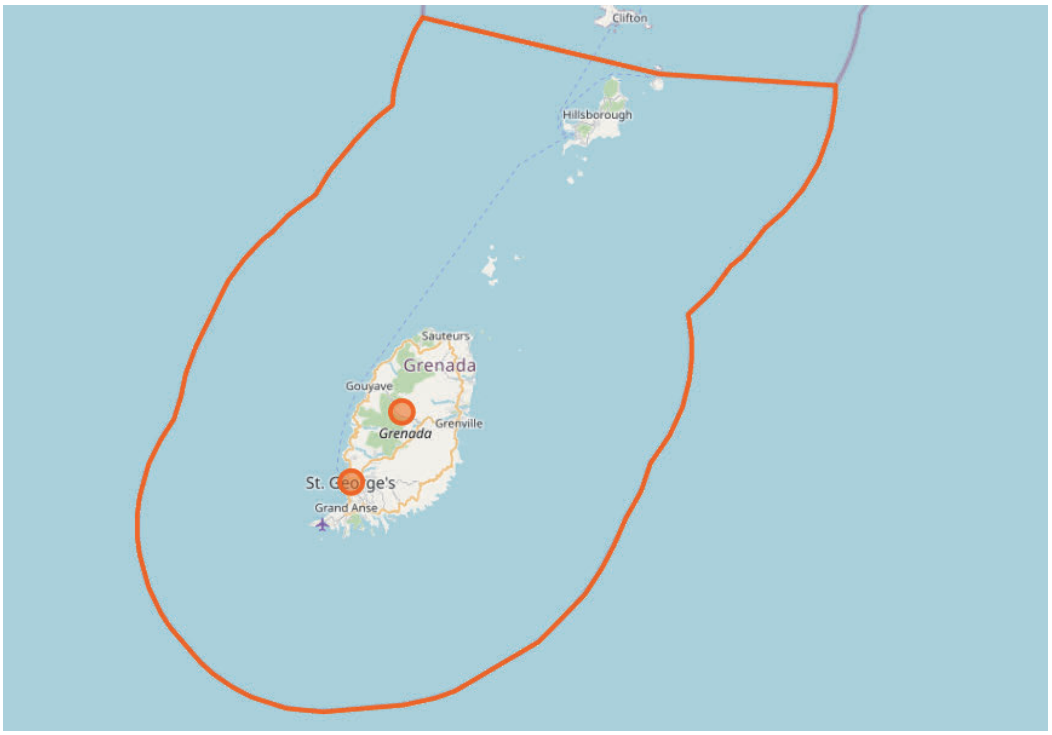


Figure 2-20 Map of Grenada[36]

The capital is St. George's, located in the southwestern part of Grenada Island, and the capital's population accounts for 35% of the total population. Carriacou, the largest remote island, has a population of about 10,000. African (82.4%) is the main ethnic group, others include mixed race (13.3%) and East Indian (2.2%). The official language is English, but Grenadian Creole is also used. The religion is mainly Christianity (Catholic, Protestant, Anglican Church, etc.). The table below summarizes information on demographic trends and projections of future population changes in the country. The population will remain flat in the future, but it is estimated that about half of the population will live in

[36] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

major urban areas by 2050.

Table 2-50 Demographic trends and population projections in Grenada

Item (Unit)	Data	
Population (person)	111,454	
Population growth (annual %)	0.5	
Population density (person/km^2)	327.8	
Urban population (person)	40,427	
Urban population (% of total population)	36.3	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	1.9	
Population ages 0-14 (% of total population)	23.6	
Population ages 15-64 (% of total population)	66.8	
Population ages 65 and above (% of total population)	9.6	
Population, male (% of total population)	50.4	
Population, female (% of total population)	49.6	
Population projections	2030	2050
Projection of population, total (person)	116,000	116,000
Projection of urban population (person)	45,000	55,000
Projection of urban population (% of total population)	38.9	47.3

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[37]

The economy relies heavily on tourism, in addition to agriculture and the production of traditional agricultural products such as nutmeg, bananas, cacao and mace, and various service industries. It recorded a high growth rate in the latter half of the 1980s, but slowed down when entering the 1990s, and the GDP growth rate in 2001 became negative due to the effects of the terrorist attacks on the United States. After that Hurricane Ivan in September 2004 and Hurricane Emily in July 2005 caused devastating damage to domestic infrastructure, but the country achieved positive economic growth in 2006 and 2007. Although the economy has been sluggish since 2008 due to the global economic recession, structural reforms are being implemented under the IMF's Poverty Reduction and Growth Facility (PRGF). With the tourism and construction industries as driving forces, growth is expected to continue, albeit moderately.

Below is a summary of the economic situation of Grenada

Table 2-51 Economic situation of Grenada

Item (Unit)	Data
GDP (current US$)	1,185,925,925.9

[37] Source: MOFA. 2019c

Item (Unit)	Data
GDP per capita (current US$)	10,640.5
GNI per capita, PPP (current international $)	14,100.0
GDP growth (annual %)	4.2
GDP per capita growth (annual %)	3.6
Inflation, consumer prices (annual %)	0.8
Imports of goods and services (% of GDP)	55.2
Exports of goods and services (% of GDP)	54.2
Main industries (MOFA. 2019c)	Tourism, manufacturing, agriculture (cacao, nutmeg, bananas, fruits)
Contribution of Fisheries to GDP (% of GDP) (2016 Preliminary) (CRFM. 2016)	1.40
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	56.6
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	5.2

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data

2.5.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Grenada. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 297 to 3,294 tons/year. Since the waste collection rate and the disposal rate at a sanitary landfill are both high, the amount of plastic litter released into the ocean is not expected to be large.

Table 2-52 Waste management status and emissions of marine plastic litter in Grenada

Main item		Sub-item	Data	Unit
Generation		Amount generated	85	ton/day
		Proportion of plastic	16	%
		Amount of plastic litter generated	14	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	97.0	%
		Uncollected waste from households (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	98.3	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	297	ton/year
		Amount released per day	0.81	ton/day
		Length of the coastline	121	km
		Amount released per km of coastline	2.46	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	3,294	ton/year
		Amount released per person	29.71	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d., UNEP. 2018b

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. The gradual ban on plastic bags was planned in three stages as follows.

- Stage 1 (from February 1, 2019): Ban on importation and local manufacture of single-use plastic bags with handles.
- Stage 2 (from December 1, 2019): Ban on the sale of single-use plastic bags with handles.
- Stage 3 (from February 1, 2020): Ban on the sale of food item using single-use plastic bags with handles.

Table 2-53 Policies and initiatives related to marine plastic litter in Grenada

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ Non-Biodegradable Waste Control Act, No. 9 of 2018. ・ Ban on the importation of Styrofoam (effective September 1, 2018, sale sanctions effective March 1, 2019, and ban on use from April 1, 2019) (Non-Biodegradable Waste Control (Expanded Polystyrene) Order, 2018). ・ Ban on single-use plastic bags with handles (Non-Biodegradable Waste Control (Plastic Bags) Order, 2018). ・ Ban on all single-use plastics such as cutlery, plates, straws and cups by February 1, 2019 (Non-Biodegradable Waste Control Act, No. 9 of 2018).	・ When announcing the ban on Styrofoam in 2017, the Minister of Health also announced a proposal for a product recycling bills (UNEP. 2018a). ・ Littering regulations in coastal areas, territorial waters, terrestrial water bodies, national parks and protected areas (Waste Management Act) (UNEP. 2014).	・ Regulations on the storage of fishing gear after use and prohibition of waste dumping in ecosystems such as coral reefs and marine protected areas (Fisheries Act).
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ Joined UNEP's #CleanSeas Campaign (The Planetary Press. 2019).	・ Participation in the ICC coordinated by Ocean Conservancy.

2.5.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Grenada

Table 2-54 Waste-related organizations in Grenada

Organization name	Responsibilities and/or Initiatives
Grenada Solid Waste Management Authority (GSWMA)	Department within the Ministry of Health. Responsible for collecting and disposing of solid waste and cleaning roads. There are 6 administrative staff, 23 workers, and a total of 29 employees. Annual budget is about ECD 9-10 million
Ministry of Health, Environmental Health Department	Policy and regulatory body for solid waste management.
Ministry of Infrastructure Development, Public Utilities, Energy, Transport & Implementation	Responsible for disaster waste management and the restoration of municipal solid waste collection and disposal services in cooperation with GSWMA (NaDMAC & NaDMA. 2015).

Source: Website of each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. GSWMA announced a shift to integrated waste management, focusing in turn on waste reduction, reuse, recycling, WTE and finally landfill disposal (GSWMA. n.d.a).

Table 2-55 Legal system related to waste management in Grenada

Name of the legislation	Contents
Abatement of Litter Act (1973)	Act on pollution prevention and waste reduction
Grenada Solid Waste Management Authority Act (1995)	Act on the establishment of the Solid Waste Management Authority in 1995.
Environmental Levy Act (1997)	Regulations on the taxation of people and goods/services. Among the sources of income for the Grenada Solid Waste Management Authority, the environmental tax represents 80% (other sources of income are private and government services for 20%).
Grenada Waste Management Act 2001	Law on waste management.

Source: GSWMA. n.d.a

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-56 System and infrastructure related to waste management in Grenada

Waste management stage	Content
Discharge	・ The amount of waste generated in 2018 was 1.13kg/per/day. ・ Curbside collection and discharge in communal bins. ・ There are issues regarding illegal dumping.
Collection/Transport	・ Door-to-door collection or collection from communal bins. ・ Collection and road cleaning are carried out by contractors, and the collection rate is 98%. ・ Collection frequency of municipal solid waste is at least twice a week for each community (every in towns and suburbs, and about twice a week in other areas). Special collection services for household white goods and

Waste management stage	Content
	bulky items are provided once a month in each community. ・ In 201, 44,508 tons of waste were collected, of which 21,345 tons were from households and 23,163 tons were road cleaning, commercial waste, and industrial waste. ・ Waste collection and transport is completely outsourced to the private sector. The selection is by bidding, and the contract period is 5 to 7 years. ・ Waste collection costs will be covered from the following sources. However, there is no fee collection system set up for waste collection, transport, and disposal. ➢ Household Levy: ECD 0-10/month is levied depending on electricity consumption. ➢ Stay-Over Visitors Levy: The Airport Authority levies ECD 4.05 on airport users. ➢ Marine Visitors Levy: The Port Authority levies ECD 4.05 on cruise users. ➢ Environmental Levy: ECD 0.25 is levied on glass and PET bottles.
Treatment	・ Bulky metals are purchased by recyclers. Reusable bottles are collected by waste pickers and returned to breweries. ・ Copper wire, aluminum, stainless steel, scrap iron, etc. are collected by waste pickers for export. ・ Medical waste is incinerated. GSWMA does not produce compost, but owns a wood crusher. Rental for those who want to produce compost. Interest in WTE
Disposal	・ There are two final disposal sites in the country, both managed by GSWMA: Perseverance on Grenada and Dumfries on Carriacous. ・ There is no tipping fee at the above-mentioned two final disposal sites, and soil covering occurs sometimes (RAC-REMPEITC Carib. 2018).
Road cleaning	・ Carried out in all towns (GSWMA. n.d.b). ・ Road cleaning is carried out by contractors for 19,251 people, which represents 18% of the country's population, but the quality of service and service rate are not sufficiently managed and supervised (World Bank Group. 2019).

Source: GSWMA. n.d.a, JICA. 2015

The figure below shows the annual collection amount for each of the six collection zones nationwide.

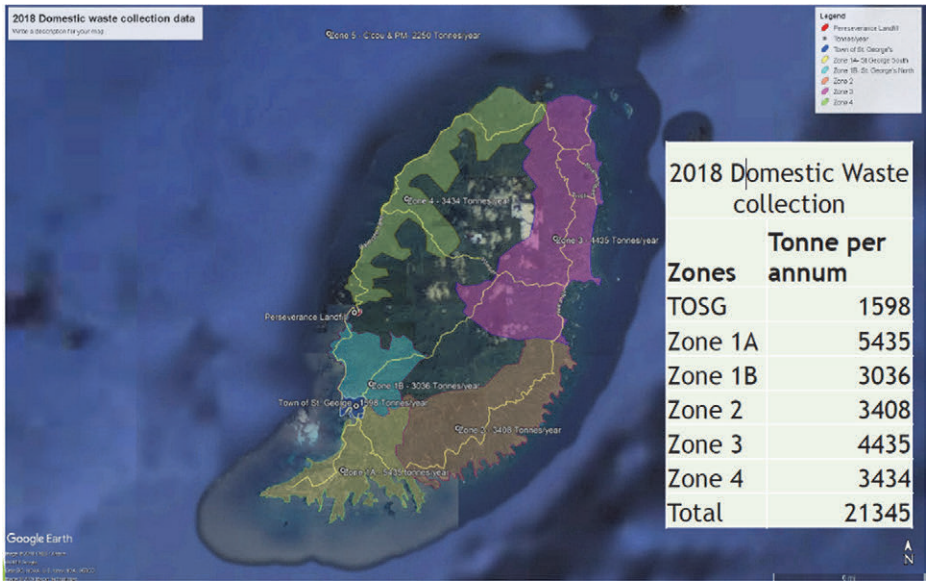


Figure 2-21 Grenada waste collection zones and annual collection amount of each zone[38]

Figure 2-22 Littering and illegal dumping in Grenada (Photographs)[39]

[38] Source: GSWMA. n.d.a

[39] Source: GSWMA. N.A.a

2.6 Jamaica

2.6.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Jamaica is an island country located in the Caribbean Sea with a population of 2,934,855 (2018) and an area of 10,990 km^2 (almost the same size as Akita Prefecture) (MOFA. 2019d). The Republic of Cuba and the Cayman Islands are on the north side, and the Republic of Haiti and the Dominican Republic are on the east side across the Jamaica Channel. There are remote islands such as Great Goat Island and Salt Island.

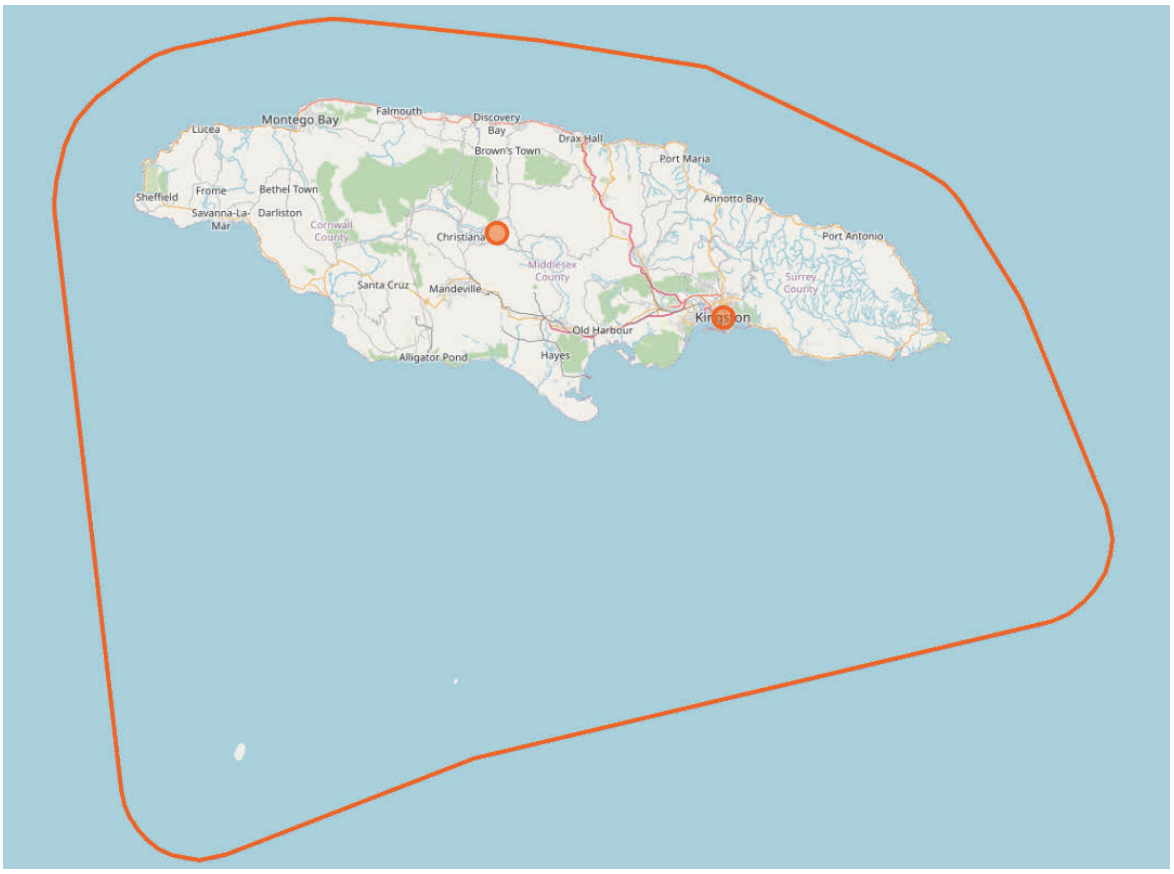


Figure 2-23 Map of Jamaica[40]

The capital is Kingston, whose population accounts for more than 20% of the total population. African (92.1%) is the main ethnic group, and other mixed races represent 6.1%. The official language is English, but Jamaican Creole is also used. Religion is Christianity such as Protestantism and Anglican Church. The table below summarizes information on demographic trends and projections of future population changes in the country. Although the population is expected to decrease in the future, the overcrowding

[40] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

of major urban areas will continue.

Table 2-57 Demographic trends and population projections in Jamaica

Item (Unit)	Data	
Population (person)	2,934,855	
Population growth (annual %)	0.5	
Population density (person/km^2)	271.0	
Urban population (person)	1,633,951	
Urban population (% of total population)	55.7	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	3.6	
Population ages 0-14 (% of total population)	23.8	
Population ages 15-64 (% of total population)	67.5	
Population ages 65 and above (% of total population)	8.8	
Population, male (% of total population)	49.7	
Population, female (% of total population)	50.3	
Population projections	2030	2050
Projection of population, total (person)	3,048,000	2,960,000
Projection of urban population (person)	1,839,000	2,085,000
Projection of urban population (% of total population)	60.3	70.4

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy41

In Jamaica's economy, the service industry accounts for more than 60% of GDP. Foreign currency is highly dependent on the tourism industry, remittances from overseas migrants, and mining industries such as bauxite and alumina. Due to the global financial crisis and recession, the prices of bauxite and alumina plummeted, and the number of tourists, who are about 70% from the United States, decreased. In recent years, the economy has been improving.

Below is a summary of the economic situation of Jamaica.

Table 2-58 Economic situation of Jamaica

Item (Unit)	Data
GDP (current US$)	15,713,908,816.1
GDP per capita (current US$)	5,354.2
GNI per capita, PPP (current international $)	8,900.0
GDP growth (annual %)	1.9
GDP per capita growth (annual %)	1.5
Inflation, consumer prices (annual %)	3.7
Imports of goods and services (% of GDP)	51.1
Exports of goods and services (% of GDP)	38.0
Main industries (MOFA. 2019d)	Agriculture (coffee, sugar, banana)

[41] Source: MOFA. 2019d

Item (Unit)	Data
	mining (bauxite and alumina), manufacturing, construction, finance/insurance
Contribution of Fisheries to GDP (% of GDP) (2016 Preliminary) (CRFM. 2016)	0.50
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	34.0
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	6.6

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data

2.6.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Jamaica. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 7,834 to 27,823 tons/year. Since waste collection is a serious issue in the country with a waste collection rate of 64%, and a considerable amount of uncollected waste from households (358,605 tons/year), it is considered that the total loss of plastic into the marine environment is close to the maximum estimated value.

Table 2-59 Waste management status and emissions of marine plastic litter in Jamaica

Main item		Sub-item	Data	Unit
Generation		Amount generated	2,921	ton/day
		Proportion of plastic	12	%
		Amount of plastic litter generated	356	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	64.0	%
		Uncollected waste from households (World Bank Group. 2019)	358,605	ton/year
		Uncollected waste from households per person (World Bank Group. 2019)	122.2	kg/person/year
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	64.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	7,834	ton/year
		Amount released per day	21.46	ton/day
		Length of the coastline	1,022	km
		Amount released per km of coastline	7.67	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	27,823	ton/year
		Amount released per person	9.53	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d., UNEP. 2018b

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Starting from January 1, 2019, the Jamaican government has banned the import, manufacture, distribution and use of certain plastic packaging materials, including single-use plastic bags, expanded polystyrene foam and plastic straws (CEP. 2019). In addition, an environmental protection tax has been introduced in the country (UNEP. 2018a), which is levied on imported and domestically manufactured products and used for recycling costs and waste management (Jamaica Environment Trust. 2016).

Table 2-60 Policies and initiatives related to marine plastic litter in Jamaica

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	・ Plastic Ban (The Trade (Plastic Packaging Materials Prohibition) Order) and the NRCA (Plastic Packaging Materials Prohibition) Order).	・ The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution thatsupports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a). The NEPA Plastic Waste Minimization Project (2018-2021) aims to strengthen national policy and legal framework to reduce land-based marine plastic litter by implementing waste management activities (NEPA. n.d.). The Trash-Free Waters initiative, a joint enterprise between USEPA and UNEP, carried out recycling, social surveys, bin distribution, waste management improvement pilot projects, beach surveys, awareness activities, etc. from 2016 to 2018 (UN. n.d.).	・ Regulations on the protection and conservation of natural resources, protection from pollution and to secure clean beaches (Natural Resource Conservation Authority Act) (UNEP. 2014) ・ NEPA supports beach cleanup activities and conducts the Adopt a Beach program. The purpose is to raise public awareness on marine debris (NEPA. 2020).
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ Promotion of proper waste disposal and waste reduction technology through education and public awareness activities. Dissemination of information through television, radio, advertisements, SNS and leaflets distribution (UNEP. 2014). ・ In the Regional Collaboration for Marine Litter Reduction by GCFI and CaMPAM, after the community-wide cleanup, garbage cans and skips have been purchased and installed, and regular waste collection services have been set up (UNEP. 2014). The deposit system is a private sector initiative implemented by	・ Participation in the ICC coordinated by Ocean Conservancy. ・ 150 employees of multinational companies participated in "World Oceans Day" in 2019 and carried out beach cleanup activities.

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
		the Recycling Partners of Jamaica (RPJ). The price per pound (lb) of PET bottles is US$ 10. 360 schools are used as depots, and there are about 120 other depots nationwide. In fiscal year 2018/2019, 2.3 million pounds of PET bottles were collected (The Gleaner. 2020). In January 2020, NSWMA started a Plastic Separation Pilot Project in 12 communities of St Andrew. Once collected, the bottles are transported to the Recycling Partners of Jamaica Limited. As of April 2020, over 3,500 lbs of plastic have been collected from the communities (Jamaica Social Investment Fund, 2020).	

2.6.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Jamaica

Table 2-61 Waste-related organizations in Jamaica

Organization name	Responsibilities and/or Initiatives
Ministry of Local Government and Community Development (MLGCD)	Responsible for regional development including solid waste management. Policy and regulatory body for waste management.
Environment Health Unit of the Ministry of Health & Wellness	Provide the direction of strategic policies for environmental health programs.
National Solid Waste Management Authority (NSWMA)	Agency within the Ministry of Local Government and Community Development. Provide solid waste management services. The total number of NSWMA employees is 4,214.
National Environment and Planning Agency (NEPA)	Responsible for promoting sustainable development by ensuring the protection of the environment and orderly development.
Local Parish Councils (NEPA. n.d.)	Support solid waste management and collection.

Source: UNEP. 2014, IDB. 2016, Websiteof each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. In 2009, the Petroleum Corporation of Jamaica (PCJ) and Cambridge Project Development signed an MOU to build two incineration power plants with a total power generation capacity of 65 MW, but they have not been built

yet (Natacha C *et al.*, 2015). Then in 2012, British company Naanovo announced that it would build an incineration facility at the Riverton final disposal site. The project cost is estimated to be between US$ 140 million and US$ 180 million (Natacha C. *et al.*, 2015). The sale of the Riverton final disposal site seems to be underway as part of the plan to establish a WTE system, but details of the progress are unknown (Radio Jamaica News. 2020).

Table 2-62 Legal system related to waste management in Jamaica

Name of the legislation	Content
National Solid Waste Management Act (2001)	Established National Solid Waste Management Authority, stipulates waste management standards, etc.
National Solid Waste Management (Public Cleanliness) Regulations	Implement the National Solid Waste Management Act.
National Solid Waste Management Policy	Overall framework for solid waste management.
Public Health Act (1996)and Public Health Regulations	Regulations for environmental hygiene, waste management and pollution prevention.
National Energy from Waste Policy (2010-2030) (FAO. 2010)	The main purpose is to provide clean energy from waste at an affordable price for future generations. This policy stipulates the construction of economic infrastructure so that energy can be produced from waste.
Environmental Protection Levy	
Trade Actand The Trade (Scrap Metal) Regulations, 2013	Regulate the scrap metal industry.
The Trade (Plastic Packaging Materials Prohibition) Orderand The NRCA (Plastic Packaging Materials Prohibition) Order (MEGJC. 2019)	The ban on plastic packaging materials is governed by these two Ministerial Orders.

Source: UNEP. 2014, UNEP. 2018a, IDB. 2016

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-63 System and infrastructure related to waste management in Jamaica

Waste management stage	Content
Discharge	・ Illegal dumping (rivers, vacant lots, open burning) occurs as a result of low waste collection frequency. ・ Waste reduction through a pilot project on sorting, waste conversion, and recycling carried out by NSWMA (JICA. 2017).
Collection/Transport	・ Collection is carried out directly by the government with the support of private contractors. ・ Carried out according to the collection schedule of each area. ・ As of 2016, 30% of household waste is not collected. There is a disparity between urban and rural areas, with about 90% of solid waste collected in urban areas and only 50% in rural areas. ・ The total number of NSWMA trucks is 65. Two dump trucks were donated by the Japanese government through the embassy (see figure below).
Treatment	・ Initiatives to collect and export recyclable resources are mainly led by the private sector. Collecting metal scraps and PET bottles and selling them

Waste management stage	Content
	overseas is profitable. • Informal recyclers also work at the final disposal site. • Dairy farms and pig farms in the country generate electricity from organic waste at biogas plants.
Disposal	• There are 8 final disposal sites nationwide, but these are not sanitary landfills. The access roads to the disposal sites are damaged, and spontaneous combustion occurs inside the disposal sites. • Tipping fees at disposal sites are not being enforced. • Riverton and Retirement final disposal sites receive respectively about 60% and 20% of the waste generated in the country (Natacha C. *et al.*, 2015).

Source: IDB. 2016

Figure 2-24 Collection vehicles donated by the Japanese government[42]

Table 2-64 Jamaica's final disposal sites and site area[43]

Name	Disposal Site	Size (hectares)
Riverton	St Catherine	43.50
Church Corner	St Thomas	1.21
Martin's Hill	Manchester	7.82
Myersville	St. Elizabeth	3.70
Retirement	St. James	10.96
Tobolski	St. Ann	4.94
Hadden	St. Ann	3.88
Doctors Wood	Portland	n/a

Source: PIOJ, 2007

[42] Source: Jamaica Observer. 2020

[43] Source: IDB. 2016

Figure 2-25 Location of Jamaica's final disposal sites[44]

Retirement final disposal site[45]

Fire at Riverton final disposal site[46]

Figure 2-26 State of Jamaica's final disposal sites (Photographs)

[44] Source: NSWMA. n.d.

[45] Source: Jamaica Social Investment Fund. 2015

[46] Source: Jamaica Observer. 2015

2.7 Republic of Suriname

2.7.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Republic of Suriname is a country located in the northeastern part of South America, with a population of 575,991 (2018), and an area of 163,820 km^2 (about half of Japan) (MOFA. 2019e). It borders French Guiana on the east, Guyana on the west, Brazil on the south, and the Caribbean Sea and the Atlantic Ocean on the north.

Figure 2-27 Map of the Republic of Suriname[47]

The capital is Paramaribo, a northern city facing the Caribbean Sea and the Atlantic Ocean, and the capital population accounts for more than 40% of the total population. Ethnic groups are diverse, including Hindu (27.4%), Maroon (21.7%), Creole (15.7%), Javanese (13.7%) and mixed race (13.4%). The official language is Dutch, but English and Sranan are also used. The religions are Christianity (Protestant, Catholic, etc.), Hinduism, Islam, etc. The table below summarizes information on

[47] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

demographic trends and projections of future population changes in the country. Population in 2050 is expected to increase by about 18% compared to the population in 2018, with approximately three quarters of the population living in a major urban area.

Table 2-65 Demographic trends and population projections in Suriname

Items (Unit)	Data	
Population (person)	575,991	
Population increase (annual %)	1.0	
Population density (person/km^2)	3.7	
Urban population (person)	380,500	
Urban population (% of total population)	66.1	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	56.2	
Population ages 0-14 (% of total population)	27.2	
Population ages 15-64 (% of total population)	65.9	
Population ages 65 and above (% of total population)	6.9	
Population, male (% of total population)	50.3	
Population, female (% of total population)	49.7	
Population projections	2030	2050
Projection of population, total (person)	632,000	680,000
Projection of urban population (person)	428,000	504,000
Projection of urban population (% of total population)	67.6	74.0

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[48]

Mineral products, mainly gold, account for more than 50% of total exports, and agricultural products such as shrimps, rice, and bananas are also actively exported. Most of the capital and consumer goods depend on imports.

In 2009, as exports slumped due to decrease of investment and prices decrease, the economy slowed down. Although the growth momentum resumed after 2010, the economy has again been sluggish since 2014 due to the collapse in oil and resource prices.

Besides the economic crisis caused by significant deterioration in the terms of trade, the economy is also deteriorating due to insufficient fiscal buffers and policy responses. Furthermore, in connection with the general election held in 2015, expenditures far in excess of economic growth have been incurred, such as salaries of public officials equivalent to 1.1% of GDP, partial increase in social security expenses and public works projects. In addition, the value of the Surinamese dollar against the US dollar has fallen to

[48] Source: MOFA. 2019e

less than half, and in conjunction with soaring utility bills, inflation rate of over 60% was recorded in 2016. It is expected that the difficult situation will continue in the future.

The development of bauxite mines and new oil fields is underway through a partnership between a state-owned oil company and a western company, and further development is desired.

Below is a summary of the economic situation of the Republic of Suriname.

Table 2-66 Economic situation of Republic of Suriname

Items (Unit)	Data
GDP (current US$)	3,590,753,768.8
GDP per capita (current US$)	6,234.0
GNI per capita, PPP (current international $)	13,820.0
GDP growth (annual %)	1.9
GDP per capita growth (annual %)	0.9
Inflation, consumer prices (annual %)	N/A
Imports of goods and services (% of GDP)	N/A
Exports of goods and services (% of GDP)	N/A
Main industries (MOFA. 2019e)	Mining (gold, bauxite, oil), agriculture (rice, sugar, banana)
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	3.8
Contribution of Travel & Tourism to GDP (% of total economy) (WTTC. 2018)	3.7
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	9.0

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.7.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Republic of Suriname. The total amount of marine plastic litter released into the ocean , calculated using the two methods, is estimated to range from 1,530 to 10,508 tons/year. In the country, waste collection rate is 63-79.5%, and about 30,000 tons of household waste remains uncollected every year. Assuming that uncollected plastic waste accounts for about 11% of uncollected waste from households, it is considered that about 3,000 tons of plastic litter is released annually into the ocean.

Table 2-67 Waste management status and emissions of marine plastic litter in the Republic of Suriname

Main item	Sub-item	Data	Unit
Generation	Amount generated	234	ton/day
	Proportion of plastic	11	%
	Amount of plastic litter generated	26	ton/day
Discharge	Amount discharged	Unknown	
Collection/Transport	Collection rate (World Bank Group. 2019)	63.0-79.5	%
	Uncollected waste from households	29,599	ton/year

Main item		Sub-item	Data	Unit
		(World Bank Group. 2019)		
		Uncollected waste from households per person (World Bank Group. 2019)	51.4	kg/person/year
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	63.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	1,530	ton/year
		Amount released per day	4.19	ton/day
		Length of the coastline	386	km
		Amount released per km of coastline	4.0	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	10,508	ton/year
		Amount released per person	18.42	kg/person/year

Source: Created by JICA Survey Team based on the information of World Bank Group. n.d. and UNEP. 2018b.

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-68 Policies and initiatives related to marine plastic litter in the Republic of Suriname

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies including setting the legal systems and regulations	・ The ban on plastic bags is under discussion due to lobbying by NGOs (CEP. 2019). ・ Import ban on Styrofoam from May 1, 2019. Many companies quickly recognized the ban and switched to biodegradable products (Suriname Herald. 2019).	・ The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a).	・ N/A
Initiatives by local governments, companies and NGOs	・ Lobbying by NGOs such as Support Recycling Suriname (Suresur) and Green Heritage Fund Suriname (GHFS) for the ban on plastic bags (CEP. 2019).	・ N/A	・ Participation in the ICC coordinated by Ocean Conservancy. ・ Cleanup activities are carried out such as SuReSur World Clean Up Day (Stichting SuReSur, 2019).

2.7.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste

management sector

The table below describes the organizations related to waste in Suriname.

