**Caribbean Region** 

## Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region

**Project Completion Report** 

January 2024

Japan International Cooperation Agency (JICA)

> EX Research Institute Ltd. Nippon Koei Co., Ltd.

GE JR 24-005



Location of the five target countries

Photos (First workshop and site visit in Saint Lucia: Part 1)



Address by the Chief Representative of the JICA Saint Lucia Office



Explanation of the workshop by the Chief Advisor



Welcome remarks by SLSWMA



Interviews on country-specific needs



Interviews on country-specific needs



Couterparts and JICA Advisory Team

Photos (First workshop and site visit in Saint Lucia: Part 2)



Site visit at Vieux Fort



Site visit at Vieux Fort



Small waste pyrolysis unit that was installed at Vieux Fort but whose operation was stopped.



Deglos landfill



Deglos landfill



Deglos landfill

Photos (Second workshop and site visit in Jamaica: Part 1)



Opening of the workshop



Address by the Minister of the Environment



Address by the Ambassador of Japan



Presentation by NSWMA, Jamaica



Presentation by SLSWMA, Saint Lucia



Participants

Photos (Second workshop and site visit in Jamaica: Part 2)



Visit to the gullies in Kingston



PET bottel recycling company



At the mouth of a gully



Waste leakage at the mouth of a gully



At a fishing village in Kington



At a fishing village in Kington

Photos (Third workshop and site visit in Saint Lucia: Part 1)



Discussion during the workshop



Address by the Chief Representative of the JICA Saint Lucia Office Presentation by NEPA, Jamaica



Presentation by NSWMA, Jamaica



Discussion during the workshop





Presentation by SLSWMA, Saint Lucia

Photos (Third workshop and site visit in Saint Lucia: Part 2)



Presentation by OECS



Presentation by UNEP



Presentation by SLSWMA, Saint Lucia



Discussion via the internet



Plastic recycling company in Saint Lucia



Plastic recycling company in Saint Lucia

### Photos (Final seminar and site visit in Guyana: Part 1)



Address by the Minister of MLGRD, Guyana



Presentation by MLGRD, Guyana



Address by the Chief Representative of the JICA Saint Lucia Office







Presentation by OECS



Discussion

Photo album (Final seminar and site visit in Guyana: Part 2)



Visit to Haags Bosch Landfill



Visit to Haags Bosch Landfill



Visit to Haags Bosch Landfill



Visit to a recycling plant



Visit to a recycling plant



Visit to a recycling plant

### Photos (CWWA Annual Conference and High-Level Forum)



CWWA Annual Conference



Solid Waste High-Level Forum



Solid Waste High-Level Forum



Solid Waste High-Level Forum



Participants of the Solid Waste High-Level Forum



**CWWA Technical Session** 

### Photos (Guyana: Support for the development of a waste management plan) Current status of the target area (Region 5)



Candidate landfill site in Blairmont, Region 5



Access road to the candidate site



Vehicle depot of a private company in Region 5



Compactor truck operating in Region 5



Plastic recycling plant



Plastic recycling plant

### Photos (Guyana: Support for the development of a waste management plan) Waste Amount and Composition Survey





Explanatory meeting



Waste collected for the survey



Physical composition survey

Collection of waste



Survey conducted by MLGRD staff



Physical composition survey

### Photos (Guyana: Support for the development of a waste management plan) Time-and-Motion Survey



Waste loading, compactor truck



Waste loading, flatbed truck



Waste loading, skip loader



Unloading at the disposal site



Waste loading, small tractor and trailer



Unloading at the disposal site

Photos (Guyana: Survey on disposal sites)



Haags Bosch: Materials for semi-aerobic Haags Bosh: Slope of Cell #2 landfill





Open dump site in Region 2



Candidate landfill site in Bertika



Candidate landfill site in Blairmont (Region 5)



Candidate landfill site in Zorg-en-Vlygt (Region 2)

### Photos (Jamaica: Support for plastic legislation)



Visit to the Minister of the Environment



Visit to the Minister of the Environment



PET bottles in a recycling company



PET bottles in a recycling company



PET bottles in a recycling company



Visit to Riverton Landfill

Photos (Jamaica: Support for the analysis of plastic waste leakage into Kingston Harbour)



Waste accumulation in a gully



Waste accumulation at the mouth of a gully



Waste removal at the mouth of a gully



Waste accumulation in the mangrove forest



### Photos (Saint Lucia: Landfilling training)





Waste unloading





Soil cover



Waste compaction

Soil cover



Final layer

Photos (Saint Lucia: Gas vent pipes and leachate treatment)

Photos (Antigua and Barbuda, Grenada)



Gas vent pipe



Preparation work at the leachate treatment pond



Visit to Antigua and Barbuda

Cook landfill



Visit to Grenada



Perseverance landfill



#### Membership Website (SharePoint) used during the Project

Introduction of Best Practices

G	C Caribbean	PlasticWaste Private group ★ Follow	ing 🙁 41 members
Ē	Home	+ New → T Upload → ····	∕ ♥ 0 ₽
_	News		
U	Documents	Documents 🐘 🖌	
₽	Shared with us	🗅 Name 🗸	Modified $$
$\oplus$	Best Practices	Final_seminar_20231023_25	October 26
	Conversations	JICA ALUMNI ASSOCIATION IN JAMAICA TECHNOLOGY TRANSFER W	6 hours ago
	Notebook	North and Latin America Data Collection Survey on Marine Plastic Litt	April 8, 2022
	X Add real-time chat	Project Brief Note	March 23
	Add Microsoft Teams to collaborate in real-time and	TechOnlineMeetings	May 12, 2022
	share resources across Microsoft 365 with your team.	Work Plan	March 14, 2022
	O Add Microsoft Teams	Workshop_20220314-18	March 14, 2022
		Workshop_20220831_0901	September 6, 2022

Sharing of project documents

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### List of abbreviations

BCRC	Basel Convention Regional Centre
BOD	Biochemical Oxygen Demand
C/P	Counterpart
CARICOM	Caribbean Community Secretariat
CARIFORUM	Caribbean Forum
CARPHA	Caribbean Public Health Agency
CDS	Container Deposit System
CFU	Colony Forming Unit
COD	Chemical Oxygen Demand
CWWA	Caribbean Waste and Wastewater Association
DRS	Deposit Refund System
EC	Electric Conductivity
EPA	Environmental Protection Agency
GIS	Geographic Information System
GPS	Global Positioning System
GSWMA	Grenada Solid Waste Management Authority
IDB	Inter-American Development Bank
JAT	JICA Advisory Team
JICA	Japan International Cooperation Agency
KMA	Kingston Metropolitan Area
M/M	Man-Month
MEGJC	Ministry of Economic Growth and Job Creation
MLGRD	Ministry of Local Government and Regional Development
NDC	Neighbourhood Democratic Councils
NEPA	National Environment and Planning Agency
NGO	Non-Governmental Organisation

NSWMA	National Solid Waste Management Authority
OECS	Organisation of Eastern Caribbean States Commission
PET	Polyethylene Terephthalate
POS	Public Opinion Survey
RPJ	Recycling Partners of Jamaica
SIDS	Small Island Developing States
SLSWMA	Saint Lucia Solid Waste Management Authority
SWM	Solid Waste Management
TN	Total Nitrogen
TOR	Terms of Reference
TSS	Total Suspended Solids
UNEP	United Nations Environment Programme
WACS	Waste Amount and Composition Survey
WMU-GOI	World Maritime University-Sasakawa Global Ocean Institute

### **1 Project overview**

### 1.1 Background

In recent years, the international community has recognised the seriousness of the marine plastic litter problem and countries and organisations have been working on this issue. Japan proposed the Osaka Blue Ocean Vision at the 2019 G20 Osaka Summit, which aims to reduce additional pollution from marine plastic litter to zero by 2050 through improved waste management and innovative solutions, and this was shared as a common global vision. In order to realise this vision, the Government of Japan has been carrying out support activities for (i) proper waste management, (ii) marine litter recovery, (iii) technological innovation and (iv) capacity building in countries around the world under the name "Marine Initiative". JICA is the main agency involved in the above-mentioned efforts and has been supporting the implementation of proper waste management in various countries since before the "Marine Initiative".

On the other hand, Caribbean countries and Japan have established good relations through years of cooperation in many fields. Like many other island countries, they face common challenges such as being vulnerable to natural disasters. Therefore, they are important partners in the fields of environment and disaster prevention. In the Caribbean region, countries are surrounded by sea and most marine litter comes from land-based sources, with plastic waste accounting for the majority. Waste, especially plastic litter, that flows into the ocean causes marine pollution, such as accumulation on coastlines, and there are concerns about the impact on important industries such as the tourism industry, centred on beach resorts, and the fishing industry.

Against the above background, JICA conducted the "North and Latin America Data Collection Survey on Marine Plastic Litter in the Caribbean Region (hereinafter referred to as the "Basic Survey")" covering the 17 countries listed in the table below. Of these, the five countries covered by this project (Antigua and Barbuda, Grenada, Guyana, Jamaica and Saint Lucia) differ in terms of land area, population size and economic growth levels, but the survey results confirmed that they all have issues with their land-based waste management capacity. Jamaica is a relatively large island country in the Caribbean region in terms of land area and population, and has a thriving tourism industry that accounts for around 34% of its total GDP, but there is a gap between waste collection rates in coastal urban areas and rural areas on the island. There are also challenges in the operation and maintenance of the final disposal site, and there are issues with basic waste management capacity, ranging from waste collection and transport to the operation and maintenance of the final disposal site. The Eastern Caribbean Island countries, which include Antigua and Barbuda, Grenada and Saint Lucia have a similar land area and population size. In terms of waste management, their collection rates have reached nearly 100%, but they face common challenges regarding final disposal. Due to the small size of the country, it is difficult to secure land for new disposal sites and the disposal capacity is becoming increasingly tight. Guyana differs from the other four countries in that it is a coastal country on the South American continent, and it has different natural and economic conditions, with a large land area and agriculture and mining as its main industries. The lack of basic waste management capacity, from waste collection and transport to the operation and maintenance of final disposal sites, has been identified as a deficiency.

Against this background, the above-mentioned five countries requested assistance from Japan to improve waste management with the aim of reducing marine plastic litter. This project was implemented in accordance with this request.

Although the project supports the five target countries, it was implemented with the idea of sharing knowledge and experience in tackling the challenges aiming at establishing a continuous and evolving cooperation framework for the waste sector in the Caribbean region in the future.

Basic survey (already implemented)		This project		Prospects
Information gathering		Improvement support		Continuation and expansion of cooperation
Caribbean region (17 countries)		Caribbean region (5 countries)		Caribbean countries
Antigua and Barbuda, Grenada, Guyana, Jamaica, Suriname, St Vincent and the Grenadines, St Kitts and Nevis, St Lucia, Dominica, Trinidad and Tobago, Haiti, Bahamas, Barbados, Belize, Cuba, Dominican Republic, Mexico	$\Rightarrow$	<ul> <li>Antigua and Barbuda</li> <li>Grenada</li> <li>Guyana</li> <li>Jamaica</li> <li>Saint Lucia</li> </ul> The results of this project will form the basis for continued and expanded cooperation in the future.	⇒	expanded cooperation with CARICOM Member States and neighbouring countries, and establishment of a framework for such cooperation.

### **1.2** Objectives, outputs and activities

The table below shows the project objectives, outputs and activities.

Project title	Project for improving solid waste management systems in the Caribbean region and reducing marine plastic waste derived from inappropriate management on land			
Target countries	Jamaica, An	tigua and Barbuda, Grenada, Saint Lucia, Guyana		
Vision	In the Caribbean region, efforts to improve waste management and information sharing to prevent the outflow of plastic waste into the ocean will be promoted.			
Goal	To prevent the outflow of plastic waste into the ocean, the capacity to respond to waste management priorities will be strengthened in the target countries, and the achievements and lessons learned from each country's efforts will be shared in the Caribbean region.			
Outputs	Output 1:	Waste management bodies in each country (central ministries, local governments, waste management corporations, etc.) understand the current status and priority issues of waste management.		
	Output 2:	Technologies and methods applicable to solving the challenges identified in each country are shared and plans for their implementation are formulated in some countries.		
	Output 3:	Pilot projects to improve waste management and prevent plastic waste from leaking into the ocean are implemented in some countries.		
	Output 4:	Information sharing on waste management is promoted between the target countries and other Caribbean countries.		

Table 1-2: Project objectives, outputs and activities

Activities	Activity 1-1: Understanding the current situation and analysing problems
	Activity 1-2: Prioritizing issues
	Activity 2-1: Sharing of technologies and methods applicable to issues, as well as Japanese knowledge and experience
	Activity 2-2: Waste management plan or action plan formulation
	Activity 3-1: Selection of pilot projects or activities
	Activity 3-2: Implementation of pilot projects or activities
	Activity 3-3: Evaluation and analysis of the results of pilot projects or activities
	Activity 4-1: Preparation of seminar presentation materials
	Activity 4-2: Arrangement of issues, lessons learned, and solutions common to the Caribbean region
	Activity 4-3: Consideration of an information sharing framework within the Caribbean region
	Activity 4-4: Holding of an information sharing seminar

### **1.3** Organization framework

The main actors of the project are the waste management agencies in the five target countries and the JICA Advisory Team (JAT) that supports them. In addition to these, organizations related to environmental management in each country, private companies responsible for waste management services, NGOs engaged in waste related activities, international organizations in the Caribbean region, JICA regional offices, etc. are stakeholders of this project.

#### 1.3.1 Counterparts

The table below shows the responsible authorities and persons in charge in the five target countries.

Country	Name of the authority	Persons in charge
Antigua and	National Solid Waste	Mr. F. Daryl Spencer, General Manager
Barbuda	Management Authority (NSWMA)	Mr. Sherwin Wiltshire, Acting Landfill Manager
Grenada	Grenada Solid Waste Management Authority (GSWMA)	Ms. Myrna Julien, Communications Manager
Guyana	Ministry of Local Government & Regional Development	Mr. Satrohan Nauth, Director of Sanitation
Jamaica	National Environment	Mr. Anthony McKenzie
	and Planning Agency	Director, Environmental Management & Conservation Division
	National Solid Waste	Mr. Edon Carr
	Management	Projects & Planning Manager
	Authority	Mr. Garfield Murray
		Senior Planning & Research Officer
		Ms. Kimberly Blair
		Community Relations Manager

Table 1-3: Counterparts

Country	Name of the authority	Persons in charge				
Saint Lucia	Saint Lucia Solid	Ms. Joanna Raynold Artherton, General Manager				
	Waste Management	Mr. Laurianus Lesfloris, Deputy General Manager				
	Authority (SLSWMA)	Ms. Marie Dalsan, Operations and Landfill Manager				
		Ms. Emlyn Jean, Information and Communication Manager				

#### 1.3.2 JICA officials

The table below shows the parties involved on the JICA side.

Affiliation/Responsibility	Name
JICA Advisory Team (JAT)	-
Leader / Solid Waste Management	Mr. Ikuo Mori
Sub-leader / Solid Waste Management	Mr. Makoto Yamashita
Collection and Transport	Mr. Satoshi Higashinakagawa
Final Disposal Operation and Maintenance	Mr. Yukihisa Sakata
Landfill Design	Mr. Osamu Nahata
Organisational and Institutional Analysis	Mr. Taisuke Watanabe
Solid Waste Management	Mr. Paulo Souza (from September 2023)
JICA Headquarters	-
Chief manager	Ms. Yumi Kimura (from February 2023)
Chief manager	Ms. Chie Shimodaira (until January 2023)
Staff member in charge	Mr. Joji Araki (from May 2022)
Staff member in charge	Mr. Keita Harada (until April 2022)
JICA Saint Lucia Office	-
Chief representative	Mr. Ichiro Mimura (from August 2022)
Chief representative	Mr. Hiroyasu Tonokawa (until August 2022)
Staff member in charge	Mr. Akimasa Matsuzaki
Staff member in charge	Ms. Hitomi Urushihata
JICA Jamaica Office	-
Chief representative	Mr. Mitsuyoshi Kawasaki (from July 2022)
Chief representative	Mr. Toru Togawa (until July 2022)
Staff member in charge	Mr. Hiroyuki Okazaki

Table	1-4:	Officials	on tl	he JI	CA side
I GDIO		Omolaio	011 0	10 01	<i>o, , oia</i> ,

#### 1.3.3 Other relevant institutions

In line with the project's objective of information sharing in the Caribbean region, the following regional organisations were engaged:

- United Nations Environment Programme (UNEP), Caribbean Sub-Regional Office
- Caribbean Community Secretariat (CARICOM), Sustainable Development Programme
- Organisation of Eastern Caribbean States (OECS) Commission
- Caribbean Waste and Wastewater Association (CWWA)

#### **1.3.4 Projects and agencies involved**

The diagram below shows an image of the project's relationship between stakeholders, including Caribbean regional organisations, private companies, NGOs, JICA alumni (former trainees) and Japanese agencies.

The main actors in the project were the five target countries, JAT, which supported them, and JICA, the project implementing agency. The five target countries and JAT worked on the ground, while JICA made the decision whether or not to implement the activities.

With a view to horizontal development in the Caribbean region, JAT collaborated with international organisations and private companies working on the issue of marine plastics. In addition, the project was smoothly implemented in collaboration with the Japanese Embassy and JICA offices, which are well-versed in information on the Caribbean region, and Japan's presence on the marine plastics issue was enhanced by introducing the project at the CWWA's annual meeting.



Figure 1-1: Agencies involved in the project

### 1.4 **Project schedule**

The project was implemented in four phases over a period of approximately two years, as shown in the table below.

Phase	Activity	Period
Phase 1 (Identification of issues)	1-1, 1-2	Dec. 2021 - May 2022
Phase 2 (Planning)	2-1, 2-2	June 2022 - Nov. 2022
Phase 3 (Improvement implementation)	3-1, 3-2, 3-3, 4-3	Dec. 2022 - May 2023
Phase 4 (Knowledge sharing)	4-1, 4-2, 4-4	June 2023 - Jan. 2024

Table 1-5: Approximate schedule of activities

The table below shows the detailed activity schedule. The project was generally implemented according to the schedule.

Activity -		2021		2021 2022											2023 2024												24	
		12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1-1 Understanding the current situation and analysing problems			I																									
1-2 Prioritizing Issues					H																							
2-1 Sharing of technologies and methods applicable to issues, and Japanese knowledge and experience								┢	-																			
2-2 Waste management plan or action plan formulation											ł		[															
3-1 Selection of pilot projects or activities					Ļ		-				Г																	
3-2 Implementation of pilot projects or activities											ļ						+		<b>L</b>			∎₁						
3-3 Evaluation and analysis of the results of pilot projects or activities																												
4-1 Preparation of seminar presentation materials																							Ļ					
4-2 Arrangement of issues, lessons learned, and solutions common to the Caribbean region																	L		•									
4-3 Examination of information sharing framework in the Caribbean region					I												-				1							
4-4 Holding an information sharing seminar																								_,				
Reports		4	∆Wo	ork	P1	an		 △Pı	rogi	ress	Re	por	t 2	ΔP/	R					ΛP	/R		Fi	P/I nal	R∆ Ret	ort	tΛ	

#### Table 1-6: Detailed schedule of activities

## 2 Initial basic policy and actual operation

Although the project was initiated with the following basic policies, it was managed flexibly in response to circumstances that arose during project implementation, such as local needs, counterpart personnel and budgetary constraints, activities of other donors, and the relaxation of travel restrictions under COVID-19. This chapter describes the initial basic policy and the actual implementation of the project.

Basic policy 1:	The JICA Advisory Team will support country-led waste
	management improvements.
Basic policy 2:	Maximise the expression of cooperation results, bearing in
	mind the constraints imposed by COVID-19.
Basic Policy 3:	Support capacity gains through consistent efforts from
	waste management planning to pilot project implementation.
Basic Policy 4:	Liaise with organisations working in the Caribbean region on
	the issue of marine plastics.

### 2.1 Basic Policy 1: The JICA Advisory Team will support countryled waste management improvements

#### a. Initial basic policy

Countries have continuously improved their waste management and the responsible institutions have a certain level of experience and capacity. JICA has also provided cooperation mainly through issue-specific training, and many former trainees are engaged in their daily work with the knowledge they have gained from the training.

In this project, the JICA Advisory Team (JAT) would support waste management improvements undertaken by each country on its own initiative.

#### b. Actual operation

In four countries (except Guyana), a public corporation (SWM Authority) has been exclusively responsible for waste management for many years and its staff are experienced and competent. Some have experience in JICA issue-specific training and have a deep understanding of JICA cooperation. These organisations were appropriate as counterparts for the project. In Guyana, there is no public corporation and local governments are responsible for providing waste services. However, they had capacity constraints. The Ministry of Local Government and Regional Development therefore acted as the counterpart agency.

In order to foster a sense of project ownership in each country, the current issues and the activities to be implemented during the project were discussed with the counterparts at the start of the project, and a Memorandum of Understanding was exchanged with JAT. In Guyana, Jamaica and Saint Lucia, where field trips were possible, it was decided that pilot projects would be implemented and JAT would assign a person in charge to support the efforts of each country.

Although the capacity of the counterpart agencies in each country did not differ significantly from what was originally envisaged, staff numbers and budgets were limited and none of the countries was able to allocate a full-time person to the project. In addition, the planned

procurement of new collection vehicles in Jamaica was delayed, creating waste collection problems at the national level that had to be addressed. Taking into account the actual situation of the counterpart organisations, the project was designed to facilitate the participation of many counterparts, such as monthly online technical meetings and semi-annual hybrid (in-person and remote) workshops, as described below, and to provide technical support and information exchange.

# 2.2 Basic policy 2: Maximise the expression of cooperation results, bearing in mind the constraints imposed by COVID-19

#### a. Initial basic policy

In January 2022, the number of countries JAT could visit was limited only to Jamaica and St Lucia due to the COVID-19 pandemic. Therefore, these two countries became the main recipients of on-site activities and JAT decided to support them through long-term stays. As for Antigua and Barbuda, Grenada and Guyana, JAT decided to support the activities of the counterparts through short-term visits as soon as travel became possible.

Item	Main target countries	Supplementary target countries					
Country	Jamaica, Saint Lucia	Antigua and Barbuda, Grenada, Guyana					
Phase 1 (Identification of issues)	On-site investigation	Remote survey					
Phase 2 (Planning)	Comprehensive waste management plan with a target year of about five years.	Action plans for partial (e.g. collection and disposal) improvements.					
Phase 3 (Improvement implementation)	Implementation of pilot projects extracted from waste management plans.	Implementation of actions (improvement activities).					
Phase 4 (Knowledge sharing)	Organise the process and results from planning to implementation of improvements. Knowledge sharing through seminar presentations.						
JAT support	Supported by long-term stays.	Supported by short-term visits.					
Complementary financial support	Research and pilot project costs.	Travel expenses for seminars, workshops and visits to pilot projects.					

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#### b. Actual operation

Even after the project started, there was no prospect of travel to Antigua and Barbuda, Grenada or Guyana. Therefore, flexible measures were taken, such as suddenly changing the date and the location of workshops which were originally planned to be held in (i) Jamaica, (ii) Saint Lucia (Eastern Caribbean: covering Antigua and Barbuda, Grenada and Saint Lucia) and (iii) Guyana. Instead, a one-week workshop was held in Saint Lucia in March 2022.

During the workshop, JAT introduced case studies and technologies from Japan and other countries, and representatives from each country explained the current status of waste management. As the participants shared the same culture and language, they actively exchanged opinions and information with each other, which was recognised as a meaningful activity towards the project's goal of sharing knowledge in the Caribbean region.

At the request of the national representatives, it was decided to hold a second workshop in Jamaica at the end of August 2022, although it was not originally planned, bringing together representatives from all five countries. The workshop was attended by private sector organisations and an academic institution working on marine plastics issues in Jamaica, as well as UNEP, which has a strong presence in the field of marine plastics in the Caribbean region. Speeches were also made by Jamaica's Minister of Environment, the Japanese Ambassador and the Chief Representative of JICA's Jamaican office. In addition, the media were also invited as participants to enhance the visibility of the initiative in the Caribbean region.

The third workshop to review the information sharing framework was held in Saint Lucia from 22 to 24 March 2023. Due to various circumstances, face-to-face participation was limited to two countries, but UNEP and OECS also participated face-to-face And there was also an online presentation from CARICOM. In total, 22 participants from the Caribbean Public Health Agency (CARPHA), World Maritime University-Sasakawa Global Ocean Institute (WMU-GOI), UNEP and others attended this workshop.

A three-day final seminar was held in Guyana from 23 to 25 October 2023. In addition to presentations by counterparts and JAT summarising project activities, messages, presentations and exchanges of views were also made by CARICOM, UNEP and OECS. In the final discussion, the participants discussed how to continue and develop the networks and knowledge gained from the project. In addition, the Caribbean Water and Wastewater Association (CWWA) held its annual meeting in parallel, which provided an opportunity to introduce the project to Caribbean countries outside the five target countries.

In the project design, only one workshop in three countries was supposed to be held at the start of the project, but taking into account travel restrictions due to COVID-19 and the wishes of the counterparts, it was decided to hold workshops for the five countries once every half year, as well as a final seminar. With the participation of regional organisations such as UNEP, OECS, CARICOM, it is believed that the foundations for the formation of an information sharing framework for waste management across the entire Caribbean region have been laid.

An activity that, together with the workshops, overcame the limitations of COVID-19 and contributed to the project's results was the monthly online technical meetings. A total of 17 meetings were held from May 2022 to September 2023. In addition, examples from around the world in the field of marine plastic litter and waste management that were found to be of particular interest to Caribbean countries were highlighted and presented on SharePoint as Best Practices a total of 35 times. In addition to these Best Practices, materials from workshops and monthly online technical meetings were uploaded to SharePoint, so that counterparts and other members of the project could access them at any time.