Table 2-69 Waste-related organizations in Suriname

Organization name	Responsibilities and/or Initiatives
Ministry of Public Works, Transport & Communications (OWT & C)	Responsible for waste management policies and regulations.
OWT & C Directorate of Public Green Spaces (Directoraat Openbaar Groen)	Responsible for cleaning activities, maintenance of public parks and monuments, etc.
OWT & C Department of Solid waste Collection and Disposal (VOV: Vuil Ophaal en - Verwerking)	Department in charge of solid waste collection and disposal., especially in Greater Paramaribo and Wanika. The activities of the organization are financed by the national budget.
Ministry of Regional Development	In charge of implementating waste collection and cleaning services throughout Suriname, excluding the Paramaribo area.
National Environment Council (NMR: Nationale Milieu Raad)	Advisory body to the Government of the Republic of Suriname.
National Institute for Environment and Development in Suriname (NIMOS: Nationaal Instituut voor Milieu en Ontwikkeling in Suriname)	Founded in 1998 as an autonomous government foundation and work arm of the NMR,NIMOS initiates the development of a national legal framework for environmental policy and management in the interest of sustainable development.

Source: UNEP. 2014, IDB. 2016, and Website of each organization.

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. The Waste Act (*afvalstoffenraamwet*) and Environment Act (*milieuraamwet*) have long been discussed and create the framework of the solid waste management sector.

Table 2-70 Legal system related ito waste management in Suriname

Name of the legislation	Content
Nuisance Act, 1929	Regulations regarding the installation of facilities that may cause danger, damage or inconvenience.
Police Criminal Code	A law that punishes improper disposal of waste.
Suriname Bureau of Standards (SSB: Surinaams Standaarden Bureau)	The Surinaams Standaarden Bureau establishes standards for waste collection and treatment.

Source: IDB. 2016 and UNEP *et al.*, 2019

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. Waste collection from residents is covered by taxes while businesses have to pay a small additional fee (RAC-REMPEITC Carib. 2018).

The coastal zone of Suriname is very flat. The capital Paramaribo is located in the coastal zone, that is vulnerable to flash floods, especially during the rainy season from late April to early August every year

(Meteorological Service Suriname. n.d.). In recent years, the situation has worsened with waste dumped into canals and plastic litter blocking drains (Meteorological Service Suriname. n.d.).

Table 2-71 System and infrastructure related to waste management in the Republic of Suriname

Waste management stage	Content
Collection/ Transport	・ Collection and transport are carried out by each local government directly or through private contractors.
Treatment, including planning stage	・ OWT & C signed an MOU with GSD Innovations in March 2019. Projects related to household waste treatment are planned, including management of the final disposal site and municipal solid waste, separation and treatment, oil production from plastic litter, wastewater treatment and incineration of waste residue (WTE is also considered). ・ It was agreed that options will be developed to confirm financial feasibility of WTE. ・ At the facility proposed in Ornamibo, 220 tons of household waste will be sorted and treated daily. In addition, waste from the existing final disposal site will also be treated at a daily rate of 95 tons (estimate). ・ The project development phase was scheduled for the third quarter of 2019. By the first quarter of 2020, the recycling and oil production facilities should be operational, additionally, the design of the incinerator should be completed and the construction should start. Test operation of the incinerator should start in the first quarter of 2021.
Disposal	・ Ornamibo final disposal site is mainly used in the Great Paramaribo region. It used to be an open dumping site, but rehabilitation of infrastructure and construction works such as roads and lighting have been carried out. Waste covering with soil is a requirement for compliance.

Source: IDB. 2016, OWT & C. 2019, and De Bood Schap. 2019

Figure 2-28 Soil cover operation in the Ornamibo final disposal site in the Republic of Suriname (Photograph)[49]

[49] Source: OWT & C. 2019

2.8 Saint Vincent and the Grenadines

2.8.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Saint Vincent and the Grenadines is an island country located in the Caribbean Sea with a population of 110,210 (2018) and an area of 390 km^2 (almost the same as Fukue Island in the Goto Islands) (MOFA. 2019 f). It consists of the volcanic island of St. Vincent and the Grenadines archipelago (31 remote islands: Bequia, Mustique, Canouan, Mayreau, Union Island, Petit Mustique, Savan, The Pillories, Baliceaux, Isle à Quatre, etc.). Neighboring countries are Saint Lucia on the north side, Barbados on the east side, and Grenada on the southwest side (JICA. 2015).

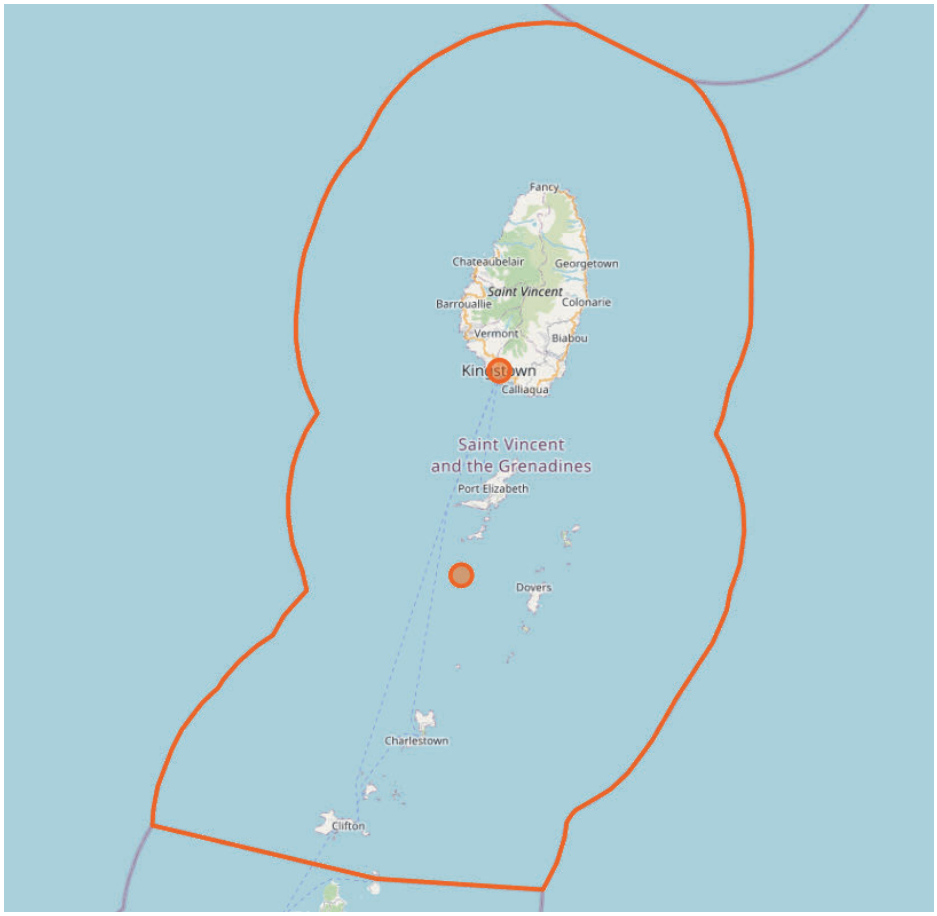


Figure 2-29 Map of Saint Vincent and the Grenadines[50]

The capital is Kingstown, whose population accounts for about 25% of the country's total. The main ethnic group are African (72.8%) and mixed race (20%), and others include Europeans (4%), Caribs (3.6%), and East Indians (1.4%). The official language is English, but Vincentian Creole is also used.

[50] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

The religion is mainly Christianity (Church of England, Protestantism, Catholicism, etc.). The table below summarizes information on demographic trends and projections of future population changes in the country. The population is expected to increase by 2030 and then decline in 2050.

Table 2-72 Demographic trends and population projections in Saint Vincent and the Grenadines

Items (Unit)	Data	
Population (person)	110,210	
Population increase (annual %)	0.3	
Population density (person /km^2)	282.6	
Urban population (person)	57,527	
Urban population (% of total population)	52.2	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	3.7	
Population ages 0-14 (% of total population)	22.5	
Population ages 15-64 (% of total population)	67.9	
Population ages 65 and above (% of total population)	9.6	
Population, male (% of total population)	50.8	
Population, female (% of total population)	49.2	
Population projections	2030	2050
Projection of population, total (person)	113,000	109,000
Projection of urban population (person)	65,000	71,000
Projection of urban population (% of total population)	57.3	65.5

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[51]

The economy is centred on tourism and exports of bananas that are a traditional agricultural product. Despite being affected by external factors such as natural disasters and fluctuations in international prices, stable growth is maintained by improving the quality of agricultural products and promoting diversification. The attacks of September 11, 2001 in the United States affected the tourism industry, and economic growth was sluggish in 2001, but tourism and banana exports have been favourable since then, so that economic growth was about 4% in 2007. Since 2008, the tourism industry has been sluggish due to the global economic recession, but the macro economy has been steadily growing owing to the export of agricultural products.

Below is a summary of the economic situation of Saint Vincent and the Grenadines.

[51] Source: MOFA. 2019f

Table 2-73 Economic situation of Saint Vincent and the Grenadines

Items (Unit)	Data
GDP (current US$)	811,300,000.0
GDP per capita (current US$)	7,361.4
GNI per capita, PPP (current international $)	12,160.0
GDP growth (annual %)	2.2
GDP per capita growth (annual %)	1.8
Inflation, consumer prices (annual %)	2.3
Imports of goods and services (% of GDP)	N/A
Exports of goods and services (% of GDP)	N/A
Main industries (MOFA. 2019f)	Tourism, agriculture (banana industry)
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.50
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	45.5
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	7.2

Source: Created by JICA Survey Team based on 2018 data of World Development Indicators of World Bank Group.

2.8.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Saint Vincent and the Grenadines. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 295 to 2,287 tons/year. Since waste collection rate and landfill disposal rate are high, the amount of plastic waste released into the ocean is not expected to be at a significant level.

Table 2-74 Waste management status and emissions of marine plastic litter in Saint Vincent and the Grenadines

Main item		Sub-item	Data	Unit
Generation		Amount generated	87	ton/day
		Proportion of plastic	8	%
		Amount of plastic litter generated	7	ton/day
Discharge		Amount discharged	Unknown	
Collection/Transport		Collection rate (World Bank Group. 2019)	96.0	%
		Uncollected waste from households (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	99.91	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	295	ton/year
		Amount released per day	0.18	ton/day
		Length of the coastline	84	km
		Amount released per km of coastline	3.5	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	2,287	ton/year
		Amount released per person	20.82	kg/person/year

Source: Created by JICA Survey Team based on information of World Bank Group. n.d. and UNEP. 2018b.

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. Styrofoam for food service products has been phased out since 2017, and the use of biodegradable, recyclable and other environmentally friendly food containers or packaging is promoted (VAT is exempted on these products). The law is fully enforced since January 31, 2018, and violators can be fined up to 5,000 EC and/or imprisonment for 12 months (UNEP. 2018c).

The import of single-use plastic bags will be banned from March 1, 2020, and their distribution, sale and use will be prohibited from August 1, 2020. Also, the import of single-use plastic food service containers will be banned from August 1, 2020, and their distribution, sale and use will be prohibited from January 1, 2021 (Searchlight. 2019).

Table 2-75 Policies and initiatives related to marine plastic litter in Saint Vincent and the Grenadines

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ Deposit on non-returnable beverage bottles (UNEP. 2018a). ・ Ban on import, manufacture, sale, use or provision of Styrofoam for food service products (Environmental Health (Expanded Polystyrene Ban) Regulations (SRO No.21 of 2017)). ・ Signed a ban on single-use plastic bags and designated plastic containers in November 2019 (Searchlight, 2019)	・ There is EPR for single-use plastics (UNEP. 2018a). ・ Littering of public places and private land is prohibited. Sufficient waste bins must be installed in public institutions, busses, taxis, ships and boats (Litter Act No. 15 of 1991, Environmental Health Services Act No. 14 of 1991) (UNEP. 2014).	・ Prohibition of dumping hazardous waste into marine protected areas (Fisheries Act) (UNEP. 2014). ・ Pollution prevention of solid waste from ships (Management of Ship Generated Solid Waste Act No. 16 of 2002).
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ N/A	・ The Sustainable Grenadines Project was implemented in 2008-2010 by a local non-profit organization (later SusGren, an international NGO). Environmental management workshops were held for fishermen, vendors, and water taxi

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
			drivers operating near the Tobago Cays Marine Park to raise awareness. In addition, a waste management program was implemented at the marine park, such as supporting patrols with the cooperation of related parties (SusGren. n.d.). ・ Participation in the ICC coordinated by Ocean Conservancy. ・ NGOs carry out related activities such as beach cleanup and awareness raising.

2.8.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Saint Vincent and the Grenadines.

Table 2-76 Waste-related organizations in Saint Vincent and the Grenadines

Organization name	Responsibilities and/or Initiatives
Ministry of Health, Wellness and the Environment, Environmental Health Division	Responsible for waste management policy and regulations. The Division promotes environmental hygiene practices related to waste removal and maintenance of public toilets and baths. It coordinates and implement regional and international activities related to environmental treaties, agreements and protocols.
CWSA: Central Water and Sewerage Authority	A semi-governmental company under the jurisdiction of the Ministry of the Environment. It provides solid waste management services and manages SWMU. The total number of staff is 291 as of December 31, 2016. 224 staff belong to the water and sewage section, and 67 staff belong to the solid waste management unit.
SWMU: Solid Waste Management Unit	The Unit was established in 1999 and belongs to CWSA. It consists of the following departments: waste collection, management of final disposal site, waste reduction and environmental education. It has a management information system (MIS). The annual budget is about ECD 8 million (Eastern Caribbean dollar).

Source: UNEP. 2014, and Website of each organzsation.

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-77 Legal system related to waste management in Saint Vincent and the Grenadines

Name of the legislation	Content
Litter Act No. 15 of 1991	Act that regulates and control littering.

Name of the legislation	Content
Environmental Health Services Act No. 14 of 1991	Regulations on activities that can affect public health and the environment.
Waste Management Act No. 31 of 2000	Act that prescribes the management of solid waste in accordance with best environmental practices.
Management of Ship Generated Solid Waste Act No. 16 of 2002	Guidelines for preventing pollution from solid waste from ships.
Solid Waste regulations No. 11 of 2005	These regulations are related to SWMU.
Environmental Health (Expanded Polystyrene Ban) Regulations (SRO No.21 of 2017)	Prohibition of import, manufacture, sale, use or provision of food service products using Styrofoam. Promotion of the use of biodegradable, recyclable and other environmentally friendly food containers or packaging.

Source: UNEP. 2014, UNEP. 2018a, and St. Vincent and the Grenadines. 2019

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. The country is vulnerable to many natural disasters such as hurricanes, earthquakes, volcanic activity, droughts, tsunamis, floods and landslides. The National Emergency Management Organization (NEMO) urges to ensure that waste does not block drainage pipes (NEMO. n.d), and the Central Water and Sewerage Authority (CWSA) provides prevention recommendations and communicates the current status of disaster on its Facebook page (Central Water and Sewerage Authority. 2015).

To secure the cost of recycling, an import tax of ECD 0.5 is levied on each PET bottle and can. However, if the importer or the agent properly disposes of it as a recyclable resource, it is possible to receive a refund (JICA.2015).

In addition, there is an intention to construct a WTE and biogas power generation facility, and a feasibility study for these technologies has already been carried out (JICA. 2015).

Table 2-78 System and infrastructure related to waste management in Saint Vincent and the Grenadines

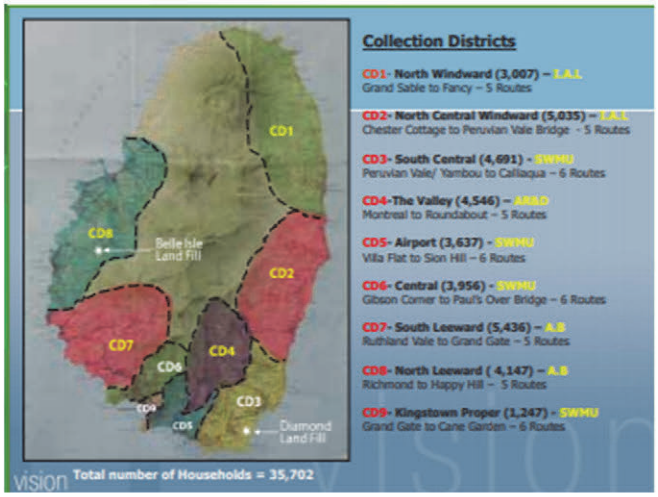
Waste management stage	Content
Discharge	・Only 8% of the residents of the Grenadines pay the monthly environmental fees. ・Solid waste revenue in 2015 was US$ 7,898,127.
Collection/Transport	・St. Vincent Island is divided into 9 districts, and waste is collected by three private contractors in 5 districts, and SWMU in the remaining 4 districts. Collection of municipal waste is carried out based on a daily route schedule (as of 2015). ・Waste collection operations in some of the remote islands (Bequia, Canouan, Union Island, etc.) other than the main island are also outsourced to the private sector. ・Private operators are selected by bidding and have a 3-year contract. ・SWMU and entrusted private sector companies posses their own collection vehicles. SWMU possesses 9 vehicles purchased with own funds. Necessary spare parts are ordered from the UK. ・SWMU gains income from waste collection fees. Charges apply to

Waste management stage	Content
	households where water pipes are connected. ECD 17/month is charged to general households regardless of the amount discharged, and ECD 50-500 (upper limit)/month is charged to companies based on the number of office workers. ・SWMU provides a free collection service for white goods waste twice a year on St. Vincent Island (as of 2015). ・Besides general waste, industrial waste, hospital waste and harmful waste are also collected for disposal.
Treatment	・SWMU produces charcoal, compost and wood chips, which are sold to residents and farmers, to reduce the amount of disposal and recover part of the waste management costs. ・Scrap metal is exported by individuals and private companies, under the monitoring of SWMU. Due to the small number of export products in the country, scrap metal was the number one export item in 2012. ・Recyclable waste such as paper, plastic, and metal is first brought to the final disposal site, but is then picked up by a recycler.
Disposal	・There are 5 sanitary landfill sites operated and managed by SWMU. Two (Diamond and Belle Isle) on the main island , and one each on Bequia, Canouan, and Union Island in the Grenadines. ・Two sanitary landfill sites were constructed in 2001 and 2004 using a CDB loan. ・Medical waste is crushed into small pieces and disposed of in landfill without sanitary treatment.

Source: CWSA. 2015 and JICA. 2015

Figure 2-30 Collection vehicles used in Saint Vincent and the Grenadines (Photographs)[52]

[52] Source: CWSA. 2015



Waste Collector	Collector Code	District	Percentage
Bullocks Trucking	AB	CD8 & CD7	17
AR & D Trucking	AR&D	CD4	16
Industrial Autmotive Supply	IAS	CD1 & CD2	11
Solid Waste Unit	SWMU	CD3, 5, 6 & 9	56
TOTAL			100

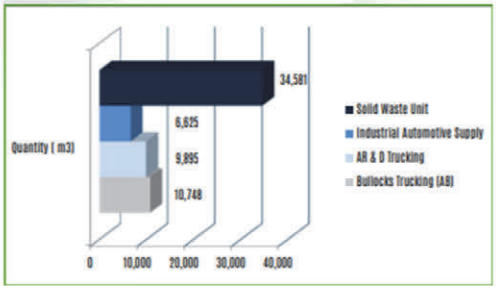


Figure 2-31 Breakdown of the nine districts and collectors on St. Vincent Island[53]

Disposal Site	Location	Total Volume of Waste (m^3)
Diamond Landfill	St. Vincent	124, 120
Belle Isle Landfill	St. Vincent	16, 223
Raintree Landfill	Bequia	6, 470
Taffia Landfill	Canouan	17, 853
Clifton Landfill	Union Island	1, 972

Figure 2-32 Amount of waste at the five sanitary landfills[54]

Raintree final disposal site

Taffa final disposal site

Clifton final disposal site

Figure 2-33 Sanitary landfills in Saint Vincent and the Grenadines (Photographs)[55]

[53] Source: CWSA. 2015

[54] Source: CWSA. 2015

[55] Source: CWSA. 2015

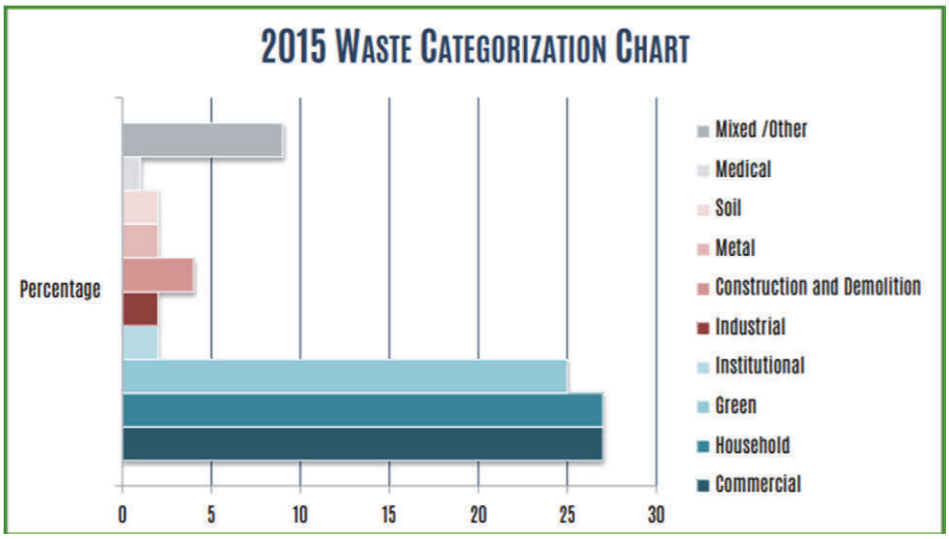


Figure 2-34 Types of waste received at the final disposal sites (2015) [56]

[56] Source: CWSA. 2015

2.9 Saint Christopher and Nevis

2.9.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Saint Christopher and Nevis is an island nation located in the Caribbean Sea with a population of 52,441 (2018) and an area of 260 km^2 (almost the same as Iriomote Island) (MOFA. 2019g). The population and area are the smallest in the Americas. It consists of two islands, Saint Kitts on the northwest side and Nevis on the southeast side. Neighboring countries are British Anguilla in the northwest, Antigua and Barbuda in the east, and the British island of Montserrat in the southwest.

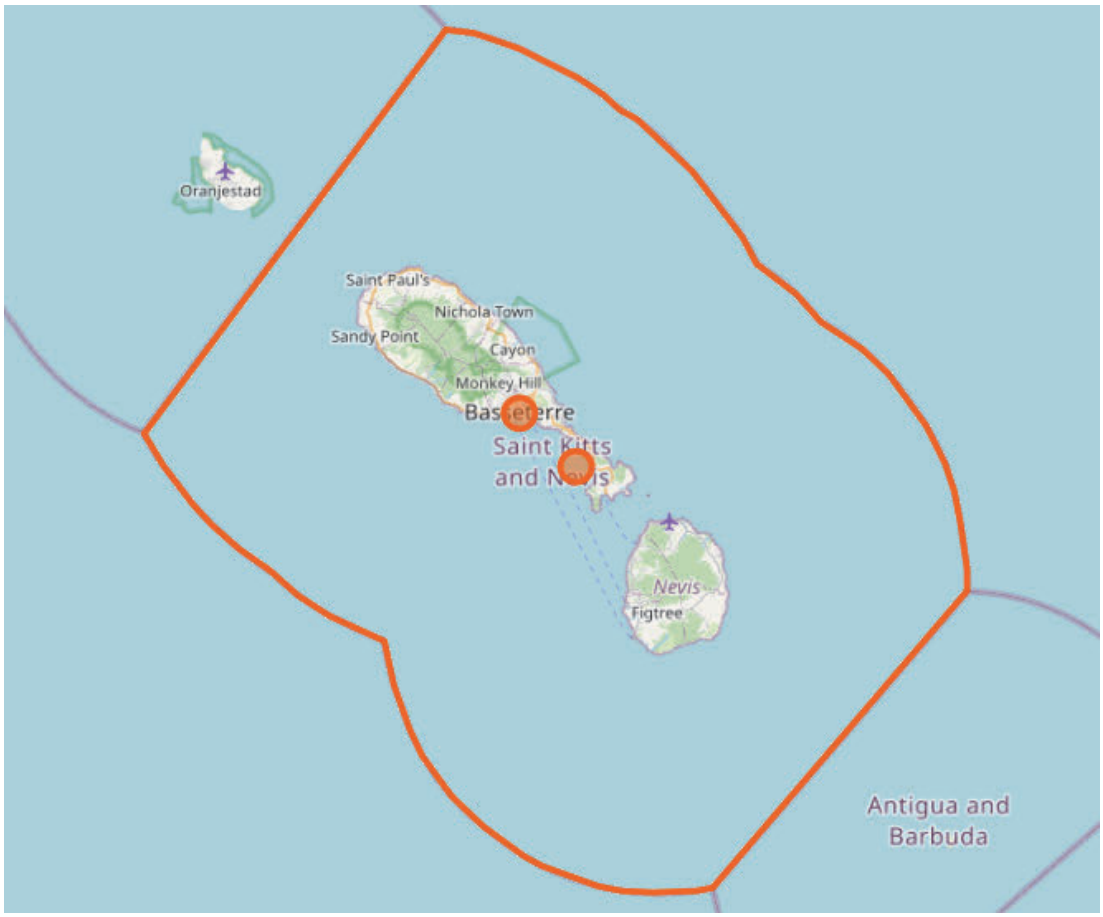


Figure 2-35 Map of Saint Christopher and Nevis[57]

The capital is Basseterre, whose population accounts for more than 25% of the total. The main ethnic group is African (92.5%), and others include mixed races (3.0%), Caucasians (2.1%), East Indians (1.5%), etc. The table below summarizes information on on demographic trends and projections of future population changes in the country. According to predictions, future population will increase

[57] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

slightly up to 2030 and then level off until 2050.

Table 2-79 Demographic trends and population projections in Saint Christopher and Nevis

Items (Unit)	Data	
Population (person)	52,441	
Population increase (annual %)	0.8	
Population density (person /km^2)	201.7	
Urban population (person)	16,139	
Urban population (% of total population)	30.8	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	3.9	
Population ages 0-14 (% of total population)	N/A	
Population ages 15-64 (% of total population)	N/A	
Population ages 65 and above (% of total population)	N/A	
Population, male (% of total population)	N/A	
Population, female (% of total population)	N/A	
Population projections	2030	2050
Projection of population, total (person)	56,000	56,000
Projection of urban population (person)	18,000	23,000
Projection of urban population (% of total population)	32.4	40.3

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[58]

In the past, the country was heavily dependent on sugar production, but as a result of economic diversification measures including the promotion of agricultural products other than sugar such as citrus fruits, tourism, and offshore finance , the economic structure is now centred on the service industry. In the early 1990s, driven by the growth of the tourism industry, the manufacturing and agriculture industries, centred on light industrial products and food products, grew rapidly, maintaining a relatively high growth rate and a low unemployment rate. However, the economy is sensitive to external factors, and the damages caused by Hurricane George in 1998, and Hurricanes Jose and Lenny in 1999 had a serious impact on agriculture and tourism, and the number of tourists decreased due to the attacks of September 11, 2001 in the United States. In 2005, the sugar industry was closed and the economy remained centred on tourism. Since then, although tourism revenue has declined significantly due to the recession of the world economy, continued growth could be observed subsequently thanks to the revitalization of the construction industry, manufacturing industry, tourism industry, etc.

Below is a summary of the economic situation of Saint Christopher and Nevis.

[58] Source: MOFA. 2019g

Table 2-80 Economic situation of Saint Christopher and Nevis

Items (Unit)	Data
GDP (current US$)	1,010,822,222.2
GDP per capita (current US$)	19,275.4
GNI per capita, PPP (current international $)	28,530.0
GDP growth (annual %)	2.9
GDP per capita growth (annual %)	2.1
Inflation, consumer prices (annual %)	-1.0
Imports of goods and services (% of GDP)	58.8
Exports of goods and services (% of GDP)	59.9
Main industries (MOFA. 2019g)	Tourism, manufacturing (clothing, footwear, etc.)
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.32
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	62.4
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	1.2

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.9.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Saint Christopher and Nevis. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 485 to 3,675 tons/year. Since waste collection rate and landfill disposal rate are high, the amount of plastic waste released into the ocean is not expected to be at a significant level.

Table 2-81 Waste management status and emissions of marine plastic litter in Saint Christopher and Nevis

Main item		Sub-item	Data	Unit
Generation		Amount generated	86	ton/day
		Proportion of plastic	23	%
		Amount of plastic litter generated	20	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	95.0	%
		Uncollected waste from households (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	100.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	485	ton/year
		Amount released per day	1.33	ton/day
		Length of the coastline	135	km
		Amount released per km of coastline	1.0	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	3,675	ton/year
		Amount released per person	70.62	kg/person/year

Source: Created by JICA Survey Team based on the information of World Bank Group. n.d. and UNEP. 2018b

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. The Ministry of the Environment announced in December 2019 that it would consider prohibiting the use of single-use plastics, but hinted that it could take up to five years for plastics to be completely banned in order to ensure a sufficient coordination period (St Kitts & Nevis Observer. 2019).

Table 2-82 Policies and initiatives related to marine plastic litter in Saint Christopher and Nevis

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	・Deposit of non-returnable beverage bottles and cans (Trade (Bottles and Cans Deposit Levy) Act, 2002). ・An online petition for a ban on disposable plastics was supported by government members in September 2019 (SKN News. 2019).	・There is Extended Producer Responsibility for single-use plastics (UNEP. 2018a). ・Prime Minister and Finance Minister considered a ban on single-use plastics and Styrofoam containers in 2018 and announced the start of an island-wide recycling program (UNEP. 2018a). ・Pollution prevention and control of basic hygiene in water supply. Prohibitionto discharge offensive solid or liquid matter into waterways (Water Courses and Water Works Ordinance) (UNEP. 2014). ・The Ministry of Tourism hosted Plastic Free July in 2018 and 2019 to explain how plastic pollution threatens marine life, the environment, health, and tourism (St Kitts & Nevis Observer. 2019).	・As part of Youth Month 2019, the Department of Youth Empowerment and the Department of Marine Resources organized cleaning activities. The Ministry of the Environment was in charge of waste disposal (Usfnews. 2019).
Initiatives of local governments, companies, NGOs, etc.	・N/A	・N/A	・Participation in the ICC coordinated by Ocean Conservancy. ・ICC and National Beach Clean-ups carry out beach cleaning for coastal beautification and to provide statistical data for geography and sociology in junior high school. The Tourism Bureau is also involved (UNEP. 2014). ・Volunteers who participated in Youth Month 2019 were divided into teams for activities both on the beach and in

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
			the sea (Usfnews. 2019). ・Heart of St. Kitts Foundation conducts collection activities of plastic containers and beach cleaning activities.

2.9.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Saint Christopher and Nevis.

Table 2-83 Waste-related organizations in Saint Christopher and Nevis

Organization name	Responsibilities and/or Initiatives
The Saint Christopher and Nevis Solid Waste Management Corporation (SWMC)	・ Established in 1996 with the responsibility of supervising the collection and disposal of solid waste. It carries out waste collection and transport, sorting, storage, reuse, recycle, treatment and disposal. ・ There is a strategic disaster countermeasure plan to prepare for natural disasters in both waste collection and landfill. An initial response team will be assigned in the event of a natural disaster. Also, it ensures that drainage channels and regulation pond at the final disposal site are clean, not only during the hurricane season, but throughout the year (St. Kitts Solid Waste Management Corporation. n.d.).
Nevis Solid Waste Management Authority (NSWMA)	・ Agency of the Ministry of Health that is in charge of the collection and disposal of household waste in Nevis.
Department of Environment	・ Environmental policy and regulatory body, including for waste management.
Environmental Health Department, Ministry of Health	・ Promotion of the integrated protection and preservation of the natural and historic resources of St. Christopher and Nevis for the purposes of conservation, and provision of the effective management and sustainable development of resources for the benefit of prosperity.
Physical Planning Department, Ministry of Sustainable Development	・ Regulate the development of land and buildings. Prevent, mitigate and/or reverse environmental degradation.

Source: UNEP. 2014 and Website of each organization.

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-84 Legal system related to waste management in Saint Christopher and Nevis

Name of the legislation	Content
(Amended) Public Health Act, 1969	Act on the management of environmental health issues and the maintenance of hygiene.
Solid Waste Management Corporation Act, 1996	Established SWMC.

Name of the legislation	Content
(Amended) Nevis Solid Waste Management Authority Ordinance, 2002	Solid waste storage, collection, treatment and disposal on Nevis. Established NSWMA.
(Amended) Solid Waste Management Act, 2009	Law on the provision of solid waste management in compliance with best environmental practices. When applying for a waste management license, the applicant must submit a disaster countermeasure plan to the Minister and review the plan every year after the license is issued.