During project implementation, travel restrictions to Guyana were lifted and local assistance activities were implemented from August 2022. In addition, as travel to Antigua and Barbuda and Grenada became possible during the final stage of the project, a short field trip was undertaken in October 2023.

### 2.3 Basic policy 3: Support capacity acquisition through integrated efforts from waste management plan development to pilot project implementation

### a. Initial basic policy

Assessing the current situation, developing a plan and implementing a pilot project are organically linked processes that are supported as one. Experiencing and understanding all of these at one stage can help build capacity for effective waste management.
In the planning process, emphasis would be placed on supporting capacity acquisition for waste flow analysis to properly identify improvement issues. Where necessary, support would also be provided for field surveys to acquire the necessary data for waste flow analysis. The costs would be handled as part of the pilot project costs.

Through these efforts, a manual for waste management formulation, texts on various survey methods for plan formulation, waste management plans and pilot project plans to be developed, reports on surveys and pilot projects, videos and photographs, etc. would be produced. These are expected to serve as a reference for other countries and cities.

#### b. Actual operation

Initially, it was envisaged that the project would develop comprehensive waste management plans in Jamaica and Saint Lucia, where travel was possible, with a target year of around five years, and support the implementation of pilot projects drawn from the waste management plans. However, there was no need to develop a new comprehensive waste management plan in either country, and the counterpart organisations identified issues in their day-to-day operations, such as preventing illegal dumping in waterways in Jamaica and improving the current landfill site in Saint Lucia. Therefore, the original plan was revised to support the counterpart agencies in line with their needs. On the other hand, in Guyana, where the trip restrictions were lifted, the need to develop waste management plans for local cities was raised at the beginning of the project, and this was supported.

Although there was no need to develop comprehensive waste management plans, many counterpart agencies have responsibilities for on-the-ground tasks such as collection service management and disposal site operations and face various challenges in their implementation. To assist in resolving such challenges, presentations at the monthly online technical meetings were summarized into a document that can be used as a reference for later reading. In addition, manuals and other materials incorporating the findings and lessons learned through the pilot projects were prepared. Some counterparts are willing to post these materials on their websites.

### 2.4 Basic Policy 4: Work with organisations working in the Caribbean region on the issue of marine plastics

#### a. Initial basic policy

Several initiatives have already been undertaken in the Caribbean region on waste management and marine plastics issues, and knowledge would be shared in the Caribbean region by co-organising workshops, etc. with the following organisations that lead such initiatives:

- Caribbean Public Health Agency (CARPHA) of CARICOM: an organisation focused on the human health aspects of solid waste management.
- OECS (Organisation of Eastern Caribbean States): has a track record of working on plastic returns (transport off-island) in small island states.
- UNEP: Secretariat of the Cartagena Convention for the Caribbean (office in Jamaica).
- Caribbean Water and Wastewater Association (CWWA): has partnerships with both government and the private sector.

#### b. Actual operation

UNEP has a significant presence in the Caribbean region with various initiatives on the issue of marine plastics. Contact was made before the project started and good relations were

established after the start of the project, with participation in all workshops in Saint Lucia (1st), Jamaica (2nd) and Saint Lucia (3rd) and the final seminar in Guyana.

In March 2022, OECS could be contacted online, but there was no indication of further collaboration with the project as it co-sponsors the French-led RePlast project on marine plastics. In March 2023, contact was made with a RePlast representative from OECS who subsequently attended the third workshop in Saint Lucia and the final seminar in Guyana. This opened the door for future collaboration. In February 2023, a JICA expert was assigned to CARICOM, and it was agreed to contact and exchange information with the waste-related department (Sustainable Development Programme) of CARICOM through this expert. Following this, CARICOM participated online in the third workshop and a delivered a speech at the beginning of the final seminar.

CARPHA is an organisation under CARICOM that develops activities related to public health. Waste management is not its main activity, but it assists countries in environmental monitoring of disposal sites from an environmental health perspective. The head office is in Trinidad and Tobago, but there is a branch office in Saint Lucia. In March 2023, JAT contacted the Saint Lucia office and received positive feedback that they would like to sign a memorandum of understanding with JICA to share information.

In October 2023, the project had the opportunity to be introduced at the annual meeting of CWWA through the mediation of UNEP. Representatives from more than 10 countries in the Caribbean region and relevant organisations such as IDB attended the meeting, which allowed to demonstrate the presence of the JICA project beyond the five target countries.

### **3** Overview of the implementation of activities

This chapter presents an overview of all project activities, comparing the original plan and the actual results.

#### 3.1 Output 1: Waste management actors (central ministries, municipalities, waste management authorities, etc.) in each country understand the current status and priorities of waste management

#### 3.1.1 Activity 1-1: Current situation and problem analysis

	1
Output	<ul> <li>Information on waste management in different countries.</li> </ul>
	<ul> <li>Issues to be addressed by each country.</li> </ul>
	• Identification of counterpart agencies and contact persons in each country.
Method	• Countries update the results of the basic survey and organise up-to-date waste management information.
	• Based on up-to-date waste management information, countries identify issues that need to be resolved or addressed (what, when and how).
	• Countries set the actions (tasks) to be taken to solve the problem.
	• JICA experts provide expert advice on the importance of the issue and the feasibility of action.
Points of	• When analysing the problem, municipal waste flows, plastic waste flow
concern	diagrams and stakeholder maps must be prepared to quantify and visualise the problem.
	• For Antigua and Barbuda, detailed waste management information was not obtained at the time of the basic survey, so this data will be new.

#### a. Action plan

#### b. Activity results

- The counterparts and JAT updated the basic survey results and organised them as upto-date waste management information (Annex C2: Current Situation (as of March-April 2022)).
- Based on the latest waste management information, the counterparts and JAT identified issues that need to be resolved or addressed (Annex C3: Agreements on activities to be carried out in the Project).
- The counterparts and JAT set out actions (tasks) to be taken to solve the problem (Annex C3: Agreements on activities to be carried out in the Project).
- JAT prepared a pilot project proposal with expert advice on the importance of the issue and the feasibility of implementing the actions, which was discussed remotely.

#### 3.1.2 Activity 1-2: Prioritisation of issues

8		
Output	Prioritised actions (issues).	
	<ul> <li>Proposed implementation of short-term actions (issues).</li> </ul>	
Method	• Each country organises its actions according to the timeframe in which they should be addressed (short-term (1-2 years), medium-term (within 5 years) and long-term (5 years and beyond)).	
	• Analyse the feasibility of implementing actions classified as short-term.	
	Consider the proposed implementation of short-term actions.	
Points of	• For short-term actions, the feasibility of their implementation is analysed	
concern	from multiple perspectives, including financial (Capital, O&M), implementing agencies and understanding of residents and other stakeholders.	

#### a. Action plan

#### b. Activity results

Initially, it was planned to organise the actions to be undertaken in each country by time period (short-term (1-2 years), medium-term (within 5 years) and long-term (5 years and beyond)), but when identifying the needs of each country, it was found that the medium- and long-term plans or strategies were already supported by other donors and that there was not a strong demand for JICA assistance. On the other hand, it became clear that the day-to-day problems faced by the counterpart agencies managing the field were more important. Against this background, the following activities were carried out:

- For Saint Lucia, the improvement of the Deglos landfill site and the reduction of the volume of final disposal (mainly plastics) were identified as high priorities.
- For the three countries of Antigua and Barbuda, Grenada and Guyana, issues were identified through consultations at the workshop held in March 2022, and priorities were organised.
- For Jamaica, discussions were held with NEPA and since the formulation of a policy on plastic waste management was identified as a priority issue, the development of a material flow was prioritized. For NSWMA, the reduction of illegal dumping and waste disposal through public awareness and other factors was identified as a priority issue, so the prevention of illegal dumping and the segregation and recycling of plastic waste were proposed. The proposals from both organisations were merged into a highpriority project to be addressed as Integrated Marine Plastic Waste Prevention.
- The results of the discussions with each country were documented in an agreement, which was signed by both the national counterpart representatives and the JAT leader (Annex C3: Agreements on activities to be carried out in the Project).

# 3.2 Output 2: Technologies and methods applicable to solving the challenges identified in each country are shared and plans for their implementation are formulated in some countries

### 3.2.1 Activity 2-1: Sharing of technologies and methods applicable to the issues, as well as Japanese knowledge and experience

	l l
Output	<ul> <li>Workshop materials.</li> <li>List of workshop participants.</li> <li>Question-and-answer session and comment recordings from the workshops.</li> </ul>
Method	<ul> <li>While focusing on courses related to waste management formulation methods, applicable technologies and methods, as well as knowledge and experience from Japan and other countries that can be used as reference, will be shared in response to priority issues identified through field surveys in each country.</li> </ul>
	<ul> <li>The workshops will be implemented for the five target countries by group ((i) Jamaica, (ii) Eastern Caribbean Small Island States (Antigua and Barbuda, Grenada and Saint Lucia) and (iii) Guyana), with an expected duration of about five days.</li> </ul>
Points of concern	• Tools such as Zoom and Teams (SharePoint) will be used to record workshops, exchange opinions through the chat function and upload documents and other information. An online site will be open continuously during this project to store the waste management plans to be developed and related information and make them accessible to all relevant stakeholders.
	• The content of the workshops will also be discussed with counterparts during the first trip, and for countries without waste management planning needs, the content will be designed according to the needs of the destination country.

#### a. Action plan

#### b. Activity results

- A total of 17 monthly online technical meetings, called "Monthly Online Technical Meetings", were held on the second Tuesday of each month to share knowledge and experience through lectures and Q&A sessions, from May 2022 to September 2023.
- A total of three semi-annual hybrid workshops (in-person + online) were conducted for all five countries.
- Twice a month, information on plastic waste and waste management was collected, compiled and disseminated as Best Practices on SharePoint for a total of 35 times.
- Monthly online technical meetings and workshop materials were stored in SharePoint for post-event access by counterparts and others.

#### Activity 2-2: Develop an action plan for waste management planning or 3.2.2 problem solving

а.	Action plan
Output	<ul> <li>Waste management plans (including pilot project plans) in two countries (Jamaica, Saint Lucia).</li> <li>Action plans in three countries (Antigua and Barbuda, Grenada, Guyana).</li> <li>Manual for preparing waste flows, etc.</li> </ul>
Method	<ul> <li>Waste management plans are to be developed for a planning year of five years. The table of contents of the waste management plan is envisaged to be as follows, but the specific contents and the entity responsible for developing the plan will be determined based on field surveys in each country.</li> <li>Objective</li> <li>Part 1 Current status of SWM</li> <li>Basic information (natural conditions and topography, population, socio-economic situation, legal system)</li> <li>Current status and challenges of SWM</li> <li>Current waste flow</li> <li>Technical systems from generation to disposal (facilities, equipment, status of private sector outsourcing)</li> <li>Organisational structure, division of roles</li> <li>Financial affairs</li> <li>Activities of relevant actors</li> <li>Part 2 SWM strategy</li> <li>Purpose, vision and scope</li> <li>Future waste flow</li> <li>Targets (including numerical targets)</li> <li>SWM issues and actions</li> <li>Part 3 Action plan</li> <li>Action 1 (activities, timetable and costs)</li> <li>Action 2 (activities, timetable and costs)</li> <li>Action 3 (activities, timetable and costs)</li> <li>Action 1 (activities, timetable and costs)</li> <li>Part 4 Pilot business plan</li> <li>The content of the action plans to be prepared in the three countries will remain within the scope necessary for individual improvement projects, such as collection improvements and disposal site improvements.</li> <li>When conducting Waste Amount and Composition Surveys (WACS), Public Opinion Surveys (POS) and recycling surveys, which are necessary for the preparation of waste flows, the method of conducting the surveys is recorded and made available in the form of manuals with videos and photographs. The survey costs are expected to be allocated as part of the pilot project costs.</li> </ul>
Points of concern	<ul> <li>JICA experts will mainly assist in the development of waste management plans, but will also make short visits as appropriate to assist in the preparation of action plans.</li> <li>Progress reporting meetings on the development of the plan are held online to share information.</li> </ul>

#### Action plan

#### Activity results b.

The ban on travel to Guyana under COVID-19 was lifted and a pilot project was • planned in Guyana, involving the formulation of a waste management plan with actual field surveys such as WACS, etc.

- In Jamaica, two pilot project was planned, which included support for the strengthening of plastic regulations and analysis of plastic waste leakage into Kingston Bay.
- In Saint Lucia, a pilot project was planned, which included the development of an expansion plan to improve the operation and extend the life of the current disposal site.

## 3.3 Output 3: Pilot projects to improve waste management and prevent plastic waste from leaking into the ocean are implemented in some countries.

#### 3.3.1 Activity 3-1: Selection of pilot projects or improvement activities

#### a. Action plan

The actual selection of pilot projects or improvement activities is carried out in "Phase 2: Planning". In the selection process, the following points should be taken into account:

- Effectiveness: can the effect be measured within one year? Is the effect widely recognisable?
- Feasibility: are the resources (e.g. personnel, equipment, land, costs) sufficient? Can stakeholders' agreements be obtained?
- Sustainability: will the activities be sustainable after the pilot project has ended?

#### b. Activity results

- In August 2022, travel restrictions to Guyana were lifted and the local situation could be confirmed. At that time, MLGRD requested support for the development of a regional waste management plan, and after discussions with JICA, it was decided to support planning activities, including on-site surveys such as WACS, etc., as a pilot project.
- For Jamaica, the parties agreed to implement a pilot project, which would include the preparation of a material flow to contribute to policy formulation and the prevention of illegal dumping.
- In March 2022, an agreement was reached to implement two pilot projects in Saint Lucia, one to improve the current disposal site and the other to introduce source separation. However, a subsequent scrutiny of the introduction of source separation revealed that even if plastics were collected through separate collection, there was a risk that there would be no takers due to the low market price of waste plastics. Therefore, it was decided to only implement the improvement of the disposal site as a pilot project.

a.

Action plan

Output	Pilot project implementation monitoring record.		
Output	Improvement project implementation monitoring record.		
	• Pilot project plans drawn from the developed waste management plans will be elaborated and implemented in two countries (Jamaica, Saint Lucia).		
	<ul> <li>Action plans will be elaborated and implemented in three countries (Antigua and Barbuda, Grenada, Guyana).</li> </ul>		
	Stage	Contents	
		1) Determination of the activities of the pilot project.	
		2) Setting of effectiveness indicators.	
	Plan	3) Determination of the activity implementation area.	
		4) Determination of the activity implementation period.	
Method		5) Formulation of activity plans.	
Method		6) Procurement of planned equipment, etc.	
	Implementation and monitoring	<ol> <li>Obtention of the pre-implementation values of the effectiveness indicators set in 2).</li> </ol>	
		8) Implementation of the plan.	
		9) Implementation monitoring during the implementation period determined in 3).	
	10) Evaluation and	10) Measurement of the effectiveness indicators set in 2) after implementation of the pilot project.	
	analysis	11) Evaluation and analysis of the pilot project results through the results of 10) and stakeholder interviews.	
Points of concern	<ul> <li>It should be equipment.</li> </ul>	e noted that it may take some time to procure materials and	

#### 3.3.2 Activity 3-2: Implementation of pilot projects or improvement activities

#### b. Activity results

- A pilot project was conducted in Guyana, which involved the formulation of a waste management plan with on-site surveys such as WACS, etc.
- In Jamaica, two pilot project was implemented, which included support for the strengthening of plastic regulations and analysis of plastic waste leakage into Kingston Bay.
- In Saint Lucia, a pilot project was implemented, which included the development of an expansion plan to improve the operation and extend the life of the current disposal site.

These pilot projects are described in more detail in Chapter 4: Pilot projects.

### 3.3.3 Activity 3-3: Evaluation and analysis of the results of pilot projects or improvement activities

Output	• Deliverables summarising the results, evaluation and analysis and lessons learned from the pilot projects.
	<ul> <li>Manuals and other documents used in the pilot projects.</li> </ul>
	• The results of the pilot project will be evaluated and analysed, and the effectiveness of the method, challenges and measures to improve them will be considered and reflected in the waste management plan being developed.
Method	• The development of the pilot project (planning, implementation, results) and lessons learned will be compiled into a tool that can be used by counterparts in each country, such as guidelines or a booklet, to serve as a reference for waste management projects in countries facing similar challenges in the Caribbean region.
Points of	• The results will be summarized with a view to using them in the regional seminar
concern	in Activity 4-4.

#### Action plan

a.

#### b. Activity results

The results of the respective pilot projects in Guyana, Jamaica and Saint Lucia were evaluated and analysed and are presented in more detail in Chapter 4: Pilot projects.

• Plans, design documents, manuals, etc. were prepared through the pilot project (see "10.5 List of deliverables").

## 3.4 Output 4: Information sharing on waste management is promoted between the target countries and other Caribbean countries

#### 3.4.1 Activity 4-1: Preparation of seminar presentation materials

#### a. Action plan

Output	<ul> <li>Presentation materials by national counterparts at seminars.</li> </ul>	
Method	• Each country organises its efforts in the project (understanding the current state of waste management, planning, implementing pilot projects and learning from these processes).	
Points of concern	• To facilitate the preparation of presentation materials, the results of past activities (survey results, plans, activity implementation records, photographs, etc.) should be organised on an online site.	

#### b. Activity results

- The results of past activities (reports, presentation materials, etc.) are posted on SharePoint.
- Counterparts from Guyana, Jamaica and Saint Lucia presented their pilot projects at the final seminar.

For more information, see "9.3 Activities related to the promotion of information sharing".

### 3.4.2 Activity 4-2: Identification of common Caribbean challenges, lessons learned and solution methods

Output	<ul> <li>Materials presented by experts at seminars.</li> </ul>	
Method	• The experts will summarize the current status of waste management in the Caribbean region, the analysis results of challenges and improvement measures, the development and results of the pilot projects, and how to use the manuals and other tools created based on lessons learned.	
Points of concern	• To facilitate the preparation of presentation materials, the results of past activities (survey results, plans, activity implementation records, photographs, etc.) should be organised on an online site.	

#### a. Action plan

#### b. Activity results

• The participants unanimously recognised that the problems faced by Small Island Developing States (SIDS) (e.g. it is difficult to ship collected plastics outside the islands due to high transport costs, or to secure land for a disposal site in small island countries) hinder resource circulation and constitute a common challenge in the Caribbean region. The seminar also concluded that, despite the differences in scale, the tight remaining capacity of final disposal sites that Japan faced in the 1990s and the subsequent efforts to create a resource-recycling society could be used as a reference for waste management in the Caribbean in the future.

### 3.4.3 Activity 4-3: Consideration of an information sharing framework within the Caribbean region

a	Action plan
	<ul> <li>Records of discussions with relevant organisations on information sharing in the field of waste management in the Caribbean region.</li> </ul>
Output	<ul> <li>Records of consultations on methods and content of information sharing.</li> <li>Records of briefings and exchanges of views with countries and institutions.</li> </ul>
	participating in the framework.
	• Determination of regional institutions to co-implement Activity 4-4 seminars.
Method	<ul> <li>Consider a framework for effectively sharing information on waste management among countries in the Caribbean region. Specifically, it will be considered that collaboration with a country(s) or and a regional organisation(s) that could serve as the core of future cooperation in the Caribbean region. Candidate regional organisations include:         <ul> <li>CARICOM</li> <li>OECS</li> <li>UNEP (Secretariat of the Cartagena Convention for the Caribbean)</li> <li>Caribbean Water and Wastewater Association (CWWA)</li> </ul> </li> </ul>
Points of concern	• As many countries in the Caribbean region are thought to face similar challenges, the aim is to build a framework that will contribute to the resolution of issues across the region on an ongoing basis in the future.

#### b. Activity results

• Information on international organisations in the Caribbean region that could be potential information-sharing partners was obtained and organised via the internet, and visits were made to organisations that seemed to have good potential for collaboration.

• UNEP, CARICOM and OECS have also been invited to the workshops and final seminar, and a relationship that will form the basis of future cooperation was established.

#### 3.4.4 Activity 4-4: Organisation of information sharing seminars

	Seminar materials.
	List of seminar participants.
Output	<ul> <li>Record of questions and comments at seminars.</li> </ul>
	<ul> <li>Recommendations for the continuation and development of waste management improvement activities.</li> </ul>
	The content of the seminars is expected to include the following:
	Presentation by the five countries
	Presentation by JICA experts
Method	• Presentation by seminar co-organisers (regional institutions)
	• Presentation by JICA (on the framework for future cooperation)
	• Compilation of recommendations for the continuation and development of waste
	management improvement activities.
Points of	• Care should be taken to ensure a wide range of participants, with online
concern	participation also possible.

a. Action plan

#### b. Activity results

- An information sharing seminar (final seminar) was held in Guyana from 23 to 25 October 2023.
- Presentations and exchanges of views were made by counterparts from the five countries, CARICOM, OECS, UNEP and JAT.

The participants discussed the nature of information sharing on waste management in the Caribbean region in the future.

### 4 Pilot Projects

This chapter summarises the pilot projects implemented in Guyana, Jamaica and Saint Lucia, including the selection process, evaluation and analysis of implementation results, and lessons learned and recommendations for deployment in other countries in the Caribbean region.

#### 4.1 Guyana

#### 4.1.1 Overview of the pilot project

#### 4.1.1.1 Selection process

Waste management in Guyana lags behind the other four countries. This is particularly evident in rural areas, where, at the time of the field survey in August 2022, waste collection services were only provided to a small number of fee-paying emitters, and most disposal sites were open dumps. Although the need to improve this situation is recognised, the lack of a waste management plan based on an analysis of the current situation and future projections and the lack of clarity as to what is to be implemented and in what order of priority have resulted in a lack of progress in improving waste management.

Guyana has 10 regions, each of which has its own Municipality and Neighbourhood Democratic Councils (hereafter referred to as NDCs). Waste management (collection, transport, treatment and disposal) in each region is the responsibility of the Municipality and NDC under the management of the Ministry of Local Government and Regional Development (MLGRD).

In order to take a step forward to overcome the current situation, MLGRD has requested assistance from JAT to formulate waste management plans in each of the regions. After discussions, the two parties decided to implement a pilot project in which a model waste management plan is jointly developed for one region and MLGRD leverages the knowledge gained from the process to formulate plans for the other regions.

The model region selected was Region 5, a coastal region with a relatively large population, which shared many similarities with the other regions and where safety issues would not hinder the activities of the expert. It was also decided to create technical guidelines to enable MLGRD to formulate plans in other regions.

#### 4.1.1.2 Objectives and outputs

#### a. Objectives

- Through activities to formulate a waste management plan in Region 5, the capacity to investigate the current waste management status and identify issues, including survey methods such as waste amount and composition surveys and time-and-motion surveys, will be strengthened.
- Strengthen the capacity to prepare waste management plans, including methods for estimating the future waste amount setting targets and considering technology options.
- Capacity building on planning methods through the development of collection and transport plans and final disposal plans.

#### b. Outputs

- The current status of waste management in Region 5 is understood. Issues are identified. Future waste amount is estimated based on population projections. Waste management indicators are set. Future waste flows are prepared. And a waste management plan is formulated.
- Guidelines for developing waste management plans in other regions will be created based on the experience of formulating a waste management plan in Region 5.

#### 4.1.1.3 Implementation system

#### a. Counterpart

Ministry of Local Government and Regional Development

Mr. Satrohan Nauth, Director, Sanitation Department Mr. Kittindy Glasgow, Senior Environmental Officer, Sanitation Department Ms. Keisha Philips, Environmental Officer, Sanitation Department

#### b. JAT

Contact: Makoto Yamashita, Satoshi Higashinakagawa

#### 4.1.1.4 Activity schedule

### a. Information gathering survey to consider specific assistance to Guyana (development of a waste management plan)

Activity	Period
1) Discussions with MLGRD (e.g. confirmation of the organisational structure and responsibilities of MLGRD, exchange of views on the content of support, etc.)	Late October 2022
2) Confirmation of the content and progress of the Waste Management Bill prepared with UNEP's support	Late October - Early November 2022
3) Consultations with the Environmental Protection Agency (EPA)	Late October 2022
4) Selection of the region for the waste management plan	Late October - Early November 2022

#### b. Developing a waste management plan for Region 5

Activity	Period
1) Assessment of the current situation (e.g. Region 5 overview and waste management implementation status, waste amount and composition surveys, time-and-motion surveys, etc.)	January 2023 - Mid-February 2023
2) Future conditions (population projections, waste generation projections)	Late February 2023 - Early March 2023
3) Review of waste management strategies and target setting	Late February 2023 - Early March 2023
4) Planning (collection, transport and final disposal)	Early - Mid-March 2023
5) Implementation plans (review of cost estimation, finance and cost recovery).	Mid-March 2023 - Late March 2023
6) Drafting of plans	Late March 2023 - Early April 2023
7) Receipt of comments from counterparts	Late April 2023 - Mid-August 2023

Activity	Period
8) Collection of missing data	Late August 2023 - Late September 2023
9) Finalisation of waste management plans	Mid-October 2023 - Late October 2023

c.