Source: UNEP. 2014 and UNEP. 2018a

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-85 System and infrastructure related to waste management in Saint Christopher and Nevis

Waste management stage	Content
Discharge	・ SWMC is responsible for collecting household waste from homes and small apartments, and carries out curb side collection. On the other hand, the disposal of household waste from apartments, condominiums, and university dormitories is the responsibility of the housing manager. ・ The disposal of "non-household waste" discharged from companies, educational institutions, government agencies, etc. is the responsibility of the discharger. ・ In the event of a disaster, SWMC recommends fixing waste bin can to a sturdy structure, making sure that the waste bin has holes for drainage, and pruning branches to minimize the effects of natural disasters. (St. Kitts Solid Waste Management Corporation. n.d).
Collection/Transport	・ SWMC or contractor collects waste. ・ There is a collection schedule for each area, and a collection service is provided at least once a week in St. Kitts island (at least twice a week on Nevis island). ・ SWMC also accepts special waste such as medical waste, chemical waste (printer toner), battery, pesticide, hazardous waste containers, waste from slaughterhouse, waste from cruise ships, etc. as hazardous waste.
Treatment	・ There is a plan for a WTE facility on Nevis island (2015) in partnership with the US Omni Alpha company (Nevis Island Administration. 2014).
Disposal	・ The final disposal site on St. Kitts island is located on the suburbs of Conaree, which used to be an open dumping site but has become a sanitary landfill in 2002. ・ Final disposal site on Nevis island is Low Ground Sanitary Landfill. ・ Final disposal site owned by SWMC accepts construction and demolition waste. ・ Drainage and regulation ponds have been constructed in the final disposal site owned by SWMC based on the disaster countermeasure plan, and a temporary disposal site exists as a temporary storage site (St. Kitts Solid Waste Management Corporation. n.d.).

Source: St. Kitts Solid Waste Management Corporation. n.d.

Waste collection

Compactors for waste collection

Scrap metal squeezed in final disposal site

Sanitary landfill site in Conaree

Figure 2-36 Waste management in Saint Christopher and Nevis (Photographs)[59]

[59] Source: The Saint Christopher and Nevis Solid Waste Management Corporation. 2020

2.10 Saint Lucia

2.10.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Saint Lucia is an island nation located in the Caribbean Sea with a population of 181,889 (2018) and an area 620 km^2 (almost the same as Awaji Island) (MOFA. 2019h). Regarding neighboring countries, there are the French Martinique on the north side, St. Vincent and the Grenadines on the south side, and Barbados on the southeast side.

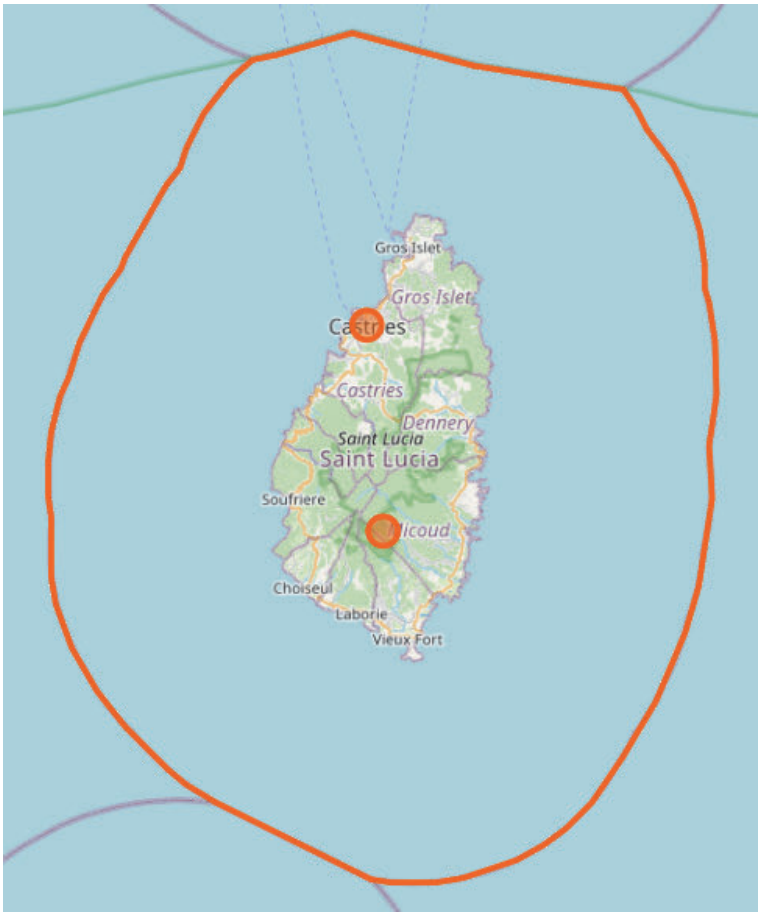


Figure 2-37 Map of Saint Lucia[60]

The capital is Castries, which is located on the north side, and the capital population accounts for about 12% of the total population. Africans account for 85.3% of the ethnic groups, and others are mixed races (10.9%) and East Indians (2.2%). The official language is English, but Saint Lucian Creole is also used. Christianity (Catholic, Protestant, Anglican, etc.) is the main religion. The table below summarizes information on demographic trends and projections of future population changes in the country.

[60] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

Population is expected to increase slightly in 2030 and then decrease in 2050. The population ratio in urban areas will be about 25% in 2050, which is less concentrated than in the other surveyed countries.

Table 2-86 Demographic trends and population projections in Saint Lucia

Items (Unit)	Data	
Population (person)	181,889	
Population increase (annual %)	0.5	
Population density (person/km^2)	298.2	
Urban population (person)	33,973	
Urban population (% of total population)	18.7	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	1.6	
Population ages 0-14 (% of total population)	18.5	
Population ages 15-64 (% of total population)	71.7	
Population ages 65 and above (% of total population)	9.8	
Population, male (% of total population)	49.2	
Population, female (% of total population)	50.8	
Population projections	2030	2050
Projection of population, total (person)	189,000	182,000
Projection of urban population (person)	38,000	49,000
Projection of urban population (% of total population)	20.4	26.6

Source: World Bank Group. World Development Indicators.

2) Macroeconomic situation, economic policy[61]

It is an economy that relies on agriculture, with a focus on banana exports, and tourism. Due to the slump in banana production caused by natural disasters such as hurricanes and price fluctuations in the international market, the economy has shifted to a tourism-centred and achieved steady economic growth. Because of the global economic recession since 2008, foreign investment has plummeted, and the economy has been sluggish.

The following is a summary of the economic situation in Saint Lucia.

Table 2-87 Economic situation in Saint Lucia

Items (Unit)	Data
GDP (current US$)	1,921,848,222.2
GDP per capita (current US$)	10,566.0
GNI per capita, PPP (current international $)	12,990.0
GDP growth (annual %)	0.9
GDP per capita growth (annual %)	0.3
Inflation, consumer prices (annual %)	1.9
Imports of goods and services (% of GDP)	N/A

[61] Source: MOFA. 2019h

Items (Unit)	Data
Exports of goods and services (% of GDP)	N/A
Main industries (MOFA. 2019h)	Agriculture (banana, coconut), tourism
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.54
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	41.8
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	2.1

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.10.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Saint Lucia. The total amount of marine plastic litter released into the ocean , calculated using the two methods, is estimated to range from 295 to 4,301 tons/year. Since the waste collection rate and the disposal rate in a sanitary landfill are both high, the amount of plastic litter released into the ocean is not expected to be large.

Table 2-88 Waste management status and emissions of marine plastic litter in Saint Lucia

Main item		Sub-item	Data	Unit
Generation		Amount generated	217	ton/day
		Proportion of plastic	22	%
		Amount of plastic litter generated	48	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	96.0-100	%
		Uncollected waste from households (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	96.8	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	295	ton/year
		Amount released per day	0.18	ton/day
		Length of the coastline	158	km
		Amount released per km of coastline	3.1	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	4,301	ton/year
		Amount released per person	23.77	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. The government announced in March 2018, that it would mitigate the environmental impact of plastics in marine and land environments (CEP. 2019).

- Phase out of Polystyrene (Styrofoam) from food service containers.
- No import tax on all biodegradable and compostable food service containers.
- Total ban on plastic bags to encourage the use of reusable shopping bags, and a total ban on single-use plastics and personal care products that contain microplastics.
- Waste conversion and minimization strategies conducted by the Solid Waste Management Authority in collaboration with related organizations. Promotion of recycling, reuse, composting, and alike for the prolongation of the life of the final disposal site and the provision of employment and economic opportunities.
- Public awareness raising activities regarding the economic and environmental impacts of alternative products.
- Increased opportunities for education and public awareness raising activities in order to understand the negative impacts of plastics and to encourage community recycling and composting.
- Proposal for a subclassification of plastics to the Council of Trade and Economic Development (COTED) as member country responsible for sustainable development within CARICOM.
- Prohibition of Styrofoam. Import ban from December 1, 2018, use ban by November 30, 2019.

Imports of Styrofoam and plastic food service containers were actually banned after December 1, 2018, then their use was prohited and the ban is now total.

The plastic waste recycling project carried out by UNITE Caribbean aims to (UNITE Caribbean. n.d., St. Lucia News Online. 2019a):

- Establish a stakeholder involvement system for the collection and management of plastic waste.
- Support the export of used PET bottles from local recyclers to Martinique.
- Raise awareness about the management and separation of recyclable waste.
- Share lessons from the pilot projects with other regions.

Table 2-89 Policies and initiatives related to marine plastic litter in Saint Lucia

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ Environmental protection levy for	・ The Returnable Container Bill is nearing	・ There are regulations prohibiting the

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
establishment of regulations	imported goods and related matters (Environmental Protection Levy Act) (UNEP. 2018a). ・ Ban on import, manufacture, sale, use or distribution of Styrofoam and Plastic Food Service Containers (Styrofoam and Plastic Food Service Containers (Prohibition) Act No. 22 of 2019)	completion. Considering measures to deal with the inappropriate disposal problem of plastic waste (UNEP. 2018a) ・ The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a).	pollution of the aquatic environment (Fisheries Regulations (No. 9 of 1994)).
Initiatives of local governments, companies, NGOs, etc.	・ Major retailers charge for plastic bags (SLHTA. n.d.).	・ Two-year pilot project on the recycling of plastic waste in the RePlast OECS project conducted by UNITE Caribbean (UNITE Caribbean, n.d., St. Lucia News Online. 2019a)	・ Economic Assessment of the Impact of Marine Litter on the Livelihood of Fishers Demonstration Project in Bananes Bay. SLSWMA and fishermen in Bananes Bay work together to remove large debris. Project activities included measuring and assessing the amount and type of waste (UNEP. 2014). ・ Participation in the ICC coordinated by Ocean Conservancy. ・ Underwater and land waste were collected on Earth Day 2018.

2.10.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Saint Lucia.

Table 2-90 Waste-related organizations in Saint Lucia

Organization name	Responsibilities and/or Initiatives
Saint Lucia Solid Waste Management Authority (SLSWMA)	Established for the purpose of improving public health and environmental quality standards through efficient waste management. Involved in waste management operations

Organization name	Responsibilities and/or Initiatives
	nationwide. Annual budget of SLSWMA is about ECD 12 million (Eastern Caribbean dollar) (JICA. 2015). The number of staff is 8 (JICA. 2015).
Sustainable Development & Environment Division, Ministry of Education, Innovation, Gender Relations and Sustainable Development	The Ministry of Education, Innovation, Gender Relations and Sustainable Development is the policy maker. The Sustainable Development & Environment Division is in charge of regulation. It oversees all issues related to sustainable development in the country and confirms compliance with various protocols.
Environmental Health Department (EHD), Ministry of Health and Wellness (MOHW)	The Department reviews plans, implements and supervises public health and related regulatory practices. It is responsible for promoting public awareness about public health and environmental issues, including health-affecting practices such as food preparation, public health, solid waste management, liquid and solid waste treatment, dust and air pollution, water quality, and occupational health and safety issues.
Castries Constituency Council	Daily management of the capital Castries includes regular cleaning of small drains in urban areas.

Source: UNEP. 2014, IDB. 2016, GoSL. 2019, and Website of each organization.

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. In the past, the introduction of waste collection fees was considered, but the government chose an environmental tax paid by visitors.

Table 2-91 Legal system related to waste management in Saint Lucia

Name of the legislation	Content
Environmental Levy Order 1996 and Management of Containers Bill, Returnable Containers Bill・Management of Beverage Containers Act (Draft)	Encourage the return of plastic containers in exchange for refund payments. UNEP provided financial support to develop a solid waste management strategy in 2016.
Waste Management Act (No. 8 of 2004)	Establishment of SLSWMA in response to littering and illegal dumping. Applicants for the waste management license must submit a disaster countermeasure plan that needs to be reviewed once a year, together with the application form.
Environmental Protection Levy Act	Act that regulates the imposition and collection of environmental protection taxes on goods imported into Saint Lucia.
Styrofoam and Plastic Food Service Containers (Prohibition) Act No. 22 of 2019	Act prohibiting the import, manufacture, sale, use or distribution of Styrofoam and plastic food service containers.

Source: UNEP. 2014, IDB. 2016 and UNEP. 2018a

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.There are no fees for the collection, treatment and disposal, and basically the country promotes the use of the final disposal site by making it available free of charge. Tipping fees are collected from the private sector,

supermarkets, suppliers, and cruise ships that require special disposal, and bring revenue to SLSWMA. In addition, there are funding opportunities from international organizations and other governments.

Table 2-92 System and infrastructure related to waste management in Saint Lucia

Waste management stage	Content
Discharge	・ For areas with appropriate road infrastructure, curb side collection is carried out. In areas where access is limited, collection is carried out using shared bins. ・ Appropriate discharge by residents of unplanned settlement is an issue. In terms of accessibility for the waste collectors, the waste containers must be placed away from the living quarters, but the residents do not discharge their waste into the waste containers.
Collection/Transport	・ As of 2015-2016, SLSWMA provided a minimum of twice-weekly collection service for all populations. It is responsible for collecting solid waste from homes, schools, hospitals, health centers, prisons, government agencies, etc. Bulky waste collection service is provided monthly to all communities. ・ Commercial and industrial entities have to hire waste carriers themselves to transport waste to the final disposal sites. ・ The waste collection area is divided into 11 zones. Waste collection service is provided by a private contractor selected by competitive bidding in PPP scheme (contract is 5 years). As of 2015-2016, 6 companies are in charge of one or more zones. The collection vehicles, necessary equipment and personnel are provided by the private waste collection contractor. In addition to waste collection, the removal of unnecessary vehicles in public spaces, remediation of indiscriminate dumping sites, provision of monthly bulky waste collection services, and public awareness raising activities are conducted (as of 2015). ・ The total amount of money entrusted to six private collection companies is about ECD 6.6 million per year.
Treatment	・ Recycling is done by the informal sector. Recyclable items are first brought to the final disposal site, and are then picked-up by a recycler. ・ SLSWMA works with a local recycler to collect scrap metal from a stockpile in Vieux-Fort landfill. Similarly, in Deglos sanitary landfill, several tons of plastic waste, e-waste and scrap wire are collected. In addition, SLSWMA has agreed with waste pickers at the Vieux-Fort landfill to recover materials such as iron metal, scrap wire and wood. Waste pickers are regularly monitored and are required to follow authorities-issued guidelines, including annual health examination, wearing protective clothing, and complying with prescribed safety measures. ・ SLSWMA is investigating the possibility of WTE with the support of the Clinton Climate Initiative (CCI). Due to factors such as the amount of waste collected, it was not promising from the viewpoint of feasibility (Business News Caribbean. 2016, Government of Saint Lucia. 2014.). ・ Medical waste is treated in an autoclave. There is no incineration facility. Waste that is sterilized is landfilled. ・ There is no composting facility, but there is an intention to build one.
Disposal	・ As of 2014-2015, the waste management facility operated by SLSWMA accepts the following waste: household waste, public waste, commercial waste, industrial waste, constructionand demolition waste, specific hazardous waste, metal scrap, waste vehicles, and quarantine waste (waste generated on ships and aircraft visiting the country).

Waste management stage	Content
	• Deglos landfill (located in the northern part of the island) was designed as a facility that accepts waste for 20 years from 2003. Site area is about 9 ha. There are modern equipments such as resource recovery facility, weighing building, repair building, biomedical waste treatment facility, waste oil storage container, woodchipper, car wash, and tire shredder. • The Vieux-Fort final disposal site (located in the southern part of the island) is a solid waste management facility with an area of 7.4 ha. It was upgraded to standard waste management facility in 1998, with modern facilities such as emergency parking, weighing building, weighbridge, resource recovery facility, repair building, tire shredder and more. • Equipment failures at the final disposal site are frequent due to aging equipment and lack of financial resources for renewal. • The Vieux Fort final disposal site was closed in November 2019 as the first step of the plan towards a landfill free Saint Lucia by 2030 (St. Lucia News Online. 2019b). All household and commercial waste is first transported to a transfer station within the Vieux Fortfinal disposal site, transferred to a 45-feet container, and then transported to the Deglos landfill. • Pyrolysis facility is planned to be introduced in February 2020.
Clean-up	• SLSWMA conducts street sweeping (World Bank Group. 2019).

Source: IDB. 2016, SLSWMA. 2015, and JICA. 2015.

Deglos sanitary landfill site　　Vieux-Fort final disposal site

Figure 2-38　Final disposal sites in Saint Lucia (Photographs)[62]

[62] Source: SLSWMA. N.A.

2.11 Commonwealth of Dominica

2.11.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Commonwealth of Dominica is an island country located in the Caribbean Sea with a population of 71,625 (2018) and an area 750 km^2 (almost the same as Amami Oshima) (MOFA. 2019i). Neighboring countries include the French Guadeloupe on the northwest side and French Martinique on the southeast side.

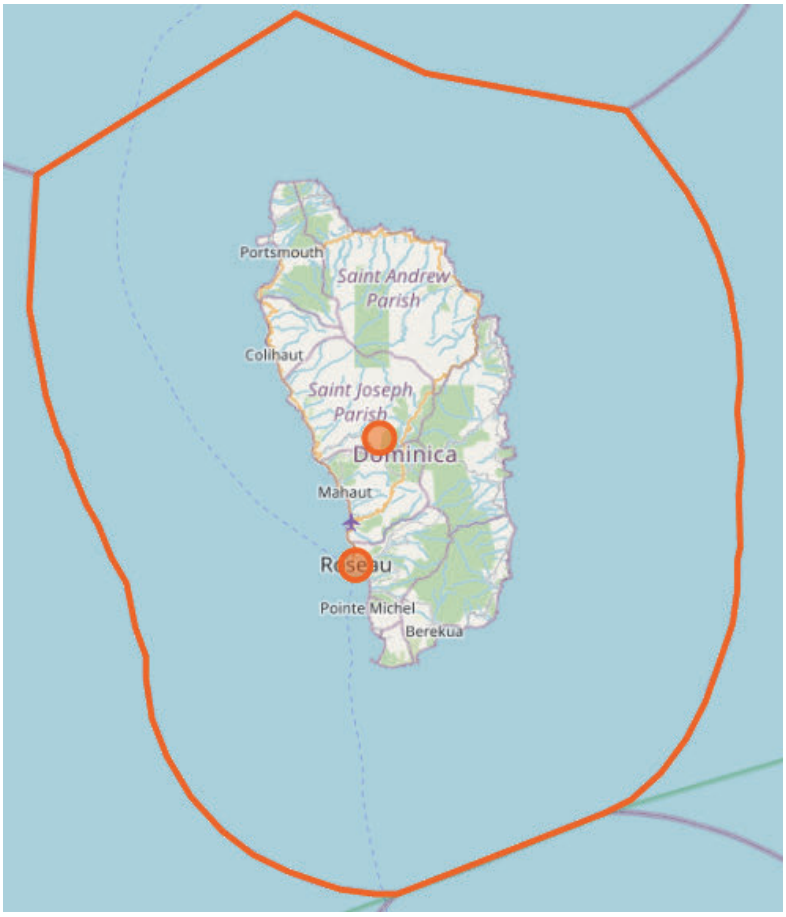


Figure 2-39 Map of the Commonwealth of Dominica[63]

The capital is Roseau, whose population accounts for more than 20% of the total population. The main ethnic group is African, accounting for 86.6%, and others include mixed races (9.1%) and Caribs (2.9%). The official language is English, but Dominican Creole French is also used. The religion is Christianity such as Catholic and Protestant. The table below summarizes information on demographic trends and projections of future population changes in the country. The population will increase slightly until 2030

[63] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

and then decrease, but the urban population ratio will increase, and it is predicted that 80% of the total population will live in urban areas by 2050.

Table 2-93 Demographic trends and population projections in the Commonwealth of Dominica

Items (Unit)	Data	
Population (person)	71,625	
Population increase (annual %)	0.2	
Population density (person/km^2)	95.5	
Urban population (person)	50,483	
Urban population (% of total population)	70.5	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	1	
Population ages 0-14 (% of total population)	N/A	
Population ages 15-64 (% of total population)	N/A	
Population ages 65 and above (% of total population)	N/A	
Population, male (% of total population)	N/A	
Population, female (% of total population)	N/A	
Population projections	2030	2050
Projection of population, total (person)	73,000	71,000
Projection of urban population (person)	54,000	57,000
Projection of urban population (% of total population)	74.2	80.0

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2) Macroeconomic situation, economic policy[64]

The basis of the economy is small-scale manufacturing centred on agroindustry, such as agriculture with a focus on bananas and soap production. In the 1990s, the tourism industry centered on cruise ships recorded high growth, but the number of tourists decreased due to attacks of September 11, 2001, and the domestic economy grew negatively. The infrastructure was severely damaged by the earthquake in November 2004, but by 2007, the tourism industry had recovered, and the manufacturing industry performed well, achieving positive growth. Affected by the global financial crisis of 2008, the tourism industry was sluggish and received financial support from the IMF. The country suffered devastating flood damage caused by the Tropical Storm Erica in August 2015, which amounted to 90% of GDP, and the damage from Hurricane Maria in September 2017 reached about US$ 1.3 billion (about 216% of GDP).

Below is a summary of the economic situation of the Commonwealth of Dominica.

[64] Source: MOFA. 2019i

Table 2-94 Economic situation of the Commonwealth of Dominica

Items (Unit)	Data
GDP (current US$)	550,892,592.6
GDP per capita (current US$)	7,691.3
GNI per capita, PPP (current international $)	10,270.0
GDP growth (annual %)	2.3
GDP per capita growth (annual %)	2.0
Inflation, consumer prices (annual %)	1.0
Imports of goods and services (% of GDP)	65.1
Exports of goods and services (% of GDP)	42.9
Main industries (MOFA. 2019i)	Agriculture (banana, coconut, citrus), tourism, manufacturing (soap, etc.)
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.49
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	33.4
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	11.1

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data

2.11.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Commonwealth of Dominica. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 192 to 4,029 tons/year. Since the waste collection rate and the disposal rate in a sanitary landfill are both high, the amount of plastic litter released into the ocean is not expected to be large.

Table 2-95 Waste management status and emissions of marine plastic litter in the Commonwealth of Dominica

Main item		Sub-item	Data	Unit
Generation		Amount generated	36	ton/day
		Proportion of plastic	16	%
		Amount of plastic litter generated	6	ton/day
Discharge		Amount discharged	Unknown	
Collection/Transport		Collection rate (World Bank Group. 2019)	94	%
		Uncollected waste from households (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	94.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	192	ton/year
		Amount released per day	0.53	ton/day
		Length of the coastline	148	km
		Amount released per km of coastline	1.3	ton/km/year
	Calculation based on the length of the	Unit rate	27.22	ton/km/year
		Amount released per year	4,029	ton/year
		Amount released per person	56.38	kg/person/year

Main item		Sub-item	Data	Unit
	coastline			

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b

2) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-96 Policies and initiatives related to marine plastic litter in the Commonwealth of Dominica

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ There is no import tax on certified biodegradable products and reusable shopping bags since December 2018 (UNEP. 2018a). ・ Ban on import and use of all single-use plastic products (including straws, plates, forks and knives) and Styrofoam containers since January 2019 (CEP. 2019). ・ Single-use plastic bags are banned from 2020 (announced in July 2019). Mid-February 2020, the government provided jute and cotton bags to all households and proclamed their use as an alternative to single-use plastic (Dominica News Online. 2019).	・ Waste management on public and private land (Litter (Amendment) Act (No. 20 of 1997)).	・ Beach management and control (Beach Control Act (UNEP. 2014)).
Initiatives of local governments, companies, NGOs, etc.	・ DSWMC and supermarkets have partnered to start the No Plastic Day initiative in April 2016. Customers bring their own bags to the supermarket (Da Vibes, 2016).	・ Cleaning of drains and rainwater drains by Village Councils (UNEP. 2014). ・ 3R program at school by DSWMC (UNEP. 2014). ・ Recycle to high quality building materials (Plastic Brick) by Recycle Rebuild (NPO) (Recycle Rebuild. n.d.).	・ As part of the ICC, NGOs carry out annual national beach and waterway cleanups and coastal area management workshops. (UNEP. 2014).

2.11.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste

management sector

The table below describes the organizations related to waste in the Commonwealth of Dominica.

Table 2-97 Waste-related organizations in the Commonwealth of Dominica

Organization name	Responsibilities and/or Initiatives
Dominica Solid Waste Management Corporation (DSWMC)	Established in 1997 under the Ministry of Health. Responsible for the storage and collection of solid waste and the development of facilities for treatment and disposal. The total number of staff is about 100 including collection workers and management staff at final disposal site. There are 4 managers.
Environmental Coordinating Unit (ECU), Ministry of Environment, Rural Modernisation and Kalinago Upliftment	Waste management policy and regulation agency. It acts as a coordinating, facilitating, managing and collaborating body for all environmental and sustainable development management programs, projects and activities.
Environmental Health Department (Unit), Ministry of Health, Wellness and New Health Investment (UNEP. 2014)	Responsible for the hygienic management of the waste collection system and monitoring the appropriate management of disposal sites. Identification of approved disposal sites.
Village Councils (UNEP. 2014)	Local community groups that implement cleaning projects of drainage ditches and rainwater drainage pipes to maintain the community healthy.

Source: UNEP. 2014 and Website of each organization

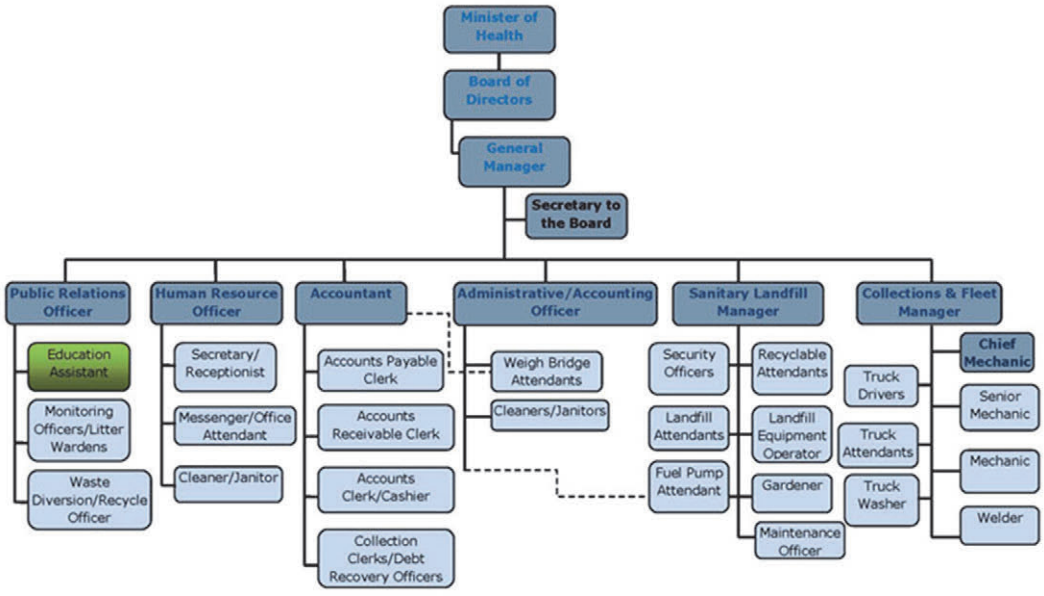


Figure 2-40 Organization chart of DSWMC[65]

[65] Source: Website of DSWMC (http://www.dswmc.dm/index.php/about-us/11-organizational-chart)

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. From the interviews with DSWMC in the JICA Survey 2015, the Solid Waste Management Act was established in 2002, but the appropriate treatment methods according to the type of waste was not stipulated, therefore the need for guidelines was recognized. (JICA. 2015).

Table 2-98 Legal system related to waste management in the Commonwealth of Dominica

Name of the legislation	Content
Litter (Amendment) Act (No. 20 of 1997)	The Litter (Amendment) Act is a law concerning the management of waste on public and private land.
Environmental Health Services Act (No. 8 of 1997)	Regulations related to the environmental protection and maintenance of places that are frequently visited by the general public for the purpose of general health. Empowers the Environmental Health Department to manage and dispose of environmental pollution, solid, liquid and gaseous waste, investigate and prevent common hygiene issues.
Solid Waste Management Act (No. 1 of 2002)	Act that regulates the management of solid waste in accordance with the best environmental practices. Defines rules for managing, transporting, and handling solid waste, prohibits unauthorized disposal of solid waste, and provides licenses for waste management facilities. Established the Solid Waste Management Corporation. It is stipulated that all license holders need to consider a disaster preparedness response plan by March every year. Waste management companies are responsible for developing and maintaining an emergency response plan, including restoration of waste management services after a hurricane, flooding of final disposal sites, and actions to be taken in the event of an waste transport vehicle accident. (UNEP/OCHA Joint Unit. 2017)

Source: UNEP. 2014 and UNEP. 2018a

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.At the final disposal site, a crusher for the treatment of recyclable waste, such as plastics received from businesses, is installed but not in operation. The issue is that due to the small population, the quantity required to sell recyclable resources is not collected (JICA. 2015).

Since the opening of the Fond Cole sanitary landfill, the necessary capital investment to reduce waste has been made and recycling has been promoted. Examples of assistance include the procurement of compactors by the Caribbean Development Bank (CDB), PET shredders by PAHO, small PET trucks by the Swiss government, biodiesel facilities by the Global Environment Facility (GEF), and support from UNDP (Commonwealth of Dominica. 2017). However, these equipment have been damaged by Tropical Storm Erika and Hurricane Maria in 2015. Besides, all waste, including medical waste, is disposed of at Fond Cole, which is already saturated (Commonwealth of Dominica. 2017).

Table 2-99 System and infrastructure related to waste management in Commonwealth of Dominica

Waste management stage	Content
Discharge	・ Waste is discharged to community collection points (Roseau only). ・ As a DSWMC community program, education through Adopt a Block campaign and newsletter (Lets Talk About Solid Waste) distribution. Adopt a Block is a hygiene incentive campaign for companies in Roseau. ・ Waste separation and recycling are rarely conducted.
Collection/Transport	・ In the target zone of Roseau, waste is collected at least every two weeks, and in some areas collection is carried out at least once a week (collected daily in areas where business establishments are concentrated). Collection of waste from community collection points. ・ Collection and transport are directly managed, although outsourcing to the private sector also exists. ・ There is no charge for the collection from ordinary households, and ECD 54/ton is basically charged to businesses, but in reality there are many uncollected fees. Fees collected by the Environmental Levy (ECD 4.00 or US$ 1.5) for port users including airports and cruise passengers are used for waste collection, transport and disposal. ・ Collection and transport are done by 3 compactor trucks from DSWMC and several other contract trucks. Vehicles and equipment, including compactor trucks, are insufficiently maintained and function only partially. ・ A waste transfer station will be built in Melville Hall. The initial capacity will be 170,000 m^3, but it will be increased to a maximum of 230,000 m^3 to accept solid waste throughout the island over a period of 15 to 20 years. ・ Waste collection has not been implemented in communities other than Roseau. Some of those uncollected waste are burned, disposed of at old dumping sites, or stored at temporary dumping sites.
Treatment	・ Recycling program of DSWMC promotes the recycling of following items: cardboard (for composting), ELV, glass, lead storage batteries, plastics, engine waste oil, waste tires, white goods. Businesses are encouraged to directly bring in these recyclable materials. ・ There is a plastic bottle crusher with a belt conveyor, but it is not in operation. ・ Medical waste is treated in a gasification facility before combustion. Refrigerated vehicles for collection and processing are funded by the Caribbean Development Bank (CDB). ・ Recycle Rebuild, a non-profit organization, helps communities recycle waste into high-quality building materials at affordable prices. It also aims to provide an immediate source of income for those affected by natural disasters. It set up a small recycling center in the middle of the second city, Portsmouth. At the recycling center, the surrounding communities gather waste to sort and shred. It functions as a hub for new product manufacturing based on community demand (Aichi resort & spa. 2018.).
Disposal	・ Disposal at Fond Cole sanitary landfill. Details are described below: ➢ The site was constructed through a co-grant of CDB, WB and EU. The plan was to have a landfill capacity of 15 years accepting only municipal waste. ➢ The site is located in Fond Cole, 1.6 km north of Roseau, along a river in a steep narrow valley near the sea, with approximately 18 acres. It officially went into operation in 2007 and is operated by DSMC.

Waste management stage	Content
	➢ The site is difficult to access for large waste collection vehicles. ➢ The site accepts following waste: industrial waste, green waste, commercial waste, household and facility waste, hazardous medical waste (treated at medical waste management facility in Princess Margaret Hospital). ➢ A car wash is set up in the facility to prevent dirt, mud, debris and dust. ➢ Introduction of odour and leachate control system, and gas extraction piping system. Place appropriate cover material on top of waste. ➢ A Bomag Sheep Foot Compactor was purchased with a loan from the Caribbean Development Bank to compact waste and cover it with soil, but it remained unused. ➢ Fire broke out in the final disposal site in 2015 and 2019. ➢ Waste pickers are not allowed to enter the final disposal site due to health protection.

Source: Commonwealth of Dominica, 2017 and JICA. 2015

Gas extraction pipe and leachate treatment facility Compaction

Figure 2-41 Fond Cole sanitary landfill site (Photographs)[66]

[66] Source: DSWMC. n.d.