### Guidelines for waste management planning prepared and explained to counterparts

Activity	Period
1) Creation of guidelines for the preparation of waste management plans for other regions (the guidelines include: current status and problem identification, future waste volume projections, targets, collection and transport, intermediate treatment and recycling, final disposal plans, organisation, cost estimates (initial investment, operation and maintenance costs), etc.).	July - early September 2023.
2) Explanation to counterparts and receipt of comments on the waste management planning guidelines.	Early - late September 2023.
3) Update of the waste management planning guidelines and distribution at seminars to provide operational guidance.	Mid- to late-October 2023.
4) Finalisation of the waste management planning guidelines	From early November 2023

#### 4.1.2 Activity

### 4.1.2.1 Information gathering survey to consider specific assistance to Guyana (development of a waste management plan)

Assistance was provided in Guyana for approximately three weeks, from 24 October to 12 November 2022, to support the development of a regional waste management plan. The purpose of the assistance, which had been communicated in advance to the Ministry of Local Government and Regional Development, was reiterated to confirm their understanding, and the method and content of the plan formulation were discussed. To select the target areas, visits were made to NDCs (municipalities) in coastal Regions 5 and 6 to interview them about the situation of waste collection, transport and disposal by municipalities and private companies, as well as on the personnel, equipment and costs involved. The main areas of assistance provided were as follows.

### a.1.1 Consultation with the Ministry of Local Government and Regional Development (MLGRD)

It was confirmed that the purpose of this support was for JAT to provide technical assistance to MLGRD on waste planning methods through the formulation of a model plan in one region, after which MLGRD will expand the planning process to other regions, and the staff in charge were assigned to the project. The organisational structure of the MLGRD, its responsibilities regarding waste management and the future direction of waste management were also confirmed.

### a.1.2 Confirmation of the content and progress of the Waste Management Bill prepared with UNEP's support

A draft version of the UNEP-supported Waste Management Bill (SWM Bill) was obtained from MLGRD and analysed. The Bill is a revised version based on one that was once prepared in 2014, and UNEP has hired a legal consultant to assist in the review process. A three-day public opinion hearing was held at the end of September 2022, with the aim of enacting the Bill during 2023.

The main content of the draft version is that a new Solid Waste Management Authority, a national-level organisation specialising in waste, will be set up and that this Authority will manage the financial aspect, prohibiting waste collection fees currently levied by municipalities. The Authority will grant permits, licences and operating authorisations to collectors, processors and others. Targeted waste include household, business, medical, industrial, agricultural and mining waste.

#### a.1.3 Consultations with the Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) is the government agency responsible for regulating waste to protect the environment, requiring environmental impact assessments to issue environmental permits for landfill sites and issuing environmental permits for waste collection facilities and equipment (it does not grant operating licences). To regulate hazardous waste, EPA oversees all types of industrial waste such as waste oil from power stations, electrical and electronic waste, medical waste and waste generated during oil field drilling. Medical waste is considered particularly problematic, and measures are being discussed with the Ministry of Health. The Waste Management Bill is being coordinated by the EPA's legal team and it is understood that the Bill will cover non-hazardous waste.

### a.1.4 Selection of one region for which a waste management plan is to be developed

As a result of the above-mentioned field visits, it was decided to develop a model plan in Region 5 (Mahaica Berbice) in consultation with MLGRD, taking into account the wishes of the local authorities in the target area. The reasons for the selection are as follows:

- The development of a waste management plan for Region 5 will be useful for the design, construction and operation of the semi-aerobic (Fukuoka method) sanitary landfill currently underway in the region.
- Region 5 is close to Georgetown, where fact-finding surveys such as waste amount and composition surveys and time-and-motion surveys can also be conducted.

#### 4.1.2.2 Formulation of a waste management plan for Region 5

The Solid Waste Management Plan in Region 5 is attached as Annex B2. This section reports on the activities undertaken to formulate the plan.

#### a. Obtain an accurate understanding of the situation

### a.1 Overview of Region 5 and current status of waste management implementation

Information on natural conditions such as topography, geology and climate, and social conditions such as population and economic information in Region 5 was collected based on existing literature and information on the internet. There are 10 NDCs in Region 5, and in consultation with MLGRD, representative NDCs were visited, and interview surveys were conducted. At that time, information on waste discharge and collection conditions, location of disposal sites and landfill conditions was confirmed. A questionnaire was prepared, and

information was collected from each NDC on waste management staff and waste management equipment (collection vehicles, heavy machinery, etc.).

#### a.2 Waste amount and composition survey

A waste amount and composition survey was conducted to estimate the future waste volume and waste quality (data required for planning purposes). At the same time, a questionnaire survey was conducted regarding the residents' family structure, economic situation, etc. A summary of the survey results is given below.

Item	Household Waste
Planned sample number	90
Actual and effective sample number	65
Average [kg/person/day]	0.31
Upper limit [kg/person/day]	0.98
Lower limit [kg/person/day]	0.04

Table 4-1: Results of the survey on the amount of household waste

Table 4-2: Results of the survey on the amount of commercial waste

Item	Restaurant	Shop	Institution (School)
Planned sample number	9	9	9
Actual and effective sample number	1	6	8
Average [kg/day/staff]		1.14	0.37
Upper limit [kg/day/staff]	0.61 -	1.66	1.08
Lower limit [kg/day/staff]		0.57	0.08



Figure 4-1: Results of the survey on the composition of household waste

#### a.3 Time-and-motion survey

The time-and-motion survey was conducted to determine the current collection and transport situation that will serve as reference for future collection and transport planning. Loading

time, collection and transport time, and unloading time were measured and the efficiency of each collection vehicle was compared. The results are presented below.

Type of vehicle	Average loading time [Second]	Number of loading points	Average speed during transport [km/h]	Unloading time [Second]
Compactor vehicle	30	46	54	130
Skip vehicle	35	1	24	84
Small tractor- trailer	35	18	14.4	37
Truck w/o dump function	17	15	50.5	590

Table 4-3: Summary of the time-and-motion survey results

#### b. Future conditions (population estimates and waste generation projections)

The population was estimated up to 2040 based on census data from 2002 and 2012 and population estimates for 2021. The amount of waste generated per capita was assumed to increase progressively until 2040, assuming that in 2040 the region will achieve the same level of economic development as Region 4 (the region where Georgetown is located) at present. These were multiplied to determine the future waste amount. The projected results are shown in the figure below.



Figure 4-2: Results of future waste amount projections

### c. Identification of waste management issues, strategy review and target setting

Waste management issues were identified and strategies were reviewed based on the draft version of the National Solid Waste Management Strategy. In addition, future targets for the waste collection rate, recycling rate and final disposal rate have been set.

Item	2023	2030	2035	2040
Collection rate (%)	70%	80%	85%	90%
Self-disposal rate (%)	30%	20%	15%	10%
Recycling rate (%)	2%	5%	7%	10%
Final disposal rate (%)	98%	95%	93%	90%

Table 4-4: Future targets for the waste collection rate, recycling rate, final disposal rate, etc.

Note: Collection rate = (Volume collected)/(Volume generated); Self-disposal rate = (Volume uncollected)/(Volume generated); Recycling rate = (Volume recycled)/(Volume collected); Final disposal rate = (Volume disposed)/(Volume collected)

Future waste flow reflecting the targets in the table above has been prepared. The future waste flow for 2030 is shown below.



Figure 4-3: Future waste flow (2030)

#### d. Plan formulation

#### d.1 Collection and transport

When preparing the collection plan, the number of trips was calculated by dividing the area by the amount of waste collected. The number of trips required when using a 12m<sup>3</sup> compactor is shown below. The number of collection vehicles required was considered based on the number of trips.

Name of NDC	Necessary trips in 2030	Necessary trips in 2040
Blairemont - Gelderland [trip/week]	2	4
Zeelust - Rosignal [trip/week]	8	10
Woodlands - Belair Park [trip/week]	2	2
Bath - Woodley Park [trip/week]	4	6
Union - Naarstigheid [trip/week]	9	13
Seafield - Tempe [trip/week]	4	7
Profit - Rising Sun [trip/week]	3	6
Mahaicony - Abary [trip/week]	10	10
Hamlet - Chance [trip/week]	4	4
Woodlands - Farm [trip/week]	10	10
Total number of trips [trip/week]	56	72
Total number of vehicles	5	7

#### Table 4-5: Number of trips required in 2030 and 2040

#### d.2 Final disposal

The final disposal site in Region 5 is planned to be built in Blairemont to the east and land has already been acquired. The access road is under construction, and although the access bridge has not yet been built, a significant portion of the road has been constructed. The site is long and narrow, as shown in the figure below, and is accessed by a bridge from the access road to the entrance. The construction of a final disposal site is expensive, and the construction costs required are concentrated at the start of construction. It was therefore decided to divide the construction into phases so that, as much as possible, the budget for the initial construction would not be too high.



Figure 4-4: Phased development of the final disposal site in Region 5



Figure 4-5: Relationship between landfill capacity and waste volume at the disposal site

#### e. Implementation plans (review of cost estimation, finance and cost recovery)

As unit prices for equipment and construction work were not available, the estimated costs have been calculated by referring to data from other regions, taking into account purchasing power parity, GDP and price levels. In collaboration with MLGRD personnel, the costs were scrutinised and compared to the tender prices submitted for each project to confirm that they were reasonable.

Item Co		Contents / Detail	Number (Year 2030)	Cost [USD]
Collection and transport	Compactor vehicle (12m <sup>3</sup> )		5	1,170,000
Landfill development	Landfill facility	Landfill area, Gas vent pipe, Rainwater drainage, Leachate collection pipe, Leachate treatment system, Sorting area, Weighbridge and Monitoring room, Washing and parking area, Gatehouse, Fence	1	4,369,000
	Landfill equipment	Bulldozer (Swamp type around 260 HP)	1	299,000
		Excavator (around 150 HP)	1	184,000
		Wheel Dozer (around 300 HP)	1	266,000

Table	4-6:	Estimated	costs of	collection	vehicles,	procurement	of heavy	equipment	for	the
dispos	al sit	e and main	itenance of	of the dispo	osal site	-				

Financial considerations and cost recovery were examined based on the current budget of MLGRD and the budget of each NDC. Estimates were made for the waste management budgets of each NDC over a three-year period as follows, and estimates were carried out up to 2040.



Figure 4-6: Waste management budgets from 2019 to 2021



Figure 4-7: Estimated waste management budgets to 2040

Below is a comparison of the estimated budget and operation and maintenance costs for 2030 and 2040: in 2030, the budget is slightly underfunded, but in 2040 the budget exceeds the operation and maintenance costs. However, the operation and maintenance costs do not take into account the inflation rate, so it is estimated that the operation and maintenance costs will exceed the budget when the inflation rate and other factors are taken into account.

Table 4-7: Comparison c	f estimated bu	dget and	required	operation	and mair	ntenance
	costs in	2030 and	2040			

Item	OPEX (2030)	OPEX (2040)
	[million GYD]	[million GYD]
Estimated budget	66.8	98.3
Operation and maintenance costs	57.1	91.0

#### 4.1.2.3 Preparation of a guideline for the formulation of waste management plans

A waste management guideline was prepared in line with the Region 5 Waste Management Plan. The following points were taken into account when creating this document:

• The flow for preparing a waste management plan is shown and the objectives and outputs of each item are described. Then, the investigation and planning methods are explained.

- As an example, the development of the waste management plan for Region 5 is presented, as well as examples of several technology options and other considerations in the collection and transport plan, the final disposal site plan and the recycling plan.
- How to assess institutional, technical, financial, environmental and social aspects is explained.

#### 4.1.2.4 Inputs for the development of waste management plans

The main human resources as well as materials and equipment for achieving the activities are listed below.

#### a. Human resources

- Waste management planning specialists: approx. 5 M/M
- Assistants: approx. 3 M/M
- Counterparts: 3 participants, 2 recorders, 2 people for the waste amount and composition survey

#### b. Equipment and materials

Main materials and equipment for the waste amount and composition surveys:

• Collection vehicles, waste sampling and weighing equipment (scales, buckets, sealed plastic bags), plastic sheets, stirring equipment (plastic sheets, shovels, brooms) safety equipment (work clothes, gloves, masks, etc.), recording forms, cameras, etc.

Main equipment and materials for the time-and-motion surveys:

• Vehicles (for tracking collection vehicles), stopwatches, GPS, cameras, recording forms, etc.

#### 4.1.2.5 Technical assistance to counterparts in each activity

The items of technical assistance provided to the counterparts throughout each activity are shown below:

- Visits to each NDC to investigate the current status of waste management and conduct a status survey.
- Explanation of the survey method and joint implementation of the waste amount survey.
- Explanation of the survey method and joint implementation of the time-and-motion survey.
- Explanation of the method for estimating the future amount and composition of waste.
- Formulation of plans for collection, transport and final disposal and explanation of how they were developed.
- Formulation of an implementation plan (organisation, timetable, etc.) and explanation of how it was developed.
- Preparation and explanation of the waste management planning guidelines.

#### 4.1.3 Evaluation and analysis of pilot projects

The following is an evaluation and analysis of the pilot project in Guyana.

Item	Evaluation and analysis
Challenges	The three main challenges in the formation and implementation of the pilot project
and methods	were:
(Were there any challenges in the formation and implementation of the pilot project? Are these common challenges in the Caribbean region? How were they overcome (solution methods)?	<ul> <li>Firstly, it was difficult to obtain the necessary data. In other countries, regarding the socio-economic frameworks, there are regional plans (not for the waste sector), where information such as population data and natural and social conditions are available, but in the case of Guyana, there were no regional plans and it appeared that individual ministries were carrying out their own forecasts. Therefore, in order to formulate a waste management plan for Region 5, it was necessary to carry out new population projections for Region 5. These also need to be harmonised across sectors, and it is a challenge to ensure that similar data can be used across ministries in the future, so that they can share information with each other.</li> <li>Secondly, the legal status of waste management plans was not clear. In this respect, it was proposed that the law, which is currently being amended to clarify the legal position, should include a requirement for local waste management plans, and it was attempted to obtain data held by other ministries.</li> <li>Thirdly, due to the counterparts' circumstances, the training targets changed frequently. In a sense, this made it possible to train more than one person. In addition, since the guideline has been drawn up and documented, it is hoped that the know-how will be shared within the organisation.</li> <li>Although these issues are not common to all Caribbean countries, the first point (difficulty in obtaining data) is a common challenge due to the unavailability of uniform information across sectors, lack of weighbridges or breakdowns when measuring waste volumes, etc. In addition, the rotation of training targets may depend on the country, but it is thought that in some countries the person in charge</li> </ul>
Output achievement (Have the expected outputs been achieved?)	In terms of expected results, the initial target was achieved with the development of a waste management plan for Region 5. In addition, guidelines for the development of plans were developed, explained to and understood by counterparts, which helped to strengthen their capacities. On the other hand, detailed information on some items, such as costing and financial data, was not available and the census data is outdated, so further updates are still needed.
Capacity building (Has the capacity of individual counterparts and the organisation improved?)	In terms of individual capacity related to survey methods, such as waste amount and composition surveys and time-and-motion surveys, the competence of the counterparts who participated in the surveys is considered to have improved through the survey work. The methods for preparing waste management plans were explained individually, and data collection and analysis were also requested from some of the counterparts. The capacity of the counterparts is considered to have improved through these tasks, as they were also briefed on planning methods. In addition, it is thought that the participants were able to gain a better understanding of the survey as a whole by listening to the presentations of each country and JAT at the final seminar. On the other hand, it has not been possible to measure whether the organisation's capacity as a whole has improved, but when individual counterparts were asked, there was a lack of understanding about what others were doing.
Continuity and development (Is there potential for development	This time, the plan was formulated in Region 5, the guideline was prepared and explained to the counterparts and information was shared. It is expected that the guideline and other materials created will be used in other regions in the future. On the other hand, MLGRD has a limited number of staff and it will be difficult to develop plans for each region in the short-term future. Therefore, it will be

Item	Evaluation and analysis
after the pilot project?)	necessary to set priorities when formulating plans, building waste treatment and disposal facilities and developing a waste management implementation system.
Regional development (Applicable to other countries: can it be shared in the Caribbean region?)	<ul> <li>This time, the planning for Region 5 was carried out mainly by JAT, and capacity building was provided in the form of explanations at each stage of the planning process. The waste amount and composition survey, time-and-motion survey and data collection from each NDC were partly conducted by the counterparts, so it is believed that they understood the method. Also, since the guideline has also been explained, counterparts should be able to formulate plans in other regions of Guyana.</li> <li>On the other hand, when formulating plans in other countries in the Caribbean region, the following points should be taken into account:</li> <li>Differences in land area and population density (e.g. it may only be required to formulate a waste management plan at national level, frequency of collection and transport, limited remaining capacity of disposal sites, need to reduce waste, etc.)</li> <li>Impact of tourism (e.g. prediction of waste generated by tourists, collection of environmental taxes from tourists, awareness-raising measures, involvement from tourism operators, etc.)</li> </ul>

#### 4.1.4 Lessons learned/Recommendations

#### a. Continued development after the pilot project

Lessons learned from the process and results of the pilot project included the availability of data, legal status and changes in the target group for capacity-building training. Based on these points, recommendations for post-pilot project development will be made.

#### a.1 Development of legal systems and higher-level strategies

For the development of waste management plans, it is important to clarify their position in the legal system. To this end, in the case of Guyana, it is important to proceed with the revision, approval and promulgation of the Solid Waste Management Bill and to finalise the National Solid Waste Management Strategy, and to clarify the position of regional waste management plans within these. This will also facilitate the development of waste management plans in other regions, which should continue to develop.

### a.2 Need to increase the number of employees and build the capacity of the organisation

In the department in charge of waste management in MLGRD, there are around 10 staff members to deal with waste management legislation, planning, design, tendering, facility development, equipment procurement, operation and maintenance, and that is not enough. It is planned to increase the number of employees by a few people in the future, and MLGRD is looking for qualified personnel, especially postgraduates in environmental technology or civil engineering, but there are not enough qualified engineers interested in the waste sector.

#### a.3 Prioritising the formulation of waste management plans for other regions

MLGRD has a limited number of staff and will employ a consultant to develop the plans in other 9 regions.

#### b. Application in other countries in the Caribbean region

When formulating waste management plans in other countries in the Caribbean region, the waste management formulation guidelines and Region 5 waste management plan developed in this pilot project are considered to be helpful in terms of the requirements for waste

management plans and methods for formulating such plans. The main points of reference are listed below:

- Data sheets for questions as a method for assessing the current situation.
- Method for conducting a waste amount and composition survey, including sampling methods for waste amount surveys, methods for surveying physical composition, bulk density and moisture content in waste composition surveys, explanatory material for residents and operators, explanatory material for drivers, methods for analysing data from surveys and examples of survey results in regional cities in Guyana.
- Method for conducting a time-and-motion survey with the survey results for each type of vehicle.
- Methods for processing population projections and predicting waste generation based on them.
- Future targets are set based on current waste collection, recycling and final disposal rates and future waste flows are created based on these targets.
- Estimation of the amount of waste to be collected and transported and, on this basis, calculation of the number of trips and vehicles required as a method for formulating a collection and transport plan.
- Methods for estimating the volume of waste to be landfilled and the required capacity of the final disposal site when formulating a final disposal site plan.
- Calculation for cost estimation.
- Financial and cost recovery studies.

On the other hand, Guyana and the other Caribbean island states have different waste management situations, and waste planning policies need to be tailored to their local context. The main characteristics and points to be considered are listed in the table below.

Main characteristics of island countries	Points to bear in mind when referring to Guyana's case study
The country is smaller and has a smaller population than Guyana.	In Guyana, a waste management plan at the regional level is needed, but in other island countries, where the land area is smaller and the population smaller, it would be better to develop a national waste management plan.
More densely populated than Guyana.	As the distance travelled within the collection area is reduced, collection times are relatively short. In the case of Guyana, the low population density and attempts to implement individual collection resulted in a situation where collection took so long that the daily operating hours were over without the loading capacity being reached. This is unlikely to be the case in other island states.
Little room for the development of secondary industries.	The lack of expected development of secondary industries makes it difficult to develop facilities for intermediate treatment, recycling industries, etc. In particular, the development of facilities for the recycling of valuable resources will be difficult in the future, so the countries will ultimately have to rely on exports.
High waste generation intensity and relatively large amount of high- quality waste.	Intermediate treatment is a possible solution for waste that contains a large amount of plastics, paper and other materials with low moisture content and high calorific value. However, with the exception of Jamaica, the amount of waste is low, making energy use difficult. Given the large amount of waste generated per capita, there is a strong need to prevent the generation and reduce the volume of waste. To this end,

Main characteristics of island countries	Points to bear in mind when referring to Guyana's case study
	it is necessary to consider the establishment of systems to control the use of disposable containers and packaging, such as EPR and green procurement.
Lots of waste from tourists.	It is necessary to consider systems for reducing waste generation, source reduction, etc., involving the tourism industry. Designing a system based on the polluter-pays principle could also be considered, such as the collection of an environmental tax from tourists.
Roads are narrow.	Due to the narrow width of the roads, small packer trucks are effective as collection vehicles. If the transport distance is long, a transfer station should be set up and a waste transfer and transport system should be established.
Few suitable sites for waste treatment and disposal facilities.	Since there is a limited amount of suitable land for final disposal sites, there is a particular need to reduce the volume of waste to be disposed of through reduction and reuse at source, intermediate treatment, etc.

#### 4.2 Jamaica

#### 4.2.1 Overview of the pilot projects

#### 4.2.1.1 Selection process

In Jamaica, regulations pertaining to the import, manufacture and distribution of plastic products (The Trade (Plastic Packaging Materials Prohibition) Order (2018) and The Natural Resources Conservation Authority (Plastic Packaging Materials Prohibition) Order (2018)) began to be enforced and the responsible authority, National Environment and Planning Authority (NEPA), was in the process of measuring their effectiveness and considering the addition of new items as well as the introduction of a Deposit Refund System. The Minister in charge of the environment participated in the 2022 UN Environment Assembly, where he expressed support for the adoption of the resolution "End Plastic Pollution: Towards an internationally legally binding instrument", and was focusing on combating plastic waste.

Meanwhile, in the capital city of Kingston, littering of waterways has become a common practice, and water pollution in Kingston Bay, where the waste ends up, and environmental pollution in the coastal areas where mangrove forests spread, have become social problems. The National Solid Waste Management Authority (NSWMA), who is in charge of waste management, was also emphasising efforts to address this problem.

Against this background, two pilot projects were carried out: (1) the strengthening of plastic regulation, mainly for NEPA, which included activities related to plastic material flow estimation and case studies of other countries to quantitatively assess the effectiveness of plastic regulation legislations, and (2) the management of waste on land and littering (especially plastic) into the ocean, mainly for NSWMA, which included the development of GIS maps to identify causal relationships between terrestrial waste management and marine litter (especially plastics) discharges.

NEPA has established a technical working group, including relevant ministries, on the expansion of the scope of the ban on single-use plastics. Minister Samuda, in charge of the environment, made statements on the expansion of the scope of the ban on single-use plastics and the preparation of a draft law on the Deposit Refund Scheme by the end of the year (similar remarks were made at the workshop organised by JAT on 31 August 2022).



Figure 4-8: Waste dumped into Kingston's rivers

#### 4.2.1.2 Objectives, outputs and activities

#### a. Objectives

Strengthen plastics regulation through activities related to plastic material flow estimation and case studies of other countries.

Organise data on waste management on land with GIS and identify causal links with waste (especially plastic) discharges to the ocean.

#### b. Outputs

- Estimated plastic material flows in Jamaica.
- Cases from other countries concerning plastics regulation will be presented and studied.
- Kingston's waste management data is organised and visualised as a map.
- The causal link between Kingston's waste management and the leakage of waste into Kingston Bay is clarified.

Note: As stricter regulations on plastics are being considered, it is important, as part of capacity building, to organise reflections on legislation and recycling promotion, while understanding the situation of plastics (JAT is not required to prepare draft regulations). Estimating the flow of plastic materials leads to an understanding of the plastic situation (including what data is known or not), knowledge transfer through case studies from other countries leads to the organisation of issues that need to be considered for strengthening regulations, and regulatory review work by NEPA consultants leads to the development of concrete regulatory proposals. All these activities are intended to strengthen capacities.

#### c. Activity

#### c.1 Stricter plastics regulations

The activities carried out were as follows. These activities were carried out with NEPA as the counterpart.

- Assessing the situation through plastic material flows.
- Strengthening knowledge through knowledge transfer through case studies from other countries, etc.
- Support for regulatory review work by NEPA.

#### c.2 Plastic waste marine leakage analysis

The activities carried out were as follows. These activities were implemented through local outsourcing with NSWMA as the counterpart.

- Collection of information on terrestrial areas that are presumed to be a source of plastic leakage.
- Organisation of information as geographical information system (GIS) data and creation of GIS maps.
- Analysis of causal relationships between sources and plastic waste leakage.

#### 4.2.1.3 Implementation system

#### a. Stricter plastics regulations

#### a.1 Counterpart

Since policy formulation is the responsibility of the Ministry of Economic Growth and Job Creation (MEGJC), which is a higher authority than NEPA, capacity building was also provided to MEGJC.

#### NEPA:

Mr. Anthony McKenzie, Director, Environmental Management & Conservation Division Ms. Bethune Morgan, Pollution Prevention Branch Ms. Johnil Morgan, Environmental Officer Ms. Shannon Douse, Environmental Engineer

#### MEGJC:

Ms. Gillian Guthrie, Chief Technical Director

#### a.2 JAT

Contact person: Mr. Taisuke Watanabe

#### b. Plastic waste marine leakage analysis

#### b.1 Counterpart

#### NSWMA:

Mr. Edson Carr, Projects & Planning Manager Mr. Garfield Murray, Senior Planning & Research Officer

#### b.2 JAT

Contact person: Mr. Ikuo Mori

#### 4.2.1.4 Schedule

#### a. Stricter plastics regulations

The table below shows the activities and the timing of implementation.