2.12 Dominican Republic

2.12.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Dominican Republic is an island country located in the Caribbean Sea with a population of 10,627,165 (2018) and an area of 48,442 km^2 (Kyushu and Kochi prefecture combined) (MOFA. 2019j). There are also remote islands such as Saona Island and Beata Island. It borders the Republic of Haiti on the west side of the island, Puerto Rico on the east side across the Mona Passage, Cuba on the west side of the island across the Windward Passage, and Jamaica across the Jamaica Channel.

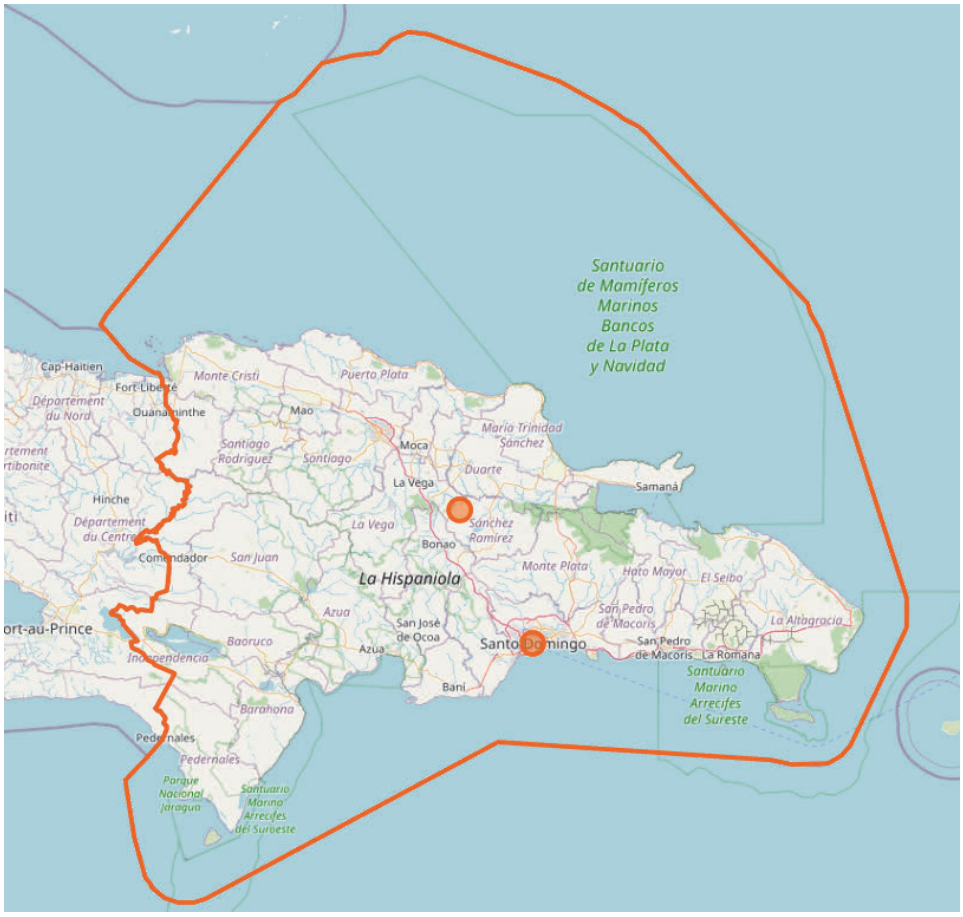


Figure 2-42 Map of the Dominican Republic[67]

The capital is Santo Domingo, which is located on the south side, and the capital population accounts for more than 30% of the total population. Ethnic groups are mixed race (73%), European (16%), and African (11%). The official language is Spanish, and the religion is Catholism. The table below summarizes information on demographic trends and projections of future population changes in the

[67] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

country. The future population in 2050 is expected to increase by 20% compared to 2018, with more than 90% of the population living in major cities and about 30% of the population in cities with more than 1 million people.

Table 2-100 Demographic trends and population projections in the Dominican Republic

Items (Unit)	Data	
Population (person)	10,627,165	
Population increase (annual %)	1.1	
Population density (person/km^2)	220.0	
Urban population (person)	8,615,868	
Urban population (% of total population)	81.1	
Population in urban agglomerations of more than 1 million (% of total population)	29.8	
Population living in areas where elevation is below 5 meters (% of total population)	1.2	
Population ages 0-14 (% of total population)	28.0	
Population ages 15-64 (% of total population)	64.9	
Population ages 65 and above (% of total population)	7.1	
Population, male (% of total population)	50.0	
Population, female (% of total population)	50.0	
Population projections	2030	2050
Projection of population, total (person)	11,770,000	12,796,000
Projection of urban population (person)	10,330,000	11,777,000
Projection of urban population (% of total population)	87.8	92.0

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[68]

It has long been an exporter of primary products such as sugar, coffee, cacao, and tobacco, but since 1990, exports of light industrial products such as textiles from free trade areas (free zones) have been increasing. In addition, the tourism industry has developed due to the attraction of foreign investment and the progress of infrastructure development. The number of foreign tourists was about 7.9 million and the tourism revenue was about US$ 7.2 billion in 2018. Another major source of foreign currency are the remittances from about 2 million overseas residents (approximately US$ 6.5 billion).

During the first period of the Fernandez administration from 1996 to 1999, the country recorded a high economic growth of 7% on average, but under the Meheer administration after that, the economy deteriorated due to the stagnation of the US economy, the decrease in tourism revenue, and the collapse of major banks since 2002. In the second term of the Fernandez administration from 2004 to 2008, based on an IMF standby agreement, the Dominican Republic achieved substantial results in stabilizing exchange rates and controlling inflation. High growth rates of 9.3% in 2005, 10.7% in 2006, and 8.5%

[68] Source: MOFA. 2019j

in 2007 resulted from the tax reform, fiscal policy (reduction of subsidies, reform of tax collection system, etc.), monetary policy such as price stability, strengthening of the financial sector, and the reform of the electric power sector. During the third term of the Fernandez administration from 2008 to 2012, the global financial crisis of September 2008 reduced exports from free zones, remittances abroad, and tourism revenue. Especially in the free zones, the growth rate was low at 0.9% in 2009 because of a significant drop due to the decline in demand in the US market. However, economic growth continued in 2010 (8.3%), 2011 (3.1%), and 2012 (2.8%). The real economic growth rate during the first phase of the Danilo Medina administration from 2012 to 2016 reached an average annual rate of 6.4%, driven by the construction and tourism industries. In the construction industry, low-priced housing, villas, hotels as private investment, and schools, roads, and subway line 2 extension as public investment boosted growth. In the second phase of the administration from 2016 to 2020, the real economic growth rate remained at 4.6% due to a decrease in public-private investment, slowing growth in the construction industry, and hurricane damage (2017). The growth rate in 2018 was 6.98%[69].

Below is a summary of the economic situation of the Dominican Republic.

Table 2-101 Economic situation of the Dominican Republic

Items (Unit)	Data
GDP (current US$)	85,555,390,387.0
GDP per capita (current US$)	8,050.6
GNI per capita, PPP (current international $)	16,950.0
GDP growth (annual %)	7.0
GDP per capita growth (annual %)	5.8
Inflation, consumer prices (annual %)	3.6
Imports of goods and services (% of GDP)	28.5
Exports of goods and services (% of GDP)	23.6
Main industries (MOFA. 2019j)	Tourism, agriculture, mining, textile processing, medical supplies, service industry (call center, etc.)
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	N/A
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	17.2
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	5.1

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.12.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic

[69] World Bank Group. World Development Indicators, 2018 data

litter emissions in Dominican Republic. The total amount of marine plastic litter released into the ocean , calculated using the two methods, is estimated to range from 28,196 to 35,065 tons/year.The Dominican Republic ranks second, after the Republic of Haiti, amongst the surveyed countries in terms of uncollected household waste (1,020,042 tons/year). In addition, the amount of uncollected plastic waste from households (102,004 tons/year) is reported to be the largest in the surveyed countries (World Bank. 2019). Therefore, it is likely that the amount of plastic waste released into the ocean is close to the maximum estimated value.

Table 2-102 Waste management status and emissions of marine plastic litter in the Dominican Republic

Main item		Sub-item	Data	Unit
Generation		Amount generated	11,118	ton/day
		Proportion of plastic	10	%
		Amount of plastic litter generated	1,112	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	74.9-97	%
		Uncollected waste from households (World Bank Group. 2019)	1,020,042	ton/year
		Uncollected waste from households per person (World Bank Group. 2019)	96.0	kg/person/year
Treatment/Disposal		Recycling rate	8.2	%
		Landfill disposal rate	72.6	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	28,196	ton/year
		Amount released per day	77.25	ton/day
		Length of the coastline	1,288	km
		Amount released per km of coastline	21.9	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	35,065	ton/year
		Amount released per person	3.34	kg/person/year

Source: Created by JICA Survey Team based on t World Bank Group. n.d. and UNEP. 2018b

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. The ban on plastic bags and packaging materials is under discussion under the Law on Solid Waste Management, and the following contents are planned to be enforced (CEP. 2019):

- Free distribution of all types of plastic covers is prohibited 12 months after the law comes into force.
- The use and delivery of non-biodegradable plastic bags in commercial establishment is prohibited. Only degradable or biodegradable products that are compatible with the minimization of environmental impact can be used to transport goods or products.
- Twenty-four months after the law comes into force, the use of all types of expanded polyethylene containers is prohibited for packaging intended for the conservation and sale of food and beverages.
- Prohibition to serve food in single-use plastic containers for use in the same food distribution center.

Table 2-103 Policies and initiatives related to marine plastic litter in the Dominican Republic

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	・ A ban on plastic packaging materials and plastic bags is under discussion.	・ The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a).	・ N/A
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ Reuse and recycling of plastic bags are regulated by local governments in consultation with the national government (UNEP. 2018a).	・ Participation in the ICC organized by Ocean Conservancy. ・ Implementation of international programs such as Sandwatch, which works on beach cleaning and other activities for the purpose of beautifying the beaches of Gibara Bay. ・ The Vida Azul Foundation, which is a NGO working to protect coastal and marine life, implements a recycling program (UNEP. 2014).

2.12.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in the Dominican Republic. Each municipality is responsible for waste disposal.

Table 2-104 Waste-related organizations in the Dominican Republic

Organization name	Responsibilities and/or Initiatives
El Ministerio de Medio Ambiente y Recursos Naturales: MARENA (Ministry of Environment and Natural Resources)	Organization in charge of waste management policies and regulations in the Department of Environment and Natural Resources. Responsible for the preparation, implementation and supervision of national policies on the environment and natural resources, as well as their protection, restoration and promotion of sustainable use.
Manejo de Residuos Sólidos Municipales, Dirreción de Gestión Ambiental Municipal, MARENA (Municipal Solid Waste Management, Municipal Environmental	Support the capacity building of local governments for the purpose of appropriate management of the environment and the proper management of public goods and services. Waste-related services include technical training for municipalities, evaluation of potential site for final disposal, and promotion

Organization name	Responsibilities and/or Initiatives
Management Directorate, MARENA)	of the 3Rs.
Environmental Management and Urban Cleansing Directorate, National District Municipality	Santo Domingo's waste disposal agency. In charge of city cleaning.

Source: UNEP. 2014 and Website of each organization

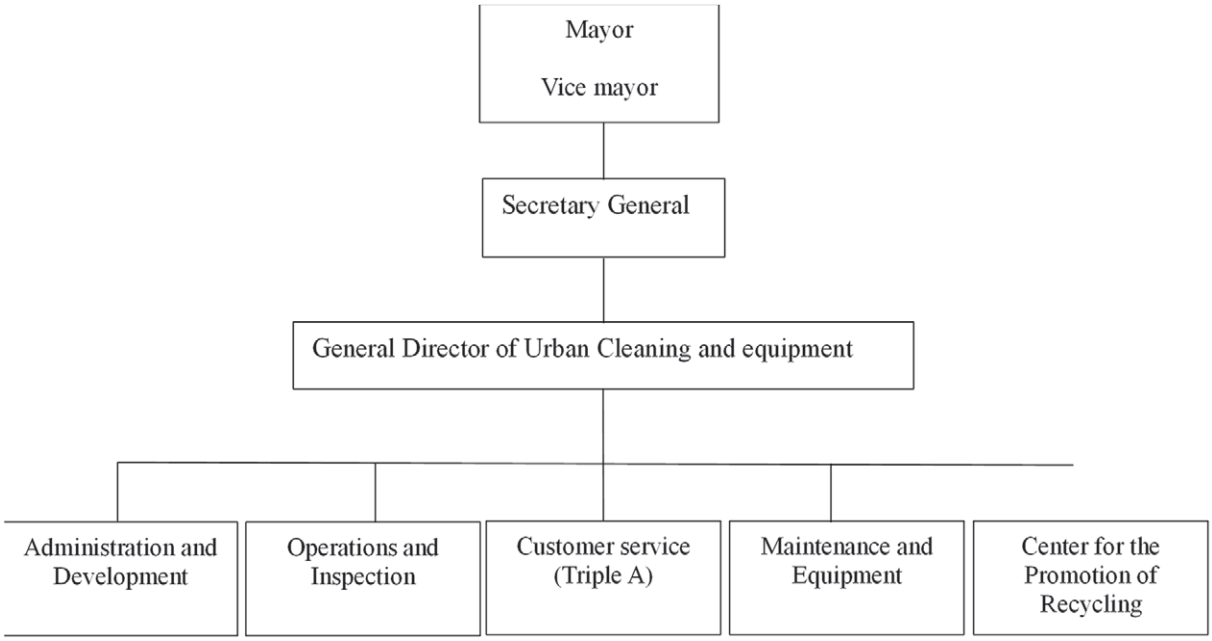


Figure 2-43 Organization chart of the Santo Domingo Special District[70]

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-105 Legal system related to waste management in the Dominican Republic

Name of the legislation	Content
Ley No. 64/00 - General sobre Medio Ambiente y Recursos Naturales (Law No. 64/00 - Environment and Natural Resources)	The management of municipal waste is under the jurisdiction of the Department of Environment and Natural Resources and the Ministry of Health and Welfare. This law provides rules for the protection, improvement and restoration of the environment and natural resources, by ensuring the sustained development thereof.
Ley No. 176-07 del Distrito Nacional y 10s Municipios (Law No. 176-07 of the National District and 10 Municipalities	Law stipulating that waste management is the responsibility of the municipalities.

[70] Source: http://adn.gob.do/joomlatools-files/docman-files/Organigrama%20Aseo%20Urbano.pdf

Name of the legislation	Content
Norma NA-RS-001-03 para la gestión ambiental de residuos sólidos no peligrosos (Standard NA-RS-001-03 for the environmental management of non-hazardous solid waste)	Standards for environmental management of non-hazardous solid waste. The purpose of this standard is to establish guidelines for the sanitary management, storage, collection, recycling, transport and final disposal of non-hazardous municipal solid waste.
Ley No. 120 - Prohíbe tirar desperdicios sólidos y de cualesquiera naturaleza en lugares públicos (Law No. 120 - Prohibiting the disposal of solid waste and of any kind in public places)	Penalties for illegal dumping of waste.
Ley No. 42 - Ley general de salud (Law No. 42 - General Health Law)	Law concerning the establishment of a legal system for waste management in cooperation with the Ministry of Environment and Natural Resources.
Resolución No. 19/2014 - Aprueba la Política Nacional para la Gestión Integral de los Residuos Sólidos Municipales (Resolution No. 19/2014 - Approval of national policy for integrated management of municipal waste) (UNEP. 2014)	Approval of national policy for integrated management of municipal waste. It aims to build an environmentally sustainable and socio-economically viable society that avoids or minimizes adverse effects on health.
Resolución No. 2/06 - Reglamento para la gestión de sustancias y desechos químicos peligrosos (Resolution No. 2/06 - Regulations on the management of hazardous chemical substances and waste)	The purpose is to establish legal responsibilities and essential technical requirements related to the management of all stages of hazardous wastes and chemicals, as well as management procedures, and to protect safety, human health, and the environment.
Plan Dominicana Limpia (Clean Dominican Republic Plan)	This plan started in 2018 and includes the closure of 360 open dumping sites nationwide, conversion into sanitary landfill sites, and support of local governments (purchase of heavy machinery, etc.).

Source: UNEP. 2014 and UNEP. 2018a

3) System and infrastructure related to waste management

In January 2020, the President of the Republic, Danilo Medina, issued Order 21-20 that established a "Presidential Committee for the Reorganization of the Duquesa Final Disposal Site" consisting of 15 agencies from provinces, municipalities, districts and municipalities. (CDN. 2020). The Committee, chaired by the President, has main three purposes: (1) restoration of the Duquesa final disposal site, (2) closure technology, and (3) development of a construction plan of a sanitary landfill for the waste from the Santo Domingo Special Zone (CDN. 2020).

As a background, the Duquesa final disposal site has been managed by the concession contractor Lajun Corporation since 2006 (El Día. 2020). In 2013, the mayor at the time demanded cancellation of the contract, establishing a breach of the agreement by the foreign-affiliated company. In 2017, Lajun Corporation limited the operation hour of the disposal site due to non-payment from the local government, which made the situation even more complicated (El Día. 2020). The Higher Administrative Court of the Dominican Republic then decided that the Duquesa final disposal site would be managed by the Ministry of the Environment, the Ministry of Public Health and the City of Santo Domingo (El Día. 2020).

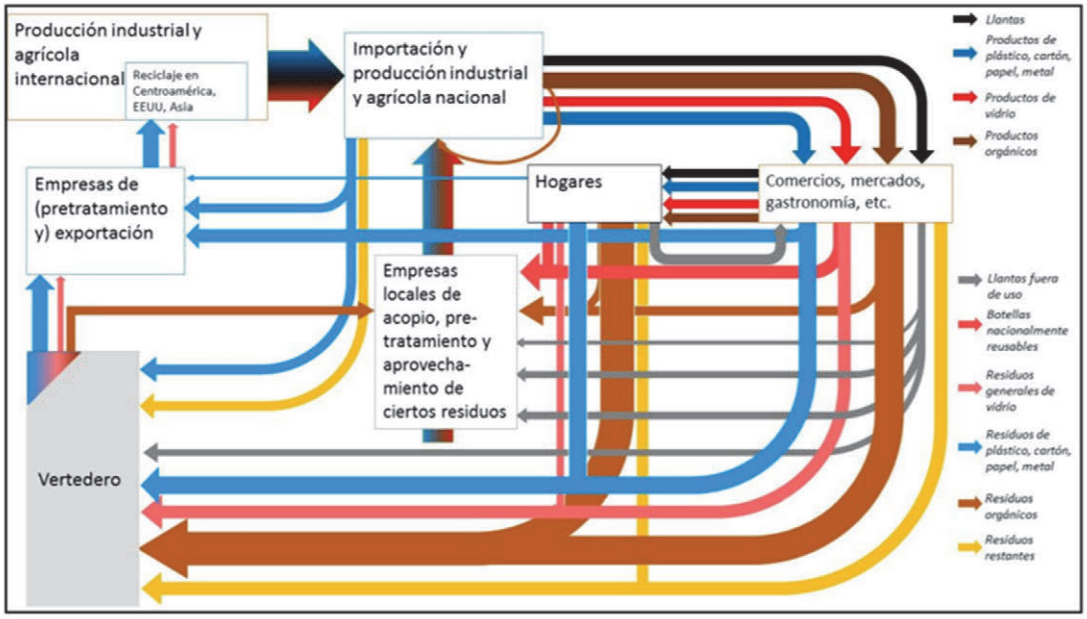
The table below outlines the system and infrastructure related to waste management.

Table 2-106 System and infrastructure development related to waste management in the Dominican Republic

Waste management stage	Content
Discharge	・ Organic waste is sometimes used in animal feed (GIZ. 2018). ・ Waste management in companies and industrial waste are the responsibility of the discharger. They must conclude a contract or agreement with a private waste collector.
Collection/Transport	・ Not all local governments carry out waste collection (GIZ. 2018). ・ Many recyclable waste are collected before or during the collection and transport stage by collection and transport workers or informal collectors. ・ Industrial waste is the responsibility of the discharger, but is included in the municipal collection.
Treatment	・ 264,000 tons of plastic waste is generated and less than 8% is recycled (Diario Libre. 2019). ・ Residues are collected, incinerated, or landfilled according to their characteristics.
Disposal	・ A certain amount of waste is dumped in unauthorized places. There is also illegal open burning. ・ Most of the waste is disposed of at dumping sites. There are about 325 final disposal sites nationwide, but there is no proper management system and environmental pollution (air, soil, water) is a serious issue. ・ The collection and sale of recyclable waste at final disposal sites is a source of social and economic conflict between local governments and management companies, as well as with informal recyclers. The wave of privatization of landfill management over the last decade has also led to serious and violent disputes over waste property rights. ・ The Duquesa final disposal site accepts household waste from the Greater Santo Domingo Special Zone. Currently, about 5,000 informal waste pickers live in the Duquesa final disposal site.
Cleaning	・ In the Dominican Republic, 70% of local governments carry out street sweeping, and it is reported that 10% to 95% (42% on average) of the population in the capital Santo Domingo Special District also receive street sweeping services (World Bank Group. 2019).

Source: GIZ. 2018

The figure below shows the main flows of materials entering a management system (municipal, private and/or informal), created based on information gathered in the framework of Value Chains component in the ZACK project.



Gráfica 3: Mayores flujos de materiales y residuos en República Dominicana. Elaboración propia.

Figure 2-44 Flows of materials entering (municipal, private and/or informal) management systems

Figure 2-45 Duquesa final disposal site (Photograph)[71]

[71] Source: Dominican Today. 2020

Figure 2-46 Location of Duquesa final disposal site

2.13 Republic of Trinidad and Tobago

2.13.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Republic of Trinidad and Tobago is an island country located in the Caribbean Sea with a population of 1,389,858 (2018) and an area of 5,130 km^2 (slightly larger than Chiba Prefecture) (MOFA. 2019k) It consists of two islands, Trinidad and Tobago, and numerous smaller islands, with Grenada on the north side, Barbados on the northeast side, and Venezuela on the south side.

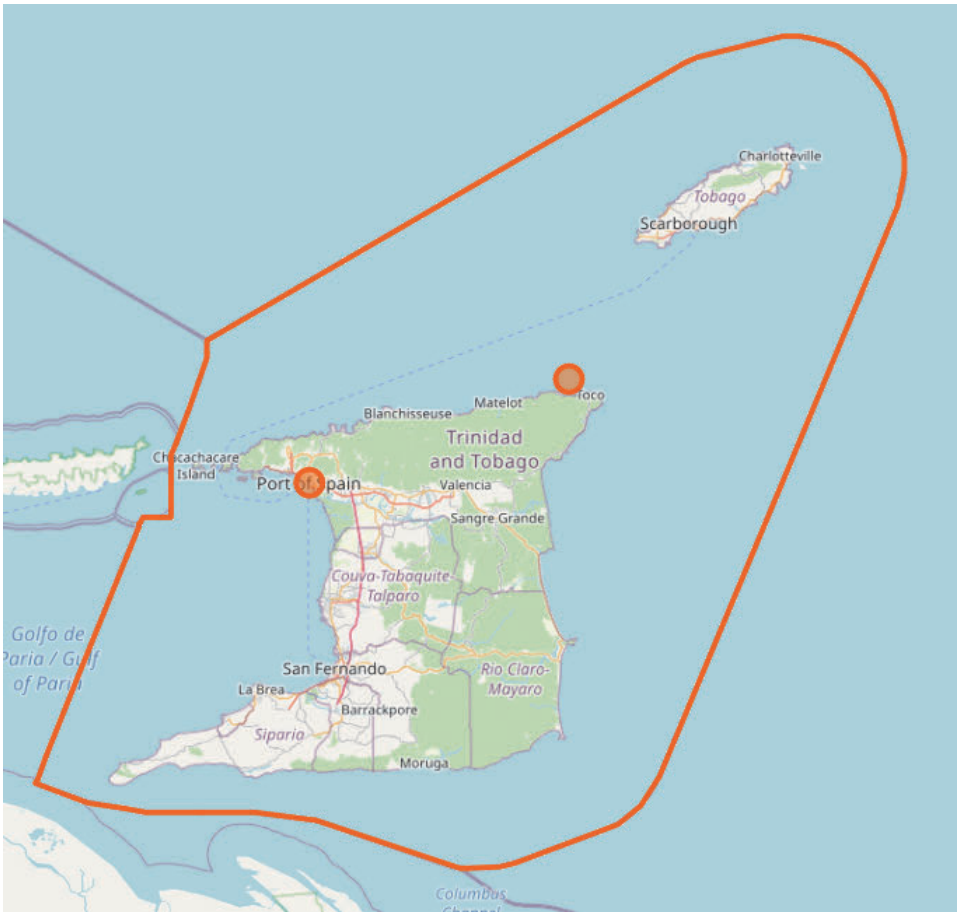


Figure 2-47 Map of the Republic of Trinidad and Tobago[72]

The capital is Port of Spain, whose population accounts for about 40% of the total population. Ethnic groups include Indians (35.4%), Africans (34.2%), and mixed races (23%). The official language is English, but Hindu, French, Spanish, Trinidadian Creole, and Tobagonian Creole are also used. The religions are Christianity, Hinduism, Islam, etc. The table below summarizes information on demographic trends and projections of future population changes in the country. The future population

[72] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

is expected to increase through 2030 and then decline around 2050.

Table 2-107 Demographic trends and population projections in the Republic of Trinidad and Tobago

Items (Unit)	Data	
Population (person)	1,389,858	
Population increase (annual %)	0.4	
Population density (person/km^2)	270.9	
Urban population (people)	739,182	
Urban population (% of total population)	53.2	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	2.9	
Population ages 0-14 (% of total population)	20.4	
Population ages 15-64 (% of total population)	68.8	
Population ages 65 and above (% of total population)	10.7	
Population, male (% of total population)	49.4	
Population, female (% of total population)	50.6	
Population projections	2030	2050
Projection of population, total (person)	1,413,000	1,344,000
Projection of urban population (person)	775,000	843,000
Projection of urban population (% of total population)	54.8	62.7

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[73]

The petroleum and petrochemical sector used to account for more than 50% of export revenues and government revenues, but in the mid-1980s oil prices plummeted and the country suffered a serious economic crisis. In the latter half of the 1980s, structural adjustment of the economy was necessary, such as promotion of exports, deregulation, and promotion of privatization. Since 1993, economic growth has turned positive thanks to the expansion of the natural gas and natural gas-related sectors in addition to the oil sector, and until the first half of 2008, export revenues surged as a consequence of soaring oil and natural gas prices. The Republic of Trinidad and Tobago has achieved positive growth for 15 consecutive years. From 2009 to 2011, the economy slowed down due to sluggish growth in the energy sector and reduced production in the non-energy sector resulting from the global financial crisis. After the global economic crisis, the country has been working on diversifying its industry from the dependence on the energy sector. The fall in gas prices in 2016 affected the investment and production of local energy companies, and the sharp decline in energy revenues curtailed government spending. From the latter half of 2017, signs of economic recovery began to appear as international crude oil prices recovered and new gas field development became active. The economy in 2018 saw a recovery in

[73] Source: MOFA. 2019k

government tax revenues and in the non-energy sector due to the start of new gas production, rising oil prices, and increased royalties from the natural gas sector. On the other hand, compared to the upward trend of gas production, oil production has continued to stagnate, and state-owned oil company Petrotrin announced in August 2018 that it would close its refinery and significantly reduce employment. Fluctuations in the energy sector still havea significant influence on the country's economy and finances.

Below is a summary of the economic situation of the Republic of Trinidad and Tobago.

Table 2-108 Economic situation of Republic of the Trinidad and Tobago

Items (Unit)	Data
GDP (current US$)	23,808,146,747.8
GDP per capita (current US$)	17,129.9
GNI per capita, PPP (current international $)	30,980.0
GDP growth (annual %)	-0.2
GDP per capita growth (annual %)	-0.7
Inflation, consumer prices (annual %)	1.0
Imports of goods and services (% of GDP)	N/A
Exports of goods and services (% of GDP)	N/A
Main industries (MOFA. 2019k)	Energy industry (petroleum/petroleum products, natural gas, methanol, ammonia, urea), steel products, food products, cement
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.051
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	7.6
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	1.0

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.13.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Republic of Trinidad and Tobago. The total amount of marine plastic litter released into the ocean, calculated using the two methods,is estimated to range from 3,712 to 9,855 tons/year. Although the waste collection rate is high in the country, most is disposed of at dumping sites, and there is also a certain amount of uncollected household waste (27,923 tons/year). The proportion of plastic in waste is also high, and the amount of uncollected plastic waste from households is estimated to be about 5,400 tons/year.

Table 2-109 Waste management status and emissions of marine plastic litter in the Republic of Trinidad and Tobago

Main item	Sub-item	Data	Unit
Generation	Amount generated	2,078	ton/day
	Proportion of plastic	19	%
	Amount of plastic litter generated	398	ton/day

Main item		Sub-item	Data	Unit
Collection/Transport		Collection rate (World Bank Group. 2019)	94.3-100	%
		Uncollected waste from households (World Bank Group. 2019)	27,923	ton/year
		Uncollected waste from households per person	20.1	kg/person/year
Treatment/Disposal		Recycling rate	Unknown	
		Rate of disposal in controlled landfill	12	%
		Rate of disposal in dumping site	84	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	3,712	ton/year
		Amount released per day	10.17	ton/day
		Length of the coastline	362	km
		Amount released per km of coastline	10.3	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	9,855	ton/year
		Amount released per person	7.12	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b.

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. As of October 2019, imports of finished products of Styrofoam in the food and beverage industry will be banned from January 1, 2020, and the production will be banned from June 1, 2020.

The enforcement status of the Beverage Containers Bill is currently unknown, but it is a regulation that introduces a deposit system for beverage containers, which can be a measure to improve recycling and reduce marine leakage. With the introduction of this bill, a six-month nationwide cleanup activity was carried out through Project Tomorrow from October 2013 under the direction of EMA. The purpose of this project was as follows:

- Remove existing beverage containers from the environment before introducing the beverage container deposit system.
- Actively carry out public awareness activities.
- Use GIS to analyse data and connect it to future waste management policies.

Yacht Services Association of Trinidad and Tobago set up a cleanup day each year on the same day as the ICC to help clean up oil spills. It has also established the Marine Environment Fund to address environmental issues and promote appropriate waste disposal or recycling facilities for waste, oil, glass and batteries by all mariners. It works closely with Chaguaramas-based oil companies to ensure that those businesses do not adversely affect the yacht service industry (UNEP. 2014).

Table 2-110 Policies and initiatives related to marine plastic litter in the Republic of Trinidad and Tobago

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	• Ban on import and manufacture of Styrofoam (EPS) finished products in the food and beverage industry. Elimination of tariffs on substitutes (Gov.tt. N.d.b).	• The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a). Regulation on littering (Litter Act). • Collection, sorting and processing of recyclable materials by Community-based Environmental Protection and Enhancement Programme (CEPEP) (UNEP. 2014). • Beverage Containers Bill that provides for a beverage container deposit system. The enforcement status is unknown (UNEP. 2014).	• Designate specific marine areas to preserve and enhance natural beauty and regulate the protection of animals and plants in marine areas (Preservation and Enhancement) Act (No. 1 of 1970 Amended by 37/1996)) (UNEP. 2014). • Participation in the ICC organized by Ocean Conservancy. (Policymakers also participate).
Initiatives of local governments, companies, NGOs, etc.	• Since July 4, 2018, Massy Stores Trinidad charges 50 cents per shopping bag (CEP. 2019). • There is a petition requesting a ban on the use of single-use plastics (CEP. 2019).	• Participated in UNEP's CleanSeas campaign (The Planetary Press. 2019). • Collection of beverage containers including PET bottles in the "iCARE" (Community, Awareness, Recycle, Everyday) project (UNEP. 2014). • Project to control pollution through bio-engineering techniques in the rivers and waterways leading from land-based sources in the St James area into the Gulf of Paria, from 2010 to 2016 (UNEP. 2014).	• Participation in the ICC organized by Ocean Conservancy. • Caribbean Network for Integrated Rural Development, (CNIRD), an NGO that coordinates ICC, cleans the beach once a month. Other educational activities are also conducted.

2.13.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in the Republic of Trinidad and Tobago. There are two ministries related to waste management, and SWMCOL and THA also have their respective roles, but there are no clear division of functions, which creates confusion about responsibility for waste management. Resources are wasted due to overlapping implementations while there are also management gaps (National Waste Recycling Policy. 2015).

Table 2-111 Waste-related organizations in the Republic of Trinidad and Tobago

Organization name	Responsibilities and/or Initiatives
Ministry of Rural Development and Local Government	The Ministry is the central coordinating agency of 14 Municipal Corporations.
Municipal Corporation	Agency responsible for the collection and disposal of household waste.
The Trinidad & Tobago Solid Waste Management Company Limited (SWMCOL)	State limited liability company operated under the Ministry of Rural Development and Local Government. Ensures environmental protection and strengthening through waste collection, treatment and disposal, resource recovery, and provision of public awareness.
Ministry of Planning and Development	Previously Ministry of the Environment and Water Resources. In charge of environmental policy, planning and management.
Environmental Management Authority (EMA)	Organization under the Ministry of Planning and Development. Established to regulate and coordinate domestic sustainable environmental management, including waste management.
Tobago House of Assembly (THA)	Responsible for the collection and disposal of solid waste through local health authorities. The Division of Infrastructure, Quarries and the Environment manages sustainable development policies and plans for infrastructure, natural resources and space. The Division of Health, Wellness and Family Development has a waste eradication program.
Waste Recycling Management Authority	In accordance with the establishment of the National Waste Recycling Policy, it was planned to be established under SWMCOL, but the actual status of establishment and operation is unknown.
Plastikeep	NGO established in 2012. The number of staff is 5 and the activity is supported by the government. Plastic waste collection activities are carried out in the north-western region of Trinidad (population: approximately 140,000). Collection containers are installed, and an outsourced private company collects them using a dedicated vehicle. Waste is sorted at the RECO facility, a recycling facility operated by a private company. About 28,000 lb. are collected a month. After crushing, plastic is packed in bags and exported.

Source: Government of the Republic of Trinidad and Tobago. 2015, UNEP. 2014, IDB. 2016 and Website of each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-112 Legal system related to waste management in the Republic of Trinidad and Tobago

Name of the legislation	Content
Public Health Act, 1950	Legislation on public health.
Litter Act of 1973 and the Public Health Act of 1950	Prohibits the deposit of waste in public places other than those designated for such deposit and defines various littering violations. It stipulates the appointment of litter prevention wardens by public authority and powers of the appointed wardens.
Environmental Management Act	It stipulates the establishment and function of EMA, environmental management and impact assessment, pollution reduction, and protection of natural resources.
Municipal Corporation Act, 1990	It stipulates that the disposal of solid waste is the responsibility of the local governments.
National Environmental Policy (2006)	Provides a comprehensive environmental policy. The goal is to achieve environmentally sustainable development, balance economic

Name of the legislation	Content
	development with environmental use, and improve the quality of life for current and future generations.
National Solid Waste or Resource Management Policy (2012)	A 10-year strategy with the goal of achieving sustainable and socially acceptable integrated waste management in a way that protects human health and the environment.
Beverage Containers Bill, 2012	A law governing the establishment of a Beverage Container Advisory Committee and a deposit and refund system for beverage containers and related matters. The enforcement status is unknown.
National Waste Recycling Policy (2015)	The purpose is to provide guidance to enable the establishment of legislative, administrative, and institutional frameworks for waste reduction and recycling.
Vision 2030 National Development Strategy, (NDS)	National multi-sectoral strategy from 2016 to 2030. The main purpose is to establish the country's development vision and broad framework up to 2030. It also defines key priorities for the first planning period 2016-2020.
Waste Rules (2018) (Draft)	Supports current waste management systems and objectives defined in national policy on waste management. Draft by EMA.

Source: UNEP. 2014, Government of the Republic of Trinidad and Tobago. 2015, IDB. 2016, UNEP. 2018a and Environmental Management Authority. 2019

In March 2018, the Minister of Planning and Development announced the government's intention to close final disposal sites and replace them with a waste collection and disposal method (Government of the Republic of Trinidad and Tobago. 2018). It will be centered on a nationwide waste recycling project already started by EMA in January 2018. To avoid unsustainable waste management, strategic sector plans include:

- Closure and rehabilitation of both Beetham and Gunapo final disposal sites.
- Upgrade Forres Park Landfill to international standards. Waste control is underpinned by strategies that promote control and minimization of waste at the source.
- Waste diversion from landfill (84% of collected waste is considered as recyclable and may be diverted from landfill).
- Resource recovery for a productive economy, including reuse, recycling and WTE.
- Strengthen policy, legislative, institutional and regulatory frameworks related to waste management.
- Implementation of public awareness regarding sustainable waste practices such as waste prevention and reduction at source, reuse, and recycling.

Regarding WTE, in fact, examination and comparison of WTE technologies based on waste quality, power generation amount, economic feasibility, economic model and current obstacles are examined in the report of Natacha C. *et al.* from 2015.

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-113 System and infrastructure related to waste management in the Republic of Trinidad and Tobago

Waste management stage	Content
Discharge	・ The Office of Disaster Preparedness and Management (ODPM) encourages citizens through its website and leaflets to properly discharge waste without dumping it into rivers and to clean the drains (ODPM. n.d). ・ A private glass company implemented a deposit system for the collection of beer bottles.
Collection/Transport	・ Collection services are provided mainly by the private sector under contract with local governments. ・ The cost of waste collection services is high, and relies on government funding.
Treatment	・ Plastic recycling activities by Plastikeep (NGO). ・ SWMCOL has a recycling depot that recycles glass bottles, plastic beverage bottles, beverage cans, and milk and juice carton. ・ In 2015, SWMCOL launched a beverage container recycling facilitywhich process post-consumer beverage containers into high-quality materials for manufacturing new products. ・ "iCARE" (Community, Awareness, Recycle, Everyday) project. A recyclable waste collection project started in 2015 following the beverage container collection project. Phase 2 was planned to begin in 2018 and aimed to include tires and e-waste as well as other solid waste (Ministry of Planning and Development. 2018). ・ A regional-based composting promotion program is being implemented under the guidance of the government.
Disposal	・ The final disposal method is landfilling, but there is no sanitary landfill site. At many final disposal sites, informal recyclers recover resources from solid waste. ・ There are three major final disposal sites managed by SWMCOL: Beetham final disposal site located in the coastal area, Forres Park final disposal site, and Guanapo final disposal site (Trinidad & Tobago Solid Waste Management Company Limited. n.d.). The disposal amount is about 1,000 tons/day for Beetham, about 500 tons/day for Forres Park, and about 500 tons/day for Guanapo (Natacha C. *et al.*, 2015). ・ THA manages the final disposal site of Studley Park. ・ In addition to the above, there is a final disposal site that is operated in cooperation with the Regional Corporation and private contractors. ・ Disposal cost is approximately 100 TT$ (Trinidad and Tobago dollars)/ton (Natacha C. *et al.*, 2015).

Source: Government of the Republic of Trinidad and Tobago. 2015 and IDB. 2016

Figure 2-48 Final disposal sites in the Republic of Trinidad and Tobago (Photographs)[74]

[74] Source: Trinidad & Tobago Solid Waste Management Company Limited. n.d.

2.14 Republic of Haiti

2.14.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Republic of Haiti is an island country located in the Caribbean Sea with a population of 11,123,176 (2018) and an area of 27,750 km^2 (about one-third the area of Hokkaido) (MOFA. 2019l). In addition to the main island, there are also remote islands. As for neighboring countries, the Republic of Haiti borders the Dominican Republic on the eastern side of the island, while the Republic of Cuba lies on the northwest side across the Windward Passage in the Caribbean Sea and Jamaica on the west side across the Jamaica Channel.

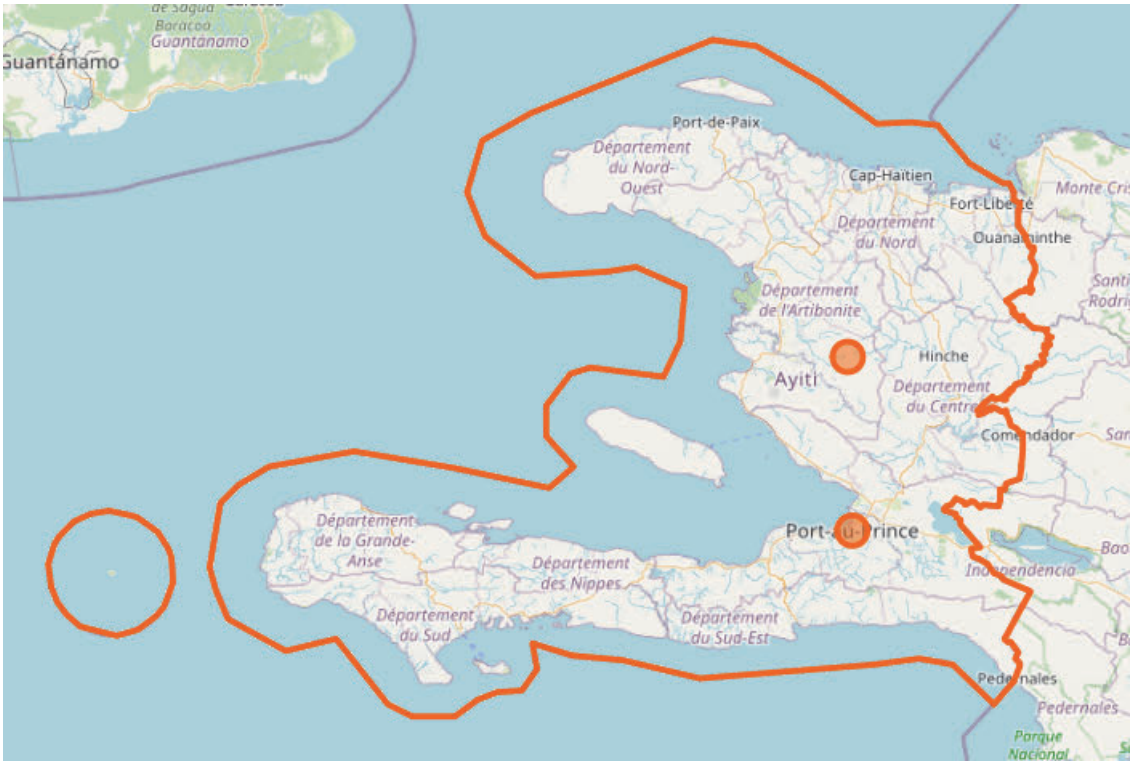


Figure 2-49 Map of the Republic of Haiti[75]

The capital is Port-au-Prince, whose population accounts for about 25% of the total population. The ethnic group is mainly African accounting for about 95% of the total population. The official languages are French and Haitian Creole. Christianity (Catholic, Protestant, etc.) and Voodoo are the main religions. The table below summarizes information on demographic trends and projections of future population changes in the country. The population will grow in the future, with an expected increase of about 34% in 2050 compared to 2018. The influx of population into major cities is also increasing, and it is

[75] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

estimated that by 2050, about three out of four people will live in major cities, and the population of cities with more than 1 million people will reach about 24%.

Table 2-114 Demographic trends and population projections in the Republic of Haiti

Items (Unit)	Data	
Population (person)	11,123,176	
Population increase (annual %)	1.3	
Population density (person/km^2)	403.6	
Urban population (person)	6,148,669	
Urban population (% of total population)	55.3	
Population in urban agglomerations of more than 1 million (% of total population)	23.7	
Population living in areas where elevation is below 5 meters (% of total population)	1.9	
Population ages 0-14 (% of total population)	33.2	
Population ages 15-64 (% of total population)	61.8	
Population ages 65 and above (% of total population)	4.9	
Population, male (% of total population)	49.3	
Population, female (% of total population)	50.7	
Population projections	2030	2050
Projection of population, total (person)	12,733,000	14,878,000
Projection of urban population (person)	8,267,000	11,147,000
Projection of urban population (% of total population)	64.9	74.9

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[76]

Until the 1970s, it was an agriculturally dependent and fragile industrial structure. Since the 1980s, some light industry has developed, but economic development has been hindered by domestic political instability and economic sanctions from the international community triggered by the military coup d' état in 1991. In 1994, the population was concentrated in the capital, many were unemployed and fell into distress. Despite the restoration of democracy and the resumption of assistance from the international community, the economic and social situation has been severe since then due to political instability and the occurrence of natural disasters.

In September 2008, hurricanes passed continuously near the Republic of Haiti killing about 800 people, affecting about 800,000 people, and the country lost about 15% of GDP. In January 2010, a large-scale earthquake in the suburbs of the capital killed about 310,000 people and affected about 3.7 million people (announced by the Government of Haiti). Many lived in concrete houses that were not earthquake resistant. The country also suffered a loss of about US$ 7.8 billion, which is about 120% of GDP. Hurricane Matthew in October 2016 also hit the economy, that lost about US$ 2 billion, approximately

[76] Source: MOFA. 2019l

one-fifth of GDP. The agricultural sector suffered US$ 580 million worth of damage, with 90% of the crops damaged.

Below is a summary of the economic situation of the Republic of Haiti.

Table 2-115 Economic situation of the Republic of Haiti

Items (Unit)	Data
GDP (current US$)	9,658,721,168.9
GDP per capita (current US$)	868.3
GNI per capita, PPP (current international $)	1,880.0
GDP growth (annual %)	1.5
GDP per capita growth (annual %)	0.2
Inflation, consumer prices (annual %)	12.5
Imports of goods and services (% of GDP)	58.5
Exports of goods and services (% of GDP)	17.1
Main industries (MOFA. 2019l)	Accommodation/restaurant, agriculture/forestry/fisheries, construction/public works, light industry, transport/communications, and other service industries (2015 GDP ratio, IHSI[77])
Contribution of Fisheries to GDP(% of GDP) (2015 Preliminary) (CRFM. 2018)	1.5
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	7.9
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	18.9

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.14.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Republic of Haiti. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 29,454 to 48,214 tons/year. Since waste collection is a serious issue in the country, with a waste collection rate of 11%, and uncollected household waste (1,673,750 tons/year) is the largest among the surveyed country, it is considered that the amount of plastic litter released into the ocean is close to the maximum estimated value.

Table 2-116 Waste management status and emissions of marine plastic litter in the Republic of Haiti

Main item	Sub-item	Data	Unit
Generation	Amount generated	6,407	ton/day
	Proportion of plastic	13	%
	Amount of plastic litter generated	814	ton/day

[77] Haitian Institute of Statistics and Informatics

Main item		Sub-item	Data	Unit
Collection/Transport		Collection rate (World Bank Group. 2019)	11.0	%
		Uncollected waste from households (World Bank Group. 2019)	1,673,750	ton/year
		Uncollected waste from households per person	150.5	kg/person/year
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	9.94	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	29,454	ton/year
		Amount released per day	80.70	ton/day
		Length of the coastline	1,771	km
		Amount released per km of coastline	16.6	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	48,214	ton/year
		Amount released per person	4.39	kg/person/year

Source: Created by JICA Survey Team based World Bank Group. n.d. and UNEP. 2018b.

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

TableTable 2-117 Policies and initiatives related to marine plastic litter in the Republic of Haiti

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ Ban on import, commercialization, manufacture and use of black plastic bags and Styrofoam (since 2013).	・ Rainwater drainage cleaning project in the Port-au-Prince metropolitan area (Cabinet Order of 1978, Ministry of Public Works, Transport and Communications).	・ N/A
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ The city of Les Cayes collaborates with UNEP and the Interministerial Committee for Regional Development to develop an integrated waste management plan. During the Gelée Festival, public awareness activities are held to show how to recycle and reduce waste at source. In addition, local young people educate tourists and beach users during a five-week summer camp regarding efficient collection and transport of waste, proper landfill disposal, eradication	・ 4Ocean is a marine cleanup company headquartered in Boca Raton, Florida. Operations started in Port-au-Prince in August 2018 and the company collects waste along the coast and at the estuary to remove plastic and debris before they reach the ocean. With the support of the Government of Haiti, the US Department of Commerce and the American Chamber

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
		of illegal dumping, and promote recycling. ・ As part of the efforts of Plastic Bank, which was established in 2014, more than 70 plastic collection bases were opened as of November 2018. Local people can earn income in exchange for collecting plastic waste. ・ Montachem, a global plastic raw material company, joined the existing Groupe HM recycling activity and is now turning plastic waste collected from streets, beaches and water sources into school desks for children.The Plastic Ocean Project tried oil treatment of plastics recovered in the country using a technology developed at MIT in 2011. The current situation is unknown.	of Commerce, project implementation around Carrefour, Port-au-Prince, Luly, Saint-Marc, the goal is to collect at least 3,000 lb. of plastic and debris daily from the waters and beaches of the Republic of Haiti. It consists of 81 workers, 8 captains, and one operation manager. ・ Dell collects marine plastic litter of the Republic of Haiti and uses it for computer parts (Ministry of the Environment, Japan. 2019).

2.14.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in the Republic of Haiti.

Table 2-118 Waste-related organizations in Republic of Haiti

Organization name	Responsibilities and/or Initiatives
Ministère de l'Environnement (Ministry of the Environment)	Promote sustainable development and environmental conservation through the formulation and implementation of environmental policies, the formulation of environmental standards, and the creation of laws and regulations.
Ministère des Travaux Publics, Transport, Communications et Énergie (Ministry of Public Works, Transport, Communications, and Energy)	Similar to the Ministry of the Environment, this Ministry is responsible for waste policy and regulations.
Direction du Cadre de Vie et Assainissement, Ministère de l'Environnement (Living Environment and Sanitation Directorate, Ministry of Environment)	Deals with issues related to living environment and public health sectors to strengthen local governments.
Ministère de l'Intérieur et des Collectivités Territoriales (Ministry of Internal Affairs and Local Governments)	This Ministry has jurisdiction over the local governments.

Organization name	Responsibilities and/or Initiatives
Ministère de la Santé Publique et de la Population (Ministry of Population and Public Health)	
Local government	Responsible for the collection and disposal of waste.
Service National de Gestion des Résidus Solides (SNGRS) (National Solid Waste Wanagement Service)	Established under the supervision of the Ministry of the Environment, it provides services to the entire country in cooperation with local governments. It deals with the collection, transport, sorting, recycling, treatment and conversion of waste (including solid waste, medical waste and hazardous waste), and sets the implementation standards for these activities, especially regarding the construction of the final disposal site.
Environmental Cleaning Solutions S.A. (ECSSA)	Operates a business that proceeds to the collection, processing, and sustainable export of recyclable plastic resources (IDB. 2019).

Source: UNEP, 2014, IDB, 2016 and Website of each organization

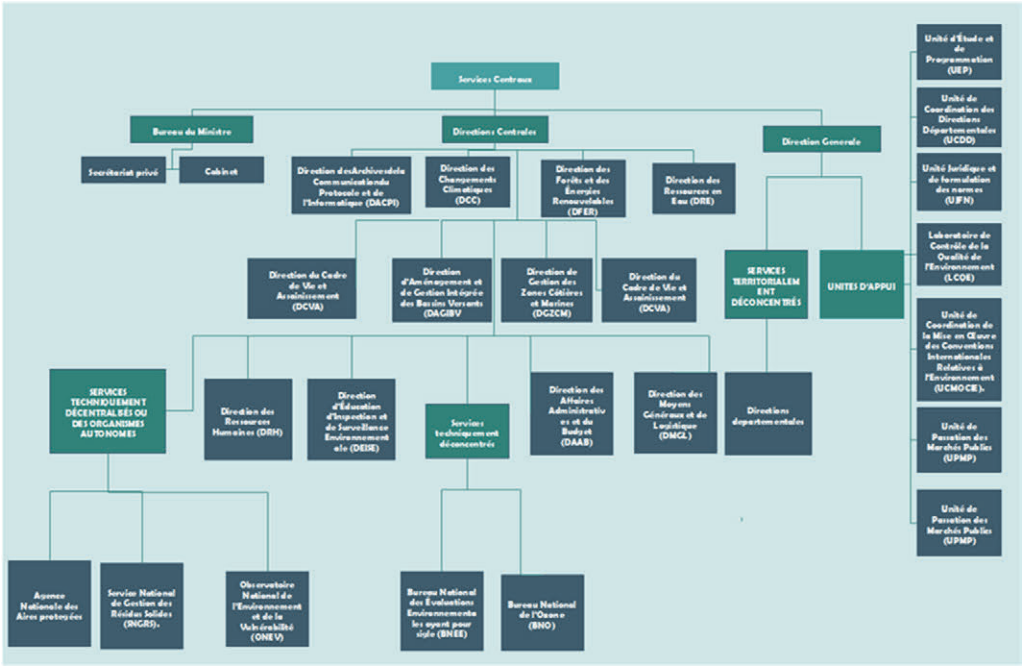


Figure 2-50 Organization chart of Ministry of Environment[78]

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-119 Legal system related to waste management in the Republic of Haiti

Name of the legislation	Contents
Décret du 3 mars 1981, créant une loi-cadre régissant la gestion et l'élimination des déchets et prévoyant en même	Definition of a framework for waste management. It is stipulated that the

[78] Source: https://www.mde.gouv.ht/index.php/fr/le-ministere

Name of the legislation	Contents
temps les sanctions appropriées (Decrees of March 3, 1981, Framework Act that stipulates waste management and disposal, and at the same time provides appropriate measures)	management of household waste is carried out by local governments, groups of local governments, or special organizations.
Arrêté présidentiel du 21 avril 1983 déclarant une portion de terrain située à l'habitation « Truitier », section rurale des Varreux en la commune de Delmas zone de traitement et de mise en décharge des déchets collectés dans la zone métropolitaine et ses environs immédiats (Presidential Decree of April 21, 1983, regarding a part of the land in the house of "Truitier" in the village of Varreux in the town of Delmas, declared disposal and final disposal site for waste collected in and around the metropolitan area)	Decision of Truitier final disposal site.
Loi portant création, organisation et fonctionnement du service national de gestion des résidus solides (SNGRS), 2017 (Law that regulates the establishment, organization and operation of SNGRS)	Establishment of SNGRS. It stipulates the management of solid waste, medical waste and hazardous waste in cooperation with local governments.

Source: UNEP. 2014 and IDB. 2016

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. The country encourages private sector participation in waste management.

Table 2-120 System and infrastructure related to waste management in the Republic of Haiti

Waste management stage	Content
Discharge	・ As of 2018, the average amount of waste generated in the capital Port-au-Prince is estimated to be 6,000 m^3 per day. ・ The collection rate is 30%. Most of the remaining waste is abandoned along canyons and streets.
Collection/Transport	・ Since 2017, SNGRS has collected solid waste instead of Service Métropolitain de Collecte des Résidus Solides (SMCRS, Metropolitan Solid Waste Collection Service). SNGRS is a national agency for solid waste management and regulations, while SMCRS activities were limited to the metropolitan area. ・ Approximately 1.6 million tons of solid waste is reported to be uncollected each year in the country (World Bank Group. 2019).
Treatment	・ There are private companies and initiatives related to the recycling of resources such as plastics and metals. ・ IDB announced support for plastic recycling implemented by ECSSA in the country. The objective is to improve the capacity of ECSSA and experiments the use imitation wood made of recycled plastic domestically and overseas (IDB. 2019). ・ Plastic Bank set up a system to pay for plastic waste collected by residents and brought to the recycling center through a blockchain app.The recycling centers make profits by pelletizing plastics and selling the collected plastic.
Disposal	・ The final disposal site, Truitier, is an open dumping site. It is Port-au-Prince's only public waste disposal site, built on 618 acres of land in the 1980s. It is located in Truitier, the municipality of Cite Soleil, 5 km north

Waste management stage	Content
	of the center of the capital. As of 2018, about 200 people live there (see figure below) and are rummaging through waste to find food and valuables. In addition to insufficient equipment, existing equipment is not functioning due to lack of maintenance. The disposal site is managed by SNGRS. As of 2019, the site is full, and trucks cannot enter.

Source: IDB. 2016 and Le Nouvelliste. 2019

State of waste discharge[79]

Dwelling at the Truitier final disposal site [80]

Figure 2-51 Situation related to waste in the Republic of Haiti (Photographs)

[79] Source: Le Floridien. 2019

[80] Source: Haiti Liberte. 2018

2.15 Commonwealth of The Bahamas

2.15.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The Commonwealth of The Bahamas is an island country located in the Caribbean Sea with a population of 385,640 (2018) and an area of 13,880 km^2 (almost the same as Fukushima Prefecture) (MOFA. 2019m). It consists of about 700 islands, including many remote islands with a larger area than New Providence island, where the capital is located. Neighboring countries are the Florida Peninsula of the United States on the northwest side, Cuba on the southwest side, and the Republic of Haiti on the southeast side.

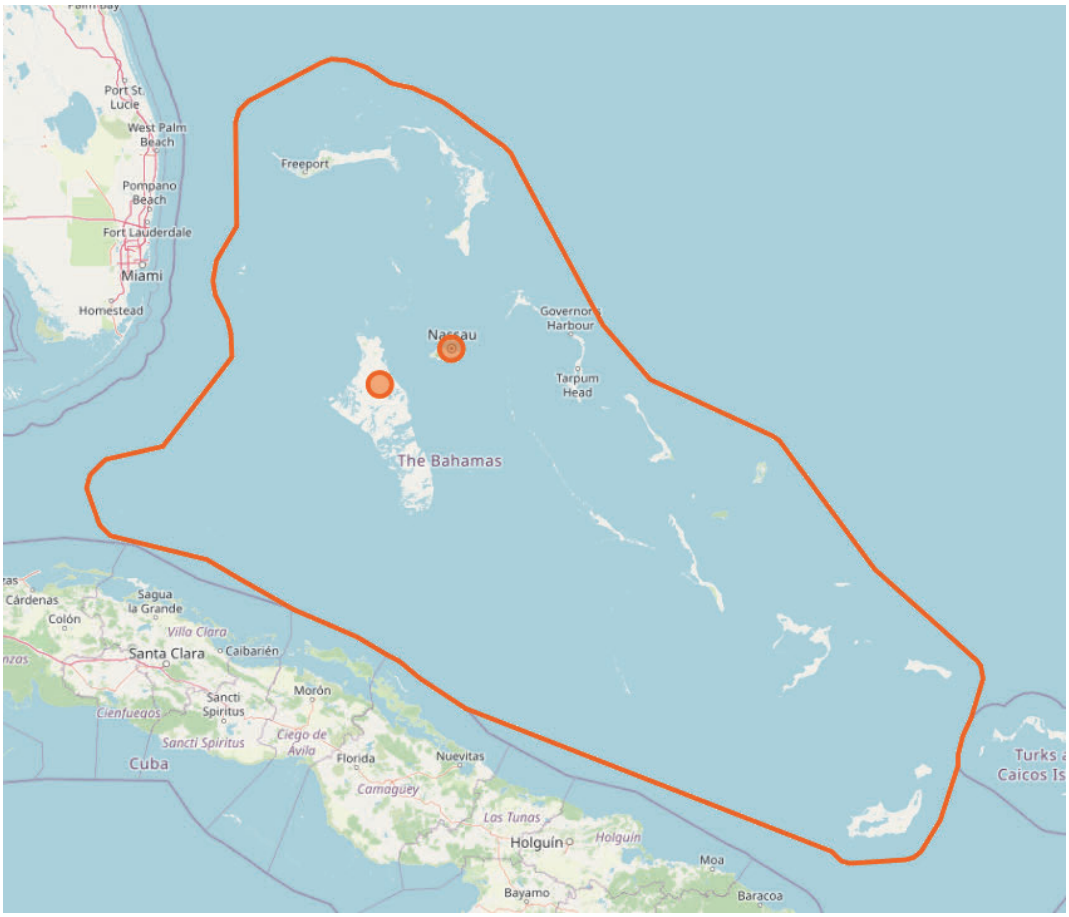


Figure 2-52 Map of Commonwealth of The Bahamas[81]

The capital is Nassau, whose population accounts for more than 70% of the total population. As for ethnic groups, Africans account for more than 90%, European Caucasians 4.7% and mixed races 2.1%. The official language is English, and the religion is Christianity such as Protestantism, Anglican Church,

[81] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

and Catholicism. The table below summarizes information on demographic trends and projections of future population changes in the country. The population is expected to increase in the future. The population ratio of the capital is currently high, and it is estimated that nearly 90% of the population will live in major cities including the capital by 2050.

Table 2-121 Demographic trends and population projections in Commonwealth of The Bahamas

Items (Unit)	Data	
Population (person)	385,640	
Population increase (annual %)	1.0	
Population density (person/km^2)	38.5	
Urban population (person)	320,178	
Urban population (% of total population)	83.0	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	20.3	
Population ages 0-14 (% of total population)	22.5	
Population ages 15-64 (% of total population)	70.3	
Population ages 65 and above (% of total population)	7.3	
Population, male (% of total population)	48.6	
Population, female (% of total population)	51.4	
Population projections	2030	2050
Projection of population, total (person)	427,000	463,000
Projection of urban population (person)	362,000	410,000
Projection of urban population (% of total population)	84.7	88.4

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[82]

The economy is growing steadily due to the development of the tourism industry that takes advantage of the terrain and climate. Although the government is trying to promote agriculture, manufacturing, the financial sector, among others due to the need for economic diversification to maintain growth, the country still relies heavily on tourism (GDP contribution of tourism is about 50%). As more than 80% of tourists come from the United States, the economy of the country is easily affected by the US economy. After the Lehman shock, the budget deficit has expanded. The country has adopted a tax haven policy that exempts income tax, corporate tax, and others in order to attract foreign companies and financial institutions. As a result, foreign banks and multinational companies opened offices and the country has one of the largest number of registered vessels in the world, but it relies on import duties and royalties for its financial income. The Commonwealth of the Bahamas is currently applying for membership in

[82] Source: MOFA. 2019m

the WTO.

Below is a summary of the economic situation of the Commonwealth of The Bahamas.

Table 2-122 Economic situation of the Commonwealth of the Bahamas

Items (Unit)	Data
GDP (current US$)	12,424,500,000.0
GDP per capita (current US$)	32,217.9
GNI per capita, PPP (current international $)	30,330.0
GDP growth (annual %)	1.6
GDP per capita growth (annual %)	0.5
Inflation, consumer prices (annual %)	2.3
Imports of goods and services (% of GDP)	41.3
Exports of goods and services (% of GDP)	36.1
Main industries (MOFA. 2019m)	Tourism, finance
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.9
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	40.4
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	0.9

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.15.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the Commonwealth of The Bahama. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 1,024 to 96,427 tons/year. Since the waste collection rate and the disposal rate in sanitary landfill are both high, the amount of plastic waste released into the ocean is not expected to be large.

Table 2-123 Waste management status and emissions of marine plastic litter in the Commonwealth of The Bahamas

Main item		Sub-item	Data	Unit
Generation		Amount generated	714	ton/day
		Proportion of plastic	13	%
		Amount of plastic litter generated	93	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	100.0	%
		Uncollected waste from households (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	100.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	1,024	ton/year
		Amount released per day	2.81	ton/day
		Length of the coastline	3,542	km
		Amount released per km of coastline	0.29	ton/km/year
	Calculation	Unit rate	27.22	ton/km/year

Main item		Sub-item	Data	Unit
	based on the length of the coastline	Amount released per year	96,427	ton/year
		Amount released per person	252.59	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-124 Policies and initiatives related to marine plastic litter in the Commonwealth of The Bahamas

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	• Ban on single-use plastic food packaging, non-biodegradable/oxo-degradable/biodegradable single-use plastic bags, and balloons. There are regulations on the use of compostable single-use plastic bags. The legislation was enforced on January 1, 2020. Companies are allowed to own banned plastics and sell them to customers until June 30, 2020 (Environmental Protection (Control of Plastic Pollution) Bill).	• N/A	• Beach, coastal and port cleaning, and educational activities by various ministries (Ministry of the Environment, Ministry of Tourism, etc.). • Bahamas National Trust, which manages national parks, conducts marine debris campaigns, including the removal and cleaning of illegally dumped waste (UNEP. 2014).
Initiatives of local governments, companies, NGOs, etc.	• N/A	• Implementation of recycling activities by the community (UNEP. 2014).	• The Bahamas Project identifies the accumulation of marine debris on beaches and its impact on the tourism industry. It creates educational materials and set up signboards on beaches and coastal areas with heavy traffic (UNEP. 2014). • Environmental NPO Bahamas Plastic Movement conducts a citizen-participation survey on plastics found on beaches. The Plastic Beach Project has started in April 2013 and conducted

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
			macro and microplastic concentration surveys on 16 beaches on South Elysera Island. More than 350 volunteers participated (UNEP. 2014). ・ Citizen Science Debris Surveys are collection surveys on marine and land debris conducted by citizens (UNEP. 2014).

2.15.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in the Commonwealth of The Bahamas.

Table 2-125 Waste-related organizations in Commonwealth of The Bahamas

Organization name	Responsibilities and/or Initiatives
Bahamas Environment, Science & Technology (BEST)	Part of DEHS. Manages the implementation of multilateral environmental agreements by the government and reviews EIAs and Environmental Management Plans for development projects in the Commonwealth of The Bahamas.
Department of Environmental Health Services, Ministry of Environment and Housing (DEHS)	Responsible for the environmental management, collection and disposal of solid waste, public health, etc. DEHS is in charge of waste collection and disposal on the island of New Providence.

Source: UNEP. 2014, IDB. 2016 and Website of each organization.

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-126 Legal system related to waste management in the Commonwealth of the Bahamas

Name of the legislation	Content
Environmental Health Services Act	Regulations for promoting and protecting public health, and protecting and maintaining the environment.
Local Government Act (No. 5 of 1996, amended in 2012 and 2015)	Act that requires district councils to provide community services such as water, health care, sanitation, and waste collection and disposal.
Environmental Planning and Protection Act (2000) (UNEP. 2014)	Act on the establishment of Environmental Planning and Protection departments, reduction or control of pollution, regulation of activities, environmental management, conservation, sustainable use, and related purposes.
Environmental Health Services (Collection and Disposal of Waste) Regulations, 2004 (amended in 2013)	Regulations on environmental health services, including waste collection and disposal. Established in 2004, revised in 2013.
Freeport (Removal of Refuse) By-laws	Created based on the Freeport Bye-laws Act. These By-laws stipulate the collection and disposal of waste in the Freeport

Name of the legislation	Content
	area, and provide rules on the prevention of pollution by waste in that area including waters.