Activity	Late 2022	First half of 2023	Late 2023
Plastic material flow	Proposal description	Presentation of results	Explanation of use
	Information gathering		
Knowledge transfer	(Continued implementation)		
Support for regulatory review work	Comments on TOR	Comments on inception report	Comments for review

#### b. Plastic waste marine leakage analysis

The table below shows the activities and the timing of implementation.

Activity	Late 2022	First half of 2023	Late 2023
Identification of terrestrial information and preparation of TOR for outsourcing	<b>←</b> →		
Data entry and GIS mapping			
(outsourcing)			
Analysis of factors contributing to plastic waste leakage			

#### 4.2.2 Stricter plastics regulations

#### 4.2.2.1 Plastic material flow

An attempt was made to understand the status of plastics by quantifying plastics and plastic products at each stage, namely importation, manufacturing, waste generation, recycling, exportation and leakage into the environment. The counterpart introduced the Development Bank of Jamaica (which conducted a waste amount and composition survey to consider waste PPP projects), Recycling Partners of Jamaica (RPJ) and information on recycling companies. Local contractors were used to collect information from manufacturers and recyclers.

Regarding the data obtained, only quantities of pure plastic products (including resins) were available for the import stage, while for the production stage, no data was provided by the manufacturing companies and quantitative information was only available for plastic bottles. From the waste stage onwards, estimates of leakage into the environment could be made based on waste generation and collection rates. This attempt allowed the counterparts to understand what data was or was not available.

Based on the data that was available, the plastic material flow below was prepared. The work will be continued by the counterparts in the future.



Figure 4-9: Plastic waste material flow

Title	Overview
Plastic Material Flow (Ver. 2)	Aim: In order to understand the situation of plastics in Jamaica, data is collected and estimated by stage: import/export of plastics, manufacturing, waste generation, waste collection, recycling and leakage. A summary of the material flow is presented in a PPT.
	Overview:
	<ul> <li>A key finding is that the main plastic pollution problem in Jamaica is marine and coastal plastics, with an estimated potential leakage of plastics into the environment of approximately 71,400 tonnes per year for the country as a whole and 21,800 tonnes for the Kingston Metropolitan Area (KMA).</li> </ul>
	<ul> <li>Import/export data, manufacturing data, waste generation data, recycling data and leakage data for plastic products are collected, and although the data is limited, such as manufacturing data, it provides an insight into the marine leakage of plastics.</li> </ul>
	The application of material flows is shown to focus on specific plastic products.
Plastic Material Flow (Detail)	Aim: To understand in detail the material flow of plastics in Jamaica.
(Ver. 2)	Overview:
	<ul> <li>Detailed explanation of the data/information presented in the above-mentioned PPT, including acquisition method and calculation method.</li> </ul>
Data Resource Guidance for	Purpose: To indicate the sources of data/information for using and
Plastic Material Flow	updating the plastic material flow.
	Overview:
	Data source for imports and exports: description of UNCOMTRADE.
	Data from the plastic manufacturing industry: the lack of statistics makes interviews with manufacturers and bottlers necessary, but manufacturers tend to refuse to provide data.
	Data on waste generation and collection: based on "Solid waste characterization study over 3 seasons – Jamaica (conducted by

Title	Overview
	ecogeos)" and NSWMA Annual Report.
	<ul> <li>Data on plastic recycling: based on interviews with RPJ and Jamaica Recycles, the data provided mainly concerns plastic bottles.</li> </ul>
	<ul> <li>Data for the Kingston Metropolitan Area: due to the lack of data on the Kingston Metropolitan Area, data has been converted based on population ratios.</li> </ul>
Plastic Material Flow Follow-	Purpose: To provide supplementary information on the use of the
up	plastic material flow.
	Overview:
	<ul> <li>A key finding from the plastic material flow is that leakage into the environment is an issue when considering environmental pollution caused by plastics, and leakage into the environment is estimated from non-collected plastic waste.</li> </ul>
	<ul> <li>As an application of the material flow, the report describes how to target specific plastic products and collect reliable data. For example, it explains that in the case of data collection for PET bottles, manufacturing data is likely to be available due to the limited number of major manufacturers, recycled volumes can be obtained from recyclers and leakage into the environment and recycling rates can be estimated.</li> </ul>

#### 4.2.2.2 Knowledge transfer through case studies from other countries

MEGJC has set as direction of the plastic policy the strengthening of the regulations on single-use plastics and the introduction of a Deposit Refund Scheme. In addition, the preparation for intergovernmental negotiations (starting in November 2022) to create an international framework for plastic pollution (a treaty is envisaged) was raised as an issue, and in response knowledge transfer was provided in the form of workshops and material sharing. Topics for each session were selected based on the counterpart concerns, pilot project activities and related information. For example, in the third session, as the expansion of the regulation (ban) on single-use plastics is being considered, examples of how to draft legal texts on covered products and those treated as exceptions were presented based on legal texts from Caribbean island countries. In addition, industry associations, NGOs and other organization are conducting activities to combat plastics in Jamaica. Interviews were conducted and introduced in the 11th edition. The list of knowledge transfer activities is as follows.

Table 4-9: Knowledge transfer activities related	to	plastic	policy
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No.	Overview	
1	Date: 5 August 2022	
	Title: Overview of JICA activities in Jamaica	
	Overview:	
	✓ Introduction of project activities related to policy tools for marine litter control that contribute	
	to the formulation of policies to combat marine plastic litter.	
2	Date: 22 August 2022	
	Title: Disposable plastics regulations and plastic bottle refund schemes	
	Overview:	
	✓ Regulation of single-use plastics, issues, context and examples from Caribbean countries.	
	$\checkmark$ Deposit Refund Scheme (DRS), including potential expansion and examples from	
	Caribbean countries.	

No.	Overview
3	Date: 10 October 2022
	Title: Legislation for a deposit and refund system
	Overview:
	✓ Approach to legislation
	✓ Legislative matters (for mandatory schemes)
	✓ Legislative matters (for voluntary schemes)
4	Date: 20 October 2022
	Litle: Disposable Plastics Regulation
	<ul> <li>Introduction (interpretation and explanation of current regulations, lessons learned from Aptigua and Barbuda)</li> </ul>
	$\checkmark$ How to specify eligible products
	<ul> <li>✓ How to stipulate exceptions</li> </ul>
	✓ Handling of biodegradable plastics
5	Date: 22 November 2022
	Title: Preparations for the first negotiating conference for the Plastic Pollution Convention
	Overview:
	✓ What are discussed
	✓ What the Secretariat is preparing
	<ul> <li>✓ Discussion points</li> <li>✓ What does lamaica want?</li> </ul>
	<ul> <li>What does samale want?</li> <li>✓ How to make Jamaica's voice louder</li> </ul>
6	Date: 16 January 2023
-	Title: Plastic material flow
	Overview:
	<ul> <li>Plastic material flow in Jamaica, including quantitative data for each stage</li> </ul>
	✓ Other outputs of the pilot project
7	Date: 14 February 2023
	Title: Supporting plastic policy development in Jamaica
	Overview:
	✓ JICA project activities
	<ul> <li>Overview of the plastic material flow</li> <li>Other plastic policy support activities</li> </ul>
0	Other plastic policy support activities
0	Title: Enactment of Janan's Containers and Packaging Recycling Law - Legislative process and
	stakeholder consultations
	Overview:
	✓ Major government ministries and agencies
	✓ Overview of the Containers and Packaging Recycling Law
	✓ Draft process for the Containers and Packaging Recycling Law.
-	Opinions from various industries, consumer organisations and local authorities
9	Date: 30 July 2023
	Cuerview
	Viciview.
	✓ Implementation of CDS in the Marshall Islands
10	Date: 25 August 2023
	Title: Information on plastic alternatives
	Overview:
	<ul> <li>Example of research in Trinidad and Tobago</li> </ul>
	✓ Examples of statements in draft regulations or impact assessments on single-use plastic

No.	Overview		
	bans (Canada, UK, New Zealand)		
11	Date: 31 August 2023		
	Title: NGO/private sector action against plastic pollution in Jamaica		
	Overview:		
	✓ Recycle and Refund		
	✓ Beverage company campaigns		
	<ul> <li>Hotels and tourism associations activities</li> </ul>		
	✓ Kingston Bay clean-up project		
	<ul> <li>International Coastal Cleanup activities</li> <li>NOM/MA pathibities (for reference)</li> </ul>		
10	<ul> <li>NSWMA activities (for reference)</li> </ul>		
12	Date: 15 September 2023		
	Title: Plastic Material Flow Supplement		
	Overview:		
	<ul> <li>Plastic Material Flow Ver. 2 (version with additional information)</li> </ul>		
	<ul> <li>Plastic Material Flow (detailed) Ver. 2 (version with additional information)</li> </ul>		
	<ul> <li>Data Resource Guidance for Plastic Material Flow (addendum)</li> </ul>		
	<ul> <li>Plastic Material Flow Follow-up (supplementary information and usage instructions)</li> </ul>		
13	Date: 10 October 2023		
	Title: Preliminary comments on the consultant's report on single-use plastic policy (comments for		
	review of the report).		
	Overview:		
	✓ Feedback from stakeholders		
	✓ Review of the legal framework		
	✓ Capacity of key stakeholders		
	<ul> <li>Justification for national policy preparation</li> </ul>		

#### 4.2.2.3 Support for NEPA's regulatory review work

During the field survey, meetings were held with NEPA every 1-2 weeks to explain the progress of the pilot project, hear about issues of interest and exchange information, including knowledge transfer on plastic material flow, case studies from other countries, etc.

Following NEPA's budget for external consultants ("Policy Consultant to prepare a National Policy on Single Use Plastic Management" and "Consultant to prepare a Legislative Framework for a Deposit Refund Scheme for PET Bottles"), the following activities were carried out. During the field survey period, a consultant was selected as "Policy Consultant to prepare a National Policy on Single Use Plastic Management" to examine the regulation on single-use plastics. This report is highly anticipated as it includes stakeholder consultation, and the determination of which products will be covered by the expanded regulations is heavily influenced by stakeholder views on the availability of alternative products.

- Comments were provided on the draft TORs of the two studies.
- The consultant for "Policy Consultant to prepare a National Policy on Single Use Plastic Management" was selected and JET provided comments on the inception report.
- Given the time taken by the consultant to submit his report on "Policy Consultant to prepare a National Policy on Single Use Plastic Management", comments explaining the points to be considered when the report is released have been provided (No. 13 in the preceding list).

#### 4.2.2.4 Evaluation and analysis of the pilot project

The results of the evaluation and analysis of this pilot project are presented in the table below.

Item	Evaluation and analysis						
Issues and methods	• The accuracy of material flows is largely dependent on available data. Lack of data can have a negative impact on planning and other aspects of the waste flow management.						
Level of achievement	<ul> <li>The plastic material flow visualises the amount of plastic introduced in the region and reveals important characteristics, providing insight into th "circularity" of plastics in the country. It could identify areas where furth work is needed to reduce resource use and introduce alternatives.</li> <li>Regarding knowledge transfer, the content was varied and provide background information to inform what steps should be taken in the futu in terms of policy and legislation. In particular, topics on legal and polic options and country experiences were of interest to the counterparts.</li> <li>For regulatory reviews, the documents provided by JAT were helpful ar have been shared with the policy consultant.</li> </ul>						
Capacity building	<ul> <li>Support from JAT for the development of a plastic material flow has provided numerous opportunities for organisational and individual capacity building.</li> <li>Information was shared by conducting the following sessions:</li> <li>Knowledge of plastic waste management, including refund schemes, bans on single-use plastics and economic incentives implemented in other Caribbean countries.</li> <li>Plastics-related policies, plastic material flow and waste segregation in Japan.</li> <li>Workshop aimed at direct exchange of information on current waste management practices in the Caribbean region.</li> <li>The presentation of NEPA staff on the plastic material flow at the final seminar also showed improved competence (see figure below).</li> </ul>						
Sustainable development	<ul> <li>Material flows illustrate the importance of data collection and the need for inventory management to facilitate the implementation of plans and policies on reducing plastic pollution. Analysing plastic material flows can provide useful information for the implementation of plastic waste policies in Jamaica, i.e. actions to reduce plastic pollution.</li> <li>The draft regulations will be discussed with the sector group following the submission of the consultant's report and will then be submitted to the Cabinet.</li> </ul>						
Regional development (Applicable to other countries)	• At the final seminar, regarding the plastic material flow, the counterpart presented the methods and challenges of material flows using the Jamaican case, and JAT presented what can be gained from the material flow. The counterpart and JAT also shared with other countries and regional organisations how the material flow can be used in other countries with similar challenges if they want to quantitatively understand the plastic situation (e.g. to determine the amount of plastic leakage into the environment).						



From NEPA's presentation at the final seminar.

Figure 4-10: Comparative analysis of various plastic data by NEPA

#### 4.2.2.5 Lessons learned/Recommendations

#### a. Continued development after the pilot project

NEPA consultants are currently exploring the possibility of strengthening the single-use plastic regulation (ban). A report that can adequately justify the proposed regulations is highly anticipated. If discussions with the sector group proceed after this report, the conditions for strengthening the regulation will be met, although the final decision will be political. Given NEPA's limited manpower, it is appropriate to make use of consultants, but it is important to provide an environment in which they can work effectively (e.g. by providing them with a list of key stakeholders).

It was recognised that obtaining information on plastic waste was essential for estimating its leakage into the environment. On the other hand, it was difficult to obtain information from manufacturers of plastic products, including not only the amount (number) of plastic products manufactured but also the type of plastic used. It is important to take this as a lesson to be learnt and to promote information gathering by targeting specific plastic products (e.g. PET bottles, for which the number of manufacturers is limited).

#### b. Application in other countries in the Caribbean region

When considering plastic measures, Caribbean countries face the following common challenges:

- As plastic resins and products are imported (and products are manufactured from resins), import restrictions are not easy to enforce.
- Products are consumed and become waste, but if they are not properly discarded by consumers and if discarded waste is not properly collected and disposed of, it will leak into the environment.
- Collection for recycling is limited to PET bottles and export is costly.

The information shared in this project will be helpful in addressing these issues.

#### 4.2.3 Plastic waste marine leakage analysis

#### 4.2.3.1 Activity

### a. Identification of information on terrestrial areas that are presumed to be a source of plastic leakage

The Kingston Metropolitan Area comprises the Kingston Parish and St Andrew's Parish. Under the Parishes are the Communities, and under the Communities are the Enumeration Districts. Information on terrestrial sources of plastic waste, which are presumed to be a source of plastic leakage, was extracted and organised by enumeration district as follows:

- 0. Name of community and enumeration district
- i. Name of community
- ii. Name of enumeration district
- A. Basic socio-economic data
- i. Population (enumeration district)
- ii. Population density, person/km<sup>2</sup>
- iii. Squatter settlements
- iv. Roads (largest road class in the enumeration district)
- v. Income proxy, by level (Low-income, Lower-middle income, Middle income, Uppermiddle income, and High income)
- vi. Poverty
- vii. Name of gully (watershed)
- viii. Area of enumeration district (km<sup>2</sup>)
- B. Primary Data
- i. Number of waste stockpiles (from satellite image analysis)
- ii. Number of plastic bottle drop/deposit points (from Recycling Partners of Jamaica (RPJ))
- C. Derived waste collection data
- i. Number of waste collection days, day(s) per week
- ii. Waste collection routes

### b. Organising information as geographical information system (GIS) data and creating GIS maps

The aforementioned information was obtained and organised in the format shown in the table below.

Data⊷ code∹	0-i∈	0-ii⇔	A-į⇔	A-ii≓	A-iii∈⊐	A-iv⇔	<del>A.v.</del> e	A-vi∈	A-vii⇔	A-viii≓	B-į⇔	B-ii↩	C-į⇔	C-ii↩
ਦ No.ਦੋ	e <sup>J</sup> Name of Enumeration DistricteJ	Name of community↩	ਦ Nos. of Populationਦ	Population density (person/km2)	Existence of squatter settlement (Y/N)+3	Roads (largest road class in the enumeratio n district) (highest road class only)+3	e <sup>⊥</sup> Income proxy by Levele <sup>⊥</sup>	ਦ Poverty <i>ਦ</i>	ਦ Name of gully	Area of Enumeration (km2)⊧ª	ਦਾ Nos. of waste stockpilesਦਾ	ਦਾ Nos. of RPJ' pointsਦਾ	Nos. of waste collection days perei weeke	Nos. of waste collection route↔
1	43	ρ	63	43	a	es.	13	62	43	e .	63	a	43	ρ
2	ρ	a	e.	4	a	4	4 <sup>2</sup>	5	43 43	6	د <u>م</u>	6	63 (1)	6
3	e3	2	¢3	£4	63	£3	42 2	63	4J	63	61 -	63	εş.	<sup>1</sup>
43 54	63	5	63	43 2	67	43 2	e2	63	4J	63	al.	£3	43 2	14
÷	é2	e .	4	÷	4	÷	<sup>1</sup> 2	4	÷3	÷	4	é1	÷2	é1
43	43	3	43	43	67	¢3	13	e3	43	¢1	63	£1	43	1
67	63	a	43	43	đ	43	67	63	43	62	43	6	43	¢.

Table 4-10: Geographica	l information	input format
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The GIS map produced is shown below. The map shows the potential waste generation per enumeration district based on per capita waste generation from the waste characterisation study conducted by the Inter-American Development Bank in 2022. The 1.18 kg/capita/day household waste generation is multiplied by the population of each district and graded colour
coding is used to show quantitative differences. The colour coding ranges from bright yellow (districts with the lowest potential waste generation) to bright red (districts with the highest potential waste generation).

The figure shows that waste accumulates mostly at the mouth of each river and on the opposite bank of the river where mangrove forests extend. However, it also shows that there is also a lot of waste in the middle and upper reaches of the rivers, particularly in the watershed of Sandy Gully.





Figure 4-11: GIS map of potential waste generation by population district within the Kingston Metropolitan Area

### c. Causal analysis of factors and plastic waste leakage

Detailed data on waste collection services, which is considered to be one of the main causes of waste leakage, was not available and the causal relationship between waste leakage and collection services was unclear. It is desirable to improve the monitoring system of waste collection services and to continuously develop the data in the future.

On the other hand, the accumulation of waste in the rivers was not only observed at the mouths of the rivers, but also at many locations in the upper and middle reaches, confirming that waste dumping into the rivers is taking place throughout the Kingston Metropolitan Area. At the start of the pilot project, there were problems with delays in the procurement of waste collection vehicles, which hampered the collection service, but the service was not completely suspended, so the river dumping seen across the Kingston Metropolitan Area may be indicative of a public awareness problem. The following is a summary of the results of the survey.

### 4.2.3.2 Evaluation and analysis of the pilot project

The results of the evaluation and analysis of this pilot project are presented below.

Item	Evaluation and analysis
Issues and methods	Many stakeholders are aware that dumping waste into rivers in the Kingston Metropolitan Area is the main cause of pollution in Kingston Bay. However, no analysis has been carried out on the magnitude of waste dumping and the factors causing it, so the GIS data development and mapping adopted in this pilot project was a meaningful approach to elucidate the causal relationships.
Level of achievement	There was insufficient data on the quality of collection services, considered as one of the main factors behind plastic waste leakage into the sea, to enable a causal analysis. On the other hand, counterparts felt that the map produced clearly showed how waste was accumulating in the river and polluting the mangrove forests on the other side of the estuary and could be used as an environmental learning tool to raise public awareness.
Capacity building	Although the counterparts involved in this pilot project were limited to NSWMA staff, it was evident from the workshop and seminar presentations that they fully understood the content of the project and reflected it in their work.
Sustainable development	The software used to organise and map the information is also used by NSWMA, who is already making its own use of the data organised this time.
Regional development (applicable to other countries)	In small island states, the number of rivers is limited, and it would be easier to identify the locations and causes of plastic waste leakage without replicating the methods adopted in this pilot project. On the other hand, if the area is of a certain population size and has an intricate river system, such as the Kingston Metropolitan Area, a similar approach could be useful.



From the NSWMA presentation at the final seminar.

Figure 4-12: Use of GIS by NSWMA

### 4.2.3.3 Lessons learned/Recommendations

### a. Continued development after the pilot project

The software used to organise and map the information is also used by NSWMA, and as it already makes its own use of the data organised this time, there are no obstacles to its continuation.

In the future, along with the development of data on routes and frequency of collection services, data on separate collection for recycling, whose introduction is currently under consideration, will not only help to analyse the leakage of plastic waste into the ocean, but also to improve the quality of collection services, which constitute the core business.

### b. Application in other countries in the Caribbean region

Although few countries in the Caribbean region have urban areas large enough to adopt the methods used in this pilot project, a map that visually shows plastic waste leaking into the ocean through rivers could serve as an environmental education tool in other countries.

### 4.3 Saint Lucia

### 4.3.1 Overview of the pilot project

### 4.3.1.1 Selection process

Of the five countries covered by the project, Jamaica and Saint Lucia were the only countries where activities were possible during the first round of travel. As Saint Lucia could serve as a reference for other small island states in terms of population size, social development status and economic scale, the needs for improved waste management in the country were examined during the first trip, with a view to forming a pilot project. As a result, it was determined that there was a strong need for the separate collection of plastics and other valuable materials and for the improvement of the final disposal site.

Among these, the separate collection of waste was shelved as it became clear that the counterpart lacked the personnel and budget to implement a pilot project centred on a collection model experiment. Meanwhile, the only final disposal site on the island, the Deglos Sanitary Landfill, has been in service for about 20 years, exceeding its planned lifespan at the time of its construction. However, it was difficult to secure a site for the next final disposal site on the small island, and it was the intention of the Sanit Lucia Waste Management Authority (SLSWMA) to continue to use the Deglos Sanitary Landfill for at least another 10 years by improving leachate treatment, stormwater drainage and other functions. Taking these factors into consideration, it was decided to implement a pilot project to improve the operation of the landfill and provide support for the expansion plan.

### 4.3.1.2 Objectives and outputs

### a. Objectives

- The purpose of this pilot project is to show how the problems facing the Deglos Sanitary Landfill can be addressed and to provide a pathway for extending the life of the landfill in a safe and environmentally sound manner.
- The pilot project will not only develop specific plans, but also provide training on improved landfill methods and environmental monitoring, with the aim of building the counterpart's capacities in these areas.

### b. Outputs

- A landfill improvement plan is prepared, consisting of a development plan for civil and equipment works and a landfill operation and maintenance plan.
- Through the pilot project, the capacity of the counterpart in planning and landfill operations is improved.

### 4.3.1.3 Implementation system

### a. Counterpart

Saint Lucia Solid Waste Management Authority (SLSWMA)

Ms. Marie Dalsan, Operations and Landfill Manager

Mr. Davis Poleon, Zonal Supervisor

Mr. Densroy Williams, Site Works Maintenance Coordinator

Mr. Hans Lloyd, Landscaper

Mr. Jamal Soucra, Landscaper

### b. JAT

Contact: Mr. Yukihisa Sakata (Operation and Maintenance of Final Disposal Facilities)

### 4.3.1.4 Schedule

Time	Disposal site improvements	Elements specific to the pilot project
Mar. 2022	Signature of basic agreements with the counterpart.	
May - June 2022	Formulation of the pilot project.	
July 2022	Preparation of partial weir installations based on recent survey results.	<ul> <li>Preparation of necessary materials:</li> <li>Portable analysers (water and gas measurement)</li> </ul>
Aug. 2022	Determination of the details of the pilot project content.	<ul> <li>Preparation of necessary materials:</li> <li>Aerator (leachate treatment experiment)</li> </ul>
Sep. 2022	Launch of the pilot project: estimation of future waste amount, formulation of improvement policy.	Gas drainage pipe installation Monitoring implementation
Oct Nov 2022	Cost estimation and establishment of improvement plans.	Implementation of water purification experiments. Review of environmental improvements and incorporation into plans.
Feb Mar. 2023	Preparation of draft conceptual designs (to be produced in-house by JAT).	
Apr Aug. 2023	Review of conceptual design and incorporation of phytoremediation treatment plans.	
Sep. 2023	Finalisation and phasing of estimated project costs. Finalisation of the landfill improvement plan (conceptual design).	Preparation of O&M manuals.
Oct Nov. 2023	Evaluation of the pilot project.	

### 4.3.2 Activity

### 4.3.2.1 Development of the pilot project implementation plan

### a. Confirmation of the remaining landfill capacity

Topographical surveys of the waste landfill layer were carried out at the Deglos landfill site by a local surveyor in April 2022, and the remaining landfill capacity of the site was estimated based on these surveys.

As a result, JAT reported to the counterpart that if the landfill operation continued as before, there would only be about one to two years of residual capacity left and that there was an urgent need to expand the landfill capacity. In addition, the landfill operation at that time was not in line with JAT recommendations as the slope angle exceeded the safety ratio (1:2).

### b. Calculation of required capacity

As the Deglos landfill site is the only final disposal site on the island and alternative sites are not immediately available, it was decided to secure the remaining landfill capacity for at least the next 10 years.

The future waste amount wase estimated and the cumulative landfill volume for the next 10 years was calculated at 1.72 million m<sup>3</sup>. The plan was designed to ensure this capacity until 2032, i.e. 10 years from now.

### c. Composition of landfill waste

As most of the waste collected in Saint Lucia is landfilled, the composition of the collected waste was used as the composition of landfill waste. The results of the waste composition survey conducted by the counterpart in 2018 are as follows: organics account for more than 50% of the waste, while plastics account for about 20%, which does not differ from the proportion of municipal waste in Japan (20-25 %). The counterpart recognised that the high proportion of plastics constitutes "voluminous waste" and makes landfill operations difficult.