Source: UNEP. 2014, IDB. 2016 and UNEP. 2018a

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-127 System and infrastructure related to waste management in the Commonwealth of The Bahamas

Waste management stage	Content
Discharge	• On Grand Bahama Island, waste collection fee from household is added to the water bill. Grand Bahama Port Authority (GBPA) owns a public service provider. • There is no charge for household waste on Family Islands and New Providence.
Collection/Transport	• As of 2016, waste collection is to be carried out directly by the government or through a business contracted by the government. Grand Bahama Freeport is allowed to conduct its own collection and disposal. • DEHS is in charge of waste collection and disposal on New Providence. Collection is mainly carried out by private contractors contracted by the government. • A transfer station is planned to be built for the purpose of effective transport of waste from Spanish Wells to the final disposal site in North Eleuthera (Ministry of Environment and Housing. n.d.). • Collection on Family Islands is carried out by a private contractor at the request of the local government.
Treatment	• A MRF facility opened on New Providence in 2015. The 125,000-square-feet MRF can process up to 80 tonnes of household and commercial recyclables per hour. • WTE is under consideration as a policy option for waste management and energy production.
Disposal	• As of 2016, there are 9 final disposal sites, of which only 3 (New Providence, Abaco, Grand Bahama) are sanitary landfill sites. Island / Type of Disposal Grand Cay: D Abaco: SL Grand Bahama: SL Bimini: NSL Exuma: NSL San Salvador: NSL Andros: NSL Eleuthera: NSL The Harrold Road sanitary landfill (New Providence): SL *SL: Sanitary landfills *NSL: Non Sanitary Landfills *D: Dumpsite Source: Adapted from Ms Thomasina Wilson presentation to the Caribbean Solid Waste Conference • DEHS operates and manages the New Providence landfill. In February 2019, the Waste Resources Development Group and the government signed an agreement to own, operate and rehabilitate the New Providence landfill site (Eyewitness News. 2019). • On Grand Bahama Island, the only final disposal site is owned by GBPA.

Source: IDB. 2016

Figure 2-53 New Providence landfill in the Commonwealth of The Bahamas (Photograph)[83]

[83] The Government of the Bahamas. 2017

2.16 Barbados

2.16.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Barbados is an island nation of coral reefs located in the Caribbean Sea with a population of 286,641 (2018), an area of 430 km^2 (almost the same as Tanegashima) (MOFA. 2019n). Neighboring countries are Saint Lucia located about 200 km across the sea on the northwest side, St. Vincent and the Grenadines on the west side, and Grenada and Trinidad and Tobago on the southwest side.

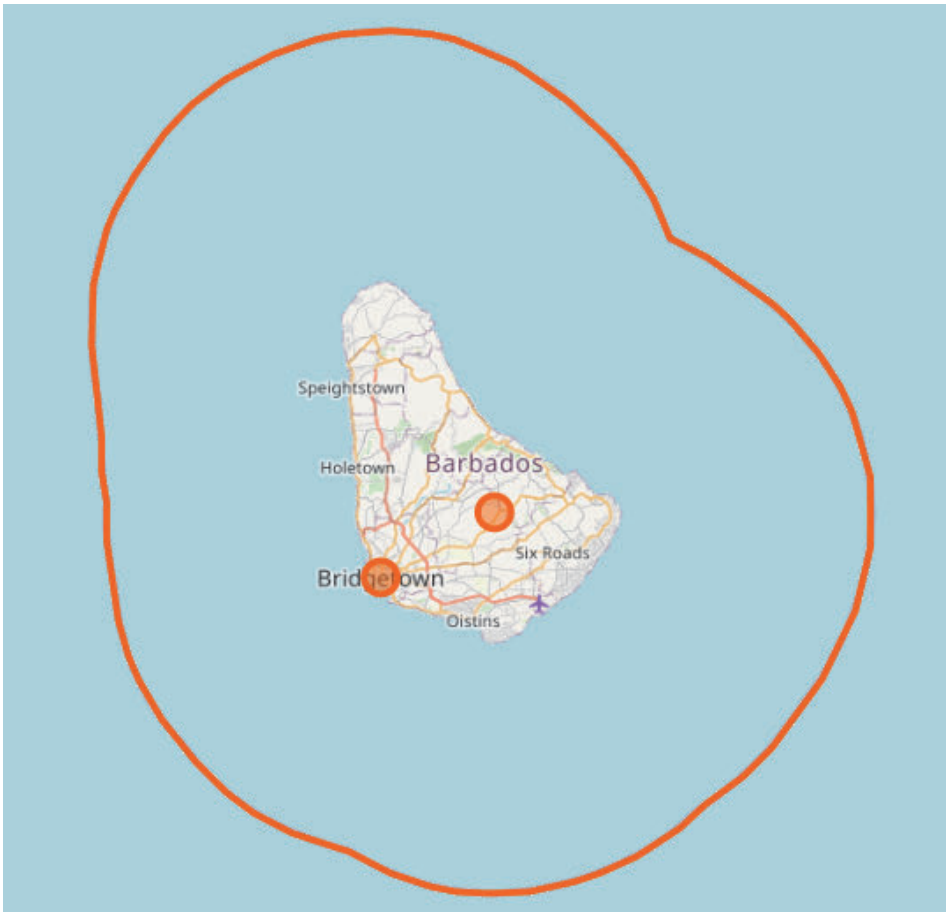


Figure 2-54 Map of Barbados[84]

The capital is Bridgetown, whose population accounts for more than 30% of the total population. The ethnic groups are mainly African, accounting for 92.4%, and others include mixed races (3.1%), Caucasians (2.7%), East Indians (1.3%), etc. The official language is English, and the religion is Christianity (Church of England, Protestant, Catholic). The table below summarizes information on demographic trends and projections of future population changes in the country. The population is

[84] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

expected to decline by 2050.

Table 2-128 Demographic trends and population projections in Barbados

Items (Unit)	Data	
Population (person)		286,641
Population increase (annual %)		0.1
Population density (person/km^2)		666.6
Urban population (person)		89,280
Urban population (% of total population)		31.1
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)		0.7
Population ages 0-14 (% of total population)		17.3
Population ages 15-64 (% of total population)		66.9
Population ages 65 and above (% of total population)		15.8
Population, male (% of total population)		48.3
Population, female (% of total population)		51.7
Population projections	2030	2050
Projection of population, total (person)	289,000	277,000
Projection of urban population (person)	95,000	113,000
Projection of urban population (% of total population)	32.8	40.8

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[85]

The economy is centered on tourism. The country maintained a high growth rate in the 1960s and 1970s due to the growth of tourism and manufacturing, but the slowdown in the 1980s caused a serious economic stagnation in the 1990s. The unemployment rate exceeded 20% in 1992 due to the government's privatization and reduction of civil servants. From 1993 to 2000, the country has maintained a positive growth due to the recovery of the tourism and manufacturing industries and the growth of the construction industry. The attacks of September 11, 2001 in the United States hit the tourism industry and caused negative growth. Thereafter, the government implemented policies such as protection of domestic manufacturing and agriculture, and revitalization of tourism and finance, and the economy returned to positive growth from 2002. In January 2006, the CARICOM Single Market (CSM) was launched. Since 2008, tourism revenue has declined due to the global economic recession, the sugar industry has fallen, and the economy has deterioratedThe new administration of Motley announced Barbados's economic reconstruction and reform plan on August 30, 2018. On September 7, 2018, the government agreed to continue negotiations with the IMF to conclude an extended credit grant (EFF). On October 1st of the same year, the IMF Executive Board approved the agreement stating that .Barbados

[85] Source: MOFA. 2019n

would work on economic reconstruction and reform with the cooperation of the IMF for the next four years.

Below is a summary of the economic situation of Barbados.

Table 2-129 Economic situation of Barbados

Items (Unit)	Data
GDP (current US$)	5,145,000,000.0
GDP per capita (current US$)	17,949.3
GNI per capita, PPP (current international $)	16,280.0
GDP growth (annual %)	-0.5
GDP per capita growth (annual %)	-0.6
Inflation, consumer prices (annual %)	3.7
Imports of goods and services (% of GDP)	40.9
Exports of goods and services (% of GDP)	42.0
Main industries (MOFA. 2019n)	Tourism, light industry, agriculture (sugar)
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.15
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	34.9
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	N/A in 2018, 1.3 in 2010 (latest information)

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.16.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Barbados. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 768 to 2,5598 tons/year. Since the waste collection rate and the disposal rate in sanitary landfill are both high, the amount of plastic litter released into the ocean is not expected to be large.

Table 2-130 Waste management status and emissions of marine plastic litter in Barbados

Main item		Sub-item	Data	Unit
Generation		Amount generated	489	ton/day
		Proportion of plastic	17	%
		Amount of plastic litter generated	84	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	90.0	%
		Uncollected waste from households (World Bank Group. 2019)	8,174	ton/year
		Uncollected waste from households per person	28.5	kg/person/year
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	90.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	768	ton/year
		Amount released per day	2.10	ton/day
		Length of the coastline	94	km

Main item		Sub-item	Data	Unit
		Amount released per km of coastline	8.17	ton/km/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	2,559	ton/year
		Amount released per person	8.94	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. From April 1, 2019, single-use plastic products such as single-use plastic cups, cutlery (including knives, forks and spoons), muddlers, straws, plates, egg trays (both plastic and foamed styrene), as well as foamed styrene containers used in the food retail industry are banned (Government information service. 2019, St. Lucia Times. 2019). The ban on plastic bags was scheduled to come into effect on January 1, 2020, but it has been postponed to April 1, 2020 so that plastic bag manufacturers can switch processes. (The Barbados Advocate. 2019). As of mid-April 2020, the government temporarily canceled the ban on petroleum-based single-use plastic bags to address concerns about potential virus infection through reusable bags and to ensure the safety of shoppers and retail staff (Loop. 2020).

The Marine Pollution Act defines pollution sources as i) land-based, ii) undersea activity, iii) dumping activity, and iv) airborne (floating), and makes provision for the prevention of pollution of the marine environment (UNEP. 2014).

In addition, Barbados has been implementing the Adopt-Your-Beach project, encourages beach users to participate in regular beach and underwater cleanupssuch as International Coastal Cleaning Day, designs and provides waste bins and benches, and promotes vegetation restoration (UNEP. 2014).

Table 2-131 Policies and initiatives related to marine plastic litter in Barbados

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・From April 1, 2020, import, retail, sale and use of petroleum-based single-use plastics are banned (Government information service. 2019, St. Lucia Times. 2019). ・Ban on all petroleum-based plastic bags,	・Recycling is mandatory (UNEP. 2018a). ・There is EPR such as Returnable Containers Act. Distributors and resellers of beverage containers cannot do business without a beverage container recycling system in place (UNEP. 2018a) ・Regulations on littering (Health Services Act) ・Prevention, reduction	・Establishment and protection of coral and marine protected areas as part of coastal zone management. Provision of penalty for people who have polluted beaches with waste (Coastal Zone Management Act). ・In “Improving Marine Litter Management in the Caribbean – The Barbados Project”, EPD selected 4 beaches and

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	except those used for pharmaceutical packaging, hygiene and food preservation (The Barbados Advocate. 2019).	and control of marine pollution from all causes, and provision of penalties (Marine Pollution Act). ・The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a).	conducted marine debris monitoring training with the participation of people from the surrounding community. Created "Barbados Marine Debris Monitoring Guide" to provide information on the causes of marine debris, appropriate data collection methods, and beach cleaning. Also published the newsletter "Litter Buzz".Adopt-Your-Beach project that includes regular beach and underwater cleanups.
Initiatives of local governments, companies, NGOs, etc.	・Retailer charges for plastic bags in 2017 (US$ 0.15-0.20 per bag) (WB. 2019).	・Joined UNEP's #CleanSeas campaign (The Planetary Press. 2019). ・The NGO Future Center Trust has established many community-operated recycling centers throughout the island through the Community Recycling Network, CoRe (CoRe Network. n.d.).	・Participation in the ICC organized by Ocean Conservancy. ・Beach cleaning activities are organized by NPOs, NGOs, private businesses, etc.

Source: UNEP. 2014 and CEP. 2019

2.16.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describesthe organizations related to waste in Barbados.

Table 2-132 Waste-related organizations in Barbados

Organization name	Responsibilities and/or Initiatives
Environmental Protection Department, Ministry of Environment and Natural Beautification	Policy and regulatory body, including waste management.
Sanitation Service Authority, Ministry of Environment and Natural Beautification (SSA)	It includes four engineering infrastructures: excreta management system, wastewater management system (including wastewater treatment facilities), solid waste management system, and rainwater drainage system.
Project Management Coordination Unit (PMCU)	The unit is in charge of policy and education It manages solid waste and runs the implementation of the integrated solid waste management program.

Source: UNEP. 2014, IDB. 2016 and Website of each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. Barbados does not have a waste management law, but it is regulated by decree and three regulations in 1969. Health Services legislation defines a regulatory framework for solid waste management, and other regulations deal with littering, collection and transport, landfill disposal, etc. The Returnable Containers Act has been introduced to encourage consumers to return empty beverage containers.

TTable 2-133 Legal system related to waste management in Barbados

Name of the legislation	Contents
Health Services Act (Act No. 38 of 1969)	
Health Services (Nuisances) Regulations, 1969	Prohibition of nuisances such as leaving solid waste in a manner that can be dangerous or harmful to health.
Health Services (Disposal of Offensive Matter) Regulations, 1969	Regulations that allow disposal only at approved final disposal sites.
Health Services (Collection and Disposal of Refuse) Regulations, 1975	Minimum collection frequency and location of final disposal site designated by the Minister.
Sanitation Services Authority Act, 1975	Grants the Public Health Service the right to remove waste from any premise and to carry out other functions within the Act.
Returnable Containers Act, 1986	Provides for the control of the sale of drinks in beverage containers, the payment of a deposit on beverage containers, a refund upon return of those containers, and final disposal of unused or unusable containers.
National Strategic Plan of Barbados 2006-2025 (FAO. 2007)	National Strategic Plan for the period 2006 to 2025. Includes comprehensive waste management.
Municipal Solid Waste Tax Act, 2014 (No.6 of 2014)	Stipulate the imposition and collection of a “local government waste tax”.

Source: UNEP. 2014 and IDB. 2016

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-134 System and infrastructure related to waste management in Barbados

Waste management stage	Conten
Discharge	・During floods, citizens are required to tightly seal their waste bin (Department of Emergency Management. n.d.).
Collection/Transport	・Collection rate is 90%. ・SSA is in charge of waste collection on the entire island, collecting household waste and some commercial waste.
Treatment	・Most of the recyclable resources collected by private recycling companies and SBRC are exported to China or South America. ・Details of the Sustainable Barbados Recycling Centre (SBRC) facility are as follows: ➢ Operations started on June 11, 2009. ➢ 20 years of operation based on a BOOT contract with the government.

Waste management stage	Conten
	➢ Receive and process solid waste from the island. ➢ Consists of an office building, a public drop-off area, a weighing building, a transfer station building, two substations, a workshop, a storage building, and a C&D MRF. ➢ Located in Vaucluse, St. Thomas Parish, adjacent to the Mangrove Pond Sanitary Landfill. ➢ The site area is 35 acres (14.1 ha). ➢ Develops and sells humus, compost, soil conditioners, wood chips, coconut fibre products, etc. from organic waste.
Disposal	・Most of MSW is disposed of at the Mangrove Pond sanitary landfill site.

Source: IDB. 2016

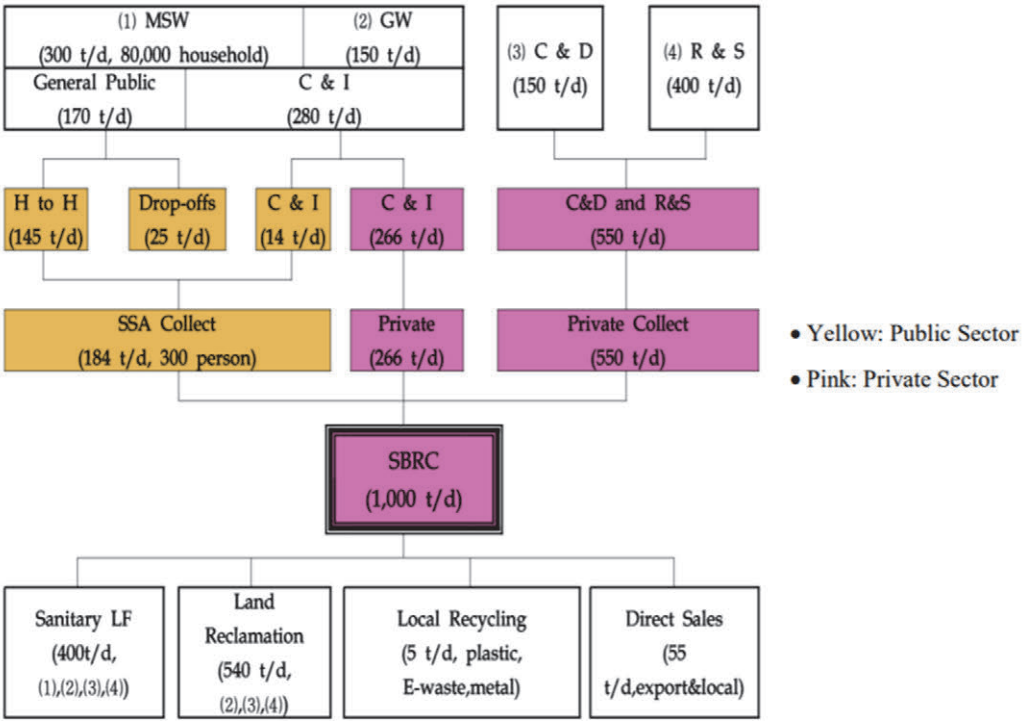


Figure 2-55 Waste flow in Barbados[86]

[86] Source: IDB. 2015

Waste collection

Collection of recyclables (paper) for recycling

Collection of recyclables (plastic) for recycling

Mangrove Pond final disposal site

Figure 2-56 Waste management in Barbados (Photographs)[87]

[87] Source: Barbados Solid Waste Management Programme. 2018

2.17 Belize

2.17.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

Belize has a population of 383,071 (2018), an area of 22,970 km^2 (slightly larger than Shikoku) (MOFA. 2019o), and is located at the base of the Yucatan Peninsula in northeastern Central America. There are remote islands such as Ambergris Caye which is the largest one, Caye Caulker, Half Moon Caye, and Harvest Caye. It borders the United Mexican States on the north side and Guatemala on the west side, with Honduras across the Gulf of Honduras on the southeast side and facing the Caribbean Sea on the east side.

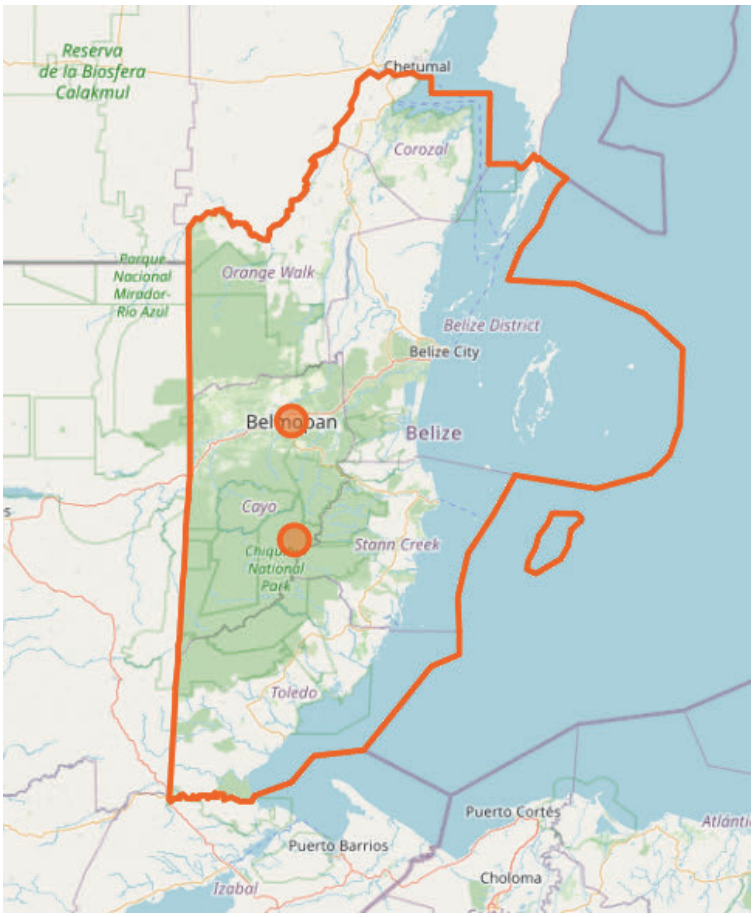


Figure 2-57 Map of Belize[88]

The capital is Belmoban, whose population accounts for 6.0% of the total population. Ethnic groups are Mestizo (52.9%), Creole (25.9%), Maya (11.3%), Garifuna (6.1%), East Indians (3.9%), Mennonites (3.6%), Caucasians (1.2%), Asians (1.0%) and others (1.5%). The official language is English, but

[88] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

Spanish, Belize Kriol, Mopan, and others are also used. Religions include Christianity (Catholic, Protestant, Anglican, etc.). The table below summarizes information on population dynamics and its future forecast. Population growth is significant, and the population is expected to increase by about 1.5 times in 2050 compared to 2018. Although the current population concentration in the capital is not large, the population ratio in major cities is also increasing and is expected to reach about 60% in 2050.

Table 2-135 Demographic trends and population projections in Belize

Items (Unit)	Data	
Population (person)	383,071	
Population increase (annual %)	1.9	
Population density (person/km^2)	16.8	
Urban population (person)	175,155	
Urban population (% of total population)	45.7	
Population in urban agglomerations of more than 1 million (% of total population)	N/A	
Population living in areas where elevation is below 5 meters (% of total population)	20.5	
Population ages 0-14 (% of total population)	30.3	
Population ages 15-64 (% of total population)	65.0	
Population ages 65 and above (% of total population)	4.7	
Population, male (% of total population)	49.8	
Population, female (% of total population)	50.2	
Population projections	2030	2050
Projection of population, total (person)	468,000	571,000
Projection of urban population (person)	227,000	326,000
Projection of urban population (% of total population)	48.6	57.1

Source: World Bank Group. World Development Indicators

2) Macroeconomic situation, economic policy[89]

The main industries is agriculture such as sugar, bananas and citrus fruits, which accounts for about 70% of the total foreign currency income and about 20% of the labor force. Diversification of agricultural production is an issue in the future due to sluggish sugar prices and the abolition of EU quotas for banana exports. In recent years, the weight of service industries such as tourism has increased.

From 2000 to 2005, after the previous administration (PUP) issued high-interest government bonds in a short period of time, public debt increased, and in August 2012, it became impossible to pay government bond interest rates.

In recent years, the agriculture and tourism industries have been on a recovery trend, and the economy is expected to grow moderately.

[89] MOFA. 2019o

Below is a summary of the economic situation of Belize.

Table 2-136 Economic situation of Belize

Items (Unit)	Data
GDP (current US$)	1,871,203,164.1
GDP per capita (current US$)	4,884.7
GNI per capita, PPP (current international $)	7,810.0
GDP growth (annual %)	3.0
GDP per capita growth (annual %)	1.1
Inflation, consumer prices (annual %)	N/A
Imports of goods and services (% of GDP)	58.0
Exports of goods and services (% of GDP)	57.7
Main industries (MOFA. 2019e)	Tourism, agriculture (sugar, citrus, banana), fisheries
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	1.4
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	44.9
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	9.6

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

2.17.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in Belize. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range from 1,008 to 10,508 tons/year. Although the landfill disposal rate is only 66%, the final disposal sites are sanitary landfills, and the waste collection rate is also not low, hence the amount of plastic litter released into the ocean is not expected to be large.

Table 2-137 Waste management status and emissions of marine plastic litter in Belize

Main item		Sub-item	Data	Unit
Generation		Amount generated	290	ton/day
		Proportion of plastic	19	%
		Amount of plastic litter generated	55	ton/day
Collection/Transport		Collection rate (World Bank Group. 2019)	85.2	%
		Uncollected waste from households (World Bank Group. 2019)	8,935	ton/year
		Uncollected waste from households per person	23.3	kg/person/year
Treatment/Disposal		Recycling rate	Unknown	
		Landfill disposal rate	66.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	2.68	kg/person/year
		Amount released per year	1,008	ton/year
		Amount released per day	2.76	ton/day
		Length of the coastline	386	km
		Amount released per km of coastline	2.61	ton/km/year
	Calculation based on the length of	Unit rate	27.22	ton/km/year
		Amount released per year	10,508	ton/year

Main item		Sub-item	Data	Unit
	the coastline	Amount released per person	27.97	kg/person/year

Source: Created by JICA Survey Team based on World Bank Group. n.d. and UNEP. 2018b

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. In 2018, the government announced its intention to phase out single-use plastics and Styrofoam with the aim of reducing their use.

The Implementation Strategy and Action Plan to Phase-out Single-Use Plastics and Styrofoam Utensils, Transition to Green Products, and Promote Recycling, which were approved by the government in July 2018, have been carried out by the Plastics and Styrofoam Task Force. Environmental Protection (Pollution From Plastics) Regulations, 2020 came into effect on January 15, 2020.

The import and manufacture of restricted products listed in Schedule I are regulated through a licensing and permitting process by the Department of the Environment. The list of single-use plastic products banned according to Schedule II is as follows:

- Bi-fold containers (“clamshells”) made of singleuse Styrofoam and plastic
- Single-use styrofoam and plastic plates, bowls, cups, and lids
- Single-use plastic forks, knives, spoons, sporks, and cutlery
- Single-use plastic carrier bags commonly referred to as shopping bags or T-shirt bags
- Single-use plastic straws

The transition process and duration are as follows:

- Import of products listed in Schedule II is banned three months after the date of enactment of the law.
- Production of products listed in Schedule II is banned six months after the date of enactment of the law.
- Sales of products listed in Schedule II is banned nine months after the date of enactment of the law.
- Possession of products listed in Schedule II is banned 12 months after the date of enactment of the law.

TableTable 2-138　Policies and initiatives related to marine plastic litter in Belize

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・Ban on use of single-use plastics and Styrofoam (Environmental Protection (Pollution From Plastics) Regulations. 2020).	・Returnable Containers Act, No. 12 of 2009 is an example of EPR (Returnable Containers Act, No. 12 of 2009). ・Prohibition of littering (Violation of Tickets) Regulations (Littering Offences (Violation of Tickets) Regulations). ・Prohibition of the accumulation, placement and discharge of pollution in coastal waters (Belize Port Authority Act) (FAO. 2001). ・Regulations that restrict and control the deposit of substances that may cause pollution in ports (Wrecks and Salvage Act). ・Regulation on the pollution of the environment including marine areas (Pollution Regulation) (FAO. 2002) ・Prohibition of dumping waste and other marine pollution sources. Regulation of development activities in an environmentally friendly manner (Environmental Protection Act, 1992). ・Vessels exercising the right of innocent passage in Belize territorial waters are required to comply with all laws, including prevention of pollution (Maritime Areas Act). ・Regulation of Merchant Ships (Pleasure Vessels) Regulations 1991 (S.I. No. 148 of 1991) stipulates that all vessels weighing more than 400 tons must comply with the International Pollution Control Regulations (MARPOL 73/78). ・The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a).	・In June 2019, the Department of the Environment (DOE) and CliP (Commonwealth Litter Programme) conducted a national survey to measure the size and amount of plastic waste. The results are expected to be used for formulating national waste management policies and developing cleaning methods (The San Pedro Sun. 2019).
Initiatives of local governments, companies, NGOs, etc.	・N/A	・Joined UNEP's #CleanSeas campaign (The Planetary Press. 2019). ・Under DOE's School Outreach Program, plastics are collected for recycling and marketable products from waste are developed (DOE. n.d.).	・Participation in the ICC organized by Ocean Conservancy.

Source: UNEP. 2014, UNEP. 2018a

2.17.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Belize. BSWaMA, along with the Ministry of Natural Resources, is the implementing agency for the Solid Waste Management Project (SWMP). The purpose of SWMP is to improve solid waste management practices in the four municipalities of the West Corridor (San Pedro Ambergris Caye, Caye Caulker, Belize City, San Ignacio/Santa Elena), to protect the environment and natural resources, and to support the objective of public health and safety protection.

Table 2-139 Waste-related organizations in Belize

Organization name	Responsibilities and/or Initiatives
Ministry of Natural Resources	Responsible for managing solid waste.
Department of the Environment (DOE), Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development and Immigration Services and Refugees	Established in September 1989 and became a fully-fledged entity with the passage of the Environmental Protection Act (EPA) in November 1992. Regulatory enforcement agency for the prevention and control of environmental pollution and the protection and management of natural resources.
Environmental Health Unit, Ministry of Health	Monitoring of solid waste, liquid waste, sewage management, disaster management, etc.
Belize Solid Waste Management Authority (BSWaMa)	・Waste disposal agency under the Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development. Established through the enactment of the Solid Waste Management Authority Act in 1991. ・Responsible for the safe and environmentally friendly management of solid waste in cooperation with local governments and other stakeholders. ・The role of BSWaMA includes the implementation and management of solid waste measures such as waste management education and promotional programs, planning and implementation of waste management facilities such as transfer stations, recycling services, and landfills.
Councils	According to the Town Councils Act, Councils are responsible for managing or regulating the timely and efficient collection and removal of waste from all residential or commercial areas in the town.

Source: UNEP. 2014, IDB. 2016 and Website of each agency

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below.

Table 2-140 Legal system related to solid waste management in Belize

Name of the legislation	Contents
Solid Waste Management Authority Act, 1991	Act on the establishment of an authority responsible for the proper management and disposal of waste nationwide.
Summary Jurisdiction (Littering Offences) (Violation	Grant authority to issue Violation Tickets to littering offenders.

Name of the legislation	Contents
Tickets) Regulations (S.I. No. 130 of 1991)	
Environmental Tax Act 1991 (amended)	Provides for the imposition of environmental taxes used to develop solid waste programs, cleanse rivers, canals and other inland waterways, and to protect and improve the environment.
Environmental Protection Act, 1992	Revised in 1998 and 2009. Establishment of DOE obligations and prohibition of the dumping of waste, toxic substances, hazardous waste and other sources of marine pollution. It stipulates that development and other activities must be carried out in an environmentally friendly manner.
Town Councils Act	Assign Councils' the responsibility to coordinate, manage and regulate the timely and efficient collection and removal of waste from residential or commercial areas.
Returnable Containers Act, No. 12 of 2009	Provisions regarding the sales of drinks in beverage containers, payment of deposits on beverage containers and refund for the return of those containers.
Hazardous Waste Regulations, 2009 (S.I. No. 100 of 2009)	Stipulate the handling, storage, treatment, disposal of hazardous waste and the classification of hazardous waste. Also define violations and stipulate penalties for violations.
Environmental Protection (Pollution From Plastics) Regulations, 2020	To reduce the use of single-use plastics and Styrofoam and protect Belize's environment from plastic pollution, the government announced on March 20, 2018 its intention to phase-out of single-use plastics and Styrofoam from April 22, 2019. Implementation Strategy and Action Plan to Phase-out Single-Use Plastics and Styrofoam Utensils, Transition to Green Products, and Promote Recycling was approved by the Belize Government on July 10, 2018. Conducted by the Plastics and Styrofoam Task Force.
Public Health Act	Mandates local governments in charge of public health to treat harmful substances, wastewater, etc.
Removal of Refuse By-Laws	Local government ordinance. Stipulate provisions for waste storage, removal and collection, places receiving waste, pollution of public places, disposal of infectious waste, waste discharge, disposal of filth from sewage tanks and toilets, and more, and prescribes violations and penalties.
Removal of Refuse (Belmopan) Regulations	Regulations on the collection of household, commercial, medical, industrial and other waste, or discarded products or substances generated by activities conducted in the city of Belmopan.
Growth and Sustainable Development Strategy 2016-2019	Waste management and pollution control are needed (Government of Belize Ministry of Economic Development. 2016).

Source: UNEP. 2014, IDB. 2016 and UNEP. 2018a

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-141 System and infrastructure related to waste management in Belize

Waste management stage	Content
Collection/Transport	・ There is no standard waste collection vehicle. Waste from all over the country is collected by various types of vehicles such as dump trucks, pickup trucks, tractor trailers, and compactor trucks.

Waste management stage	Content
	・ There is no direct involvement of BSWaMA in waste collection. SWMP's beneficiary municipalities or the contractors to the municipalities are responsible for collection and transport to transfer stations.
Treatment	・ There are multiple transfer stations (Corozal transfer station, Belize City transfer station, Burrell Boom transfer station, San Pedro transfer station, San Ignacio/Santa Elena/Benque Viejo transfer station). The facilities in the Western Corridor are managed by BSWaMA. ・ Waste is transported to the facilities by self-delivery in addition to waste collection and transport vehicles. Waste transported to transfer stations is dropped onto the concrete floor inside the station, and recyclable resources such as PET bottles, HDPE bottles, glass bottles, aluminium cans, and steel cans are manually sorted and taken out of the facility. Waste residue is loaded onto a large-capacity transport trailer by a wheel loader and transported to a regional sanitary landfill site. ・ As of 2015, the recovery rate of recyclable materials at the sanitary landfill site is 2%, about 40 tons per month.
Disposal	・ The only sanitary landfill site in the country is the Regional Sanitary Landfill. Details are given below: ➢ Located on Mile 24 on the George Price Highway. ➢ Constructed under the Solid Waste Management Project and started operation in 2013. ➢ Site area is 370 acres (150 ha). ➢ Government-owned, managed by BSWaMA, and PASA Belize Limited oversees the day-to-day operations of the facility. ➢ It is the final disposal site for waste generated from the four municipalities of Western Corridor (Belize City, San Ignacio/Santa Elena/Benque Viejo, San Pedro Ambergris Cay, and Caye Caulker). ➢ The first cell (Phase I) is about 5 acres (2 ha). ➢ During facility operation, surface water, groundwater, leachate (contaminated water) and gases are monitored, and waste screening is conducted to prevent the receipt and disposal of unacceptable or harmful solid and liquid waste. ➢ The landfill facility has a management building, a weighing building, a weighing platform, vehicle washing area, material storage area, and a repair building. There is also a hazardous waste cell used for the disposal and storage of pre-treated and containerized hazardous waste.

Source: IDB. 2016, Website of BSWaMA (https://belizeswama.com/)

Corozal Transfer station

Burrell Boom Transfer station

San Pedro transfer station

Belize City transfer station

Placencia transfer station

Regional sanitary landfill site

Figure 2-58 Facilities managed by BSWaMA in Belize (Photographs)[90]

[90] Source: Belize Solid Waste Management Authority (BSWaMA). n.d.

2.18 United Mexican States

2.18.1 Socioeconomic status

1) Current demographic trends and projections of future population changes

The United Mexican States has a population of 126,190,788 (2018), an area of 1.96 million km^2 (about five times that of Japan) (MOFA. 2020b) and is located in the southern part of North America. It borders the United States on the north side and Guatemala and Belize on the southeast side. The west faces the Pacific Ocean and the east faces the Gulf of Mexico and the Caribbean Sea.

Figure 2-59 Map of the United Mexican States[91]

The capital is Mexico City, whose population accounts for more than 17% of the total population. Ethnic groups include mixed races of Europeans such as Spanish and indigenous peoples (60%), indigenous peoples (30%), and Europeans such as Spanish (9%). The official language is Spanish, and about 90% of the people are Catholic. The table below summarizes information on demographic trends and projections of future population changes in the country. The population of 2050 is expected to increase by about 23% compared to 2018, exceeding 150 million. Even now, the population of cities with more than 1 million people exceeds 40%, and it is estimated that about 90% will live in major urban areas by 2050.

[91] Source: Open StreetMap - https://www.openstreetmap.org/#map=6/20.766/-67.247 /

TableTable 2-142　Demographic trends and population projections in the United Mexican States

Items (Unit)	Data	
Population (person)	126,190,788	
Population increase (annual %)	1.1	
Population density (person/km^2)	64.9	
Urban population (person)	101,149,488	
Urban population (% of total population)	80.2	
Population in urban agglomerations of more than 1 million (% of total population)	40.7	
Population living in areas where elevation is below 5 meters (% of total population)	1.6	
Population ages 0-14 (% of total population)	26.6	
Population ages 15-64 (% of total population)	66.2	
Population ages 65 and above (% of total population)	7.2	
Population, male (% of total population)	48.9	
Population, female (% of total population)	51.1	
Population projections	2030	2050
Projection of population, total (person)	140,876,000	155,151,000
Projection of urban population (person)	117,633,000	136,857,000
Projection of urban population (% of total population)	83.5	88.2

Source: World Bank Group. World Development Indicators

The total population of the six provinces facing the Caribbean Sea (Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan, Quintana Roo) in 2015 was 18,492,618 (INEGI. n.d.), which is about 10% of the total population of the United Mexican States.

Table 2-143　Basic information on the six Mexican states facing the Caribbean Sea

State	Population (2015)	Area (km^2)	Population density (person/km^2)	Coastline length (km)
Tamaulipas	3,453,525	79,829	43.3	433
Veracruz	8,127,832	72,815	111.6	720
Tabasco	2,400,967	24,661	97.4	200
Campeche	902,250	51,833	17.4	425
Yucatan	2,102,259	39,340	53.4	340
Quintana Roo	1,505,785	50,350	29.9	1,176
Total	18,492,618	318,828	58.0	3,294

Source: Created by JICA Survey Team based on INEGI. n.d.

2)　Macroeconomic situation, economic policy[92]

The United Mexican States joined APEC in 1993, NAFTA came into effect in 1994, and the country became a member of the OECD the same year. Although he United Mexican States experienced a serious

[92] Source: Ministry of Foreign Affairs of Japan 2020b

recession after the currency crisis in December 1994, the trade balance turned into the black due to the weak peso caused by the crisis, and the GDP growth rate recorded a high growth rate of over 5% from 1996 to 1997. From 1999 to 2000, exports expanded against the backdrop of the strong US economy and soaring oil prices.

In 2007, the real economic growth rate fell to 3.2% and to 1.4% in 2008 due to the slump in the export manufacturing industry such as automobiles caused by the deterioration of the US economy. In 2009, it was -4.7% due to the impact of the global economic crisis, but recovered to 5.1% in 2010, and then turned to 4.0% in 2011 and 2012, 1.4% in 2013, and 2.1% in 2014.

In response to the recent slump in crude oil prices, the government announced spending cuts in January 2015, but due to the recovery trend of the U.S. economy and the depreciation of the peso, exports to North America were strong and domestic private consumption was also strong. As a result, the growth rate was 2.5% in 2015, 2.3% in 2016, 2.1% in 2017, and 2.0% in 2018, achieving positive growth for the ninth consecutive year.

Below is a summary of the economic situation of the United Mexican States.

Table 2-144 Economic situation of the United Mexican States

Items (Unit)	Data
GDP (current US$)	1,220,699,479,846.0
GDP per capita (current US$)	9,673.4
GNI per capita, PPP (current international $)	19,340.0
GDP growth (annual %)	2.1
GDP per capita growth (annual %)	1.0
Inflation, consumer prices (annual %)	4.9
Imports of goods and services (% of GDP)	41.2
Exports of goods and services (% of GDP)	39.3
Main industries (MOFA. 2019e)	N/A
Contribution of Fisheries to GDP (% of GDP) (2015 Preliminary) (CRFM. 2018)	0.1
Contribution of Travel & Tourism to GDP (% of GDP) (WTTC. 2018)	17.2
Contribution of Agriculture, Forestry, and Fisheries to GDP (% of GDP)	3.4

Source: Created by JICA Survey Team based on World Bank Group. World Development Indicators, 2018 data.

The table below shows the economic indicators of the six provinces facing the Caribbean Sea (Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan, and Quintana Roo) in 2018.

The total GDP of the United Mexican States is US$ 1,220,699 million, while the total GRDP of the six states on the Caribbean coastis US$ 152,207 million[93], which corresponds to about 12.5% of the total

[93] Calculated as MXN 1 = US$ 0.045

GDP of all Mexican states.

Table 2-145 Economic indicators of the six Mexican states facing the Caribbean Sea

State	GRDP 2018 (million pesos)	GRDP 2018 (pesos/capita)	GRDP 2018 (US$/capita)
Tamaulipas	651,864	188,753	8,494
Veracruz	1,006,376	123,819	5,572
Tabasco	493,565	205,569	9,251
Campeche	549,795	609,360	27,421
Yucatan	327,107	155,598	7,002
Quintana Roo	353,671	234,875	10,569
Total	3,382,378	182,904	-

Source: Created by JICA Survey Team based on INEGI. n.d.

2.18.2 Information on marine plastic litter

1) Emissions of marine plastic litter

The table below shows the status of waste management and the calculated amount of marine plastic litter emissions in the United Mexican States. The total amount of marine plastic litter released into the ocean, calculated using the two methods, is estimated to range 27,869 from 177,189 tons/year for the entire country and 9,839 to 62,586 tons/year for the six states facing the Caribbean Sea. Although the waste collection rate is not low in the country, it is necessary to consider waste management in the six states in order to estimate the amount of marine plastic litter released into the Caribbean Sea.

Table 2-146 Waste management status and emissions of marine plastic litter in the United Mexican States

Main item		Sub-item	Data	Unit
Generation		Amount generated	144,193	ton/day
		Proportion of plastic	11	%
		Amount of plastic litter generated	15,171	ton/day
Discharge		Amount discharged	Unknown	
Collection/Transport		Collection rate (World Bank Group. 2019)	93.4	%
		Uncollected waste from householdd (World Bank Group. 2019)	Unknown	
Treatment/Disposal		Recycling rate	10.0	%
		Landfill disposal rate	21.0	%
Marine Plastic Litter	Calculation based on the population	Unit rate	1.42	kg/person/year
		Amount released per year	177,189	ton/year
		Amount released per day	485.45	ton/day
		Length of the coastline	9,330	km
		Amount released per km of coastline	19.00	ton/km/year
		Amount released in the 6 Mexican states*	62,586	ton/year
	Calculation based on the length of the coastline	Unit rate	27.22	ton/km/year
		Amount released per year	27,869	ton/year
		Amount released per person	0.22	kg/person/year
		Amount released in the 6 Mexican states*	9,839	ton/year
		Amount released per person in the Mexican 6 Mexican states*	0.53	kg/person/year

*The length of the coastline of the 6 Mexican states facing the Caribbean Sea is estimated to be 3,294 km (see Appendix 1).
Source: Created by Survey Team based on World Bank Group. n.d., UNEP. 2018b, and UNAM (Dra. Nancy Merary Jiménez Martínez. n.d. and Canal del Congreso. 2018)

The table below shows indicators on waste discharge and collection in the six Mexican states (Tamaulipas, Veracruz[94], Tabasco, Campeche, Yucatan, Quintana Roo) facing the Caribbean Sea.

Table 2-147 Indicators of waste discharge and collection in the six Mexican states facing the Caribbean Sea

State	Waste discharge rate (kg/person/day)	Collection amount in 2018 (ton/day)	Collection rate in 2010 (%)
Tamaulipas	0.933	3,223	86.2
Veracruz	0.704	5,270	64.0
Tabasco	0.771	1,852	61.5
Campeche	0.830	749	69.9
Yucatan	0.685	1,439	70.8
Quintana Roo	1.930	2,906	84.2
Total	0.859	15,888	72.8

Source: Waste discharge rate is calculated using population data from INEGI. n.d. in 2015, Collection amount in 2018 is from INEGI. 2019, and Collection rate is created by JICA Survey Team based on INEGI.2019.

[94] The official name is Veracruz de Ignacio de la Llave

2) Policies and Initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. In the United Mexican States, plastic bags or single-use plastic products are banned in more than 15 regions and cities (UNEP. 2018c, CEP. 2019). Mexico City will gradually ban other single-use plastic products such as straws, cups, cutlery and balloons by 2021 (UNEP. 2020a).

Table 2-148 Policies and initiatives related to marine plastic litter in the United Mexican States

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	・N/A	・The National Programmes of Action (NPA) are an integrated approach to the prevention of land-based marine pollution that supports the goals of UNEP's Global Programme of Action (GPA) for the Protection of the Coastal and Marine Environment (UNEP. n.d.a).	・N/A
Initiatives of local governments, companies, NGOs, etc.	・Mexico City approved a law prohibiting plastic bags in August 2010. However, the law is not respected (CEP. 2019). The Congress has prohibited companies to buy, sell or provide single-use plastics to their customers. This ban entered into force after January 1, 2020 (CEP. 2019, UNEP. 2020a). ・The city of Queretaro also banned plastic bags in 2017 (CEP. 2019, UNEP. 2018c).	・N/A	・Participation in the ICC organized by Ocean Conservancy. ・Implementation of international programs such as Sandwatch, which carries out beach cleaning and other activities for the purpose of beautifying the beaches of Gibara Bay.

2.18.3 Current status of waste management

1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in the United Mexican States.

Table 2-149 Waste-related organizations in United Mexican States

Organization name	Responsibilities and/or Initiatives
Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) (Department of Environment and Natural Resources)	Promotion of integrated management of municipal solid waste, special waste, and hazardous waste. This includes waste control, economic assessment, and proper final disposal. These actions are complemented by education, training, communication, and alike for legal and administrative frameworks. Waste can be used as raw material for the production sector and as energy source.
Autoridades Municipales (Local government)	Responsibility for managing solid municipal waste (Residuos Sólidos Urbanos (RSU))
Autoridades Estatales (State authorities)	Responsibility for managing specially controlled waste (Residuos de Manejo Especial (RME))
Organismo Operador (Waste management operating agency)	Public independent body composed of one or more local governments with its own ownership and legal character. Established to provide public services such as the collection of municipal solid waste. The objectives are to reduce waste generation and maximize reuse and recovery in environmentally effective, economically feasible and socially acceptable ways.
J.U.D. de Gestión Sustentable de Residuos Sólidos, Secretaria del Medio Ambiente de la Ciudad de México (SEDEMA) (Mexico City Environment Bureau Solid Waste Sustainable Management Department)	Waste disposal agency in Mexico City.

Source: Website of each organization

2) Policy, legal system and future plans related to waste management

The legal system related to waste management is presented in the table below. There are official Mexican standards (Normas Oficiales Mexicanas: NOM) and Mexican standards (Normas Mexicanas: NMX) as standards for waste. There are also local and state regulations.

Table 2-150 Legal system related to waste management in the United Mexican States

Name of the legislation	Content
Ley general para la prevención y gestión integral de los residuos (LGPGIR), 2003 (General law for the Prevention and Integrated Management of Waste (LGPGIR), 2003)	・ This law mentions the protection of the environment from the perspective of waste prevention and comprehensive waste management on the national territory. It guarantees the right to an appropriate environment, and promotes sustainable development through the prevention of generation, recovery and integrated management of hazardous waste, municipal solid waste, and specially controlled waste, prevent the contamination of sites with these waste and carry out their remediation.

Name of the legislation	Content
	• Article 10 stipulates that local governments are responsible for the overall management of municipal solid waste consisting of collection, transport, treatment and final disposal. • Article 9 stipulates that it is the responsibility of the federal agencies to approve the integrated management of specially controlled waste and to identify those who may be subject to management plans within the jurisdiction. • Article 26 provides for the cooperation of federal agencies and local governments, within the scope of their respective powers, to prepare and implement local programs for the the prevention and integrated management of municipal solid waste and for specially controlled waste in accordance with the LGPGIR and other applicable provisions related towaste management.
Reglamento de la Ley General para la Prevención y Gestión Integral de los Residuos, 2006 (Regulation of the General Law for the Prevention and Integrated Management of Waste, 2006)	• Establishment of rules for applying the General Laws for the Prevention and Comprehensive Management of Waste. • The provisions refer to: ➢ Waste management plan and registration procedure with the Department of Environment and Natural Resources ➢ Definition of residues under federal jurisdiction ➢ Identification of hazardous waste ➢ Permits required from waste generators and the procedure of obtention ➢ Storage, collection and transport, reuse and recycling, import/export of hazardous waste ➢ Remediation of contaminated sites
Ley General del Equilibrio Ecológico y la Protección al Ambiente (LGEEPA) (General Law of Ecological Balance and Environmental Protection (LGEEPA))	This law defines the framework of all environmental law in the United Mexican States.
Reglamento de la Ley general del equilibrio ecológico y la protección al ambiente en materia de residuos peligrosos (Regulation of the General Law on Ecological Balance and Protection of the Environment for Hazardous Waste)	Regulations of the General Law on Ecological Balance and Environmental Protection for Hazardous Waste.
Programa de Gestión Integral de los Residuos Sólidos para la Ciudad de México (PGIRS) (2016-2020) (Comprehensive Solid Waste Management Program for Mexico City (PGIRS) (2016-2020))	Instrument defining the principles and strategies for the proper management of solid waste in Mexico City through the definition of goals, objectives, actions and responsibilities.
Programa para la Prevención y Gestión Integral de Residuos 2009-2012 (Program for the Prevention and Integrated Management of Waste 2009-2012)	Regulations for the management of waste discharged in the event of a natural disaster, and for reducing the environmental, social and economic impacts of improper management and final disposal of such waste. Activities include coordination between key stakeholders and SEMARNAT, training and communication with residents (Estados Unidos Mexicanos. n.d.).

Source: Secretaria del Medio Ambiente. n.d. and Estados Unidos Mexicanos. n.d.

3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management. The United Mexican States produces 102,895.00 tonnes of waste per day, of which 83.93% is collected and 78.54% is disposed of at final disposal sites. The recycling ratio to the amount of waste generated remains at 9.63% (SEMARNAT. 2017).

Article 10 of LGPGIR stipulates the responsibilities for the management of municipal solid waste , but in many cases, there are technical and financial challenges due to the difficulty of securing financial resources for training human resources and promoting private investment.

Table 2-151 System and infrastructure related to waste management in the United Mexican States

Waste management stage	Content
Discharge	・The State of Mexico, the country's most populous state, ranks fifth in terms of waste separation. Only 15% of waste is separated (Mexico News Daily. 2019).
Collection/Transport	・Municipal solid waste services are provided in 94% of cities nationwide. About 93% of the population receives collection services. ・79% of residents use municipal waste collection services as their main waste disposal method. ・64% of the collection vehicles are compactor vehicles. ・90% of municipal waste is collected as mixed waste. ・There are 113 transfer stations nationwide. 86% of them are for storage only, and 5% of them are for sorting and compression.
Treatment	・There are 623 recycling centers in 97 of the 2,400 municipalities nationwide. 90% of them are concentrated in 5 municipalities, namely Mexico city (14 locations), San Luis Potosí (SLP) (46 locations), Veracruz (46 locations), Jalisco (37 locations), State of Mexico (23 locations). ・The recycling rate of the United Mexican States as a whole is 10%. ・Some types of resources are recovered in 117 local governments. The breakdown is 37% paper, 16% PET, 11% iron, and 11% glass. ・99 local governments own composting facilities. ・A GIZ project (2014-2018) considered the introduction of WTE as an option for treating municipal waste (GIZ. 2018a). In 2017, the Government of Mexico City signed a 30-year concession agreement with Proactiva Medio Ambiente Mexico S.A. de C.V. for power generation from waste incineration. However, Ms. Claudia Scheinbaum, an opponent to the waste incinerator, was elected during the election of the governor of Mexico in 2018 and the contract was canceled (Environmental Justice Atlas. 2019).
Disposal	・66% of the waste collected is disposed of at sanitary landfills. ・There are 1,881 final disposal sites nationwide. Sanitary landfill sites represent 13%. ・Most of the final disposal sites are managed by private companies (EL Universal. 2019).
Source: Dra. Nancy Merary Jiménez Martínez. n.d. and Canal del Congreso. 2018.	

2.19 Waste management status in the six Mexican states on the Caribbean Coast

The six Mexican states facing the Caribbean Sea are Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan and Quintana Roo. There are also remote islands such as Cozumel, Isla Mujeres, Isla Holbox and Contoy.

Figure 2-60 Location of the six Mexican states on the Caribbean coast

2.19.1 Situation of each state

Below are data on socioeconomic status, waste collection amount, and estimated amount of marine plastic litter discharged for each state.

Table 2-152 Population and socioeconomic status for each state

State	Population (2015)	GRDP 2018 (million pesos)	GRDP 2018 (pesos/person)	GRDP 2018 (US$/person)	Area (km^2)
Tamaulipas	3,453,525	651,864	188,753	8,494	79,829
Veracruz	8,127,832	1,006,376	123,819	5,572	72,815
Tabasco	2,400,967	493,565	205,569	9,251	24,661
Campeche	902,250	549,795	609,360	27,421	51,833
Yucatan	2,102,259	327,107	155,598	7,002	39,340
Quintana Roo	1,505,785	353,671	234,875	10,569	50,350
Total	18,492,618	3,382,378	182,904	8,231	318,828

Source: INEGI. 2019 Assuming Peso/US$ = 0.045

Table 2-153 Waste amount and collection rate each state

State	Waste collection amount in 2018 (kg/day)	Waste collection amount in 2018 (ton/day)	Waste discharge rate (kg/person/day)	Collection rate
Tamaulipas	3,222,864	3,223	0.933	93.0% (2015)
Veracruz	5,719,514	5,720	0.704	77.0% (2015)
Tabasco	1,852,288	1,852	0.771	66.0% (2019)
Campeche	748,520	749	0.830	92.7% (2014)
Yucatan	1,439,395	1,439	0.685	71.9% (2010)
Quintana Roo	2,905,809	2,906	1.930	99.3% (2019)
Total	15,888,390	15,888	0.859	-

Source: Created by JICA Survey Team based on INEGI. 2019 and INEGI. n.d. for Waste collection amount and Unit rate of discharge amount. Collection rate is created based on AMICA. 2015 for Tamaulipas, PEPGIR-Ver. n.d. for Veracruz, El Heraldo de Tabasco. 2019 for Tabasco, INEGI. 2017 for Campeche, INEGI.2019 for Yucatan and Plan Estatal de Desarrollo (PED) Quintana Roo 2016-2022 for Quintana Roo.

Table 2-154 Waste management status and emissions of marine plastic litter in the six Mexican states

Method 1

State	Population (2015)	Discharge amount of plastic per person per year (kg/person/year) *	Discharge amount of plastic per year (ton/year)
Tamaulipas	3,453,525	1.42	4,904.01
Veracruz	8,127,832	1.42	11,541.52
Tabasco	2,400,967	1.42	3,409.37
Campeche	902,250	1.42	1,281.20
Yucatan	2,102,259	1.42	2,985.21
Quintana Roo	1,505,785	1.42	2,138.21
Total	18,492,618		26,259.52

Method 2

State	Length of the coastline (km)	Discharge amount of plastic per km of coastline (ton/km/year)	Discharge amount of plastic per year (ton/year)
Tamaulipas	433	2.99	1,295
Veracruz	720	2.99	2,153
Tabasco	200	2.99	598
Campeche	425	2.99	1,271
Yucatan	340	2.99	1,017
Quintana Roo	1,176	2.99	3,516
Total	3,294		9,849

Refer to 2.1.2 for explanations on the estimation methods.

2.19.2 Tamaulipas

1) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-155 Policies and initiatives related to marine plastic litter in Tamaulipas

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	• Restrictions on the sale, distribution and use of bags in supermarkets, convenience stores, markets, etc. (Código para el Desarrollo Sustentable del Estado de Tamaulipas[95]: Code for Sustainable Development)	• N/A	• N/A

[95] Refer to Table 2.23

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ "Reynosa sin plástico" (Without plastic) program was launched in June 2019 on World Environment Day. Plastic bags are made from recycled materials and distributed to schools and universities. Students, school management staff, etc. put all PET bottles, plastic packaging and containers used at school and at home in this bag. The bags are regularly collected by municipal staff and donated or sold to companies that can utilize waste plastic (El Manana. 2019).	・ Club Regatas Corona A.C. participated as the coordinator of ICC 2018 (Ocean Conservancy. 2019). ・ Monthly beach cleanup in the northern area of Miramar hosted by the citizen group Ama tu Playa A.C. (El Sol de Tampico. 2019).

2) Current status of waste management

(1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Tamaulipas.

Table 2-156 Waste-related organizations in Tamaulipas

Organization name	Responsibilities and/or Initiatives
Secretaría de Desarrollo Urbano y Medio Ambiente, SEDUMA (Ministry of Urban Development and Environment, Tamaulipas)	・ State agency responsible for developing environmental policies and implementing regulations, developing standards and programs for the state's sustainable development, and promoting environmental protection. ・ SEDUMA, within the scope of its competence, , regulates and supervises the integrated management of municipal solid waste and specially controlled waste, and the treatment and final disposal of pollutants and hazardous materials.

Source: Website of each organization

(2) Policy, legal system and future plans related to waste management

The legal system related to waste management in Tamaulipas is presented in the table below. Tamaulipas consists of 43 municipalities, with 72% of the municipalities complying with the law and having good governance (Secretaría de Desarrollo Urbano y Medio Ambiente. n.d.a). In addition, 34% of local governments have public cleaning ordinances, 23% ecological and environmental ordinances, and 1% programs for controlling the generation and integrated management of municipal solid waste (Secretaría

de Desarrollo Urbano y Medio Ambiente. n.d.a).

Table 2-157 Legal system related to waste management in Tamaulipas

Name of the legislation	Content
Constitución Política del Estado Libre y Soberano de Tamaulipas (Political Constitution of the Free and Sovereign State of Tamaulipas)	The state and the local governments ensure the sustainable use of all natural resources to conserve and restore the environment.
Ley Orgánica de la Administración Pública del Estado de Tamaulipas (Organic Law of the Public Administration of the State of Tamaulipas)	Basic law that regulates the administrative organization and operations of Tamaulipas, including SEDUMA (Secretaría de Desarrollo Urbano y Medio Ambiente). Revised in 2017.
Código para el Desarrollo Sustentable del Estado de Tamaulipas (Code for Sustainable Development of the State of Tamaulipas)	Code integrating various environmental regulations for the purpose of confirming the transversality and connections of various environmental matters. It established provisions to regulate I) environmental protection, II) reduction of waste generation and integrated management, III) state and municipal natural reserves, and IV) wild fauna and flora. This Code consists of eight books, and reduction of waste generation and comprehensive waste management in the state are described in Book III (LIBRO TERCERO). The state stipulates requirements and conditions for the treatment, collection, transport, storage, recycling, processing, recycling, or final disposal of solid waste through the Secretaría de Desarrollo Urbano y Medio Ambiente. Article 122 stipulates that a program for waste prevention and integrated management must be developed in accordance with state regulations. Revised in 2018.
Reglamento de Prevención y Gestión Integral de los Residuos de Manejo Especial para el Estado de Tamaulipas (Regulation for the Prevention and Integral Management of Specially Controlled Waste for the State of Tamaulipas)	Ordinance to comply with Book III of Tamaulipas' Code for Sustainable Development. Ordinance on the collection, reduction of generation by reuse, and remediation of soil contaminated by specially controlled waste. Established in 2013.

Source: Constitucion Politica del Estado de Tamaulipas (https://www.tamaulipas.gob.mx/cazaypesca/wp-content/uploads/sites/33/2018/01/constitucion-politica-del-estado-de-tamaulipas.pdf) and Ley Orgánica de la Administración Pública del Estado de Tamaulipas (http://po.tamaulipas.gob.mx/wp-content/uploads/2017/06/Ley_Organica.pdf).

(3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-158 System and infrastructure related to waste management in Tamaulipas

Waste management stage	Content
Discharge	・ The amount of solid waste generated is 3,031 tons/day, and the amount collected is 2,812 tons/day (in 2018: 3,222 tons/day). ・ 79% of waste is generated in large cities (Reynosa (22%), Matamoros (17%), Nuevo Laredo (14%), Victoria (8%), Tampico (8%), Madero (5%), and City of Altamira (5%)). The remaining 21% comes from 36

<table>
<tr><th>Waste management stage</th><th>Content</th></tr>
<tr><td></td><td>municipalities.
・ The composition of waste is 51% organic (food waste, pruned branches), 34% recyclable (paper, plastics, metals, glass), and 15% non-recyclable other waste.
・ It is estimated that the amount of waste generated will increase by 10% by 2026.</td></tr>
<tr><td>Collection/Transport</td><td>・ Collection rate is 93%.</td></tr>
<tr><td>Treatment</td><td>・ Five transfer stations (Matamoros, Mier, Gustavo Díaz Ordaz, Antiguo Morelos, Xico téncatl) are operating in the state.</td></tr>
<tr><td>Disposal</td><td>・ There are 63 final disposal sites in the state. Nine of them are sanitary landfills used by 18 local governments, and the remaining 54 are unmanaged landfills.
・ Number of final disposal sites by region:
<table>
<tr><th>Region</th><th>Number of local governments</th><th>Number of final disposal sites</th></tr>
<tr><td>Franja Fronteriza</td><td>10</td><td>19</td></tr>
<tr><td>Valle de San Fernando</td><td>4</td><td>5</td></tr>
<tr><td>Centro</td><td>13</td><td>20</td></tr>
<tr><td>Altiplano</td><td>5</td><td>5</td></tr>
<tr><td>Mante</td><td>6</td><td>7</td></tr>
<tr><td>Sur</td><td>5</td><td>7</td></tr>
<tr><td>Toral Estado</td><td>43</td><td>63</td></tr>
</table></td></tr>
</table>

Source: Secretaría de Desarrollo Urbano y Medio Ambiente. n.d.a, AMICA. 2015 and INEGI. 2019

Victoria sanitary landfill

Crea sanitary landfill

Figure 2-61 Sanitary landfill sites in Tamaulipas (Photographs)

2.19.3 Veracruz

1) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-159 Policies and initiatives related to marine plastic litter in Veracruz

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	・ Gradually banning the use of plastic bags and straws in commercial facilities and shifting to the use of biodegradable materials. Sanctions for violators of state law regarding the handling of solid waste and plastic, such as ensuring that plastic bags comply with production standards and sustainable consumption such as reuse, are also stipulated (Ley 847/LPGIRSUME).	・ SEDEMA removed more than 40 tonnes of debris from the Blanco River in September 2019 (Gobierno del Estado de Veracruz. 2019i).	・ The Ministry of Health (SS), in collaboration with the Department of Protection against Sanitary Risks, organized a beach cleanup event before the 2019 Easter holiday. Cleanup was carried out simultaneously on the beaches of several regions (Gobierno del Estado de Veracruz. 2019h).
Initiatives of local governments, companies, NGOs, etc.	・ Veracruz and companies signed a partnership to eradicate single-use plastics (Gobierno del Estado de Veracruz. 2019j).	・ The state organizes river and beach cleaning (Gobierno del Estado de Veracruz. 2019g).	・ Plastic Oceans Mexico and Buena Pesca jointly clean up the coast of Veracruz on World Oceans Day (Plastic Oceans International. 2018).

2) Current status of waste management

(1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Veracruz.

Table 2-160 Waste-related organizations in Veracruz

Organization name	Responsibilities and/or Initiatives
Secretaría de Medio Ambiente (SEDEMA) del Estado de Veracruz (Ministry of Environment of the State of Veracruz)	Responsible for the comprehensive management of the subsector of solid waste in the state.

Source: Website of Secretaría de Medio Ambiente (SEDEMA) del Estado de Veracruz (http://www.veracruz.gob.mx/medioambiente/)

(2) Policy, legal system and future plans related to waste management

The legal system related to waste management in Veracruz is presented in the table below..

Table 2-161 Legal system related to waste management in Veracruz

Name of policy, legal system and plan	Content
Ley Estatal de Protección Ambiental 2013 (State Law on Environmental Protection)	State legislation governing the conservation, protection, restoration and environmental conservation of the ecosystem balance with the goal of sustainable development.

Name of policy, legal system and plan	Content
Ley de Prevención y Gestión Integral de Residuos Sólidos Urbanos y de Manejo Especial para el Estado de Veracruz de Ignacio de la Llave (Ley Numero 847) (Law number 847 on the Prevention and Integrated Management of Municipal Solid Waste and Special Management Waste for the State of Veracruz de Ignacio de la Llave)	State legislation that regulates waste minimization, integrated management, and specially controlled waste. I) Sets principles and standards from waste generation to final disposal, II) States appropriate division of responsibilities for the management of waste between government and local governments, III) Strengthens the capacity of the state and the local governments required for waste minimization and integrated management.
Política del Estado de Veracruz en Materia de Residuos (Policy of the State of Veracruz in the Matter of Waste)	Policy that aims to shift the traditional waste management method to integrated management that includes all stages from collection to final disposal. Step-by-step measures are taken when considering the reduction of generation and minimization, separation at source, reuse, recycling, composting, energy recovery and final disposal.
Programa Estatal para la Prevención y Gestión Integral de los Residuos Sólidos Urbanos y de Manejo Especial del Estado de Veracruz, PEPGIR-Ver (State Program for the Prevention and Integrated Management of Solid Urban Waste and Special Management Waste of the State of Veracruz)	The plan includes: 1. Definition and formulation of public policy, 2. Integrated management of municipal solid waste, 3. Generation reduction and minimization of specially controlled waste, 4. Formulation of concrete strategies for the reduction of specially managed waste generated from various sectors, 5. Improvement of infrastructure for municipal solid waste, 6. Reuse and recycling of municipal solid waste and specially controlled waste, 7. Strengthening of the legal framework for plan implementation and 8. Institutional adjustments.

Source: Gobierno del Estado de Veracruz-Llave. n.d., Gobierno del Estado de Veracruz de Ignacio de la Llave. 2018 and PEPGIR-Ver. n.d.