Figure 4-13: Waste composition in Saint Lucia

### d. Organisation of the target site

The disposal site to be covered by the improvement project is shown in the picture below. Although the overall site is slightly larger, it was decided to plan the expansion within this site.



Figure 4-14: Target site (the blue frame demarcates the site boundary)

### e. Study of improvement methods

### e.1 Improvements to leachate treatment ponds

Leachate treatment consists of leachate flowing through three treatment ponds, with sedimentation of pollutant particles, natural purification, etc. taking place during the residence time of the leachate.

Although the most recent water quality data showed that the leachate quality was not as poor as in other developing countries, it was decided to improve leachate treatment with the aim of releasing the water into the environment after proper treatment.

In the small experiment described below, it was decided to introduce an aeration system and to plan with the counterpart the installation of wetlands (a water purification system using vegetation), which the counterpart strongly requested, to create a leachate treatment system as shown in the following figure. For aeration, a gravity aeration system that takes advantage of the difference in elevation between the sedimentation basin and the first treatment basin was adopted.



Figure 4-15: Leachate treatment system

### e.2 Extension of the landfill area

The current landfill area is concentrated in the south-west side of the site, in an area of low altitude, but the eastern side of the site was also considered for use as a landfill area. The map below shows the areas targeted for expansion. A final plan was drawn up including these areas.



Figure 4-16: Development target areas

As a result of the study, the overall layout map is shown below.



Figure 4-17: Results of landfill area expansion (overall layout map)

The area indicated by the red line in the map is the current landfill area. It was planned to be extended to the area indicated by the blue line and to install stormwater gutters around it to evacuate stormwater from outside the expansion area. The expansion area is currently a wooded area, and it is planned to use the earth and sand generated during the expansion as covering material.

### e.3 Dredging of regulation ponds and installation of perimeter ditches

To prevent rainwater from flowing into the landfill area, a gutter will be installed all around. In addition, the current regulation pond that temporarily catches rainwater was dredged and the external drainage pipe was designed as a large-diameter ( $\phi$  1800 mm) hume pipe (concrete-wrapped pipe) to prevent overflow from the regulation pond, as shown in the figure below.



Figure 4-18: Drainage system with hume pipes from stormwater regulation ponds (red line)



Figure 4-19: Rainwater catchment and drainage system

### e.4 Improvements to leachate catchment area (landfill area)

The existing leachate collection and drainage system, prior to the improvement project, also collected rainfall outside the landfill area, resulting in a high leachate volume. To ensure proper leachate treatment, the improvement method plans to separate leachate from rainwater. The inflow from outside the landfill area can be separated by installing stormwater gutters around the perimeter as described above. In addition, a system was created to plan and control the amount of leachate by installing culverts at the intersection of the stormwater drainage channel and the leachate drainage channel.

### e.5 Improved access roads

As for the access road leading to the landfill area, it was decided to utilise the current access road as much as possible and replacement projects were suspended. However, the counterpart, on its own initiative, installed a new access road between the leachate treatment pond and the leachate reservoir (sump), so that several access roads can still be used even after the improvement project has been implemented.

### e.6 Improved leachate reservoirs

The leachate reservoir, which is currently an unmaintained pond, is to be replaced by a concrete tank with a certain level of height difference from the leachate treatment pond, and the plan is to use this height difference to implement gravity aeration.



Figure 4-20: Improvements to leachate reservoirs (red box)

### f. Facility operation issues

Observations of the normal operation of the Deglos landfill site suggested that the basic operation of the landfill was not problematic, as incoming waste is landfilled in the landfill area without delay.

As there was no disruption caused by waste pickers as seen in other developing countries and landfill operations were well managed, no need for urgent improvements were identified.

With regard to the impermeable structure of the disposal site, the landfill layer is formed without impermeable sheet because the ground is a clay layer. However, since the waste is already buried and no significant pollution load has been observed, it was considered that necessity of improvements of the impermeable structure could only be seen over the course of the future.

On the other hand, recyclable materials accumulated at the recycling facility have never been removed during the project period and the stock of separated recyclable materials is currently increasing. In addition, hazardous waste is stored in the open air, and further consideration is required, including improvements to the working environment.

As for the improvement plan, it was decided that the priority was to proceed as originally planned, with a focus on expanding landfill capacity.

### 4.3.2.2 Small-scale improvement experimental project

### a. Procurement of portable analysers (water and gas measurement)

Portable analysers (for water and gas measurements) were procured in Japan after confirming that they were not available locally.

Changes in water quality, etc. were measured in conjunction with the implementation of the water purification experiment. As the results of the experiments were separately outsourced for water quality analysis, the measurements here were taken as reference values and as preparation for future water quality monitoring inside and outside the facility.

The gas analysis was carried out as a preparatory work to check the future gas generation after the temporary installation of the gas extraction pipes. Regarding gas concentrations, high concentrations of methane (over 12%) were found in several gas extraction pipes, which were used as a reference for the future.

# b. Procurement of necessary equipment and materials for leachate purification sub-experiments

It was considered that the limitations of standard voltage in buildings and the procurement of equipment for small experiments in island countries would also be better learned in the pilot project, so after travelling to Saint Lucia, an attempt was made to procure the equipment locally. The equipment and materials procured are as follows.

		Price	Price
Classification	List of articles	(Tax included, in JPY)	(XCD)
Equipment	2 water tanks 154 L		299.14
Equipment	Plastic net		25.05
Equipment	2 small pumps (for implementation and comparison) *Shipping costs (XCD 60 including tax)		316.00
Equipment	Rubber tube		66.3
Equipment	Valves (for flow adjustment)		19.85
Equipment	Gravel		71.22
Equipment	Cupboard drying racks (1)		41.03
Equipment	Cupboard drying racks (2)		53.12
Equipment	Extension cord		28.73
Equipment	BF-A plug adapter		17.78
Material	Duct tape		11.73
Material	Grass for wetland		0
Measurement	Gas analyser	185,900	
Measurement	Water-quality analyser	87,890	
Tool	Bucket with handle		37.8
Tool	Rope		74.88
Tool	Small shovel or trowel used in gardening		17.69
Tool	(Hand) towel		8.07
Tool	Tub		9.65
Tool	Spare containers for sewage storage (1)		93.65
Tool	Spare containers for sewage storage (2)		53.04

Table 4-11: List of equipment and materials for water purification experiments

XCD: East Caribbean Dollar



Figure 4-21: Equipment overview of the water purification experiment

The small submersible pumps used in the leachate purification experiments were difficult to procure within Saint Lucia, and due to the voltage requirements (240 V), mail order from the Saint Lucia site was used. Regarding the procurement of materials and equipment for the experiments, the aim was to create a device that could be reproduced by the counterparts, so it was finally decided to use materials that could be procured locally. For example, a transformer was initially considered for controlling the water flow, but as electrical knowledge and special electrical work materials were required, control valves (three-way valves, plastic products) for air pumps for small ornamental fish aquariums were procured to complete the experimental apparatus.

### c. Results of leachate purification experiments

As aeration of leachate is expected to remove organic pollutants, an aeration purification experiment using a small tank (about 120 L) was conducted to confirm this effect (10 - 17 October 2022). As a result, certain effects were confirmed, such as a reduction in the coliform bacteria count by about one-fourth.

On the other hand, the wetland treatment was also tested in a comparative experiment using blank tanks. The results did not confirm the impact of the introduction of wetlands, but the conceptual design was based on the introduction of wetlands, as this technology is used and studied worldwide.

### d. Gas vent pipe installation

Gas vent pipes ( $\varphi 200 \text{ mm x 4}$ ) were installed at the Deglos disposal site and gas generation was confirmed, which indicates accelerated biochemical stabilisation within the landfill layer. The production and installation of the gas vent pipes was outsourced and carried out in conjunction with the installation of the small weirs. Gas vent pipes were installed on the old waste layer to the east and the new waste layer to the west, with and without a cap on the top

of the pipe for comparison. According to the results, gas generation did not cease even in the final period of the pilot project and the concentration reduction could not be confirmed.

A plan of the gas vent pipe is shown below.



Figure 4-22: Standard drawing of a gas vent pipe

### e. Implementation of simplified monitoring

Simple monitoring using portable analysers was carried out together with the counterpart, with the aim of regularly measuring water quality and the concentration of gases generated.

Water quality was measured in the leachate reservoir called sump, in front of the leachate treatment pond and gas concentration was measured at the gas vent pipe installed in the pilot project. As the water quality was analysed at the same time according to the official method, JAT compared the results of this analysis with the EC (electrical conductivity) measured with a simple water quality analyser and explained to the counterpart how to apply this data to daily management.



Figure 4-23: Water quality: simplified analysis

Simple estimation of water quality parameters based on the measurement results of a portable analyser

Among the parameters, COD and BOD values can be obtained from the portable analyser by converting the EC value as below.

Target water quality in the conceptual design

Parameter	Limit*	Lab's recommendations				
COD	90 mg/l	30 mg/l				
BOD	60 mg/l	30 mg/l				
Oil and Grease	30 mg/l	15 mg/l				
TSS	60 mg/l	30 mg/l				
TN	60 mg/l as daily average	80 mg/l				
Nitrate	Not stipulated**	5 mg/l				
Ammonia Nitrogen		10 mg/l				
Coliform	200 CFU/100 ml	200 CFU/100 ml				

Example of estimation Lab results: COD 50 mg/l; BOD 30 mg/l Monitoring: EC 5.0 mS/cm

Based on the relationship between laboratory results and monitoring results, EC numbers can be converted to BOD and COD as follows.

COD: 90 mg/l (limit) >> EC: 9.0 mS/cm indicated by the portable analyser BOD: 60 mg/l (limit) >> EC: 10.0 mS/cm indicated by the portable analyser

END of DOCUMENT

Figure 4-24: How to apply the results of the official method in simplified monitoring

As for gas analysis, the methane gas concentration only exceeded the detection limit as the temperature increased, so it was decided to measure and check the values every week.



Figure 4-25: Simple gas analysis

		En	Deglos S vironmenta	anitary Lan al monitorin	dfill ng record
1. Water a) Outle	r quality analy et of the Sump	rsis			Jahal Soucra
					Harrs LLayd
Date	pH (-)	EC (mS/cm)	Leachate	temp (°C)	Remark
21 Sep 2023	Note: Ambie Measured tin Measured by	ent temperatur ne: 1:4:00 ( y: HI991301D	0:00 0:00	3°C,	
	7.99 7.90 7.95	8.20 4.52 4.50	30,	0 - 3	
Date	CH4 (%)	O <sub>2</sub> (%)	CO <sub>2</sub> (%)	H-S (%)	Denvel
21 Sep 2023	Note: Ambie Measured tin	ent temperatur ne: 14:30 60	re +220	1125 (70)	Kemark
21 Sep 2023	Note: Ambie Measured tin Measured by	ent temperatur ne: 14 <del>:30 -</del> 10 /: GX-2012	e 120	1125 (70)	Kemark
21 Sep 2023	Note: Ambie Measured tin Measured by	ent temperatur ne: 14 <del>30</del> 66 7: GX-2012 20.2	e 120	1125 (70)	Kemark
21 Sep 2023	Note: Ambie Measured tim Measured by J SOCEL (TBL 2	$\begin{array}{c} \text{rest temperature} \\ \text{rest 14:30} & \text{for } \\ \text{rest 0.2} \\ \hline \text{20.2} \\ \hline \text{20.2} \\ \hline \text{12.2} \\ \hline \text{20.3} \\ \hline \text{20.3} \end{array}$	e 120		Kemark
21 Sep 2023	Note: Ambie Measured tin Measured by ACEL ColBL 2 to 3 South	ent temperatur ne: 14:30 60 7: GX-2012 20.2 20.2 12.2 20.2 20.2	e -220	113(70)	Kemark
21 Sep 2023 (2) Sep (2) Sep (2	Note: Ambie Measured tin Measured by SO (FL (G1B) 2 t 3 South CH4 (%)	$\begin{array}{c} \text{nt temperatur}\\ \text{ne: } 14:30^{-1}60\\ \text{(: } GX-2012\\ \hline \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	e - یکی CO <sub>2</sub> (%)	H <sub>2</sub> S (%)	Remark
21 Sep 2023 (2) Jack ) East-5 Date 21 Sep 2023	Note: Ambie Measured tin Measured by	ent temperatur ne: $14:30^{-1}$ for 20,2	e +1≥0 CO <sub>2</sub> (%) e 30.9 °C	H <sub>2</sub> S (%)	Remark
21 Sep 2023 2023 2023 2023 2023 2023	Note: Ambie Measured tin Measured by	nt temperatur ne: $14:30 - 10$ (3X-2012) (20,2) (2,2)	e -t≥0 CO₂ (%) e 30.9 °C	H <sub>2</sub> S (%)	Remark

Figure 4-26: Monitoring record

### f. Preventing collapses and improving landfill operations

As of 2022, when the pilot project started, waste was being unloaded, compacted and covered at a relatively high elevation in the northern part of the landfill. The site was operating well from a sanitary perspective.

If the landfill is extended to the east in the future, the landfill height will increase further and the landfill layer will need to be structurally reinforced. In particular, the south side of the landfill area is a gentle slope, which requires a structure to support the landfill layer from below while compaction of the waste is carried out.



Figure 4-27: Image of embankment installation and waste piling

As part of a pilot project to stabilise the landfill layer, an embankment was built under the slope at the south-eastern end of the landfill and the waste was piled from the bottom up.

First, civil works were required for the installation of the eastern embankment, which was carried out by a local contractor. The small embankment to be installed were as follows.



Figure 4-28: Location and overview of each facility



Figure 4-29: Small weir body diagram

### g. Landfill operation training

From 20 to 24 February 2023, landfill operation training was conducted using the small embankment that had been installed. Prior to the training, a training plan was developed with the counterpart. It was decided that there would be three landfill layers and that the final cover would be laid as an intermediate cover.

[Landfill operation procedures]



### 3rd step

- A waste vehicle comes to the site and unloads waste on the second compacted waste layer.
- Spread the waste with a dozer parallel to the embankment.
- Compact the waste with a dozer moving back and forth 10-15 times.
- Fill the target landfilling area with the waste.
- Repeat until the waste is piled up to 150 cm + 45 cm soil cover from the original ground level.
- The section drawing of the final shape after the 3<sup>rd</sup> step is shown below.





The training was conducted according to the planned schedule. Several lessons were learned, and knowledge was gained on the common landfill operation practices in Caribbean countries.

For example, a temporary access road for waste collection vehicles was installed, but even light rain caused the vehicles to stick, and the temporary road had to be rebuilt several times using mounds of earth. Although soil was procured from the site as roadbed material, the roadbed remained loose even after compaction due to the lack of hard materials such as crushed stone. A construction method using paving iron sheets, timber, etc. should have been adopted.

A new finding was that, although the number of times the waste was compacted was initially set to five round trips, a stable surface could not be formed due to the bulky nature of plastics. By increasing the number of rolling cycles to 10 round trips, a stable landfill layer could be formed. The current landfill operations in Japan are mainly based on incinerated ash, which is easy to compact, so the number of round trips for compaction could only be confirmed on site.

### 4.3.2.3 Development of improvement plans and conceptual designs

A conceptual design report was compiled based on the results of the studies described above. The following are the items to be considered.

### a. Examination of design conditions and design criteria

According to existing documents and other information on the Deglos landfill and counterpart interviews, it was found that the landfill was not constructed according to the design documents, the construction stopped midway, and the landfill was put into service as it was. One of the concerns raised was that the leachate treatment system was not functioning as designed, but in Saint Lucia, environmental and discharge standards are not legally specified, and CARPHA (the Caribbean Public Health Agency, a sub-organisation of CARICOM, a public health research and study organisation) has only published recommended standards. At the same time, existing water quality data was received from the counterpart, which showed that water quality testing was conducted regularly every year and covered more than 30 items, but that there were some water quality results that exceeded the CARPHA standards. As the counterpart does not expect chemical treatment in the leachate treatment, the controllable items were narrowed down, and the design water quality of the leachate after treatment was set based on Japanese effluent standards.

### b. Organisation of the conditions necessary for conceptual design

In order to proceed with the proposed landfill improvements, the basic figures required for the design were estimated.

The future amount of waste was calculated by estimating the amount of waste per person per day based on the most recent waste amount and multiplying by the future population.

Rainfall data was collected to estimate leachate and stormwater drainage capacities, which were used as basic figures for the conceptual design.

The effectiveness of the landfill improvements was confirmed by comparing the number of years of remaining capacity with the current structure, when it is used to its limits, and when landfill improvements (mainly area expansion) are carried out. As a result, it was estimated that the remaining life of the landfill would only be about two years in its current state, and that landfill improvements would ensure a remaining lifespan of more than 10 years.

### c. Expanding landfill capacity by installing weirs

An embankment is installed at the bottom of the landfill area, and a structurally stable landfill layer was formed by landfilling the waste in an orderly manner from the bottom to the top. The diagram below shows the overall layout and standard cross section.



Figure 4-30: Overall layout of the disposal site



Figure 4-31: Cross-sectional view of the reclaimed area (A-A')

### d. Installation of gas vent pipes

Although the existing disposal site is a sanitary landfill, its structure is based on anaerobic landfill. However, in order to promote biochemical stabilisation of the landfill, which is



mainly composed of food waste, gas vent pipes were installed as shown in the diagram below.

Figure 4-32: Standard cross section of gas vent pipe installation and landfill area

### e. Estimation of project cost

The project cost was estimated at USD 6 million (approximately JPY 900 million). In addition, it was estimated that surveying costs (USD 30,000), geological survey costs (USD 30,000) and detailed design costs (5-10% of the project cost) would be necessary.

### f. Project phasing

As the project costs approximately 900 million yen, it would be extremely difficult due to the financial situation of SLSWMA to budget and realise it all at once, so the improvement items were prioritised and divided into three phases.

The cost was divided into three equal parts.

Phase 1: Installation of weirs.

Phase 2: Improvements to rainwater catchment and drainage systems.

Phase 3: Leachate treatment system improvements.

### 4.3.3 Evaluation and analysis of the pilot project

The pilot project lasted approximately two years and covered almost everything that was originally planned. This section provides an evaluation and analysis of the pilot project.

Item	Evaluation and analysis
Issues and methods	The four main challenges in the formulation and implementation of the pilot
(Were there any	project were as follows:
challenges in the	The first challenge was to supplement the lack of appropriate
formulation and	documentation. In order to confirm the current status of the final disposal
implementation of the	site, documents were provided by the counterpart, but first the counterparts
pilot project? Are they	told JET that only the design drawings of the disposal site were available
common challenges	and that many of them were not finalised designs. Then it appeared that the
in the Caribbean	disposal site was not constructed according to the design. In order to
region? How were	ascertain the actual situation at the disposal site, it was necessary to hear
they overcome	directly from the counterpart and document the information.

Item	Evaluation and analysis
(solution methods)?	Another point is that it is often difficult to allocate human resources on the counterpart side. Based on the experience in projects in South-East Asian countries, the top-down approach was not particularly pronounced, but there were often situations where requests and discussions could not be carried out without permission from managers. For example, although almost all the staff at the final disposal site was cooperative and understanding, and there was no difficulty in responding after explanations, they almost never "discussed the details with the on-site officer and implemented them", but it was all carried out through the manager, and there were times when it was difficult to respond quickly.
	To solve these problems, a plan was drawn up for all activities and an officer was appointed in advance, which enabled the subsequent activities to proceed without delay. The case taught the lesson that careful preparation in Japan prior to on-site activities leads to the prompt implementation of field investigations.
	Secondly, it is important to be aware of the limitations of goods procurement. Most Caribbean island countries, including Saint Lucia, have small populations and tourism is the main industry, so in many cases they rely on food and drink imports in their daily lives.
	In the pilot project, the required supplies and heavy equipment were also imported. Among the supplies, the pipe to be used for the gas vent pipe was initially planned and ordered with a diameter of 300 mm, but it would have taken more than a month to receive this pipe (or it would have been necessary to use an express delivery service at an expensive price) and only 200 mm was available on the market at the implementation stage, so there was no choice but to change to this.
	In the small experiments, most of the items were procured locally to assess the ease of procurement, and the equipment was created, but all of them were imported and although they were functionally identical to the experimental equipment originally planned, many of them were made up of different parts.
	Procurement limitations does not only apply to materials and equipment, but also to human and technical resources, with only three companies in the country able to submit a quote for water quality analysis (one of which carries out its own analysis). Similarly, it is hard to say that competition was possible for geological survey and surveying.
	In fact, if subsequent maintenance projects were to follow this pilot project, it would be inevitable to rely on the USA, Canada, Spain or a large South American country, and since the scale of the project is small, there are concerns that the project would be more expensive than expected because the principle of competition would not easily apply.
	Although there is no way to solve these problems quickly, when implementing maintenance projects, there are many areas where local companies can perform the work. Therefore, for work that is not technically difficult, creative approaches such as assigning competent construction managers and placing separate orders are needed to foster domestic companies.
	Third, budget acquisition is institutionally unstable. The counterpart is not a ministry directly under the state, but a department under the Ministry of Sustainable Development, Energy, Science and Technology, and it is not easy to obtain a national budget. Therefore, it is not easy to obtain budgets not only for the development of facility, but also for operation and maintenance. As an example, when a pilot project for separate collection was proposed, the counterpart was unable to contribute to the fuel cost and driver's wages for the waste collection vehicles owned by the counterpart.

Item	Evaluation and analysis
	Meanwhile, in the last two years of the pilot project, the counterpart has used its own budget to conduct a phytoremediation experiment (Wetland project) and has also been steadily enhancing its composting project. These activities were all considered by the managers of the counterpart for several years. Based on this, it can be assumed that projects that the counterpart considers necessary are likely to be implemented after several years of consideration.
	Fourth, there was a lack of awareness regarding information management. The Wetland project mentioned above involved the use of heavy machinery to raise the leachate treatment pond by several thousand cubic meters of earth and sand, but there were no drawings to manage this, only illustrations of the plans. The construction was carried out by an external contractor, and it was assumed that the work was carried out based on their know-how, but the construction, which was supposed to take four months, was not completed even after nine months.
	Through the development of conceptual designs and operation and maintenance manuals, we repeatedly highlighted that documentation is required and that plans and drawings contain important figures, so by complying with these guidelines, it can be expected that not only specific projects, but also operations will become more efficient.
Level of achievement (Have the expected results been achieved?)	In terms of expected results, the original objectives were achieved, as a concrete landfill improvement plan was carried out through conceptual design. In addition, an operations and maintenance manual was created with the counterpart, which documented the landfill management capacities originally possessed by the counterpart. As these were compiled as standard contents for Caribbean countries, it was possible to document contents specific to landfill operations in the Caribbean region, rather than a detailed manual as would be the case in Japan.
Capacity building (Has the capacity of individual counterparts and the organisation improved?)	Regarding the individual abilities of the counterparts, since their abilities were judged to be excellent from the start, there have been no particular achievements. However, the manager and her subordinates expressed opinions, held discussions and implemented the ideas brought by the Japanese experts. In view of these points, it is considered that they acquired new knowledge.
	In particular, with regard to the nature of landfilled waste, the ratio of plastics to food waste was well understood, and a method of compaction was proposed based on this, contributing to the elaboration and optimisation of the manual.
	This pilot project was implemented under the recognition that they were not counterparts from a developing country, and it was possible to successfully share their strengths (landfill operations) and the strengths of the Japanese experts (intermediate treatment technologies and design methods).
Sustainable development (Are there possibilities for development after the pilot project?)	The project has been reviewed and submitted as an output. To make it a reality, a briefing document has also been compiled and submitted to the Ministry of Sustainable Development, which is the higher authority. Since an improvement project was originally planned, it expected that it will be implemented in the near future.
Regional development (Applicable to other	<ul><li>Two items were created as a result of this pilot project in other Caribbean countries. These regional developments are described below.</li><li>1) Conceptual design for improving existing disposal sites</li></ul>
countries)	It is understood that what is expected from other countries with regard to landfill-related technology is the technology transfer of the "Fukuoka method", and the results presented here are a useful technical report for

Item	Evaluation and analysis
	island countries where it is difficult to acquire land for new landfills, and where it is necessary to prolong the life of the facilities.
	It is a rare example in the Caribbean region of a country where it is possible to reclaim land from vacant lot and follow the example of Japan. It is believed that it is effective to raise the land level to increase the landfill capacity by increasing the bulk, as per the conditions presented in the manual. In addition, as the manual does not describe very technical aspects and allows for step-by-step planning, it is hoped that it will be distributed as useful reference.
	2) Manual for the Operation and Maintenance of Landfill Sites (Caribbean Region Version)
	The manual takes into account the characteristics of the Caribbean region, such as waste properties, maintenance management based on the assumption that parts are difficult to procure, and inspections at a manageable frequency. As for how to use the manual, assuming that there are detailed management manuals for the landfill facilities owned by the home country, and based on these, realistic operation and maintenance management can be expected by using this deliverable, which specifically includes contents that take into account the characteristics of the Caribbean countries.

### 4.3.4 Lessons learned/Recommendations

### a. Continued development after the pilot projects

### a.1 Understanding the correct procedure on how to obtain a project budget

The pilot project went so far as to share explanatory materials with the counterpart to obtain budgets for improvement projects. However, the preparation of national budgets has certain set procedures and deadlines depending on the country. A prior understanding of this administrative mechanism would have enabled the preparation of appropriate explanatory materials in a timelier manner.

### a.2 Shared need for self-funded project implementation

As has been the case in a number of existing technical cooperation projects, there have been instances in Saint Lucia where projects have fallen into disrepair once donor support has expired. For example, during the project period, a project for the voluntary collection and recycling of plastic bottles was implemented with the support of other donors but was not continued after the project ended.