(3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-162 System and infrastructure related to waste management in Veracruz

<table>
<tr><th>Waste management stage</th><th>Content</th></tr>
<tr><td>Discharge</td><td>
・ Of the waste generated throughout the state, 85% come from household and 15% from business.
・ The amount of municipal solid waste generated is 6,157 tons/day
<table>
<tr><th>Region</th><th>Municipal solid waste generated (kg/day)</th><th>Population</th><th>Unit rate of waste generated (kg/person/day)</th><th>Population ratio in the state</th></tr>
<tr><td>Centro Norte</td><td>2,747,325</td><td>3,523,019</td><td>0.780</td><td>45.1%</td></tr>
<tr><td>Golfo Sur</td><td>1,577,644</td><td>2,040,708</td><td>0.773</td><td>26.1%</td></tr>
<tr><td>Centro</td><td>987,748</td><td>1,170,794</td><td>0.844</td><td>15.0%</td></tr>
<tr><td>Huasteca</td><td>844,657</td><td>1,078,348</td><td>0.783</td><td>13.8%</td></tr>
<tr><td>Total</td><td>6,157,374</td><td>7,812,869</td><td>0.788</td><td>100.0%</td></tr>
</table>
・ The main sources are livestock waste 1,513.15 tons/day, construction waste 778.22 tons/day, agricultural waste 372.15 tons/day, and sludge from wastewater
</td></tr>
</table>

<table>
<tr><th>Waste management stage</th><th>Content</th></tr>
<tr><td></td><td>treatment facilities 121.41 tons/day.</td></tr>
<tr><td>Collection/Transport</td><td>
• Total number of collection vehicles in the state: 537.
<table>
<tr><th>Region</th><th>Rear load compactor</th><th>Front load compactor</th><th>Dump truck</th><th>Small truck</th><th>Container system</th><th>Vehicules for transfer</th><th>Total</th></tr>
<tr><td>Centro Norte</td><td>43</td><td>14</td><td>4</td><td>7</td><td>47</td><td>0</td><td>115</td></tr>
<tr><td>Golfo Sur</td><td>184</td><td>5</td><td>26</td><td>9</td><td>16</td><td>6</td><td>246</td></tr>
<tr><td>Centro</td><td>61</td><td>23</td><td>13</td><td>2</td><td>0</td><td>0</td><td>99</td></tr>
<tr><td>Huasteca</td><td>45</td><td>12</td><td>12</td><td>8</td><td>0</td><td>0</td><td>77</td></tr>
<tr><td>Total</td><td>333</td><td>54</td><td>55</td><td>26</td><td>63</td><td>6</td><td>537</td></tr>
</table>
• Collection rate: 77%.
• The most common collection frequency is twice a week.
• Many municipalities in the state lack collection programs, and collection services are not properly implemented. In particular, there are a lack of route design, a lack of balance to prevent unnecessary trips, a lack of standardization of the waste transportation vehicles and a lack of preventive maintenance that would allow trucks to extend their useful life.
• There are three transfer stations.
</td></tr>
<tr><td>Treatment</td><td>
• There is a storage facility in Huasteca, Centro Norte, and Golfo Sur (one in each).
• Composting facilities have been successful in Teocelo City and several other local governments. In recent years, the Vermicompost program has been implemented to produce organic fertilizers used in coffee nurseries.
</td></tr>
<tr><td>Disposal</td><td>
• There are 28 final disposal sites throughout the state, 19 public facilities, and 9 privately owned sites.
• Two publicly operated landfills (Huayacocotla and Ozuluama) are fully equipped sanitary landfills.
• Three privately operated landfill located in Emiliano Zapata, Xalapa, Nogales have serious issues and waste is not properly landfilled.
• The table below lists the final disposal sites by region.
<table>
<tr><th>Region</th><th>Name of city</th><th>Private</th><th>Public</th></tr>
<tr><td rowspan="9">Huasteca</td><td>Tuxpan</td><td>X</td><td></td></tr>
<tr><td>Álamo Temapache</td><td></td><td>X</td></tr>
<tr><td>Cerro Azul</td><td></td><td>X</td></tr>
<tr><td>Huayacocotla</td><td></td><td>X</td></tr>
<tr><td>Naranjos</td><td></td><td>X</td></tr>
<tr><td>Ozuluama</td><td></td><td>X</td></tr>
<tr><td>Panuco</td><td></td><td>X</td></tr>
<tr><td>Tampico Alto</td><td></td><td>X</td></tr>
<tr><td>Tempoal</td><td></td><td>X</td></tr>
<tr><td rowspan="9">Centro norte</td><td>Poza Rica</td><td>X</td><td></td></tr>
<tr><td>Nogales</td><td>X</td><td></td></tr>
<tr><td>Medellin -Boca del Rio</td><td>X</td><td></td></tr>
<tr><td>Coyutla</td><td></td><td>X</td></tr>
<tr><td>Martínez de la Torre</td><td></td><td>X</td></tr>
<tr><td>San Rafael</td><td></td><td>X</td></tr>
<tr><td>Tecolutla</td><td></td><td>X</td></tr>
<tr><td>Tihuatlán</td><td></td><td>X</td></tr>
<tr><td>Veracruz</td><td>X</td><td></td></tr>
</table>
</td></tr>
</table>

Waste management stage	Content					
		Centro	Emiliano Zapata	X		
			Xalapa	X		
			Villa Aldama		X	
		Golfo Sur	Acayucan	X		
			Cosamaloapan		X	
			Ixhuatlán del Sureste		X	
			Lerdo de Tejada		X	
			Mecayapan		X	
			San Andrés Tuxtla		X	
			Tierra Blanca*	X		

Source: PEPGIR-Ver. n.d.

Tampico Alto sanitary landfill

Medellin-Boca del Rio sanitary landfill

Figure 2-62 Sanitary landfills in Veracruz (Photographs)

2.19.4 Tabasco

1) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-163 Policies and initiatives related to marine plastic litter in Tabasco

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	・ The following are regulations regarding plastic bags, straws, and Styrofoam containers for 2019/2020: ・ Department stores, services or traders are prohibited from distributingfree of charge to consumers plastic bags that are not biodegradable.	・ N/A	・ N/A

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	・ In shops and commercial facilities, it is mandatory to post in visible places information on the pollution generated by plastic bags, straws, and Styrofoam containers at the time of disposal. ・ Food and beverage stores and establishments should no longer provide straws.		
Initiatives of local governments, companies, NGOs, etc.	・ N/A	・ N/A	・ N/A

Source: Gobierno del Estado de Tabasco. 2020

2) Current status of waste management

(1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Tabasco.

Table 2-164 Waste-related organizations in Tabasco

Organization name	Responsibilities and/or Initiatives
Secretaría de Bienestar, Sustentabilidad y Cambio Climático (SBCC) (Ministry of Welfare, Sustainability and Climate Change)	・ Responsible for waste management in the state. ・ Each local government is in charge of the actual waste management such as collection, transport, treatment, and disposal.

Source: Website of Gobierno del Estado de Tabasco - Secretaría de Bienestar, Sustentabilidad y Cambio Climático (SBCC) (https://tabasco.gob.mx/bienestar)

(2) Policy, legal system and future plans related to waste management

The legal system related to waste management in Tabasco is presented in the table below.Tabasco consists of of 17 municipalities, of which 29% have regulations related to integrated waste management, 53% have no regulation, and in 18% regulations are under review and/or pending for approval (Arias Martinez. 2016). However, some local governments do not comply with these regulations due to lack of enforcement of the legislation and citizens ignoring the law (Arias Martinez. 2016).

Table 2-165 Rule and regulation regarding waste management in Tabasco

Name of rule and regulation	Contents
Ley de Protección Ambiental del Estado de Tabasco (Environmental Protection Law of the State of Tabasco)	State law aimed at avoiding the negative impacts of the destruction of nature on society by maintaining and restoring the balance of ecosystems, and achieving balanced state development and improved living conditions in villages and urban populations.
Ley para la Prevención y Gestión Integral de	Law on the reduction of waste generation in the state,

Name of rule and regulation	Contents
los Residuos del Estado de Tabasco (Law for the Prevention and Integrated Management of Waste in the State of Tabasco)	integrated management of municipal waste and specially controlled waste, recycling, and prevention and remediation of pollution by final disposal sites.
Reglamento de la Ley para la Prevención y Gestión Integral de los Residuos, del Estado de Tabasco (Regulation of the Law for the Prevention and Integrated Management of Waste in the State of Tabasco)	Enforcement regulation of the above law.
Norma Ambiental Estatal NAETAB-EM-001-SBSCC-2020 (State Environmental Standard NAETAB-EM-001-SBSCC-2020) Tabasco's standards for plastics such as plastic bags, plastic straws and styrofoam containers, January 4, 2020.	Standards, specifications and requirements for biodegradable and compostable plastics and biodegradable plastic bags and foamed styrene containers as stipulated by the State Law for the Prevention and Integrated Management of Waste.

Source: Ley de Protección Ambiental del Estado de Tabasco. 2019, Ley para la Prevención y Gestión Integral de los Residuos del Estado de Tabasco. 2019, and Reglamento de la Ley para la Prevención y Gestión Integral de los Residuos, del Estado de Tabasco. 2019

(3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-166 System and infrastructure related to waste management in Tabasco

<table>
<tr><th>Waste management stage</th><th>Content</th></tr>
<tr><td>Discharge</td><td>・ Populationwas 2,238,603 in 2010 (INEGI. 2010), which is the highest population in southeastern Mexico.
・ As of 2018, the amount of waste generated is 889,500 tons per year, which corresponds to 2% of the total amount of the United Mexican States (Énfasis Packaging. 2019).
・ In 2035, population will be 3,364,335, and the annual amount of municipal waste generated is estimated to become 1,239,389 tons.</td></tr>
<tr><td>Collection/Transport</td><td>・ 66% of the total population receive collection services (El Heraldo de Tabasco. 2019).
・ The Government of Tabasco has signed an agreement with the Secretaría de Medio Ambiente y Recursos Naturales (Ministry of Environment and Natural Resources) regarding the donation of containers to 17 municipalities of Tabasco as part of the Waste Collection Containerization Program (Programa de Contenerización). This represents an investment of nearly 5 million pesos.
・ The Containerization Program, in coordination with state and local governments, supports the purchase and installation of containers, ensuring ample space for citizens to discharge waste.</td></tr>
<tr><td>Treatment</td><td>・ In 2020, a sorting facility with a processing capacity of 60 tons/day was set up at the final disposal site in Macuspana City.</td></tr>
<tr><td>Disposal</td><td>・ The table below shows the types and quantities of final disposal sites as of 2013. Of the 5 sanitary landfill sites, 2 were ranked A (CHONTALPA and CENTRO).
・ As of 2019, there were only two sanitary landfill sites in the state, Centro and Comalcalco.
<table>
<tr><th>Name of region</th><th>Chontalpa</th><th>Centro</th><th>Sierra</th><th>Pantanos</th><th>Rios</th><th>Total</th></tr>
<tr><td>Population</td><td>871,390</td><td>896,024</td><td>141,361</td><td>295,723</td><td>147,716</td><td>2,352,214</td></tr>
</table></td></tr>
</table>

Waste management stage	Content						
	in 2013						
	Waste generation amount (ton/day)	862	891	137	308	149	2,348
	Number of city	5	3	3	3	3	17
	Number of sanitary landfill site	1	2	0	2	0	5
	Number of controlled disposal site	1	1	0	0	1	3
	Source: Gobierno del Estado Tabasco. 2014						

2.19.5 Campeche

1) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter.

Table 2-167 Policies and initiatives related to marine plastic litter in Campeche

Lifecycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	• Campeche's law on the integrated management of municipal solid waste, and special and hazardous waste management was amended in November 2019. The sale, distribution and delivery of single-use plastic bags and straws are prohibited. Does not apply to products used for medical reasons. • The ban came into effect in March 2020, and	• The Mexican government has received a US$ 13.7 million grant from the Inter-American Development Bank as part of the Global Environment Facility's Sustainable City Pilot Project, which was implemented to improve solid waste, clean energy production and hygiene management in the cities of Xalapa, La Paz and Campeche. BANOBRAS (Mexico Public Works Bank) is in charge of this project, and the project is carried out in the selected cities. • In Campeche, the project is related to bay cleanup research. It includes feasibility studies for investments in sewerage systems and public health, storm drainage, restoration of coastal port area, and mangrove conservation.The actions will	• N/A

Lifecycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	the use of single-use plastic bags and disposable straws will be phased out over 12 months.	support the rehabilitation of Campeche Bay, reduce health risks for the population, and enhance the attractiveness of the tourist city listed as UNESCO World Heritage Site (IDB. 2017).	
Initiatives of local governments, companies, NGOs, etc.	・ Campeche participated in the 2018 "Campaña Global de Mares Limpios".	・ The company Bepensa established Bepensa Foundation as part of its CSR.A PET bottle collection program called ReQPET has been implemented since 2010 (Bepensa. 2019).	・ NPOs such as Xpicob A.C. regularly carry out beach cleanups (Xpicob. n.d.).

2) Current status of waste management

(1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Campeche.

Table 2-168 Waste-related organizations in Campeche

Organization name	Responsibilities and/or Initiatives
Secretaría de Medio Ambiente, Biodiversidad y Cambio Climático (SEMABICC)	Responsible for environmental pollution management, solid waste management, natural area conservation, land use planning, and promotion of climate change strategies. A state law on waste management stipulates that municipalities are in charge of comprehensive municipal solid waste management, which consists of collection, transport, treatment and final disposal.

Source: Website of each organization

(2) Policy, legal system and future plans related to waste management

The legal system related to waste management in Campeche is presented in the table below.

Table 2-169 Legal system for waste management in Campeche

Name of the legislation	Content
Ley para la Gestión Integral de los Residuos Sólidos Urbanos, de Manejo Especial y Peligroso del Estado de Campeche (Law for the Integrated Management of Municipal Solid Waste, Special and Hazardous Waste Management of the State of Campeche)	The purpose of this law is the reduction of generation, the appropriate and integrated management of solid waste, waste requiring special treatment, and hazardous waste, and the prevention and remediation of soil contamination by waste. An amendment was approved on November 26, 2019, published in the official bulletin on December 13, 2019, and enforced on March 11, 2020. The use of plastic bags, straws and single-use plastic containers in commercial facilities is to be phased out over 12 months.
Ley del Equilibrio Ecológico y Protección al	The purpose of this law is to promote sustainable

Name of the legislation	Content
Ambiente del Estado de Campeche (Law on Ecological Balance and Environmental Protection of the Environment of the State of Campeche)	development and to establish the foundation for the protection, conservation and restoration of ecosystem balance as well as the protection and improvement of the environment.
Reglamento de la Ley del Equilibrio Ecológico y Protección al Ambiente del Estado de Campeche (Regulation of the Law on Ecological Balance and Environmental Protection of the Environment of the State of Campeche)	Enforcement regulation of the above law.

Source: Ley para la Gestión Integral de los Residuos Sólidos Urbanos, de Manejo Especial y Peligroso del Estado de Campeche. 2019, Ley del Equilibrio Ecológico y Protección al Ambiente del Estado de Campeche.2019, and Reglamento de la Ley del Equilibrio Ecológico y Protección al Ambiente del Estado de Campeche. 2000

(3) System and infrastructure development related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-170 System and infrastructure related to waste management in Campeche

Waste management stage	Contents
Discharge	・ The total amount of municipal waste collected in the state in 2010 was 252,000 tons/year, in 2014 it was 259,150 tons/year, and in 2018 it was 273,210 tons/year.
Collection/Transport	・ In 2014, the number of local governments with no collection was zero (collection by all local governments of the state). ・ As of 2014, the number of local governments operating the collection and final disposal was 11. ・ As of 2014, 89.50% of households received public collection services, 3.22% discharged directly to landfill or in containers, 6.58% burned in open air, and 0.70% proceeded to self-disposal. For various reasons, a large amount of waste is found on the streets and vacant lots, and this waste flows out to mangroves and the marine environment mainly in the rainy season.
Treatment	・ Unknown
Disposal	・ The amount of collection is increasing year by year. The total area of the landfill site, which was 104 ha in 1995, is 29 ha in 2010. On the other hand, the total area of the uncontrolled sites (open dumps) has increased to 76 ha. 51.3% of them are located in coastal areas. ・ Red Ambiental (Environmental Network) signed a contract with the San Francisco City Council for the concession of the municipal landfill.

Source: INEGI. 2017, INEGI. n.d. and Nava Fuentes, Juan Carlos & Granados, P. & Martins, Filomena. 2018

2.19.6 Yucatan

1) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter. In June 2019, Yucatan decided to ban plastic bags, plastic straws and containers, with the goal of replacing these products with biodegradable and other environmentally friendly products within two years. The grace

period for replacement is as follows for each business category (Juntos transformemos Yucatan. 2019):

- Grace period for plastic bags and plastic straws in commercial facilities near cenotes, nature reserves and ecosystem reserves: 6 months.
- Grace period for plastic bags and plastic straws in supermarkets: 12 months.
- Grace period for plastic bags and plastic straws at wholesale and retail stores: 18 months.
- Grace period for Styrofoam containers for businesses near cenotes, nature reserves and ecosystem reserves: 12 months.
- Grace period for Styrofoam container in supermarkets, pharmacies, restaurants, markets and sales of these products: 24 months.

Table 2-171 Policies and initiatives related to marine plastic litter in Yucatan

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
Policies, including legal system and the establishment of regulations	• A ban on plastic straws, containers and plastic bags was decided in June 2019 (Juntos transformemos Yucatan. 2019). • The single registry of plastic management (Registro Único de Control de Plásticos: RUCP) aims to systematically manage information about individuals and companies that distribute or sell single-use plastic bags, polystyrene containers, and plastic straws (Juntos transformemos Yucatan. n.d.)	• N/A	• Clean beaches, mangroves and coastal dunes at Festival de La Veda in collaboration with police station volunteers, various groups and university students (Juntos transformemos Yucatan. 2020).
Initiatives by local governments, companies, NGOs, etc.	• N/A	• Coastal PET Collection Center of the Bepensa Foundation. The purpose of the facility is to collect plastic waste along the coasts of Dzilam de Bravo and Sisal while helping women in these areas to support their families.	• The Bepensa Foundation has been leading the cleaning of Yucatan's beaches and mangroves during International

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
		(Bepensa. n.d.a). ・ The company Bepensa established the Bepensa Foundation as part of its CSR, and has been implementing a PET bottle collection program called ReQPET since 2010 (Bepensa. n.d.b).	Coastal Cleaning Day for the 10th consecutive year (Bepensa. n.d.c).

2) Current status of waste management

(1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Yucatan.

Table 2-172 Waste-related organizations in Yucatan

Organization name	Responsibilities and/or Initiatives
Secretaría de Desarrollo Sustentable del Gobierno del Estado de Yucatán (Ministry of Sustainable Development of the Government of the State of Yucatan)	The "Integrated Waste Management" program is implemented by the Natural Resources Management and Conservation Bureau and its Department for Integrated Waste Management. Provides training and technical advice for cleaning service personnel and integrated management of solid waste from collection to final disposal site, and departments related to sanitary facilities. According to the specifications established in NOM-083-SEMARRNAT-2003, it supports the final disposal site of local governments and their rehabilitation.

Source: Website of Secretaría de Desarrollo Sustentable del Gobierno del Estado de Yucatán (http://sds.yucatan.gob.mx/residuos-solidos/index.ph)

(2) Policy, legal system and future plans related to waste management

The legal system related to waste management in Yucatan is presented in the table below.

Table 2-173 Policy and regulation related to waste management in Yucatan

Name of policy and regulation	Content
Ley de Protección al Medio Ambiente del Estado de Yucatán (Environmental Protection Law of the State of Yucatan)	・ The revision of Yucatan's Law for the Integrated Management of Waste was published in Yucatan's official bulletin on June 18, 2019. ・ The use of carry bags, plastic straws, and Styrofoam containers made of single-use plastic is gradually prohibited. ・ Over the course of two years, commercial facilities such as supermarkets, self-service stores, convenience stores, pharmacies, markets, restaurants and bars must replace these products with biodegradable and/or recycled alternatives at a minimum percentage of 30%.
Reglamento de la Ley de Protección al Medio Ambiente del Estado de Yucatán (Regulation of the Environmental Protection Law of the State of Yucatan)	
Ley para la Gestión Integral de los Residuos en el Estado de Yucatán (Law for the Integrated Management of Waste in the State of Yucatan)	
Decreto 80/2019 por el que se modifica la Ley para la Gestión Integral de los Residuos en el Estado de Yucatán (Decree 80/2019 amending	

Name of policy and regulation	Content
the Law for the Integrated Management of Waste in the State of Yucatan)	
Decreto 163/2020 por el que se modifica el Reglamento de la Ley para la Gestión Integral de los Residuos en el Estado de Yucatán (Decree 163/2020 amending the Regulation of the Law for the Integrated Management of Waste in the State of Yucatan)	
Programa Estatal para la Prevención y Gestión Integral de Residuos 2009-2012 (State Program for the Prevention and Integrated Management of Waste 2009-2012)	・ The "Towards a Yucatan with zero solid waste ("Hacia un Yucatán Cero residuos")" strategy establishes policies aimed at promoting comprehensive waste management, environmental protection and a zero solid waste society. ・ It promotes responsibilities sharing among those involved in waste management and clarifies management responsibilities. ・ The program is based on five main axes: 1) implementation, 2) normativity, 3) diagnosis, monitoring and evaluation, 4) participation and cooperation, and 5) education and responsible consumption. The aim is to generate strategies enabling 51.5% valorization of the 2,475 tonnes of waste generated daily in Yucatan.

Source: Ley de Protección al Medio Ambiente del Estado de Yucatán. 2019, Reglamento de la Ley de Protección al Medio Ambiente del Estado de Yucatán. 2018, Ley para la gestión Integral de los Residuos en el Estado de Yucatán. 2019, Reglamento de la ley Para la Gestión Integral de los Residuos en el Estado de Yucatán. 2020, Decreto 80/2019 por el que se modifica la Ley para la Gestión Integral de los Residuos en el Estado de Yucatán. 2019, Secretaría de Desarrollo Sustentable del Gobierno del Estado de Yucatán. n.d.a. and Gobierno del Estado de Yucatán. 2019.

(3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

Table 2-174 System and infrastructure related to waste management in Yucatan

Waste management stage	Content
Discharge	・ The amount of municipal solid waste generated in the state is 2,475 tons/day, of which 51% (1,265 tons) is generated in the state capital, Merida. ・ Waste generation amount in Merida is 1.268 kg/person/day, while the state average is 0.881 kg/person/day.
Collection/Transport	・ Street cleaning is carried out by 105 local governments in the state. City officials manually clean major roads and plazas. ・ 200-liter drums and 20-liter cans are used for storage in public areas, schools, and shops. There are coordination issues with the collection system. ・ Collection services are generally provided by various vehicles. The most common are pickup trucks, dump trucks, compactor trucks, tricycles and hand carts. ・ The collection service is carried out on the main streets. ・ In some cases, the cost of collection services account for 80% of the total expenses that a local government spends on the waste management issue. ・ Four waste collection companies collect waste in the state capital Merida. The collection frequency is twice a week for organic waste and once a week for inorganic waste. Collection is conducted during the day or at night.

Waste management stage	Content
Treatment	・ The recycling industry in Yucatan is active. In 2017, 195 economic units specializing in the recycling of materials such as plastics, metals, glass, aluminium and paper were identified. These businesses generate a level of productivity of over 225 million pesos and was expected to reach 284 million pesos. ・ In 2014, a biogas facility with a processing capacity of 3,000 tons/month equipped with a sorting facility and an organic waste treatment facility that produces compost started operation in Merida. In addition to biogas and compost production, PET bottles and paper are collected from this facility.
Disposal	・ Yucatan has 50 final disposal sites, one with a daily processing capacity of over 100 tons, 10 up to 50 tons, and 39 up to 10 tons. ・ The Merida final disposal site, which opened in 1997 and is managed by SETASA, is a high-level sanitary landfill disposal site.800 tons of waste are discharged daily.

Source: Website of Secretaría de Desarrollo Sustentable del Gobierno del Estado de Yucatán (http://sds.yucatan.gob.mx/residuos-solidos/index.php), Secretaría de Desarrollo Urbano y Medio Ambiente. n.d.b., The Yucatan Times. 2017 and Ayuntamiento de Mérida. n.d.

Mérida sanitary landfill

Figure 2-63 Sanitary landfill site in Yucatan (Photograph)

2.19.7 Quintana Roo

1) Policies and initiatives related to marine plastic litter

The table below summarizes the policies and initiatives related to marine plastic litter in Quintana Roo. Under Ley para la Prevención, Gestión Integral y Economía Circular de los Residuos del Estado de Quintana Roo (Law for the Prevention, Integral Management and Circular Economy of Waste of the State of Quintana Roo), Quintana Roo bans the use of single-use plastic products such as plastic straws, plates, glasses, cups, trays and cutlery from December 2019. The use of single-use plastic bags in supermarkets is also prohibited. The use of merchandise used for medical purposes or plastic packaging to preserve and secure food is exceptionally permitted.

Table 2-175 Policies and initiatives related to marine plastic litter in Quintana Roo

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
Policies, including legal system and the establishment of regulations	Reduction of plastic use	Reduction of plastic waste released to the ocean	Recovery of plastic waste from the ocean
	• The state is classified into plastics regulated areas and non-active areas (islands and vulnerable areas) according to state law from December 2019. The use of single-use plastics is reduced and the concept of extended producer responsibility is strengthened in the target areas. (Qoo.gob.mx. 2018).	• Quintana Roo Ministry of Environment , the municipalities of Benito Juárez (Cancún), Solidaridad (Playa del Carmen), Tulum and Bacalar, business leaders, scholars, various NGOs focusing on ecosystems and social responsibilities signed the Pacto de Quintana Roo por un Océano Limpio (Quintana Roo Agreement for Clean Ocean) at Playa del Carmen in November 2018. • "OLAS: Océano Limpio" (Clean Ocean) is an international project to prevent the arrival of waste into the marine ecosystem. Four countries, namely Mexico, Egypt, Philippines and Morocco, participate. The three pillars of OLAS are 1) problem recognition, 2) promotion of plastic waste collection, reuse and recycling, and 3) promotion of plastic circulation economic model and incorporation into production process (Qoo.gob.mx. 2018).	• N/A
Initiatives of local governments, companies, NGOs, etc.	• The NGO Menos plástico es más fantástico (Less plastic is more fantastic) strives to reduce the consumption of products containing plastic. In collaboration with Mahahual Village, it promotes stainless eco-bottles and reduce the use of plastic	• OLAS Oceano Limpio aims to promote the separation and recycling of plastic waste and reduce the drifting of plastic to the Quintana Roo coast. In 2019, in partnership with Red Tulum Sostenible (Sustainable Tulum Network), it placed collection points in target cities to promote the separation and recovery of recyclable materials (Bepensa. n.d.b). • ReQPET: A circular economy model program of the Bepensa Foundation, which has been active since 2010. Collect and recycle PET (Bepensa. n.d.b).	• Participation in the ICC coordinated by Ocean Conservancy. The company DHC-AGUAKAN promotes beach cleaning of Quintana Roo. It is a strategic partner of Ocean Conservancy. • Participated in international beach and water cleaning in collaboration with the Federal Marítimo Terrestre and Zofemat through the Amigo Aguakan group of NGOs. • Fundación de Parques y Museos de Cozumel

Life cycle of plastic	Production or Use	Discharge, Treatment or Disposal	Leakage into the ocean
	bottles. At the "Mahahual Libre de Plástico" festival, a water replenishment station was set up to promote the use of eco-bottles by residents and tourists.The first scientific research on plastic pollution conducted in Costa Maya revealed that it represents 10% of the most polluted beaches in the world (La Jornada Maya. 2020).		(Cozumel Park and Museum Foundation) cleans the beach every month and participates in the ICC every year (Fundation de Parques y Museos de Cozumel. n.d.). ・ Regular beach cleaning at Mahahual by Menos plástico es más fantástico (Menos Plástico es Fantástico en Mahahual. n.d.). ・ Warner Bros contacted 4 Ocean and conducted a large-scale cleaning at Playa Delfines in Cancun in November 2018 (Be social. n.d.). ・ As part of Swim Against Plastic, beach cleaning of Sian Ka'n Reserve was carried out in November 2019 (Nadar Contra El Plastico. n.d.).

Source: La Jornada Maya. 2019

2) Current status of waste management

(1) Related organizations and operational capabilities and systems in the waste management sector

The table below describes the organizations related to waste in Quintana Roo.

Table 2-176 Waste-related organizations in Quintana Roo

Organization name	Responsibilities and/or Initiatives
Secretaría de Ecología y Medio Ambiente, SEMA (Ministry of Ecology and Environment)	Define the state's environmental and public policy as the entity responsible of the sector. Implement related operations, as well as ecological and environmental sector strategies and short-term, medium-term and long-term action policies.

Source: Website from Secretaría de Ecología y Medio Ambiente, SEMA (https://www.qroo.gob.mx/sema)

(2) Policy, legal system and future plans related to waste management

The legal system related to waste management in Quintana Roo is presented in the table below.

Table 2-177 Legal system related to waste management in Quintana Roo

Name of regulation and plan	Content
Constitución Política del Estado Libre y	The functions and public services of the state

Name of regulation and plan	Content
Soberano de Quintana Roo (Political Constitution of the Free and Sovereign State of Quintana Roo)	municipalities include waste cleaning, collection, transport, treatment and final disposal.
Ley para la Prevención, Gestión Integral y Economía Circular de los Residuos del Estado de Quintana Roo (Law for the Prevention, Integrated Management and Circular Economy of Waste of the State of Quintana Roo)	Law banning the use of plastic bags, straws and Styrofoam containers, strengthening recycling and promoting comprehensive waste management with a focus on the circular economy.
Decreto Número 337 por el que se expide la Ley Para la Prevención, Gestión Integral y Economía Circular de los Residuos del Estado de Quintana Roo (Decree 337 by which the Law for the Prevention, Integrated Management and Circular Economy of Waste of the State of Quintana Roo is issued)	Cabinet Order for the above law.
Ley de Equilibrio Ecológico y la Protección al Ambiente del Estado de Quintana Roo (Law of Ecological Balance and Protection of the Environment of the State of Quintana Roo)	This law aims to promote sustainable development of the state, maintain and restore ecosystem balance, and regulate behavior to protect Quintana Roo's environment.
Plan Estatal de Desarrollo (PED) Quintana Roo 2016-2022 (2016-2022 Quintana Roo State Development Plan)	Establish short-term, medium-term and long-term government actions. It consists of the following five axes. a Economic development and diversification that bring opportunities to all b Governance, security, rule of law c Modern, reliable, people-friendly government d Social development and fight against inequality e Planned growth with environmental sustainability

Source: Constitución Política del Estado Libre y Soberano de Quintana Roo. 2020, Ley para la Prevención, Gestión Integral y Economía Circular de los Residuos del Estado de Quintana Roo. 2019, Decreto Número 337 por el que se expide la Ley Para la Prevención, Gestión Integral y Economía Circular de los Residuos del Estado de Quintana Roo. 2019, Programa Estatal para la Prevención y Gestión Integral de los Residuos en el Estado de Quintana Roo, 2009-2011 and Plan Estatal de Desarrollo (PED) Quintana Roo 2016-2022.

(3) System and infrastructure related to waste management

The table below outlines the system and infrastructure related to waste management.

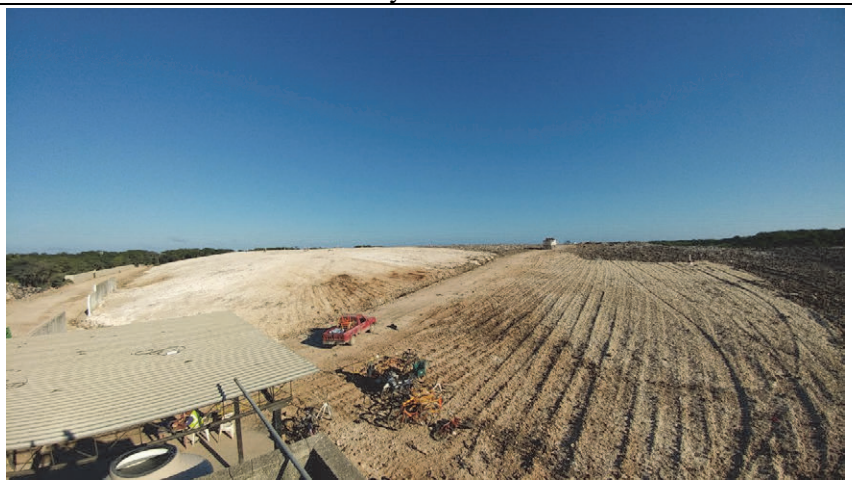
Table 2-178 System and infrastructure related to waste management in Quintana Roo

Waste management stage	Content
Discharge	・ The amount collected in 2018 was about 2,900 tons/day. ・ In the capital city of Othón P. Blanco it was 432 tons/day. ・ In Benito Juáre City, which has large resorts such as Cancun, it was 1,300 tons/day.
Collection/Transport	・ As of 2011, street sweeping is carried out manually on major streets in the state. Cleaning/sweeping with street cleaning/sweeping vehicles is carried out by four local governments in the state. ・ All local governments in the state provide waste collection services. The number of collection vehicles was 178 in 2018 (157 compactors, 18 trucks, and 3 others). ・ Waste collection rate is 99.3%.

Waste management stage	Content
Treatment	• There is a private company (LYRBA S.A. de C.V) that sorts the resources collected in Solidaridadd city and Cozumel island and recycles PET bottles. • In some areas such as Isla Mujeres and Cancún in Benito Juárez, certain resources such as aluminum, copper, iron and PET are collected and sold to a private company in Mérida (Avangard). • In 2013, the Intermunicipal Center for Solid Waste Management of Benito Juárez and Isla Mujeres (Centro Integral de Manejo de Residuos Sólidos Intermunicipal Benito Juárez–Isla Mujeres) was established with sorting, composting and sanitary landfill facilities. Various types of recycling are being carried out, and a sanitary landfill site that can accept a total of approximately 1,000 tons/day of waste is also in operation.
Disposal	• The above-mentioned sanitary landfill site. • In the state capital Othón P. Blanco, the existing final disposal site has been upgraded to a sanitary landfill.

Source: INEGI. 2019 for collection amount. Website of Solución Integral de Residuos Sólidos (Solución Integral de Residuos Sólidos. n.d. https://www.siresolcancun.com/) and SEMA. 2017

Centro Integral de Manejo de Residuos Sólidos Intermunicipal Benito Juárez–Isla Mujeres Sanitary landfill site



Sanitary landfill site in Othón P. Blanco City

Figure 2-64 Sanitary landfill sites in Quintana Roo (Photographs)