There are examples of projects, such as the leachate treatment pond improvement works, that continue smoothly as long as the counterpart bears some of the cost. By ensuring that the counterpart agency bears its own costs when implementing the project, the continuity of the project is likely to increase, with the counterpart agency taking part of the responsibility, even if the timing of implementation may be postponed.

### b. Application in other countries in the Caribbean region

Existing disposal sites have more or less problems in all the countries covered by the project. In particular, some island countries are believed to face similar challenges to Saint Lucia as their land area is small and it is difficult to secure land for a disposal site on a flat surface. This pilot project will serve as a reference to improve the operation of existing disposal sites and extend their lifespan.

## 5 Information sharing

This section details the activities related to Output 4.

### 5.1 Common challenges in the Caribbean region

Based on the results of Activities 2 and 3, this section summarises common challenges, lessons learned and effective solution methods in the region.

### 5.1.1 Degree of development of waste management

The table below shows the current status of waste management in the five target countries.

Country	Collection and transport	Final disposal	Waste reduction
Antigua and Barbuda	97% collection rate. Most waste is collected by contracted private companies.	The sanitary landfill site became full in 2016. Currently, the old landfill site is being re-used. It has basic facilities, such as a weighbridge, but has operational problems, such as a lack of equipment.	Efforts are being made for PET and aluminium can recycling and for composting, but it is not sufficient. End-of-life vehicles are collected, and waste tyres are shredded.
Grenada	98% collection rate. Most waste is collected by contracted private companies.	There have been improvements in final disposal, such as proper closure of old disposal sites and construction of semi-aerobic cells, but there is room for improvement, such as covering the current disposal site with soil.	Composting, and plastic and metal recycling are carried out, but all these initiatives are small-scale and experimental.
Guyana	Collection rates appear to be high in the capital Georgetown, but there is significant room for improvement in rural areas. In many cases, private companies sign contracts directly with customers to provide collection services.	In the capital city of Georgetown, the IDB- supported Haags Bosch sanitary landfill site is in operation. In rural areas, almost all waste is disposed of in open dumps.	Recycling of plastics and metals has just started.
Jamaica	Collection rate of approx. 70%. Most waste is collected by the public authorities.	There are several controlled dump sites across the country. Although there are some problems, such as long intervals between soil covering and lack of leachate treatment facilities, they are	Recycling companies funded by bottling companies and others collect PET bottles nationwide. In addition, segregated collection is being implemented on a project

Table 5-1: Current status of waste management in the five target countries

Country	Collection and transport	Final disposal	Waste reduction
		managed on a daily basis.	basis.
Saint Lucia	96% collection rate. Collection is carried out by a private contractor under a commissioning agreement.	There is one sanitary landfill site (Deglos) on the island. It is in relatively good condition, although there are some operational problems. However, the remaining capacity is under pressure.	Composting and plastic recycling have been implemented on a project basis, but did not become permanent initiatives.

Source: The information in the table is based on the results of the status survey conducted at the beginning of the project.

In each country, collection and transport systems are generally well established and private sector utilisation is progressing. Small island states in particular have achieved a collection rate of almost 100%, suggesting that the marine leakage of plastic waste from land areas is limited.

Of the five countries, only the Haags Bosch landfill in Georgetown, the capital of Guyana, which was built with IDB support, can be considered adequately equipped and operated as a sanitary landfill site. However, landfills in other countries can also be considered relatively well managed, although there is room for improvement.

Reduction and recycling have just started in all countries and are carried out through trial and error on a project basis, with no permanent system in place in any country. On the other hand, regulations on single-use plastics are already in place in most countries.

Thus, the five target countries have already passed the stage of collection and transport optimisation, and generally have sufficient capacity for good management of final disposal. On the other hand, waste reduction, as discussed below, is an issue that needs to be focused on in the future, due to the constraints of land for disposal site development.

### 5.1.2 Constraints as Small Island Developing Sates (SIDS)

All five target countries are on the UN list of Small Island Developing States (SIDS). SIDS face a number of challenges, many of which are due to their geographic remoteness. They not only face high import and export costs for goods, but also irregular international traffic. Due to their small resource base, they have to rely on external markets for many goods (see <a href="https://www.un.org/ohrlls/content/about-small-island-developing-states">https://www.un.org/ohrlls/content/about-small-island-developing-states</a> ).

From the perspective of waste management, imports of consumer goods, mainly from the USA, combined with the country's consumption culture, is thought to have led to an increase in the amount of waste generated per capita, particularly plastic and other container waste. Post-consumer waste, including plastic containers, accumulates on the island due to high export costs. In the pilot project in Saint Lucia, it was observed that the high proportion of plastics in the landfill waste made compaction difficult, and it is easy to infer that it exhausts the capacity of the landfill.

The small size of the countries makes it difficult to secure land for disposal sites, and the current disposal sites must be used for as long as possible. On the other hand, recycling aimed at reducing the amount of waste disposed of is difficult to achieve domestically due to the narrowness of the market. And even if were exported, it would be expensive, and irregular international traffic makes exporting even more difficult.



Source: Basics of Municipal Solid Waste Management in Africa, p.9 (https://unhabitat.org/african-clean-cities-publications) and waste generation rate reported by each country.





Source: Waste Characterisation Study Report by SLSWMA (2018). Figure 5-2: Waste composition in Saint Lucia



### Import vs Export

Figure 5-3: Imports and exports of plastics in the five target countries (2016-2020)

### 5.1.3 Issues and methods to be addressed in the future

In the 1990s, Japan faced the problem of tight remaining capacity at final disposal sites. While it was extremely difficult to secure land for the construction of new disposal sites, the amount of waste generated was increasing. Against this background, the Containers and Packaging Recycling Law came into force first, and in 2000 the Basic Law for Promoting the Creation of a Recycling-Oriented Society was enacted, marking the first year of a recycling-oriented society, and various recycling laws were developed.

Legislation has been developed and various initiatives have been taken concerning the recycling of resources involving citizens as well as technical systems. As a result, the amount of waste disposed of has decreased due to lower per capita waste emissions and higher recycling rates, and although the remaining capacity of landfills has decreased, the remaining life of landfills has increased, so that the short remaining lifespan of landfills is no longer a social problem nowadays.

Japan had a well-developed secondary industry that could serve as an outlet for recycling. This differs significantly from small island developing states. However, the problem of securing land for disposal sites is similar, albeit on a different scale. Rather than giving priority only to waste reduction and recycling that generate added economic value, it would be more appropriate to focus on promoting waste reduction and recycling to solve the problem of limited capacity of disposal sites. This seems to be in line with the sentiments of small island developing states, and similar comments were heard from the counterparts at the final seminar.

From the above, it can be concluded that the various efforts of Japan since the 1990s, ranging from legislation to public awareness-raising on the formation of a recycling-oriented society,

Source: UN-comtrade (https://comtradeplus.un.org/)

can be effectively incorporated in a form suitable for SIDS. For more information, see section 8.2 Addressing new needs (support for waste reduction).

# 5.2 Framework for information sharing within the Caribbean region

As many of the problems faced by countries in the Caribbean region are similar in terms of geographical conditions, level of economic development and population size, initiatives in the field of waste management in one country serve as a reference for waste management in another country in the region. Therefore, the following considerations were carried out in this project to promote a framework for effective information sharing on waste management within the Caribbean region and among neighbouring countries and relevant organisations.

### 5.2.1 Information on Caribbean regional organisations

Organisations identified as potentially relevant to waste management in the Caribbean region through previous activities have been listed in the table below. Organisations with high potential for collaboration were selected to discuss information sharing in more detail.

Name of the organisation	Type (location)	Waste-related activities	Possibiliti es for cooperati on
CARICOM Secretariat	Intergovernmental organisation (Guyana)	With regard to waste management, the main focus is on treaty compliance, including the Cartagena, Basel and Minamata Conventions.	"Yes" ⇒ CARPHA
Caribbean Tourism Organisation (CTO)	Organisation under CARICOM	Nothing specific has been identified regarding waste.	
Caribbean Regional Fisheries Mechanism (CRFM)	Organisation under CARICOM	Nothing specific has been identified regarding waste.	
Caribbean Public Health Agency (CARPHA)	Organisation under CARICOM	Established in 2013 by the merger five institutions.	"Yes"
<u>https://carpha.org/</u>	(Branch offices in Trinidad and Tobago, Jamaica and Saint Lucia)	Its jurisdiction covers food safety, disaster response, public health, epidemiology, occupational health, environmental health and international treaty compliance. CARPHA is currently carrying out a technical cooperation project with JICA	
		in the field of health security.	
OECS	Intergovernmental organisation (Saint Lucia)	Projects are implemented in Member States, such as Reducing Marine Pollution in the Eastern Caribbean (ReMRIT) and Pilot Plastic Waste Recycling project (RePLAST).	"Yes"
UNEP Caribbean Regional Co- ordinating Unit (CAR/RCU)	International organisation (Jamaica)	Involved in many projects, including GPML-Caribe (Global Partnership on Marine Litter and Plastic Pollution) and the Zero Waste in the Caribbean project.	"Yes"

Table 5-2: Information on Caribbean regional organisations

Name of the organisation	Type (location)	Waste-related activities	Possibiliti es for cooperati
Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC- Caribbean) <u>https://www.bcrc- caribbean.org/</u>	International organisation (Trinidad and Tobago)	Implementing agency of the GEF ISLANDS Programme. Guyana, Jamaica, Bahamas and Trinidad and Tobago participate in the Plastic Waste Partnership (PWP) Working Group. Documentation is being prepared by the Household Waste Partnership Working Group.	"Yes"
Gulf and Caribbean Fisheries Institute (GCFI) Gulf of Mexico and Caribbean Fisheries Society <u>https://gpml-caribe.org/</u>	Organisation of academic societies (Florida)	The GPML-Caribe project is being implemented with UNEP-CEP. As part of this project, a waste reduction project in Jamaica with the Sandals Foundation and a fish microplastic survey in Grenada have been implemented. Annual meetings are held. The website created as part of the JICA "Joint fisheries management project between fishermen and government in the Caribbean" for the conference presentations in 2017is well maintained.	"Yes"
Caribbean Water and Wastewater Association (CWWA) https://cwwa.net/	Regional NGO (Trinidad and Tobago)	In addition to water and wastewater, the association has also focused its efforts on the waste management sector in recent years.	"Yes"
SWANA (Solid Waste Association of North America) Caribbean Chapter <u>https://www.swanacaribb</u> <u>ean.com/about-our-</u> <u>chapter</u>	Association (Puerto Rico)	There seems to be little activity as a regional branch. (Twitter updates only.)	
Global Tourism Resilience & Crisis Management Centre (GTRCMC) https://www.gtrcmc.org/	Institution under the University of the West Indies (Jamaica)	No mention of waste found on website.	
WMU-Sasakawa Global Ocean Institute (GOI) https://www.wmu.se/goi	Academic institution (Sweden)	Institution established at the World Maritime University whose main activity is research. Research targets include marine debris and sargassum seaweed, and a research project called Closing the Circle (2020-2023) is underway in the Eastern Caribbean (supported by the Nippon Foundation).	
Inter-American Development Bank (IDB) <u>https://www.iadb.org/en</u>	Donor	IDB provided a loan for the construction of a sanitary landfill in Guyana. Announced THE CARIBBEAN WASTE MANAGEMENT ACTION PLAN (2021).	

### a. CARICOM Secretariat

Website: https://caricom.org/

### a.1 Permanent Secretariat

The Secretariat of the Caribbean Community is located in Georgetown, Guyana, and has approximately 270 employees. The Sustainable Development Programme under the Directorate of Economic Integration, Innovation and Development (EIID) within the Secretariat has jurisdiction over waste.

### a.2 Waste-related operations and projects

With regard to waste management, the Secretariat itself does not seem to often implement projects, as the main focus is the compliance with treaties such as the Cartagena, Basel and Minamata Conventions.

### a.3 Availability of an information-sharing website

Although there is a CARICOM website, the Sustainable Development Programme website itself is missing and there are no websites sharing waste-related information.

### a.4 Annual meeting

Although various meetings have been organised by CARICOM, no waste-specific meetings have been held.

### a.5 Future development potential

The CARICOM Secretariat itself focuses on compliance with treaties and policies such as the Cartagena, Basel and Minamata Conventions, so it is unlikely that the Sustainable Development Programme will take an active role in disseminating information in the waste sector in the future.

### b. Caribbean Public Health Agency (CARPHA)

Website: https://carpha.org/

### b.1 Permanent Secretariat

The headquarters is located in Trinidad and Tobago, with branches in Jamaica and Saint Lucia. Among them, the Environmental Health and Sustainable Development Department, which is responsible for waste management, is located in Saint Lucia.

### b.2 Waste-related operations and projects

The only mention of waste management within CARPHA is in the scope of work of the Environmental Health and Sustainable Development Department, but it does not appear to be involved in many activities. An article about a training on medical waste held in Grenada is

posted on the website, but it appears that it was not organised but only introduced.

With regard to technical cooperation projects, the organisation is implementing JICA's project for "Advancing Regional Health Security for Prevention and Control of Outbreaks of Communicable Diseases in the Caribbean" (Nov. 2021 – Mar. 2023) as counterpart.



### b.3 Availability of an information-sharing website

CARPHA's website is extensive and includes a Digital Library, web articles, event information and a video library.

Although the organisation publishes Newsletters and Bulletins, none is related to waste management.



https://carpha.org/More/Media

### b.4 Annual meeting

An Annual Health Research Conference is being held. In 2023, it was scheduled to be held from 27 to 29 April in the Bahamas, but the main themes are public health and tourism, with no mention of waste (see <u>https://conference.carpha.org/</u>).

### b.5 Future development potential

Although CARPHA is the only organisation under the CARICOM umbrella with a waste management agenda, it does not appear to be actively implementing waste-related initiatives. On the other hand, CARICOM is an intergovernmental organisation that covers the Caribbean region and there is no other regional organisation dealing with waste, so supporting CARPHA's waste management efforts may provide an opportunity to promote information sharing in the Caribbean region in the future.

### c. OECS

### c.1 Permanent Secretariat

The OECS Commission is located in Castries, Saint Lucia, within which Ocean Governance handles waste.

### c.2 Waste-related operations and projects

In the field of waste management, the Reduction in Marine Litter Project (ReMLIT), which aims to reduce marine litter, and RePLAST, a pilot project to recycle plastics, with its followup, the Recycle OECS project, have been implemented with support from Norway, France, the EU, the World Bank and others.

### c.3 Availability of an information-sharing website

Although there are websites for OECS, ReMLIT and RePLAST, there is no website on waste management. The Knowledge Centre is an information-sharing website, but its Ocean Governance section barely contains any information on marine litter.

### c.4 Annual meeting

Although various meetings have been organised by OECS, no waste-specific meetings have been held.

### c.5 Future development potential

OECS has actively accepted support from European countries and the World Bank in the field of waste management, for example, by developing the Draft Regional Waste Management Policy and considering the OECS Model for recycling within the Recycle OECS project. Cooperation in this area is conceivable if a project budget can be allocated.

### d. UNEP - Caribbean Regional Co-ordinating Unit (CAR/RCU)

Website: https://www.unep.org/cep/

### d.1 Permanent Secretariat

UNEP-CAR/RCU in Kingston, Jamaica, was established in 1986 and is responsible for the Cartagena Convention Secretariat and the Caribbean Environment Programme (CEP).

### d.2 Waste-related operations and projects

UNEP is the Secretariat of the Protocol concerning Pollution from Land-Based Sources (LBS) to the Cartagena Convention, and is implementing a number of waste-related projects, including the GPML-Caribe (Caribbean Node) within the Global Partnership on Marine Litter (GPML) and the Zero Waste in the Caribbean project from the EU and CARIFORUM countries.

JAT has been networking with UNEP-CAR/RCU since the pre-study of this project and the organisation has participated in all three workshops and the final seminar.

### d.3 Availability of an information-sharing website

It has a website under the name Caribbean Environment Programme (https://www.unep.org/cep/), with a "Resources" section containing newsletters and outputs from UNEP-related projects, which is updated frequently.



https://gpml-caribe.org/

The Caribbean Node of the Global Partnership on Marine Litter and Plastic Pollution (GPML-Caribe) also has a "Resources" section for information sharing purposes. It includes factsheets and reports such as the Regional Marine Litter Management Strategy.



### d.4 Annual meeting

Although no annual meeting is held, a High-Level Forum of Caribbean ministers responsible for waste is co-hosted with CWWA on an irregular basis. The 7th forum was held in Guyana (Georgetown) on 26 and 27 October 2023 and JAT had the opportunity to introduce the project's initiatives.



### d.5 Future development potential

UNEP is involved in a number of waste-

related projects in the Caribbean region, and it is expected to continue in the future. However, it should be noted that UNEP cannot take concrete action unless funding is provided in the form of project implementation.

### e. Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean)

Website: https://www.bcrc-caribbean.org/

### e.1 Permanent Secretariat

A Permanent Secretariat is located in Port of Spain (Trinidad and Tobago), which provides training, transfer of environmentally appropriate technology and assistance for compliance with the Convention.

### e.2 Waste-related operations and projects

As its name suggests, BCRC-Caribbean is an organisation that provides technical support to member states of the Basel, Rotterdam, Stockholm and Minamata Conventions in the Caribbean region. It carries out a wide range of projects related to waste, from capacity building on transboundary movements of hazardous waste, POPs (persistent organic pollutants), waste oil, e-waste, to chemical and mercury waste management in island countries.

### e.3 Availability of an information-sharing website

BCRC-Caribbean is responsible for implementing sub-projects in the Caribbean region within the GEF ISLANDS Programme, which supports the management of waste and chemical substances in island countries. The GEF ISLANDS Programme website for the Caribbean region displayed below serves as a Knowledge Hub. It contains various reports relevant to the region and is frequently updated (https://www.gefislands.org/Caribbean).

	About Reg	ions Issues Knowledge News
Antigua and Barbuda Bahamas Barbados Belize Cuba Dominica Dominica Dominican Republic Guyana Saint Kitts and Nevis Saint Lucia Suriname Trinidad and Tobago	Generally the 12 countries in the ISLANDS Caribbean project lack sufficient regulatory frameworks to manage the import of products which are challenging to dispose of as waste. This is compounded by limited technical capacity and infrastructure to safely manage, store and dispose of toxic wastes, while recycling opportunities and finances are also constrained. The Caribbean region is guided by the UNEP Caribbean Waste Management Action Plan which prioritizes environmentally and financially sustainable waste management strategies and promotes preserving capability at landfills and optimizing the use of waste as a resource. The <u>BCRC</u> -Caribbean will execute the projects in the Caribbean, while <u>FAO, IDB</u> and UNEP are the Implementing Agencies.	Island nations get new lifeline to beat pollution

### e.4 Annual meeting

There is no annual meeting as BCRC-Caribbean as each convention has its own annual meeting.

### e.5 Future development potential

With regard to plastic waste, there is a Plastic Waste Partnership (PWP) Working Group within the Basel Convention framework, in which Guyana, Jamaica, the Bahamas and Trinidad and Tobago are participating, and which is supported by BCRC-Caribbean. In addition, the Household Waste Partnership Working Group within the Basel Convention framework is preparing a document on household waste management. The conditions for becoming a Knowledge Hub on waste management in the Caribbean region are therefore considered sufficient.

### f. Caribbean Water and Wastewater Association (CWWA)

Website: https://cwwa.net/

### f.1 Permanent Secretariat

CWWA is a regional NGO established by under the laws of Trinidad and Tobago in 1991 and headquartered in Port of Spain (Trinidad and Tobago).

### f.2 Waste-related operations and projects

Until now, the main focus area has been water and wastewater, but in recent years, the organisation has also become involved in the waste sector. As of 2023, it has co-hosted with UNEP and others seven high-level forums with Caribbean ministers in charge of waste, and

is organising sessions on waste management in addition to water and wastewater at its annual meeting. Development in this area is expected.

### f.3 Availability of an information-sharing website

The website is updated regularly, though not very often, mainly regarding events. A library has been set up to share information. It contains various materials on waste management, but this section is dedicated to CWWA members, and only members can access it.



### f.4 Annual meeting

An Annual Conference and Exhibition is held in a different Caribbean country each year, and in 2023 the 32nd Annual Conference took place in Georgetown, Guyana, from 23 to 27 October. In recent years, the topic of waste, in addition to water and wastewater, is being addressed proactively, with sessions related to waste management and tours to disposal sites. It should be noted that the Annual Conference is a membership-based event for which participants pay an admission fee, and there is also a fee for using the conference venue.



### f.5 Future development potential

Although water and wastewater have been the main areas of focus so far, CWWA intends to focus on waste management in the future. Cooperation could help expand the scope of CWWA and make it a central organisation in the waste sector in the Caribbean region.
## 5.2.2 Hearings from Caribbean regional organisations on the possibility of cooperation in information sharing

Face-to-face or online interviews were conducted with the above-mentioned organisations with whom information sharing might be possible. The interviews are summarised below.

Institution	Interview summary
CARICOM, Sustainable Development Programme, Directorate of Economic Integration, Innovation and Development 3 March 2023	<ul> <li>It is this department (Sustainable Development Programme) that deals with waste management and plastic waste at CARICOM. It basically handles policy, but also technical matters. It provides guidance and support for compliance with international conventions such as the Stockholm and Basel Conventions.</li> <li>When asked about the possibility of a joint seminar between UNEP, CARICOM and JICA, they replied that sharing information within the region is also CARICOM's work, so there is a possibility.</li> </ul>
CARPHA 28 March 2023	<ul> <li>(In addition to inquiring about the possibility of cooperation in organising a regional seminar at the end of October 2023), JET asked about the possibility of including JICA assets in CARPHA's digital library, as is already the case with organisations such as GIZ. The respondent replied that it was a good idea, but that it would be desirable to conclude an agreement such as a Memorandum of Understanding (MOU) between CARPHA HQ and JICA.</li> </ul>
UNEP-CAR/RCU 10 March 2023	<ul> <li>UNEP is planning activities at both the High level and Technical sessions at the CWWA annual meeting in October.</li> <li>JET approached them about collaborating with this JICA project. They said it was a possibility and they would keep in touch.</li> <li>When asked about the participation of Japanese companies, they said it would be possible for them to have a booth at the exhibition. When asked about online connections with Oceania, they said it would be possible, but that they would need to check with CWWA for more details.</li> </ul>
OECS 22 March 2023	<ul> <li>When JET asked about information sharing with JICA when OECS attended the workshop in Saint Lucia, JET was told that it would be possible.</li> </ul>
CWWA 30 March 2023	<ul> <li>When asked about the possibility of publishing JICA documents in the Library on the CWWA website (in addition to asking about the possibility of participating in the 32nd Annual Meeting and Exhibition to be held from 23 to 27 October 2023), the CWWA said that it would be possible, as one of the functions of CWWA is to share information.</li> <li>With the endorsement of UNEP, JAT presented this project at the technical session of the annual meeting in October 2023 and at the High-Level Forum for Caribbean Ministers responsible for waste.</li> </ul>
BCRC-Caribbean	<ul> <li>No hearing was conducted</li> </ul>

Table 5-3: Interviews with Caribbean regional organisations on potential	
collaboration on information sharing	

#### 5.2.3 Considerations for collaboration potential in information sharing

The advantages and disadvantages of a framework for information sharing with each of the organisations mentioned above are summarised below.

Institution	Advantage	Disadvantage
CARICOM	<ul> <li>Many countries in the Caribbean region are members (14 countries and one region), which has a significant ripple effect.</li> <li>JICA experts have been dispatched and cooperation can be expected.</li> </ul>	Waste is under the jurisdiction of the Sustainable Development Programme. which mainly focuses on compliance with waste-related conventions, so there is a possibility that information sharing may not be possible.
CARPHA	<ul> <li>Information is actively shared.</li> <li>Little experience in the waste sector, but there is potential to develop this field through cooperation in the future.</li> <li>They have implemented a technical cooperation project with JICA and have a positive impression of JICA.</li> <li>The Environmental Health and Sustainable Development Department, which is responsible for waste, is located in Saint Lucia, where the JICA office is located, facilitating physical interaction.</li> </ul>	<ul> <li>Since health and sanitation is the main focus area, the waste sector is weak and has a poor track record.</li> <li>Less known than CARICOM.</li> </ul>
UNEP- CAR/RCU	<ul> <li>It has a track record of implementing a number of projects in the waste sector in the Caribbean region.</li> <li>There are many ways to share information, including its own website and project websites.</li> <li>It has good relations with JICA.</li> <li>The secretariat is located in Jamaica, where the JICA branch office is located, facilitating physical interaction.</li> </ul>	<ul> <li>Specific cooperation, such as posting project reports on their website, is difficult without some funding.</li> </ul>
BCRC- Caribbean	<ul> <li>It has a track record of implementing a number of projects in the waste sector in the Caribbean region.</li> <li>It covers plastic waste and household waste.</li> </ul>	<ul> <li>Cooperation may be difficult unless the topic is somehow related to the Basel, Rotterdam, Stockholm or Minamata Convention.</li> <li>It is unclear whether the Convention on Plastic Waste, which is expected to be established in the future, will be covered by BCRC.</li> </ul>
CWWA	<ul> <li>Annual meetings are held on water, wastewater and waste management, which attract good attendance</li> </ul>	<ul> <li>As it is a private organisation, no output other than the annual exhibition can be expected.</li> <li>As a membership-based</li> </ul>

Table 5-4: Considerations for collaboration potential in information sharing

Institution	Advantage	Disadvantage
	<ul> <li>By providing funds, e.g. by becoming a member, it is easy to share information.</li> </ul>	organisation that charges membership fees, the challenge is how to get staff from national waste administrations to become members.

#### 5.2.4 Draft framework for information sharing

Based on the above considerations and interviews, the potential framework proposed for efficient information sharing on waste management in the Caribbean region is as follows.

### a. Continued and expanded networking under the Saint Lucia office and Jamaica branch

- Use the networks of both offices (JICA former trainees, JOCV corps members, etc.).
- Establish partnerships with regional organisations and others (CARICOM, OECS, CARPHA, UNEP, WMU-GOI, Basel Convention Regional Centre, etc.).
- Continue Technical Online Meetings, in-person workshops, SharePoint as networking tools.
- Collaborate with the Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries (J-PRISM), as they are also Small Island Developing States (SIDS).
- Share information on topics ranging from improved collection and disposal to waste reduction and circular economy.

#### b. CARICOM

As the CARICOM Secretariat does not have a website for information sharing, it is unrealistic to create a new website within the CARICOM website. If the cooperation with CARICOM were to continue, and if cooperation on an information sharing framework were to be considered, the best option at present would be to make use of the website of CARPHA, which is affiliated to CARICOM. However, if the CARPHA website is to be utilised, some form of agreement, such as an MOU, needs to be signed between CARPHA and JICA.

#### c. CWWA website

CWWA also covers waste management alongside water and wastewater and is particularly interested in addressing the waste management sector in the future. Therefore, they would welcome cooperation in this area. It was confirmed that JICA's documents may also be included in CWWA's Digital Library. However, one point of concern is that the CWWA Digital Library is limited to members who have paid their membership fees and that it is a requirement to become a member in order to be listed on the website.

#### d. Continue SharePoint site and Online Technical Meetings

If it is difficult to conclude an MOU between CARPHA and JICA as described above, and if the CWWA membership site is not suitable for the purpose of information sharing, one option would be to continue using the SharePoint site currently used until the next cooperation project is launched. Another possibility, based on the results of the questionnaire, is to continue the Online Technical Meetings, which were well received, on a rotating basis, involving the counterparts.

#### 5.2.5 Results of Consideration of information sharing framework

After considering a number of information sharing frameworks as described above, it was decided to facilitate information sharing on waste management in the Caribbean region in the future in the following two ways.

#### a. Publication on CARICOM's website

Although the CARICOM Secretariat's website is currently not fully functional for information sharing, it is hoped that the Sustainable Development Program under the Directorate of Economic Integration, Innovation and Development (EIID) within the CARICOM Secretariat will become the focal point for waste management in the Caribbean region in the future. In addition, since a JICA expert is currently dispatched to CARICOM, the establishment of a cooperative relationship is expected. By entrusting the documents of this project to the JICA expert in CARICOM, the possibility of posting them on CARICOM's homepage in the future will be explored.

#### b. Posting on the website of the counterparts of each country

In parallel with exploring the possibility of posting the documents on the CARICOM website, the counterparts in the five target countries were approached and asked to post the project's documents on their websites. Of the five countries, positive responses were received from Grenada and Saint Lucia.

It should be noted that during the discussions at the final seminar, the counterparts expressed their expectations for the continuation of online technical meetings, setting up of an online noticeboard, creation and sharing of national waste information databases, participation in CWWA annual meetings, formation of multilateral regional organisations on waste management and holding of regular face-to-face meetings.

#### 5.3 Activities related to the promotion of information sharing

#### 5.3.1 Online technical meetings

The Online Technical Meeting (OTM) was an activity initiated under Activity 2-1 "Sharing of technologies and methods applicable to issues, as well as Japanese knowledge and experience", that became/was both a tool and opportunity to share information throughout the project. Although there were restrictions due to the online nature of the lectures, the questions and comments from the participants were similar to issues faced by other countries and provided a good opportunity to exchange information. In total, 17 sessions were held, and in the last few sessions, each country presented a review and evaluation of the pilot projects implemented in their country, and for countries that had not implemented pilot projects, participants were invited to present their current waste management issues and prepare their presentations for the final seminar.

Presentation materials and recordings of these OTMs were stored on SharePoint so that counterparts and others could access them after the event. In addition, "Best Practices", a collection and compilation of information on plastic waste and waste management, were disseminated twice a month to share information.

The dates and titles of the OTMs and the number of participants are shown in the table below.

No.	Date	Title	Participants (Excluding JAT and JICA staff)
1	10 May 2022	Landfill Management in Grenada	6
2	14 June 2022	Planning of Municipal Solid Waste Management	4
3	12 July 2022	Collection and Transport	6
4	09 Aug. 2022	Environmental Impact Assessment with Focus on the Solid Waste Sector	8
5	13 Sep. 2022	Material Recycling and Composting	4
6	11 Oct. 2022	Solid Waste Intermediate Treatment	8
7	08 Nov. 2022	Solid Waste Intermediate Treatment (continued)	3
8	13 Dec. 2022	Final Disposal	2
9	10 Jan. 2023	Final Disposal (continued)	8
10	14 Feb. 2023	Financial Issues	7
11	14 Mar. 2023	Information, Education and Communication	13
12	11 Apr. 2023	"Developing a workable solution for the management of end-of-life tyres within the Caribbean countries" by the Antigua and Barbuda National Solid Waste Management Authority	4
13	09 May 2023	Introduction of Best Practices	9
14	13 June 2023	"Addressing waste management challenges presented by new and increasing waste streams" by the Grenada Solid Waste Management Solid Waste Management Authority	9
15	11 July 2023	Recycling System in Japan with Focus on Plastics	6
16	08 Aug. 2023	"Plastic Pollution: Jamaica's Response" by the National       4         Environment and Planning Agency of Jamaica       4	
17	12 Sep. 2023	"Marine Plastic Free" by the National Solid Waste Management Authority of Jamaica	5

Table 5-5	Summary	of the o	nline t	technical	meetings	conducted
	Ourmary			Comicai	meetings	conducted

#### 5.3.2 Workshops and final seminar

The project's main activities for information sharing included three workshops held in a hybrid format during the project and a final seminar at the end.

#### a. Workshops

In total, three workshops were held, one in each phase. These workshops were the only opportunity for the counterparts of the five target countries to communicate in person, but the venue was also connected online via Zoom to accommodate the counterparts who were unable to participate face-to-face. The workshops were also recorded and stored on the SharePoint site to share information with those who were unable to attend on the day of the workshop.

A summary of the workshops held is given in the table below.

Workshop	Overview
1st	Antigua and Barbuda, Grenada and Guyana were invited to Saint Lucia for a five-day workshop for the four countries (at this point, there was no contact with Jamaica). The workshop introduced waste management planning methods and case studies and other examples from Japan and similar developing countries on collection and transport, intermediate treatment, final disposal and resource recovery. When the presenters introduced the initiatives in their countries, the participants shared some common problems, confirming the commonality of challenges in island countries.
2nd	The workshop was held in Jamaica for three days from 31 August to 2 September 2022. The first two days were spent in lectures and the last day was spent visiting the marine plastic leakage situation and recycling facilities in Kingston. The workshop was not only attended by the five target countries, but also private organisations (two organisations) and academic institutions (one institution) in Jamaica that are implementing activities related to combating marine plastic litter, as well as UNEP. The meeting opened with speeches by the Director of the JICA Branch Office, the Ambassador of Japan and the Jamaican Minister of Environment, followed by presentations and lively discussions. Questions were raised on general waste management, such as the shape of landfill sites and the frequency of covering the disposal site with soil, as well as on disposable plastic regulations, such as determining alternatives, dealing with existing stocks of products and expanding the range of items covered. Questions were also raised regarding the collection methods and pelletization of the PET bottle collection pilot project currently underway. It was shared that, not only with regard to the marine plastic litter issue, but also with regard to waste management in general, solutions to this problem are difficult to address within a single country due to the small population and industrial scale of each country, and that some form of cross-country regional cooperation is essential.
3rd	A three-day workshop was held in Saint Lucia from 22 to 24 March 2023 to discuss an information sharing framework. During the first two days, in addition to the presentation of the results of the pilot projects by the counterparts, related organisations (CARICOM, OECS and UNEP) introduced their activities, made presentations and discussed ways to share information. During the last day, participants observed the current status of PET bottle recycling in Saint Lucia and the pilot project to improve the landfill site. A total of 10 participants from two of the five target countries (Jamaica and Saint Lucia), as well as UNEP and OECS, participated in person. There was also a total of 22 online participants from CARICOM, CARPHA, World Maritime University - Sasakawa Global Ocean Institute (WMUGOI), UNEP and others for. Of particular note is that there was a lot of discussions on the challenges faced by Small Island Developing States that make recycling difficult (especially, the high cost of transport and difficulty of exporting the collected plastics off the island). A questionnaire survey on information sharing frameworks in the Caribbean region conducted among the counterparts prior to the workshop revealed that there were expectations for CARICOM and OECS to develop the network that has been established between the five target countries and related organisations, as well as for the continuation of the in-person workshops and SharePoint site that have been implemented in the project.

#### Table 5-6: Overview of workshop implementation

#### b. Final seminar

The final seminar aimed at sharing information on waste management in the Caribbean region was held as described below and a presentation was also made at the CWWA annual meeting, which was scheduled to be held around the same time. A video message from the

South Pacific Regional Environment Programme (SPREP) was also aired with a view to future collaboration with the Oceania, a region with fellow SIDS.

The final seminar was organised as follows.

#### Table 5-7: Summary of the final seminar

Venue: Conference room, Pegasus Hotel, Georgetown, Guyana Date and time: 23-25 October 2023 (site visit on 24 October) Participants: Five target countries, CARICOM, UNEP, OECS Contents:

- 1. Opening remarks
  - Address by the Minister of Local Government and Regional Development, Guyana
  - Address by the Director of the JICA Saint Lucia Office
  - Video message from the South Pacific Regional Environment Programme (SPREP)
  - Greeting by CARICOM
- 2. The current state of waste management in the five target countries, the content of the pilot projects including their results and lessons learned, the content of the formulated waste management plan and the learning from the developing process (presentations by the counterpart of each country)
  - Antigua and Barbuda
  - Grenada
  - Saint Lucia
  - Jamaica (NEPA and NSWMA)
  - Guyana
- Overview of waste management in the Caribbean region, analysis results of challenges and improvement measures, development and results of the pilot projects and how to use the tools created based on lessons learned, etc. (presentation by JAT)
  - Introduction to the Guideline for the Formulation of a Regional Solid Waste Management Plan (Guyana)
  - How to create a material flow for plastics (Jamaica).
  - GIS mapping methods for waste leakage into rivers (Jamaica).
  - Methods to improve and expand existing landfill sites (Saint Lucia).
  - Overview of waste management in Caribbean countries and summary of challenges and improvement measures

4. Overview of activities of regional organisations in the Caribbean region (presented by UNEP and OECS)

5. Future information sharing framework (group discussion)

- In addition to basic needs such as the design and proper operation of disposal sites, composting and recycling were mentioned as themes to consider in the future, from the perspective of efforts to reduce the amount of materials disposed of.
- Regarding future methods of information sharing, some expressed hope for the formation of a multilateral regional organisation and regular face-to-face meetings, while others mentioned the continuation of online technical meetings, an online noticeboard and a database of waste information in each country. OECS stated that it was beginning to internally explore such multilateral collaboration in the field of waste management, as it falls within the scope of its tasks.
- Regarding expectations towards JICA in terms of future information sharing, the provision of information on Japanese technology related to composting and e-waste, and training on systematic waste management were mentioned.

A video documenting the project's activities to date was produced by JAT and screened at the final seminar, as well as at the High-Level Forum, which will be discussed below.



[PR activities conducted primarily for external audiences]

As a result of preliminary negotiations with CWWA and UNEP, the project was able to secure one session of the High-Level Forum for Caribbean Ministers Responsible for Waste Management held by UNEP, IDB, CWWA and others in conjunction with the CWWA Annual Meeting and one session of the Technical Session of the CWWA Annual Meeting. An overview of the project was presented and the project received significant publicity.

Furthermore, the waste management officers from Jamaica (NSWMA) and Grenada were invited to the final seminar of the project, they were able to extend their stay and participate in the High Level Forum.

Venu	ue: Conference room, Mariott Hotel, Georgetown, Guyana			
Date	Date and time: 24 and 26 October 2023			
Pres	enter: Mr. Mori from JAT			
Deta	ils of presentation:			
•	Presentations were made on the project, its implementation, achievements and lessons learned in			
	the five target countries, and how information should be shared in the future.			

## Table 5-8: Programme of the 7th High-Level Forum for Caribbean MinistersResponsible for Waste Management

		26-27 October 2023 Georgetown, Guyana Thursday October 26, 2023 HLF 7: Waste Day 1	
TIME	ITEM	SPEAKERS	ANNOTATIONS
8:30 - 9:00	Registration of HLF-7 Participants		HLF Registration Desk
9:00 – 9:25	Official Opening of HLF-7 Welcome Remarks	Mr. Marlon Daniels – President - CWWA Mr. Sergio Campos – Division Chief, Water & Sanitation – IDB Mr. Vincent Sweeney – Head, Caribbean Sub-Regional Office - UNEP Mr. L. O'Reilly Lewis - Division Chief, Economic Infrastructure Division - CDB	CWWA Executive Director, Ms. Laurayne Lucky
9:25 - 9:35	Ministerial Address	Hon. Anand Persaud, Minister of Local Government and Regional Development, Guyana	CWWA Executive Director, Ms. Laurayne Lucky
9:35 - 9:50	<ul> <li>Introduction of Participants</li> <li>Review of Forum Agenda</li> </ul>	CWWA HLF-7 Moderator, Mr. Ronald Roach	
9:50 – 10:50	Regional Updates: CWMAP: IDB, EU, UNEP, JICA Reporting on Progress Made	Mr. Gilroy Lewis – Water & Sanitation Senior Specialist - IDB Trinidad and Tobago Ms. Donna Gittens – EU Delegation Barbados Zero Waste in the Caribbean Project – Ms. Shanta King, UNEP CSRO Jamaica OECS Fostering a Circular Economy Approach – OECS Commission Susanna Scott	Review of the work done by the partners to advance the progress in the Region including outputs of the CWMAP Implementation and other programmes/initiatives. Moderator – Ms. Shanta King
10:50 - 11:00	Coffee Break		
11:00 – 12:00	Regional Updates, Cont'd	Ms. Janine Boodram – Research Analyst, Basel Convention Regional Center – Caribbean Mr. Ikuo Mori – International Environment Division, Japanese International Cooperation Agency Q&A to follow	Review of the work done by the partners to advance the progress in the Region including outputs of the CWMAP Implementation and other programmes/initiatives. Moderator – Ms. Shanta King

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	Z4-00T TUESDAY			
	SOCOBI	BARIMI	POTARO	
8:30am to 9:00am 9:00am to 9:30 am				
9:30 am to 10:00 am		Plenary		
10:00 am to	Challenges and solutions for cross- sectoral co-operation	Innovative water treatment technologies	Water - Loss management in distribution systems: Pressure monitoring, DMAs and metering	
10:30 am	Njere Edwards (Iesha Nelson)	Dave Linville	Kenrick St.Louis (Jason Hughes)	
	Beetham Sludge Management Project	Improving drinking water quality using less chemicals	AWOL (Accounting Water Operating Losses) in the Water Distribution System	
10:30 am to 11:00 AM				
11:00 AM	Good governance for the development of the water and wastewater sectors	Innovative water treatment technologies	Water - Loss management in distribution systems: Pressure monitoring, DMAs and metering	
to	Justin Sealy (Thijn Laurensse)	Dragan Tutic	Carmen Julia Navarro Gomez (David Sanchez and Ruben S. Navarro)	
11:30 AM	Moving to Integrated Solid Waste Management Sint Maarten	Wave-Powered Desalination: A Sustainable Way to Increase Resilience to Water Scarcity	transition from intermittent to continuous supply by managing pressures in DMAs	
11:30 AM	Good governance for the development of the water and wastewater sectors	Innovative water treatment technologies	Water - Loss management in distribution systems: Pressure monitoring, DMAs and metering	
to	Catherine Wilson (Erik Arfalk)	Stefon Tyndall	Oneil Wright	
12:00 PM	WAAS - Sustainable, Reliable and Cost Efficient Water Management	Wave-Powered Desalination: A Sustainable Way to Increase Resilience to Water Scarcity	Water loss management In distribution systems: pressure monitoring, DMAs and metering	
12:00 pm to	Good governance for the development of the water and wastewater sectors	Innovative water treatment technologies	Water - Loss management in distribution systems: Pressure monitoring, DMAs and metering	
12:30 PM	Rushell-Kay Ricketts	Aubrey Roberts	David Maisonneuve	
	Effective Management of Water and Wastewater Utility Companies	GWI's small treatment plants: lessons and success	Water Loss Management: Digital tool for NRW Reduction	
12:30 pm to 1:00 PM				
1:00 PM to 1:30 PM				
1:30 PM	Good governance for the development of	Innovative wastewater treatment	Solid waste Management in the Caribbean	
to	the water and wastewater sectors Haniffe Morrison	technologies Alphonsus Daniel Nature-based Solution for Wastewater	Justin Sealy (Thijn Laurensse)	
2:00 pm	Energy Management in Caribbean Water and Wastewater Utilities – A plan, Do, Check Act approach	Management - Constructed Wetlands with Ornamental Flowering Plants for the La Calome Housing Development, Grenada	Sint Maarten	
2:00 PM	Inclusive Policy development for advancing the water and waste sectors	Innovative wastewater treatment technologies	Solid waste Management in the Caribbean	
to 2:30 pm	Allen Gilbert (Gennil Reuben, Leyana Romain) Sustainable Management: A Step towards a more resilient future in Grenada's Water Sector.	Holda Crocker (Brian Cohen) Climate Resilient Developments: Decentralized Liquid-Only Sewer	Ikuo MORI (Mr.) (Makoto YAMASHITA (Mr.)) JICA Technical Cooperation Project on Advisor for Marine Plastic Litter Management in the Caribbean Region -Sharing information on improving waste management to help prevent olastic waste from entering the ocean-	

## Table 5-9: Programme of the Technical Session of the 32nd Annual Meeting of CWWA

### 6 Achievement of outputs

This chapter describes the achievement of each output.

#### 6.1 Output 1: Waste management actors (central ministries, municipalities, waste management authorities, etc.) in each country understand the current status and priorities of waste management

Activities related to Output 1 were conducted in the context of travel restrictions due to COVID-19, so workshops were held in Saint Lucia with Antigua and Barbuda, Grenada and Guyana, to which JET was unable to travel. Through the workshops, site visits, etc., the current situation and waste management technologies in each country were clarified. In addition, through discussions on activities to be implemented during the project, such as pilot projects, it was possible to reach agreements with each country through a series of steps, such as problem recognition and problem-setting.

In August 2022, when COVID-19 travel restrictions to Guyana were lifted, a status survey was conducted on-site. The need for local waste management planning was identified and it was decided to provide support for the formulation of a plan.

# 6.2 Output 2: Technologies and methods applicable to solving the identified challenges are shared in each country and plans for their implementation are developed in some countries

#### a. Organisation of semi-annual workshops

The special specifications stated that "applicable technologies and methods for priority issues, as well as Japanese knowledge and experience that can serve as references, will be shared through seminars and workshops to three groups: 1) Jamaica, 2) Eastern Caribbean countries (Antigua and Barbuda, Grenada and Saint Lucia), and 3) Guyana". However, taking into account the travel restrictions imposed by COVID-19 and other constraints, a flexible approach was taken, such as holding a one-week workshop in Saint Lucia in March 2022. Based on the results of this workshop and the wishes of the counterparts, it was decided to hold hybrid workshops, both face-to-face and remotely, once every half year.

The workshop held in Jamaica in August 2022 was attended by the Minister of Environment of Jamaica and the Japanese Ambassador to Jamaica, in addition to the Director of JICA Jamaica Office, and contributed to the attractiveness of JICA's efforts to tackle marine plastic litter. In terms of knowledge sharing, private organisations and academic institutions also participated in the workshop, introducing activities that are different from those of counterparts who implement waste management projects, and commenting from different angles, making it a broader and more in-depth workshop.

At the workshop held in Saint Lucia in March 2023, UNEP and OECS participated face-toface, while relevant organisations such as CARICOM, CARPHA and WMU-GOI were able to participate online. The information sharing framework in the Caribbean region and the future of the networks built during the project were also discussed.

Although the semi-annual workshops were not included in the special specifications, they provided an opportunity to build relationships not only with the five target countries but also with key regional organisations, and the activities contributed to the main objective of the

project, namely information sharing in the Caribbean region and the creation of a framework for this purpose. Although it started as Activity 2-1, it contributed to Output 4.

#### b. Use of IT (monthly online technical meetings, SharePoint, Best Practices)

As the project covered five countries and it was not possible to travel to all of them due to travel restrictions imposed by COVID-19, IT was used to enable communication even remotely.

The aforementioned workshops utilised remote conferencing tools to link the actual venue with remote participants.

Based on the needs of the counterparts identified in Phase 1, monthly online technical meetings were held once a month from May 2022 to September 2023, for a total of 17 times. Although communication conditions were not always good, the meetings were able to continue without fail each month and served as a communication tool with counterparts to fill the time between the semi-annual workshops. It also provided technical information that was helpful in resolving issues faced by the counterparts. The activity was well received by the counterparts, who expressed the wish to continue it.

A project website was created on SharePoint with access limited to specific users to share materials from workshops and monthly online technical meetings. In addition, case studies on marine plastic litter and waste management were collected from around the world and published twice a month under the title "Best Practices", for a total of 35 times.

In this way, IT was used to continuously deliver various technical information to the counterparts.

## 6.3 Output 3: Pilot projects to improve waste management to prevent plastic waste from entering the ocean are implemented in some countries

Activity 2-2 (Waste management plan or action plan development for problem solving) related to Output 2 was in fact carried out under Output 3 to plan the pilot projects.

Pilot projects included the formulation of a waste management plan in Guyana, the strengthening of plastic regulations and analysis of plastic waste leakage into the marine environment in Jamaica, as well as the development of a plan aimed at improving the operation and extending the life of the existing disposal site in Saint Lucia4Pilot Projects (see details in Section 8: "Pilot projects").

#### a. Guyana

Travel restrictions under COVID-19 were lifted and support was provided to local cities for waste management planning in response to MLGRD request. The concept was that instead of JAT taking the lead in formulating plans, MLGRD would acquire planning skills and implement planning in local cities.

The project supported the implementation of various surveys to ascertain the current situation, and used the data obtained to define the planning specifications and direction of future planning with the counterpart. As part of the current situation surveys, field surveys were carried out, such as a waste amount and composition survey for household and commercial (restaurants and shops) waste, and a time-and-motion survey that serves as a baseline for formulating a collection and transport plan, and technology was transferred to the counterparts in the process. The survey methods have been described in a manual that can be used not only in Guyana but also in other countries.

One of the MLGRD's tasks is to develop landfills in each Region, and several regions have landfills planned or under construction. In response to the need for technical advice, a final disposal site expert was dispatched from Saint Lucia to Guyana for a week to inspect the landfill sites under construction or planned in several regions, and to compile the results for discussion with MLGRD. The expert also conducted an inspection of the Haggs Bosch landfill in Georgetown and provided advice on operational improvements.

Finally, a waste management plan for Region 5 was developed and guidelines outlining the planning method were produced.

#### b. Jamaica

#### b.1 Stricter plastic regulations

Support on strengthening plastics regulations was mainly provided to NEPA. Taking into account NEPA's needs, case studies from other countries have been organises, introduced and discussed online with the aim to strengthen their capacities. The importance of understanding plastic material flows (quantitative data on plastic imports, exports, production, disposal, etc.) in policy formulation and evaluation was also conveyed through the acquisition and use of data from the UN and other sources. In the final seminar, the counterparts used and presented plastic waste data obtained and organised independently, confirming that their understanding of the importance of quantitative data had deepened.

#### b.2 Analysis of the plastic waste leakage into the marine environment

An attempt was made to analyse the marine leakage of plastic waste using GIS data and maps with NSWMA as counterpart.

There was insufficient data on the quality of collection services, considered as one of the main factors behind plastic waste leakage into the sea, to enable a causal analysis. On the other hand, the counterpart agreed that the maps produced clearly show how waste accumulates in the river and how it pollutes the mangrove forests on the other side of the estuary, and could be used as an environmental learning tool to raise public awareness.

Although the counterparts involved in this pilot project were limited to NSWMA staff, it was evident from the workshop and seminar presentations that they fully understood the content of the project and reflected it in their work.

#### c. Saint Lucia

The study of the landfill improvement plan was compiled as a conceptual design. The current landfill is expected to be used continuously for the next 10 years. In addition, a landfill operation and maintenance manual was developed incorporating the landfill management capabilities of the counterparts.

The counterparts have cultivated knowledge over many years of operating the landfill site and were able to understand and use JAT's input efficiently. In particular, with regard to the composition of landfilled waste, they had a good understanding of the ratio of plastics to organic waste, and suggested a compaction method based on this, which contributed to the refinement and optimization of the manual.

## 6.4 Output 4: Information sharing on waste management is facilitated among the target countries and Caribbean countries

#### a. Information sharing seminar (final seminar)

A three-day final seminar was held from 23 to 25 October 2023 to share information on waste management in the Caribbean region. Presentations were made by the counterparts and JAT to summarise project activities, while messages, presentations and exchanges of views were also made by CARICOM, UNEP and OECS. In the final session, the participants discussed how to maintain and develop the networks and knowledge gained from this project. A framework for future information sharing in the Caribbean region was also discussed with regional organisations so that information sharing will not be limited to the five target countries. It is believed that this activity served as a starting point for the promotion of information sharing in the future.

In addition, the Caribbean Water and Wastewater Association (CWWA) held its annual meeting in parallel with the project, which provided an opportunity to introduce the project to Caribbean countries outside the five target countries, contributing to the further effectiveness of the project.

#### b. Common challenges and future initiatives in the Caribbean region

All five target countries are on the UN list of Small Island Developing States (SIDS) and face a number of challenges due to their remote geographical location. In terms of waste management, imports of consumer goods appear to have resulted in an increase in waste, particularly plastic and container waste. Post-consumer waste, including plastics such as containers, accumulates on the islands due to high export costs, which in turn causes a problem of tight disposal sites. These issues were frequently discussed and shared at workshops and other events.

JAT explained how Japan faced the problems of increasing waste volumes and tight landfill sites in the 1990s and worked to create a resource-recycling society, and heard the opinion that, although the scale is different, there are similarities with the situation in countries in the Caribbean region, and that it would be meaningful to implement Japanese initiatives in the Caribbean region. In this way, the project was able to convey Japan's experience and the importance of efforts to create a resource-recycling society.

#### c. Framework for information sharing within the Caribbean region

A search for partners for information sharing was conducted using various methods, including internet search and review of other materials, online meetings and site visits, resulting in the establishment of relationships with key stakeholders such as UNEP, CARICOM, OECS and CWWA.

However, these relationships were established as consultants commissioned for the project, and JICA's engagement is needed to further build these relationships in the future.

#### 6.5 List of deliverables

#### a. Technical notes

Documents summarising the content of the monthly online technical meetings.

No.	Торіс	Contents	
1	Estimation of Future Waste	- Estimation of future waste amount and	
	Amount		composition
2	Collection and Transport	-	Collection and transport plan
		-	Waste transfer
		-	Public area cleansing
		-	Preventive maintenance of collection vehicles
3	Recycling	-	Material recycling
		-	Composting
4	Intermediate Treatment	-	Incineration (Waste-to-Energy)
		-	Other treatment technology
5	Final Disposal	-	Landfilling plan and operation monitoring
		-	Environmental monitoring
		-	Preventive maintenance of landfill equipment
		-	Final disposal site selection
6	Financial Issues	-	Waste collection service fee
		-	Tipping fee for waste disposal
7	Information, Education and	-	Information, education and communication
	Communication		regarding waste management
8	Environmental Impact	-	Strategic environmental impact assessment
	Assessment	-	Environmental impact assessment of projects
9	Plastic Recycling Technology in	-	Material recycling, thermal recycling, chemical
	Japan		recycling
		-	Plastic substitutes

#### b. Plans, manuals, etc.

Plans, manuals, etc. prepared as part of the pilot projects.

No.	Title (Pilot Project Country)	Contents	
1	Guideline for the Formulation of a Regional Solid Waste Management Plan (Guyana)	<ul> <li>How to make a SWM plan:</li> <li>Understanding the region profile and waste management situation including current waste flow</li> <li>Surveys (WACS and T&amp;M)</li> <li>Setting of planning conditions: future waste generation amount, target rate (collection, disposal), etc.</li> <li>Selection of technologies</li> <li>Others</li> </ul>	
2	Solid Waste Management Plan in Region 5 (Guyana)	Deliverable from the pilot project in Guyana	

No.	Title (Pilot Project Country)	Contents
3	Plastic Policy Development (Jamaica)	How to prepare a plastic policy: - Plastic material flow - Knowledge transfer - Other support for regulatory development
4	GIS Map (Jamaica)	How to use / update the GIS Map: - Integration of SWM data, etc.
5	Manual for the Operation and Maintenance for Solid Waste Management in the Caribbean Region (Saint Lucia)	<ul> <li>How to improve the solid waste management:</li> <li>Daily operation, gas ventilation, leachate treatment, etc.</li> </ul>
6	Conceptual Design for Remediation of Deglos Landfill (Saint Lucia)	Deliverable from the pilot project in Saint Lucia

#### c. Current status and priorities of waste management in the five countries

Survey results on the current status of waste management in each country and identified priority issues for activities related to Output 1 (Waste management actors (central ministries, municipalities, waste management authorities, etc.) in each country understand the current status and priority issues of waste management.)

No.	Title	Contents
1	Current Situation, 2020	Current situation of solid waste management in each country surveyed during the basic study.
2	Current Situation, 2022	Current situation updated during the first stage of this project.
3	Agreement on Activities to be carried out in the Project	Agreement between the counterparts and JAT on the activities to be preferentially carried out in this project.
4	Report on Inspection Visit to Proposed Land for Landfills in Guyana	Observations and recommendations on the final disposal sites in operation, under construction or in the planning stage.

#### d. Materials presented at the workshops and final seminar

Presentation materials from the first, second and third workshops and the final seminar.

No.	Title	Objectives
1	1st Workshop in Saint Lucia - Commencement Workshop for the	<ul> <li>Confirm the current situation of solid waste management in each country.</li> <li>Identify issues/areas this project will address in each country.</li> </ul>
	Project	<ul> <li>Plan concrete activities that will be conducted in Phase 2 and Phase 3 of this project in each country.</li> <li>Share information and knowledge among participants.</li> </ul>
2	2nd Workshop in Jamaica	- Share information about activities in the respective countries.

No.	Title	Objectives
		<ul> <li>Obtain the participation of the private sector, academia and regional donor agencies working on marine plastic waste issues.</li> </ul>
3	3rd Workshop in Saint Lucia	- Share information about activities in the respective countries.
		<ul> <li>Discuss how to institutionalize knowledge sharing in the Caribbean region.</li> </ul>
4	Final Seminar in Guyana	<ul> <li>Share the results of the pilot projects.</li> <li>Discuss how to institutionalize knowledge sharing in the Caribbean region.</li> </ul>
5	Presentation at the technical session of the CWWA Conference	- Explain what was implemented in this JICA project.

#### e. Monthly online technical meeting presentation materials

Presentation materials of the monthly online technical meetings.

No.	Title
1	Planning of Municipal Solid Waste Management
2	Collection and Transport
3	Environmental Impact Assessment with focus on the Solid Waste Sector
4	Material Recycling and Composting
5	Solid Waste Intermediate Treatment
6	Final Disposal of Solid Waste
7	Solid Waste Management Financing with focus on Fees
8	Information, Education and Communication
9	Addressing Waste Management Challenges, Grenada
10	Recycling System in Japan with focus on Plastics
11	Plastic Pollution: Jamaica's Response
12	Marine Plastic Free, Jamaica

#### f. Video

Video summarising project activities.

No.	Title	Contents
1	Caribbean Plastic Waste Project Video	Explanation about what was conducted in this project

## 7 Challenges and lessons learnt in the implementation of operations

#### a. Multi-country project

The project covered five remote countries, albeit within the same region, and from the outset, the project was required to cover multiple countries. At the beginning of the project, there were travel restrictions due to COVID-19, and even if travel was possible, face-to-face meetings were difficult at times, so remote conferencing tools were used extensively. However, as the target sector is waste management, it is difficult to estimate the quality of collection services and disposal site management, and the cleanliness of the towns, which reflects the cultural standards of the population, without actually seeing the sites. In this context, being able to hold a workshop in Saint Lucia in March 2022 to reach a mutual understanding of the project and to directly interact with the counterparts had a significant positive impact on subsequent project management. Although meetings can be held remotely, there is a marked difference in mutual understanding in subsequent communication between face-to-face and online meetings. The holding of semi-annual workshops and monthly online technical meetings was also the result of a request from the counterparts during the first workshop.

The Caribbean region is far from Japan, so airfares were expensive, travel frequency was limited and communication with counterparts tended to be weak. This was filled by monthly online technical meetings using remote conferencing tools and the distribution of Best Practices and sharing of documents using SharePoint. The counterparts have expressed the wish that these activities continue, along with regular workshops. An open website can only contain information that is safe to make public, making it difficult to use as a management tool for ongoing projects. However, SharePoint could be used flexibly as it allows control over the members.

#### b. Inclusion of various stakeholders

Counterpart organisations are national waste authorities or relevant ministries responsible for developing waste management policies and providing waste services. The counterpart organisations were therefore well suited to the project's main objective of reducing the marine leakage of plastic waste through improved waste management on land.

On the other hand, from the perspective of marine plastic litter, the tourism industry, including hotels, and NGOs working on environmental issues are also important stakeholders. In Jamaica, JAT was able to communicate with private sector organisations, recycling companies and academic institutions working on plastic litter issues, but this has not been possible in other countries because of the reluctance to make contact due to COVID-19 and JAT's lack of communication skills to overcome this concern. It is regrettable that JAT did not have experts who could have contact and build relationships with a wide range of stakeholders. This is a lesson for future implementation of similar initiatives.

#### c. Initiatives related to information sharing

The project was implemented always keeping in mind the sharing of information across the Caribbean region. From the beginning of the project, communication was established with UNEP, which has a strong presence in the field of marine plastic litter issues and waste management in the Caribbean region, and relationships with key regional organisations such as CARICOM, OECS and CWWA were also established.

The consultants have built relationships with the regional organisation during the project, but the organization expect JICA to formally communicate with them to develop future cooperation. It is hoped that the relationships established so far will develop in some way.

### 8 Recommendations for future cooperation with Caribbean countries

#### 8.1 Future directions of cooperation with Caribbean countries

he Small Island Development States (SIDS), which are characterised by their small market, lack of development of manufacturing industries, the need to import necessary consumer goods from remote areas at high cost, and their small size, which makes them vulnerable to the effects of climate change, are members of CARICOM. The Caribbean Community (CARICOM) comprises 14 countries and 1 region with a population of approximately 19.3 million (estimation as of 2023<sup>1</sup>). Despite its small population, the Community is made up of many countries and regions, and enjoys a significant presence in the international community, which Japan has continuously supported for many years. Cooperation in the fisheries sector used to be the main focus, but now disaster prevention and the environment are the main areas of cooperation.

Meanwhile, JICA has been cooperating in the waste sector for many years with Oceania, a region with SIDS like in the Caribbean, through SPREP, a regional platform, and has accumulated a variety of knowledge. In recent years, JICA has also developed cooperation in the waste sector in Africa through the African Clean Cities Platform (ACCP). In these cooperation projects, the organization has cultivated a network of contacts not only through individual projects in partner countries, but also through training courses in Japan. This project sought to build relationships with CARICOM, OECS and CWWA, which are Caribbean regional organisations that could become JICA's partners in the waste sector, like SPERP and ACCP, and with UNEP, a major donor, and certain results were achieved through workshops and other activities. It is recommended to consolidate these relationships in the future and increase JICA's presence in the Caribbean region in the waste sector. The diagram below illustrates this proposal conceptually. The key words here are: utilisation of existing platforms, support for networking and activities of JICA alumni (former trainees), strengthening of the hub function of JICA offices, and accumulation and utilisation of information. The following is a step-by-step explanation.

<sup>&</sup>lt;sup>1</sup> United Nations, Department of Economic and Social Affairs, Population Division (2024). Data Portal, custom data acquired via website. United Nations: New York. Available from https://population.un.org/DataPortal/ (accessed 05 January 2024)



Figure 8-1: Future direction of co-operation with Caribbean countries

#### a. Use of existing platforms

As of 2023, no regional organisation in the Caribbean region partners with JICA in the environmental or water and sanitation sector, including waste, like the Secretariat of the Pacific Regional Environment Programme (SPREP). Therefore, the project has sought to develop relationships with CARICOM and OECS with a view to creating future partners. Efforts have also been made to build relationships with the Cartagena Convention Secretariat (UNEP-CEP), which is one of the Caribbean region's platforms in the environmental field, and CWWA, a regional non-governmental organisation in the water and sanitation field.

In our communication with them, we found that JICA's past activities in various fields in the Caribbean region were highly appreciated, which contributed to our ability to build relationships with these organisations. The fact that JAT was given the opportunity to introduce this project at the CWWA's High-Level Forum, thanks to the endorsement of CWWA and UNEP, is proof of this. It was also confirmed that the high-level forum functioned as a so-called platform, with the host country ministers, national waste management organisations and donors attending and exchanging information.

As the CWWA High-Level Forum is funded by IDB, it is recommended that JICA takes advantage of this platform, for example through co-financing with IDB, to increase its presence in the field of water and sanitation, including waste management, in the Caribbean region, and continue to form high-quality projects.

CARICOM is also expected to serve as a platform, but considering that the number of staff in the waste sector (Sustainable Development Programme) is limited and that they are only able to fulfil their current responsibilities, it is advisable to explore future opportunities through the JICA expert who have been dispatched to CARICOM. On the other hand, the stance of OECS is that collaboration is possible not only with member states but also with other Caribbean countries and is open to future collaboration with JICA. It can therefore be expected that collaboration with other regional organization can begin to be explored, starting with a collaboration with OECS. CARPHA, a sub-organisation of CARICOM, is also open to collaborating with JICA, and the development of activities involving CARPHA can be considered. As mentioned above, by utilising existing regional organisations and frameworks with platform functions, such as CWWA, CARICOM, OECS and UNEP, it is possible to achieve a win-win situation in the Caribbean region, with new support from a donor agency for the recipient countries and the use of existing systems for JICA.

#### b. Support for networking and activities of JICA alumni (former trainees)

JICA former trainees are a valuable human resource and information asset, not only for JICA but also for Japan. Alumni associations are established and run in countries where there are many JICA former trainees. It is not easy to make Caribbean people, who live far away from Japan, understand Japan and Japanese people correctly. However, the former trainees who have visited Japan and experienced Japanese culture, have a first-hand understanding of JICA cooperation centred on technical assistance, are valuable members of our community.

On 30 November 2023, the JICA Alumni Association in Jamaica, in collaboration with the project, organised an online seminar on the theme of marine plastic litter. Private sector organisations working active in the same field in Jamaica also took the stage, and the counterparts from other countries in the project also participated online, resulting in a lively exchange of views despite the online nature of the seminar. Such activities embody information sharing at the regional level that the project aimed to achieve, and it is hoped that they will continue and expand to other countries. The formation of a network of former trainees, who are pro-Japan and pro-JICA, in the waste sector and support for their activities is recommended as it is less expensive than setting up a new project and the effects of the training in Japan can be sustained and developed.

#### c. Strengthening the hub function of JICA offices

Cooperation with regional organizations with platform functions and support for JICA former trainees must be provided locally in a timely manner. While JICA offices may have provided support for JICA former trainees in the past, it is recommended that information on local needs from JICA former trainees is collected and shared with JICA HQ, and that the function of supporting former trainees is strengthened in line with the direction and pace of JICA HQ. If a system can be established to reflect such information in the Japanese training programmes, a lot of information will be organically connected.

As for cooperation with regional organisations, it is recommended that JICA offices play a proactive role, as this will lead to cooperation in areas other than the waste sector. On the other hand, as some communications may require specialised knowledge, it is recommended to create a system to complement the functions of the offices by dispatching experts or utilising consultants in Japan remotely.

#### d. Accumulation and utilisation of information

Caribbean SIDS face similar waste management challenges under similar geographical and economic constraints. This is also the reason why the project's main objective is to promote information sharing within the region. It has been confirmed through this project that the exchange of information between countries is directly useful in practice. As a matter of course, such information should be accumulated and organised for sharing within the region, but information from the field will also be valuable for the benefit of other regions such as Oceania and, by extension, the 50 countries and 500 million people that the JICA Clean City Initiative is aiming to reach. In the future, it is recommended that such on-the-ground information be collected through JICA offices and projects, and that a system to organise and facilitate the use of this information be built using artificial intelligence (AI) technology.

#### 8.2 Responding to new needs (support for waste reduction)

The average GNI per capita in CARICOM member states (2022) is approximately USD 13,000.<sup>2</sup> About half are classified as "high-income countries" by the World Bank, with economic levels comparable to developed countries. In accordance with their economic level, waste collection services and landfill operations are generally adequate in each country. In the 1990s, Japan's problem of tight remaining capacity of final disposal sites became more serious, and various recycling laws incorporating the concept of Extended Producer Responsibility (EPR), such as the Containers and Packaging Recycling Law, were developed and implemented throughout the country. The amount of waste generated per capita was reduced and the recycling rate was increased, thereby reducing the amount of final disposal. As a result, the remaining capacity of landfill sites has decreased, but the remaining life has increased significantly, to the point that the problem has been forgotten by the general public. Caribbean countries are facing the same challenges as Japan 30 years ago and will follow the path of policy and technology development that has been developed in Japan, Europe and the USA. It would be worthwhile to support the use of Japanese technology and knowledge in order to benefit from the latecomer's advantage and make the path shorter and flatter.

This section provides recommendations on items to support waste reduction and their development into programmes or projects.

#### 8.2.1 Waste reduction support items

The items to support waste reduction in the Caribbean region are divided into three areas, namely institutional, technical and public awareness-raising, and are summarised below. In addition, the table that follows shows the general methods of such support.

1. Institutional support (Legal development assistance)

- Tighter regulation on single-use plastics.
- Support for the development of a deposit refund system.
- Introduction of regulations on E-waste, End-of-Life Vehicles (ELVs) and other difficult-to-treat materials (introduction of EPR).
- Support for regional cooperation on returns (especially plastics).
- 2. Technical assistance
  - Separate collection.
  - Composting of organic waste.
  - Widespread use of semi-aerobic landfills and GHG reduction.
  - Landfill mining to extend the life of landfills.
  - Support for enforcement of deposit refund systems.
  - Support for proper import and export of waste (application of the Basel Convention).
  - Introduction and transfer of technology from the Japanese private sector, particularly with regard to plastic recycling.

3. Awareness-raising assistance

- Support for the development of environmental education focusing on the implementation of waste segregation.
- Support for the development of environmental education related to the prevention of plastic waste leakage into the ocean, involving the tourism industry, etc.

<sup>&</sup>lt;sup>2</sup> Simple average of GNI per capita (Atlas method, current US\$) for all countries except Montserrat, calculated by JAT based on data from World Development Indicators.

Support item	Methods of support	Target countries/agencies
Institutional support	<ul> <li>Development and implementation of a programme organising knowledge on the establishment of Japan's recycling legislation in the 1990s and 2000s through training in Japan.</li> <li>Individual experts are assigned to JICA offices to conduct regional seminars and provide individual support.</li> <li>Remote support by consultants and other experts (seminars and individual consultations).</li> </ul>	<ul> <li>Jamaica is set to expand the scope of the disposable plastics regulation and develop a deposit refund system.</li> <li>For EPRs and returns, regional efforts are needed, so CARICOM and OECS are appropriate partners.</li> </ul>
Technical support	<ul> <li>Development and implementation of a programme specialising in waste reduction technologies through training in Japan.</li> <li>Project-based support by consultants.</li> </ul>	<ul> <li>From the perspective of securing residual landfill capacity through volume reduction, small island states are appropriate as target countries.</li> <li>Guyana needs to develop landfills in rural areas.</li> </ul>
Support for raising public awareness	<ul> <li>Development and implementation of public awareness and environmental education training programmes, in particular in conjunction with local authorities (e.g. community-based sorting and processing of resources, etc.) through training in Japan.</li> <li>Project-based support by consultants.</li> </ul>	<ul> <li>It is recommended that Grenada and Saint Lucia, which are beginning to implement waste reduction measures, support public awareness raising in line with those measures.</li> </ul>

Table 8-1: Support items

## 8.2.2 Recommendations for the formulation and implementation of programmes and projects

In this section, recommendations are made for the specific development of the support items identified in the previous section. While activities related to building relationships with key actors will be developed by utilising existing platforms, individual projects related to promoting of waste reduction, which is an issue for SIDS, will be implemented. These two components will be jointly developed to achieve synergies. These activities will be linked to the JICA-owned assets shown in the diagram below, and will also contribute to the continuous enhancement of the assets by providing feedback from activities in the Caribbean region (e.g. manuals and other deliverables). An image is shown in the diagram below.

Recommendations are also made for assistance to Guyana, which, unlike small island states, needs to develop new final disposal sites.



Figure 8-2: Assistance to Caribbean countries and use of JICA assets

#### a. Building relationships with existing platforms

#### a.1 Objectives and outputs

Building relationships with existing regional platforms such as CWWA, CARICOM and OECS in the waste sector in order to form a continuous flow of high-quality projects in the Caribbean region.

#### a.2 Methods

- In order to highlight JICA's presence at the CWWA's High-Level Forum, negotiate JICA's participation in the Forum with IDB, the sponsor of CWWA and the High-Level Forum.
- Continue to present JICA's work at the CWWA High-Level Forum or at the technical sessions of the annual meetings.
- When implementing the individual projects listed below, collaboration will primarily be with OECS and CARPHA. With a view to further collaboration in the future, CARICOM will be involved as much as possible.
- Deepen cooperation at seminars and workshops on waste-related projects conducted by UNEP, the EU and other organisations by exchanging information on their respective initiatives.

#### b. Implementation of projects related to the promotion of waste reduction

#### b.1 Objectives and outputs

Reduce the amount of final disposal and extend the life of existing disposal sites. To this end, various measures and technologies related to the 3Rs will be transferred.

#### b.2 Methods

• A model country and an observer country are selected, and consultants are intensively dispatched in the model country to achieve efficient results. Meanwhile, the observer

country will be remotely informed of the activities in the model country and encouraged to carry out similar activities in its country.

- As a continuation of this project, it is recommended that Grenada, where no pilot project could be implemented during this project, serve as a model country.
- Observer countries outside the current target countries may be invited to participate.
- Hold hybrid (face-to-face + remote) workshops and monthly online technical meetings, introduce Best Practices and use SharePoint, which have been well received during the project.
- The support items should include at least composting of organic waste, which has a significant waste reduction effect, and separate collection, which is a prerequisite for this.
- Use the network of JICA former trainees to publicise the project.

#### c. Promotion of plastic resources recycling within the region

#### c.1 Objective

In order to solve the intrinsic inability of SIDS to recycle resources on the island, a pilot project will be implemented with the aim of establishing a resource recycling system within the Caribbean region.

#### c.2 Method

[Phase 1]

- While implementing the project for the promotion of waste reduction, research and studies related to the formulation of this project are carried out.
- The potential of Trinidad and Tobago to become the destination for plastic resource recycling within the region is investigated. If there is information on other countries with potential, these will also be considered and investigated.

[Phase 2]

- Involve OECS or CARICOM as co-operating organisation for a wider project.
- Identify and collaborate with private companies as recipients for the transport and reprocessing of recovered resources.
- Support the introduction and implementation of a deposit refund schemes, with a particular focus on covering transport costs.
- Support the introduction and adoption of Japanese technology for sorting and pelletising plastics.

#### d. Support for Guyana

#### d.1 Objective

Support the construction and operation of semi-aerobic disposal sites to ensure proper disposal and reduce GHG emissions.

#### d.2 Policy

• MLGRD plans to develop 10 disposal sites, one site per region, three of which are already finalizing land acquisition. MLGRD estimates that the cost of developing the 10 sites will be around 19 billion yen and will help MLGRD realise their plans.

- The future of Guyana is largely uncertain due to the development of the oil-related industry and its relationship with neighbouring Venezuela. When planning a landfill, it is recommended to consider a phased development to reduce risks.
- It is important to plan the operation and management of the landfill after its construction, especially how to secure the costs, and in this regard, it is essential to involve stakeholders as well.
- Taking the above into account, the project will support the development of a feasibility study for the construction of the landfill and the formulation of an O&M plan.

Attachment: Expert dispatch rec	cord			
Responsibility	Name	Dispatch period	Number of days	Countries
		2022.2.25 - 4.29	64	Saint Lucia, Jamaica
Leader		2022. 8. 5 – 9. 12	39	Guyana, Saint Lucia, Jamaica
/ Solid Waste Management	IVIT. IKUO INIOU	2023.2.22 - 4.4	42	Guyana, Jamaica, Saint Lucia
		2023.9.30 - 10.31	32	Jamaica, Saint Lucia, Guyana
		2022.2.25 - 4.29	64	Saint Lucia, Jamaica
Cut loodan / Calid Wrate		2022.7.26 - 10.3	70	Saint Lucia, Jamaica
Monocomout	Mr. Makoto Yamashita	$2022.\ 10.\ 21 - 11.\ 14$	25	Guyana
Management		2023. 1. 11 - 4. 4	84	Guyana, Saint Lucia
		2023.8.31 - 10.31	62	Saint Lucia, Antigua and Barbuda, Grenada, Guyana
		2022.2.25 - 4.29	64	Saint Lucia, Jamaica
		2022.7.26 - 10.3	89	Saint Lucia, Jamaica
Collection and Turners	Mr. Satoshi	$2022.\ 10.\ 22 - 11.\ 18$	28	Guyana
Collection and transport	Higashinakagawa	2023. 1. 11 - 4. 10	06	Guyana, Saint Lucia
		2023.8.18 - 9.30	44	Guyana
		2023.10.15 - 11.6	23	Guyana
		2022.2.25 - 4.29	64	Saint Lucia, Jamaica
Final Disposal Operation and		2022.7.1 - 10.28	120	Saint Lucia, Jamaica
Maintenance	Mr. Yukihisa Sakata	2023.2.8 - 4.11	63	Saint Lucia, Guyana
		2023.9.2 - 10.7	36	Saint Lucia, Antigua and Barbuda, Grenada
		2023.10.16 - 11.3	19	Guyana, Saint Lucia
Landfill Design	Mr. Osamu Nahata	(Remote work from Japan	I	
		omy)		
Organization and Institution		2022. 2. 25 – 4. 29	64	Saint Lucia, Jamaica
Analveis	Mr. Taisuke Watanabe	2022.7.20 - 9.7	50	Jamaica
cic (imix i		2023.1.24 - 2.17	25	Jamaica
Solid Waste Management	Mr. Paulo Sousa	2023. 10. 15 - 29	15	Guyana